

**VERY IMPORTANT INSTRUCTIONS:**  
**Kindly refer the official communication of the University in the**  
**B.A. R&S file .**

**UNIVERSITY OF MADRAS**  
**M.SC. DEGREE COURSES**  
**CHOICE BASED CREDIT SYSTEM**

**REGULATIONS**  
**(w.e.f. 2008-2009)**

**1. CONDITIONS FOR ADMISSION**

**Vide Appendix-A**

**2. ELIGIBILITY FOR THE AWARD OF DEGREE**

A candidate shall be eligible for the award of the degree only if he/she has undergone the prescribed course of study in a college affiliated to the University for a period of not less than two academic years, passed the examination of all the four semesters prescribed earning 90 credits and fulfilled such conditions as have been prescribed therefor.

**3. DURATION OF THE COURSE**

**Two years Courses:**

The duration of the course is for two academic years consisting of four semesters.

**5 year Integrated Course:**

The Course is for five academic years. The five academic years will be divided into ten semesters with two semesters per year.

**4 EXAMINATIONS**

There shall be four semester examinations: first semester examinations at the middle of the first academic year and the second semester examination at the end of the first academic year. Similarly, the third and fourth semester examinations shall be held at the middle and the end of the second academic year, respectively.

**5. COURSE OF STUDY AND SCHEME OF EXAMINATIONS**

**NAME OF THE COURSE**

- 1) M.Sc. APPLIED ELECTRONICS
- 2) M.SC. APPLIED MICROBIOLOGY
- 3) M.SC. BIOCHEMISTRY
- 4) M.SC. BIOINFORMATICS

- 5) M.SC. BIOTECHNOLOGY
- 6) M.SC BIOTECHNOLOGY & MANAGEMENT
- 7) M.SC. BOTANY
- 8) M.SC. CHEMISTRY
- 9) M.SC. COMPUTER SCIENCE
- 10) M.SC. COMPUTER SCIENCE & TECHNOLOGY (5 YEAR INTEGRATED)\*
- 11) M.SC. ELECTRONIC MEDIA
- 12) M.SC. FOODS SCIENCE NUTRITION AND DIETETICS
- 13) M.SC. FOOD SERVICE MANAGEMENT AND DIETETICS
- 14) M.SC. GENERAL GENETICS
- 15) M.SC. HOTEL AND CATERING MANAGEMENT
- 16) M.SC. INFORMATION TECHNOLOGY
- 17) M.SC. MATHEMATICS
- 18) M.SC. MEDICAL LABORATORY TECHNOLOGY
- 19) M.SC. PHYSICS
- 20) M.SC. VISUAL COMMUNICATION
- 21) M.SC. ZOOLOGY

The scheme of examinations for different semesters shall be as follows:

Vide **APPENDIX-B**

**The following procedure be followed for Internal Marks:**

Theory Papers:	Internal Marks
Best Two tests out of 3	10 marks
Attendance	5 marks
Seminar	5 marks
Assignment	5 marks
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	25 marks
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**Break-up Details for Attendance**

Below 60%	- No marks
60% to 75%	- 3 marks
76% to 90%	- 4 marks
91% to 100%	- 5 marks

Practical:	Internal Marks	40
Attendance		5 marks
Practical Best Test 2 out of 3		30 marks
Record		5 marks

Project:

Internal Marks	Best 2 out of 3 presentations	20 marks
Viva		20 marks
Project Report		60 marks

## **6. REQUIREMENTS FOR PROCEEDING TO SUBSEQUENT SEMESTERS:**

(i) Candidates shall register their names for the First semester examination after the admission in the PG courses.

(ii) Candidates shall be permitted to proceed from the First Semester upto the Final Semester irrespective of their failure in any of the Semester Examination subject to the condition that the candidates should register for all the arrear subjects of earlier semesters along with current (subject) Semester subjects.

(iii) Candidates shall be eligible to proceed to the subsequent semester, only if they earn, sufficient attendance as prescribed therefore by the Syndicate from time to time.

Provided in case of candidate earning less than 50% of attendance in any one of the semester due to any extraordinary circumstance such as medical grounds, such candidates who shall produce Medical Certificate issued by the Authorised Medical Attendant (AMA), duly certified by the Principal of the College, shall be permitted to proceed to the next semester and to complete the course of study. Such candidate shall have to repeat the missed semester by rejoining after completion of final semester of the course, after paying the fee for the break of study as prescribed by the University from time to time.

## **7. PASSING MINIMUM:**

- There shall be no Passing Minimum for Internal.
- For External Examination, Passing Minimum shall be of 50%(Fifty Percentage) of the maximum marks prescribed for the paper.
- In the aggregate (External + Internal) the passing minimum shall be of 50% for each Paper/Practical/Project and Viva-voce.
- Grading shall be based on overall marks obtained (internal + external).

**For M.Sc. Degree Course in Computer Science & Technology (5 year Integrated course)**

**B.Sc. Degree Course in Computer Science and Technology**

A candidate shall be declared to have passed:

- There shall be no Passing Minimum for Internal.

- b) For External Examination, Passing Minimum shall be of 40%(Forty Percentage) of the maximum marks prescribed for the paper for each Paper/Practical/Project and Viva-voce.
- c) In the aggregate (External + Internal) the passing minimum shall be of 40% .
- d) He/She shall be declared to have passed the whole examination, if he/she passes in all the papers and practicals wherever prescribed / as per the scheme of examinations by earning 140 CREDITS in Parts-I, II, III, IV & V. He/she shall also fulfill the extension activities prescribed earning a minimum of 1 Credit to qualify for the Degree.

## 8. CLASSIFICATION OF SUCCESSFUL CANDIDATES:

Candidates who secured not less than 60% of aggregate marks (Internal + External) in the whole examination shall be declared to have passed the examination in the First Class.

All other successful candidates shall be declared to have passed in Second Class.

Candidates who obtain 75% of the marks in the aggregate (Internal + External) shall be deemed to have passed the examination in First Class with Distinction, provided they pass all the examinations (theory papers, practicals, project and viva-voce) prescribed for the course in the First appearance.

## 9. GRADING SYSTEM:

The term grading system indicates a Seven (7) Point Scale of evaluation of the performances of students in terms of marks obtained in the Internal and External Examination, grade points and letter grade.

SEVEN POINT SCALE (As per UGC notification 1998)

GRADE	GRADE POINT	PERCENTAGE EQUIVALENT
`O' = Outstanding	5.50 – 6.00	75 – 100
`A' = Very Good	4.50 – 5.49	65 – 74
`B' = Good	3.50 – 4.49	55 – 64
`C' = Average	3.00 – 3.49	50 – 54
`D' = Below Average	1.50 – 2.99	35 – 49
`E' = Poor	0.50 – 1.49	25 – 34
`F' = Fail	0.00 – 0.49	0 - 24

## 10. RANKING:

Candidates who pass all the examinations prescribed for the course in the first appearance itself alone are eligible for Ranking / Distinction.

Provided in the case of candidates who pass all the examinations prescribed for the course with a break in the First Appearance due to the reasons as furnished in the Regulations under “Requirements for Proceeding to subsequent Semester” are only eligible for Classification.

#### **11. PATTERN OF QUESTION PAPER:**

PART –A (50 words):Answer 10 out of 12 Questions  $10 \times 1 = 10$  marks

PART –B(200 words):Answer 5 out of 7 Questions  $5 \times 5 = 25$  marks

PART –C(500 words):Answer 4 out of 6 Questions  $4 \times 10 = 40$  marks

#### **12. APPEARANCE FOR IMPROVEMENT:**

Candidates who have passed in a theory paper / papers are allowed to appear again for theory paper / papers only once in order to improve his/her marks, by paying the fee prescribed from time to time. Such candidates are allowed to improve within a maximum period of 10 semesters counting from his/her first semester of his/her admission. If candidate improve his marks, then his improved marks will be taken into consideration for the award of Classification only. Such improved marks will not be counted for the award of Prizes / Medals, Rank and Distinction. If the candidate does not show improvement in the marks, his previous marks will be taken into consideration.

candidate will be allowed to improve marks in the Practicals, Project, Viva-voce, Field work.

#### **13. TRANSITORY PROVISION:**

Candidates who have undergone the course of study prior to the academic year 2008-2009 will be permitted to appear for the examinations under those Regulations for a period of three years i.e., up to and inclusive of April/May 2012 Examinations. Thereafter, they will be permitted to appear for the examination only under the Regulations then in force.

#### **\*M.Sc. COMPUTER SCIENCE AND TECHNOLOGY (5 YEAR INTEGRATED)**

##### **Structure of the Course and Evaluation Pattern:**

**If a candidate is unable to continue this course after the sixth semester, he/she will be awarded B.Sc.(Computer Science & Technology) provided he/she has passed in all subjects up to VI Semester.**

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## **APPENDIX-A**

### **CONDITIONS FOR ADMISSIONS:**

#### **1. M.Sc. APPLIED ELECTRONICS**

A Candidate who has passed any one of the following examinations of the university of madras or an examination of this or any other university accepted by the Syndicate of this University as equivalent thereto is eligible for admission:

- (a) B.E.S (Bachelor of Electronics Science)
- (b) B.Sc in Electronics and Communication Science with mathematics as allied subject, and
- (c) B.Sc in Electronics and mathematics as allied subjects.

#### **2. M.Sc. APPLIED MICROBIOLOGY**

The Candidate shall be admitted to the course provided he/she has passed a Bachelor's Degree in Science in Microbiology, Zoology, Botany, Chemistry, Biology, Life Science, Bio-Chemistry, Home Science, Nutrition and Dietetics, B.S.M.S [OR] B.A.M.S [OR] B.U.M.S of this University or of any other University recognized by the Syndicate as equivalent thereto.

Candidate shall be admitted to the examination only if he/she has taken the qualifying degree in Science/ Medical subjects as mentioned after having completed the prescribed courses consisting of twelve years of study and has passed the qualifying examination.

#### **3. M.Sc. BIOCHEMISTRY**

A Bachelor's Degree in science with Biochemistry, Chemistry, Microbiology, Life Sciences, Nutrition and Dietetics as their Main Subject of this University or any other Qualification accepted as equivalent thereto are eligible for admission to M.Sc Degree Course

#### **4. M.Sc. BIOINFORMATICS**

A Candidate with a Bachelor's Degree in Science in the disciplines of Genetics, Biology, Biochemistry, Biotechnology, Physics, Chemistry, Computer Science, Botany, Zoology, Microbiology, Mathematics, Statistics, Nutrition, Foodservice Management & Dietetics, Agriculture, B.E/B.Tech(Biotech), B.V.Sc, MBBS, BDS, B.Pharm BPT & BCA from this University, or an examination of some other University, accepted by the Syndicate as equivalent thereto, shall be permitted to appear and qualify for the M.Sc Bioinformatics Degree examination of this University after a Course of two academic years in an affiliated college of this University.

#### **5. M.Sc. BIOTECHNOLOGY**

A Candidate with a Bachelor's Degree in Science in the disciplines of Biology, Botany, Zoology, Biotechnology, Microbiology, Genetics, Chemistry, Biochemistry, Physics, Agriculture from this University or B.E/B.TECH (Biotech), B.V.Sc, MBBS, BDS or an examination of some other University accepted by the Syndicate as equivalent thereto shall be permitted to appear and qualify for the M.Sc Degree Examination of this University after a course of two academic years in an Affiliated Colleges of this University.

#### **6. M.Sc BIOTECHNOLOGY & MANAGEMENT**

A Candidate who has Bachelor's Degree in Science in the disciplines of Biology, disciplines of Biology, Botany, Zoology, Biotechnology, Microbiology, Genetics, Chemistry, Biochemistry, Physics, Agriculture from this University or B.E/B.TECH (Biotech), B.V.Sc, MBBS, BDS or an examination of some other University accepted by the Syndicate as equivalent thereto shall be permitted to appear and qualify for the M.Sc Degree Examination of this University after a course of two academic years in an Affiliated Colleges of this University.

#### **7. M.Sc. BOTANY**

A Candidates who has passed the B.Sc. Degree Examination in Branch V Botany as main subject of study of this University or an examination of some University accepted as equivalent thereto shall be eligible for admission to the M.Sc Degree in Botany in the Affiliated Colleges of this University.

#### **8. M.Sc. CHEMISTRY**

A Candidates who has passed the B.Sc. Degree Examination in Branch IV Chemistry as main subject of study of this University or an examination of some University accepted as equivalent thereto shall be eligible for admission to the M.Sc Degree in Chemistry in the Affiliated Colleges of this University.

#### **9. M.Sc. COMPUTER SCIENCE**

Candidates with B.Sc. degree in Computer Science or Computer Science & Technology or B.C.A. degree of this University or any other degree accepted as

equivalent thereto by the Syndicate shall be eligible for admission to M.Sc Computer Science Degree Course.

**10. M.Sc. COMPUTER SCIENCE & TECHNOLOGY (5 Year integrated)**

Candidates seeking admission to the first year of the integrated M.Sc. Computer Science and Technology course shall be required to have passed Higher Secondary Examination conducted by Government of Tamil Nadu or an examination accepted as equivalent thereto by the syndicate, with Mathematics & Physics.

**11. M.Sc. ELECTRONIC MEDIA**

A Candidate who has passed any degree examination of this University or an examination of some other University accepted by the Syndicate as equivalent thereto shall be eligible for admission.

**12. M.Sc. FOODS SCIENCE NUTRITION AND DIETETICS**

B.Sc. Nutrition FSM D, B.Sc. CND, B.Sc. Home Science or any Science graduate with PG Diploma in Nutrition and Dietetics/ PG Diploma in Catering Technology

**13. M.SC. FOOD SERVICE MANAGEMENT AND DIETETICS**

B.Sc. Nutrition FSM D, B.Sc. CND, B.Sc. Home Science or any Science graduate with PG Diploma in Nutrition and Dietetics/ PG Diploma in Catering Technology

**14. M.Sc. GENERAL GENETICS**

A candidate who has passed the B.Sc. Degree examination in any branch of Life science / Biological Sciences: B.VSc., B.Sc (Agri) ,B.Pharm,BDS,BPT ,B.SC (Nutrition): Bachelor's Degree in Indian Medicine and MBBS of the University of Madras, or an examination accepted by the Syndicate as equivalent thereto, shall be permitted to appear and qualify for the M.Sc Degree examination of this University after a Course of two academic years in an affiliated college of the University.

**15. M.Sc. HOTEL AND CATERING MANAGEMENT**

Candidates seeking admission to the first year of the Master of Science (full – time) Degree Course in Hotel and Catering Management shall be required to possess a B.Sc Degree in Hotel and Catering Management as main subject of this University or any other university accepted by the Syndicate as equivalent thereto.

**16. M.Sc. INFORMATION TECHNOLOGY**

A Candidates who has passed any Bachelor's degree of not less than three years duration having studied Mathematics or Statistics or Business Mathematics or Business Statistics or Mathematical Physics as Main or Allied subject or any other degree course from any other University accepted as equivalent thereto.



**17. M.Sc. MATHEMATICS**

A candidate who has passed the B.Sc., degree examination in Branch I Mathematics or B.Sc., Applied Sciences of this University or an examination of some other University accepted by the Syndicate as equivalent thereto shall be permitted to appear and qualify for the Master of Science (M.Sc.) Degree Examination of this University after a course of two academic years in the University Department /colleges affiliated to the University of Madras.

**18. M.Sc. MEDICAL LABORATORY TECHNOLOGY**

A Bachelor's Degree in science with Biochemistry, Chemistry, Microbiology, Life Sciences, Nutrition and Dietetics as their Main Subject of this University or any other Qualification accepted as equivalent thereto are eligible for admission to M.Sc Degree Course

**19. M.Sc. PHYSICS**

A candidate who has passed the B.Sc Degree Examination in branch III Physics main with Mathematics as one of the ancillary subjects or B.sc Applied Science of this University with Mathematics as one of the ancillary subjects or an examination of some other University accepted by the Syndicate as equivalent thereto shall be eligible for admission to M.Sc Degree course in Br.III Physics.

**20. M.Sc. VISUAL COMMUNICATION**

A Candidate who has passed any degree examination of this University or an examination of some other University accepted by the Syndicate as equivalent thereto shall be eligible for admission.

**21. M.Sc. ZOOLOGY**

A candidate who has passed the B.Sc Degree Examination in branch VI Zoology or Advanced Zoology & Biotechnology Main of this University or an examination of some other University accepted by the Syndicate as equivalent thereto shall be admitted to appear and qualify for the M.Sc. Degree examination of this University after a course of two academic year (4 semester) in an affiliated college of this University.

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# 1. M. Sc. DEGREE COURSE IN APPLIED ELECTRONICS

## FIRST YEAR

### I SEMESTER:

Sl. No	Course Components	Subjects	Credits	Max. Marks	
				CIA	External
1.	Core – 1	Physics of Electronics Materials	4	25	75
2.	Core – 2	Mathematical Methods	4	25	75
3.	Core – 3	Advanced Digital Electronics	4	25	75
4.	Core – 4	Practical – I Applied Electronics	4	40	60
5.	Elective – 1 (within the Dept)	Analog Circuit Design	3	25	75
6.	Elective – 2 (Extra disciplinary)	(one of the elective offered by either computer sciences or physics department)	3	25	75

### II Semester:

Sl. No	Course Components	Subjects	Credits	Max. Marks	
				CIA	External
1.	Core – 5	Electromagnetic Theory and Electromagnetics	4	25	75
2.	Core – 6	Quantum and Opto Electronics	4	25	75
3.	Core – 7	Electronics Instrumentation	4	25	75
4.	Core – 8	Practical – II Computational Methods – C/C++ Programming	4	40	60
5.	Elective – 3 (within the Dept)	Wireless and Fiber Optics Communication	3	25	75
6.	Elective – 4 (Extra disciplinary)	Numerical Methods and Programming	3	25	75

## 2. M.Sc. DEGREE COURSE APPLIED MICROBIOLOGY

Sl. No.	Semester	Course Components	Name of the Subjects	Credit	Max. Marks	
					CIA	External
1.	I	Core	Microbial Taxonomy	4	25	75
2.	I	Core	General Microbiology and Laboratory Animal Science	4	25	75
3.	I	Core	Immunology	4	25	75
4.	I	Core	Practicals - I * General Microbiology, Physiology and Immunology	4	40	60
5.	I	Elective - I	Metabolic Pathways	3	25	75
6.	I		Soft Skills	2		
7.	II	Core	Virology	4	25	75
8.	II	Core	Systematic Medical Bacteriology	4	25	75
9.	II	Core	Mycology and Parasitology	4	25	75
10.	II	Core	Practicals - II * Systematic Bacteriology, Mycology, Parasitology and virology	4	40	60
11.	II	Elective - II	Biostatistics and Bioinformatics	3	25	75
12.	II		Soft Skills	2		

\* University Practical Examinations will be conducted in every semester only.

### 3. M.SC. DEGREE COURSE IN BIO- CHEMISTRY

#### COURSE OF STUDY AND SCHEME OF EXAMINATION

#### FIRST SEMESTER

S. No	Course components	Name of Course	Inst. Hours	Credits	Exam Hours	Max. Marks	
						CIA	External
1.	Core -1	Chemistry of Biomolecules	6	4	3	25	75
2.	Core -2	Biochemical techniques	6	4	3	25	75
3.	Core -3	Practical - I	6	4	6	40	60
4.	Elective-1	Human Physiology	6	3	3	25	75
5.	Elective -2	Nutritional Biochemistry	6	3	3	25	75

#### SECOND SEMESTER

S. No	Course components	Name of Course	Inst. Hours	Credits	Exam.Hours	Max. Marks	
						CIA	External
6.	Core - 4	Enzyme technology	6	4	3	25	75
7.	Core - 5	Intermediary metabolism-I	6	4	3	25	75
8.	Core - 6	Intermediary metabolism-II	6	4	3	25	75
9.	Core - 7	Practical II	6	4	6	40	60
10.	Elective - 3 Extra Disciplinary	Essentials of Biochemistry	6	3	3	25	75

#### 4. M.Sc. DEGREE COURSE IN BIOINFORMATICS

##### FIRST SEMESTER

S. No	Course Components	Name of Course	Inst. hours	Credits	Exam (Hours)	Max marks	
						CIA	Ext
1	Paper 1 Core	Biochemistry	6h	4	3h	25	75
2	Paper 2 Core	Biophysical Chemistry	6h	4	3h	25	75
3	Paper 3 Core	Biostatistics	6h	4	3h	25	75
4	Paper 4 Core	Theory and Practice of Computer Science and Programming (Practicals)	6h	4	3h	25	75
5	Paper 5 Elective	*Cell Biology / Introduction to Mathematical Methods	6h	3	3h	25	75
6	Soft Skill			2	3h		

\* **Cell Biology** to be taken compulsorily by students with a B.Sc in Maths, Physics, Computer Science, Chemistry and BE

**Introduction to Mathematical Methods** to be taken compulsorily by students with B.Sc in any branch of Life Sciences, BDS, MBBS, M.VSc, B.Pharm

## SECOND SEMESTER

S. No	Course Components	Name of Course	Inst. hours	Credits	Exam (Hours)	Max marks CIA Ext	
7	Paper 6 Core	Introduction to Bioinformatics	6h	4	3h	25	75
8	Paper 7 Core	Molecular Biology and Biotechnology	6h	4	3h	25	75
9	Paper 8 Core	Biochemistry and Molecular Biology Lab (Practicals)	6h	4	6h	25	75
10	Paper 9 Core	Theory and Practice of Computer Programming-PERL and CGI (Practicals)	6h	4	3h	25	75
11	Paper 10 Elective	Programming in JAVA	6h	3	3h	25	75
12	Paper 11 Elective (Other Departments)	Basics of Computer-aided drug design	6h	3	3h	25	75
13	Soft Skill			2	3h		
14	Internship			2			

## 5. M.SC DEGREE COURSE IN BIOTECHNOLOGY

### Course of Study and Scheme of Examination:

#### First Semester

S . No.	Course Components	Name of Course	Semester	Inst. Hours	Credits	Exam HRS	Max. Marks	
							CIA	External
1.	Paper-1 Core	Biochemistry and Biomolecules	I	4	4	3	25	75
2.	Paper-2 Core	Molecular Genetics	I	4	4	3	25	75
3.	Paper-3 Core	Molecular Cell Biology	I	4	4	3	25	75
4.	Paper-4 Core Practical	Practical I – (A) Biochemistry & Biomolecules (B) Molecular Genetics (C) Molecular Cell Biology	I	10	4	6	40	60
5.	Paper-5 Elective	Biophysics and Biostatistics	I	3	3	3	25	75
6.	Paper-6 Elective	Molecular Developmental Biology	I	3	3	3	25	75
7.		Soft Skill - I	I	2	2	3	25	75
<b>Total Credits : 24</b>								

## Second Semester

S. No.	Course Components	Name of Course	Semester	Inst. Hours	Credits	Exam HRS	Max. Marks	
							CIA	External
8.	Paper-7 Core	Plant Biotechnology	II	4	4	3	25	75
9.	Paper-8 Core	Genetic Engineering	II	4	4	3	25	75
10.	Paper-9 Core	Microbiology and Immunology	II	4	4	3	25	75
11.	Paper-10 Core Practical	Practical II – (A) Plant Biotechnology (B) Genetic Engineering (C) Microbiology and Immunology	II	10	4	6	40	60
12.	Paper-11 Elective	Introduction to Bioinformatics and Computer Applications	II	3	3	3	25	75
13.	Paper-12 Elective	Pharmaceutical Biotechnology	II	3	3	3	25	75
14.		Soft skill - II	II	2	2	3	25	75
Total credits: 24								



## 6. M.Sc. DEGREE COURSE IN BIOTECHNOLOGY AND MANAGEMENT

**Course of Study and Scheme of Examination:**

**First Semester**

S . No.	Course Components	Name of Course	Semester	Inst. Hours	Credits	Exam HRS	Max. Marks	
							CIA	External
1.	Paper-1 Core	Biochemistry and Biomolecules	I	5	4	3	25	75
2.	Paper-2 Core	Management Principles	I	5	4	3	25	75
3.	Paper-3 Core	Molecular Genetics	I	5	4	3	25	75
4.	Paper-4 Core Practical	Practical I – Biochemistry &  Biomolecules Molecular Genetics	I	5	4	6	40	60
5.	Paper-5 Elective	Biophysics and Biostatistics	I	4	3	3	25	75
6.	Paper-6 Elective	Molecular Developmental Biology	I	4	3	3	25	75
7.		Soft Skill - I	I	2	2	3	25	75
<b>Total Credits : 24</b>								

## Second Semester

S. No.	Course Components	Name of Course	Semester	Inst. Hours	Credits	Exam HRS	Max. Marks	
							CIA	External
8.	Paper-7 Core	Plant Biotechnology	II	5	4	3	25	75
9.	Paper-8 Core	Marketing Management	II	5	4	3	25	75
10.	Paper-9 Core	Genetic Engineering	II	5	4	3	25	75
11.	Paper-10 Core Practical	Practical II – (A) Plant Biotechnology (B) Genetic Engineering	II	5	4	6	40	60
12.	Paper-11 Elective	Immunology	II	4	3	3	25	75
13.	Paper-12 Elective	Pharmaceutical Biotechnology	II	4	3	3	25	75
14.		Soft skill - II	II	2	2	3	25	75
<b>Total credits: 24</b>								

## 7. M.Sc. DEGREE COURSE IN BOTANY

### I SEMESTER

SEME STER	Paper	Title of the paper	Credit	Exa m Hrs	Marks	
					CIA	Ext
I	I	Plant Diversity- I- Phycology, Mycology, Lichens and Bryology	4	3	25	75
I	II	Plant Diversity- II – Pteridophytes, Gymnosperms and Paleobotany	4	3	25	75
I	III	Plant Diversity – III- Taxonomy and Economic Botany of Angiosperms	4	3	25	75
I	IV	<b><i>Elective 1- Microbiology</i></b>	3	3	25	75
I	V	<b>Practical-I Covering Theory Papers I and II</b>	4	4	40	60
I	VI	<b>Practical 2- Covering Theory Paper- III</b>	4	4	40	60
I	-	<b>Soft Skilled course 1</b>	1X2=2	3	25	75

### II SEMESTER

SEME STER	Paper	Title of the paper	Credit	Exa m Hrs	Marks	
					CIA	Ext
II	VII	Environmental Botany, Phytogeography and Remote Sensing	4	3	25	75
II	VIII	Developmental Botany- Anatomy and Embryology Palynology of Angiosperms	4	3	25	75
II	IX	<b><i>Elective-II Wood Technology</i></b>	3	3	25	75
II	X	<b><i>Elective -III- Plant Research Methodology</i></b>	3	3	25	75
II	XI	<b>Practical- III Covering Theory Papers VII and VIII</b>	4	4	40	60
II	---	<b>Soft Skilled courses 2,</b>	2	3	25	75
		<b>Soft Skilled courses 2,</b>	2	3	25	75

## 8. M.Sc DEGREE COURSE IN CHEMISTRY

### FIRST SEMESTER

Sl. No.	Course Components	Subjects	Semester	Inst. Hours	Credits	Hrs.	Max. Marks	
							CIA	External
1	Core	Organic Chemistry-I	I	6	4	3	25	75
2	Core	Inorganic Chemistry-I	I	6	4	3	25	75
3	Core	Physical Chemistry-I	I	6	4	3	25	75
4	Core	Inorganic Chemistry Practical	I		3	6	40	60
5	Elective	Chromatographic Techniques	I	6	3	6	25	75
6	Elective	Bioorganic Chemistry	I	6	3	6	25	75
7	Soft Skill		I		2			

### SECOND SEMESTER

Sl. No.	Course Components	Subjects	Semester	Inst. Hours	Credits	Hrs.	Max. Marks	
							CIA	External
1	Core	Organic Chemistry-II	II	6	4	3	25	75
2	Core	Inorganic Chemistry-II	II	6	4	3	25	75
3	Core	Physical Chemistry-II	II	6	4	3	25	75
4	Core	Organic Chemistry Practical	II		3	6	40	60
5	Elective	Analytical Techniques in Chemistry	II	6	3	6	25	75
6	Elective	Bioinorganic Chemistry	II	6	3	6	25	75
7	Soft Skill				2			

## 9. M.SC. DEGREE COURSE IN COMPUTER SCIENCE

### First Semester

S.No.	Course components	Name of Course	Credits	Exam. Duration	Max. Marks	
					IA	UE
1	Core -1	Design and Analysis of Algorithms	4	3	25	75
2	Core -2	Advanced Java Programming	4	3	25	75
3	Core -3	Systems Software	4	3	25	75
4	Core – 4	Practical – I: Advanced Java Programming Lab	2	3	40	60
5	Core – 5	Practical – II: Operating Systems Lab.	2	3	40	60
6	Non-Major Elective - 1	Theoretical Foundations of Computer Science	4	3	25	75
7	SoftSkill-1		2	3		

### Second Semester

S.No.	Course components	Name of Course	Credits	Exam. Duration	Max. Marks	
					CIA	UE
8	Core-6	Computer Networks	4	3	25	75
9	Core-7	Distributed Database Systems	4	3	25	75
10	Core-8	Practical – III: RDBMS lab.	2	3	40	60
11	Elec – 1	Elective – I	3	3	25	75
12	Elec -2	Practical – IV: Based on Elective –I	2	3	40	60
13	Non-Major Elective - 2	Bio-informatics	3	3	25	75
14	SoftSkill-2		2	3		
15	SoftSkill-3		2	3		

Elective - I

Multimedia Systems OR Network Programming OR Windows Programming

## 10. M.Sc. DEGREE COURSE IN COMPUTER SCIENCE AND TECHNOLOGY (FIVE YEAR INTEGRATED COURSE)

### I Semester

Subject code	Name of the Subject	Credits
Part –I, Paper I	Language – I*	3
Part – II, Paper I	English - I*	3
Allied–I: Paper I	Mathematics – I	5
Allied–II: Paper I	Applied Physics – I	5
Core –Paper I	Fundamentals of Digital Computers	4
Non Major Elective / VI Tamil for non Tamil Students		2
Soft Skill		2

### II Semester

Subject code	Name of the Subject	Credits
Part –I, Paper II	Language – II*	3
Part– II, Paper II	English - II*	3
Allied–I: Paper II	Mathematics – II	5
Allied–II: Paper II	Applied Physics – II	5
Core –Paper I	Practical – I: Digital Lab	4
Non Major Elective / VI Tamil for non Tamil Students		2
Soft Skill		2

\* Syllabus for Language I, II and English I & II shall be followed as prescribed for B.Com./B.C.A.

## 11. M. Sc. DEGREE COURSE IN ELECTRONIC MEDIA

Course Code	Title of the Course	C/E/S	Credit
<b>Semester I</b>			
Core 1	Introduction to Human Communication	C	4
Core 2	Television Production	C	4
Core 3	Writing for Media	C	4
Core 4	Videography	C	4
Elective 1	Media Aesthetics	E	3
Elective 2	Indian Cinema	E	3
Soft Skills	Soft Skills	S	2
<b>Semester II</b>			
Core 5	Film Language	C	4
Core 6	Story Development & Scriptwriting	C	4
Core 7	Audio & Video Editing	C	4
Core 8	Radio Production	C	3
Elective 3	Visual Culture in India	E	3
Elective 4	World Cinema	E	3
Soft Skills	Soft Skills	S	2

## 12. M.Sc. DEGREE COURSE IN FOOD SCIENCE NUTRITION AND DIETETICS

### FIRST SEMESTER

S. No	COURSE COMPONENTS	NAME OF COURSE	SEMESTER	INST. HOURS	CREDITS	EXAM HRS	MAX MARKS	
							CIA	EXTERN
1	CORE	PAPER I APPLIED STATISTICS*	I	6 HRS	4	3	25	75
2	CORE	PAPER-II ADVANCED HUMAN PHYSIOLOGY**	I	6 HRS	4	3	25	75
3	CORE	PAPER III ADVANCED FOOD SCIENCE**	I	6 HRS	4	3	25	75
4	CORE	PAPER IV BIOCHEMISTRY	I	6 HRS	4	3	25	75
5	CORE	PAPER V COMMUNITY NUTRITION**	I	6 HRS	4	3	25	75

### SECOND SEMESTER

S. No	COURSE COMPONENTS	NAME OF COURSE	SEMESTER	INST. HOURS	CREDITS	EXAM HRS	MAX MARKS	
							CIA	EXTERN
6	CORE	PAPER I RESEARCH METHODOLOGY*	II	6 HRS	4	3	25	75
7	CORE	PAPER VII LABAROTARY TECHNIQUES PRACTICAL	II	6 HRS	6	3	25	75
8	CORE	PAPER VIII NUTRITION THROUGH LIFE CYCLE****	II	6 HRS	4	3	25	75
9	ELECTIVE INTER DISCIPLINARY	PAPER IX FOOD MICROBIOLOGY***	II	6 HRS	3	3	25	75
10	EXTRA DISCIPLINARY	PAPER X EXPERIMENTAL FOODS**		6 HRS	3	3	25	75



### 13. M.Sc. FOOD SERVICE MANAGEMENT AND DIETETICS

#### FIRST SEMESTER

SL NO		NAME OF COURSE	SEMESTER	INST. HOURS	CREDITS	EXAM HRS	MAX MARKS	
							CIA	EXTERNAL
1	CORE	PAPER I APPLIED STATISTICS*	I	6 HRS	4	3	25	75
2	CORE	PAPER II ADVANCED HUMAN PHYSIOLOGY **	I	6 HRS	4	3	25	75
3	CORE	PAPER III ADVANCED FOOD SCIENCE **	I	6 HRS	4	3	25	75
4	CORE	PAPER IV FINANCIAL AND MARKETING MANAGEMENT	I	6 HRS	4	3	25	75
5	CORE	PAPER V COMMUNITY NUTRITION**	I	6 HRS	4	3	25	75

#### SECOND SEMESTER

SL NO		NAME OF COURSE	SEMESTER	INST. HOURS	REDITS	EXAM HOURS	MAX MARKS	
							CIA	EXTERNAL
6	CORE	PAPER VI RESEARCH METHODOLOGY*	II	6 HRS	4	3	25	75
7	CORE	PAPER VII FOOD FACILITIES LAY OUT EQUIPMENT	II	6 HRS	4	3	25	75
8	CORE	PAPER VIII NUTRITION THROUGH LIFE CYCLE****	II	6 HRS	4	3	25	75
9	ELECTIVE INTER DISCIPLINARY	PAPER IX FOOD MICROBIOLOGY** *	II	6 HRS	3	3	25	75
10	EXTRA DISCIPLINARY	PAPER X EXPERIMENTAL FOODS**	II	6 HRS	3	3	25	75

**14. M.SC. DEGREE COURSE IN GENERAL GENETICS**  
**FIRST SEMSESTER**

S. No	COURSE COMPONENTS	NAME OF COURSE	SEMESTER	INST. HOURS	CREDITS	HRS.	MAX. MARKS	
							CIA	EXTERNAL
1	CORE 1	Paper I Cell Biology	I	6 HRS.	4	3	25	75
2	CORE 2	Paper II Microbial Genetics	I	6 HRS.	4	3	25	75
3	CORE 3	Paper III Eukaryotic Genetics	I	6 HRS.	4	3	25	75
4	CORE 4	Paper IV Molecular Genetics	I	6 HRS.	4	3	25	75
5	CORE 5	Paper V Practical I	I	6 HRS.	4	3	40	60
6	ELECTIVE 1 EXTRA DISCIPLINARY	Paper VI Principles of Biochemistry	I	6 HRS.	3	3	25	75
7	SOFT SKILL		I		2			

**SECOND SEMSESTER**

S. No	COURSE COMPONENTS	NAME OF COURSE	SEMESTER	INST. HOURS	CREDITS	HRS.	MAX. MARKS	
							CIA	EXTERNAL
8	CORE 6	Paper VIII Population Genetics	II	6 HRS.	4	3	25	75
9	CORE 7	Paper IX Human Genetics I	II	6 HRS.	4	3	25	75
10	CORE 8	Paper X Eco Genetics	II	6 HRS.	4	3	25	75
11	CORE 9	Paper XI Practical II	II	6 HRS.	4	3	40	60
12	ELECTIVE 2	Paper XII Principles of Immunology	II	6 HRS.	5	3	25	75
13	ELECTIVE 3 EXTRA DISCIPLINARY	Paper XIII Biostatistics	II	6 HRS.	3	3	25	75
14	SOFT SKILL		II		2			

## 15. M.Sc HOTEL AND CATERING MANAGEMENT

### First Semester

Sl. No.	Course Components	Name of Course	Sem .	Inst. Hours	Credits	Exam HRS	Max. Marks	
							CIA	External
1.	Paper – 1 Core	Food and Beverage Controls	I	6	4	3	25	75
2.	Paper – 2 Core	Tourism Management	I	6	4	3	25	75
3.	Paper – 3 Core	Business Communication	I	6	4	3	25	75
4.	Paper – 4 Core	Facility Management	I	6	4	3	25	75
5.	Paper -5 Core	Advanced Food Production Management	I	6	4	3	25	75
6.	Paper – 6 Practical	Advanced Food Production	I	4	3	3	25	75
7.	Paper – 7 Practical	Advanced Food and Beverage Service	I	4	3	3	25	75
8.	Paper – 8	Soft Skill – I	I	2	2	3	25	75
Total Credits : 28								

### Second Semester

Sl. No.	Course Components	Name of Course	Sem.,	Inst. Hours	Credits	Exam HRS	Max. Marks	
							CIA	External
9.	Paper – 9 Core	Eco Tourism	II	6	4	3	25	5
10.	Paper – 10 Core	Human Resource Management & Legal Systems	II	6	4	3	25	5
11.	Paper – 11 Core	Advanced Accommodation Management	II	6	4	3	25	5
12.	Paper – 12 Core	Hospitality Management	II	6	4	3	25	5
13.	Paper -13 Allied	Extra Disiplinary	II	6	4	3	25	5
14.	Paper – 14 Practical	Accommodation Operations	II	4	3	3	25	5
15.		Soft Skill – II	II	2	2	3	25	5
Total Credits : 25								

## 16. M.Sc. DEGREE COURSE IN INFORMATION TECHNOLOGY

### First Semester

S.No.	Course components	Name of Course	Credits	Exam. Duration	Max. Marks	
					CIA	UE
1	Core -1	C++ and Data Structures	4	3	25	75
2	Core -2	Computer Architecture	4	3	25	75
3	Core -3	Database Management Systems	4	3	25	75
4	Elec-1	Elective -I	4	3	25	75
5	Core -4	Practical – I: Data Structures Lab. Using C++	2	3	40	60
6	Core -5	Practical – II : RDBMS Lab.	2	3	40	60
7	Soft Skill-1		2	3	25	75

### Second Semester

S.No.	Course components	Name of Course	Credits	Exam. Duration	Max. Marks	
					CIA	UE
7	Core -6	Operating Systems	4	3	25	75
8	Core -7	Programming in Java	4	3	25	75
9	Elec-2	Elective – II	3	3	25	75
10	Elec-3	Elective – III	3	3	25	75
12	Core-8	Practical – III: Java Programming Lab.	2	3	40	60
13	Elec -4	Practical – IV: Lab. Based on Elective III	2	3	40	60
	Soft Skill-2		2	3	25	75
	Internship Training		2	3	25	75

#### List of Electives

##### Elective – I

Visual Programming OR E-Commerce OR Programming in C

##### Elective -II

Software Engineering OR Data Warehousing and Data Mining OR Software Testing

##### Elective III

Internet Technology OR Network Programming OR Windows Programming

##### Elective – IV

Practical IV: Based on Elective -III

## 17. M.SC. DEGREE COURSE IN MATHEMATICS

### Scheme of Examinations:

Code	Category	Paper	Title of the Paper	Marks		Durati on for UE	Credits
				CIA	UE		
Semester –I							
	Core	I	Algebra-I	25	75	3 Hrs	4
	Core	II	Real Analysis-I	25	75	3 Hrs	4
	Core	III	Ordinary Differential Equations	25	75	3 Hrs	4
	Core	IV	Graph Theory	25	75	3 Hrs	4
	Elective	V	Elective-I (Choose one from Group-A)	25	75	3 Hrs	4
	Soft skills	VI	Skill based course-I	25	75	3 Hrs	2

<b>Semester-II</b>							
	Core	VII	Algebra-II	25	75	3 Hrs	4
	Core	VIII	Real Analysis- II	25	75	3 Hrs	4
	Core	IX	Partial Differential Equations	25	75	3 Hrs	4
	Core	X	Probability Theory	25	75	3 Hrs	4
	Elective	XI	Elective-II (Choose one from Group B)	25	75	3 Hrs	4
	Soft skill	XII	Skill based course - II	25	75	3 Hrs	2
	Soft skill	XIII	Summer internship				2

### Elective - I (Semester I)

Any one of the following courses from Group-A shall be chosen as an Elective-I for Semester I.

### Group-A:

1. Formal languages and Automata theory
2. Fuzzy sets and applications
3. Mathematical Economics
4. \*Programming in C++ and Numerical methods

**Elective-II (Semester II)**

Any one of the following courses from Group-B shall be chosen as an Elective-II for Semester II.

**Group-B:**

5. Discrete Mathematics
6. Mathematical Programming
7. Wavelets
8. \*Java Programming

## 18. M.Sc. DEGREE COURSE IN MEDICAL LABORATORY TECHNOLOGY

### FIRST SEMESTER

S. No	Course components	Name of Course	Inst. Hours	Credits	Exam Hours	Max. Marks	
						CIA	External
1.	Core - 1	Basics in Human Anatomy and Physiology	6	4	3	25	75
2.	Core - 2	Biochemistry	6	4	3	25	75
3.	Core - 3	Biochemistry Practical I	6	4	6	40	60
4.	Elective- 1	General Chemistry	5	3	3	25	75
5.	Elective- 2	Nutritional Biochemistry	5	3	3	25	75

### SECOND SEMESTER

S. No	Course components	Name of Course	Inst. Hours	Credits	Exam Hours	Max. Marks	
						CIA	External
1.	Core - 4	Clinical Biochemistry	6	4	3	25	75
2.	Core - 5	Immunology	6	4	3	25	75
3.	Core – 6	Clinical Biochemistry Practical II	6	4	6	40	60
4.	Elective- 3	Endocrinology	5	3	3	25	75
5.	Elective- 4 (ED)	Basics in Physiology	5	3	3	25	75
7	Summer Internship			2			



## 19. M.Sc. DEGREE COURSE IN PHYSICS

### FIRST SEMESTER

S. NO	COURSE COMPONENTS	NAME OF COURSE	SEMESTER	INST. HOURS	CREDITS	HRS	MAX MARKS	
							CIA	EXTERNAL
1	CORE	PAPER 1 - MATHEMATICAL PHYSICS	I	6 HRS	4	3	25	75
2	CORE	PAPER 2 – CLASSICAL MECHANICS AND RELATIVITY	I	6 HRS	4	3	25	75
3	CORE	PAPER 3 - QUANTUM MECHANICS-I	I	6 HRS	4	3	25	75
4	CORE	PAPER 4 – INTEGRATED ELECTRONICS AND MICROPROCESSOR 8085	I	6 HRS	4	3	25	75
5	CORE	PAPER 5 - PRACTICAL-I *	I	6 HRS	4		40	60

### SECOND SEMESTER

S. NO	COURSE COMPONENTS	NAME OF COURSE	SEMESTER	INST. HOURS	CREDITS	HRS	MAX MARKS	
							CIA	EXTERNAL
6	CORE	PAPER 6 – QUANTUM MECHANICS –II	II	6 HRS	4	3	25	75
7	CORE	PAPER 7 – ELECTROMAGNETIC THEORY AND PLASMA PHYSICS	II	6 HRS	4	3	25	75
8	CORE	PAPER 8 – PRACTICAL - II*	II	6 HRS	4		40	60
9	ELECTIVE - I	PAPER 9	II	6 HRS	4	3	25	75
10	ELECTIVE- II	PAPER 10	II	6 HRS	4	3	25	75

## 20. M.Sc. DEGREE COURSE IN VISUAL COMMUNICATION

Course Code	Title of the Course	C/E/S	Credit
<b>Semester I</b>			
Core 1	Introduction to Human Communication	C	4
Core 2	Visualization & Storyboard	C	4
Core 3	Principles of Animation	C	4
Core 4	Computer Graphics & Animation-I (3D Max, Maya)	C	4
Elective 1	Media Aesthetics	E	3
Elective 2	Indian Cinema	E	3
Soft Skills	Soft skills	S	2
<b>Semester II</b>			
Core 5	Film Language	C	4
Core 6	Story Development & Scriptwriting	C	4
Core 7	Computer Graphics & Animation-II Designing with Maya	C	4
Core 8	Character Animation & Camera Techniques	C	3
Elective 3	Visual Culture in India	E	3
Elective 4	World Cinema	E	3
Soft Skills	Soft skills	S	2

## 21. M.Sc. DEGREE COURSE IN ZOOLOGY

### SCHEME OF EXAMINATIONS

#### Semester I

Sl. No.	Core/Elective/EDP	Name of the Course	Credits	Marks	
				Ext	Int
1.	Core	Animal Biochemistry	5	75	25
2.	Core	Cell and Molecular biology	4	75	25
3.	Core	Genetics	4	75	25
4.	Core	Lab Course I	4	75	25
5.	Elective	Elective I	3	75	25

#### Semester II

Sl. No.	Core/Elective/EDP	Name of the Course	Credits	Marks	
				Ext	Int
6.	Core	Biochemistry and Biophysics	4	75	25
7.	Core	Animal Physiology	5	75	25
8.	Core	Environmental Biology and Evolution	5	75	25
9.	Core	Lab Course II	4	75	25
10	Elective	Elective II	3	75	25
11.	EDP I	Biostatistics	3	75	25

#### Electives\*

Fishery Biology

Entomology

Endocrinology

Toxicology

Sericulture

Costal Ecosystem

Aquaculture

\* Colleges offering M.Sc. Zoology can choose any FIVE electives from the list given.

# **1. M.SC DEGREE COURSE IN APPLIED ELECTRONICS**

## **SYLLABUS**

### **PAPER I: PHYSICS OF ELECTRONICS MATERIALS**

#### **COURSE OUTLINE**

##### **UNIT 1 CRYSTAL LATTICES:**

Crystalline Periodicity - Bravais lattice and primitive vectors – Details of simple, body-centered and face-centered cubic lattices – Primitive cell – Wigner-Seitz cell and conventional cell – Crystals structures and lattice and with bases – Hexagonal, close-packed and diamond structures – Sodium chloride, Cesium chloride and Zinc blend structures. Diffraction by crystals Lattice planes and Miller indices – Braggs and Laue formalisms - Reciprocal lattice and diffraction – First Brillouin zone — Laue method and Crystal plane orientation – Crystal defects and dislocations: an overview of the types of defects of 0,1 and 2 dimensions.

##### **UNIT 2 CRYSTAL GROWTH AND THIN FILM GROWTH**

Elementary ideas in crystal growth – Melt growth – Zone refining – Non-melt techniques – chemical transports.

Thin films: Concepts of thin film growth techniques – Evaporation, sputtering, Vapour deposition – Epitaxial growth – Lattice matching – Vapour phase epitaxy – MBE – Structural features and influence of defects – Metal silicide films and applications – Diffusion in polycrystalline thin films – Electro migration in conductor films – Barrier layers – Dielectric layers of SiO<sub>2</sub>, SiN – Thin oxide layers.

##### **UNIT 3 ELEMENTS OF BAND THEORY OF SOLIDS AND SEMICONDUCTOR MATERIALS**

Electrical conductivity in metals– Concept of free electron model – Periodic lattice and Bloch's theorem – Brillouin zones – Fermi surfaces – Density of states – Energy band model and Band gap – Classification of metallic, semiconducting insulating materials– Impurities and conductivity - Elemental semiconductors – Group IV materials – Diffusion in Si – Chemical doping – Compound semiconductors: III-V & II-VI compounds – Semiconducting properties and applications of: Gallium arsenide, Indium Phosphide and Antimonide - Isomorphous systems – Sulfide, and telluride of cadmium and lead for special applications - Ternary compound semiconductor Hg<sub>1-x</sub>Cd<sub>x</sub>Te – Semiconducting oxides – ZnO and MgO .

#### **UNIT 4 DIELECTRIC MATERIALS, INSULATING AND ACTIVE DIELECTRICS:**

Polarization – Local Field – Dielectric constant and polarisability – Behaviors of Dielectric materials in an AC Field – Energy loss.

- A. Insulating dielectrics: Synthetic liquids – Polymers – Fibrous materials, mica and mica materials.
- B. Ferroelectrics: Classification – Ferro electric capacitors and semiconductors – Dopant effects in barium titanate.
- C. Piezoelectrics: Ceramics and single crystals.  
Pyroelectrics: Quartz, niobate and tantalite of lithium – Electrets – Liquids crystals.

#### **UNIT 5 MAGNETIC MATERIALS AND OPTOELECTRONIC MATERIALS**

- A. Magnetic materials: Classification of magnetic materials – Soft and hard magnetic materials – Applications – Ferrites: Production and applications in electronics – Magnetic films – Magnetic recording materials – Amorphous magnets – Dilute magnetic semiconductors (an overview only).
- B. Optoelectronic materials: Optical band gap - Materials for light emitting devices – Semiconductor compounds like GaP, ZnS, CdS, GaN, AlAs for optoelectronics – Junctions in luminescent devices – Laser materials – Materials for light detecting devices – Overview of ternary systems HgCdTe, PbSnTe, , GaInAs.

#### **BOOKS FOR STUDY:**

1. A.J. Decker, 1986, Solid State Physics, Macmillan India.
2. C. Kittel, 1996, Introduction to Solid State Physics, 7<sup>th</sup> Ed., Wiley. NT.
1. S.O. Pillai, 2002, Solid State Physics, 5<sup>th</sup> Ed., New Age International, New Delhi.
2. S.O. Pillai, 1994, Problems and Solutions to Solid State Physics, New Age International, New Delhi.
3. B.M. Tareev, and P.S. Ivanov, 1980, Electrical and Radio Engineering Materials, MIR Publishers.
4. C.R.M. Gravenor, 1989, Microelectronic Materials, Graduate Students Series in Materials Science and Engineering, B. Cantor (Editor) Adam Hilger, Bristol.

#### **BOOKS FOR REFERENCE:**

1. A.J. Dekker, Electrical Engineering Materials, Prentice-Hall of India.
2. A.G. Mines, Semiconducting Devices and Integrated Electronics, Van Nostrand Reinhold, NY.
3. D.M. Martin, 1967, Magnetism in Solids, London Iliffe Books.
1. Anderson, Dielectrics, Benjamin Publishers.

2. E.P. O'Reilly, 2002, Quantum Theory of Solids, Taylor & Francis, London.
3. D.K. Schroder, 1990, Semiconductor Material and Device Characterization, Wiley NY.
4. M.A. Wahab, 1999, Solid State Physics, Narosa, New Delhi.

## **PAPER II – MATHEMATICAL METHODS**

### **The students will**

- i) learn the necessary mathematical techniques for analyzing electrical networks.
- ii) Understand the use of basic mathematical functions and advanced techniques useful in the analysis of electronic devices.
- iii) be able to apply Fourier and Laplace transforms in the field of digital signal processing.
- iv) be able to apply probability distributions in process control and quality control, and
- v) learn the set theory, which is the basis of computational science.

## **COURSE OUTLINE**

### **UNIT 1 COMPLEX VARIABLES:**

Analytic functions – Cauchy-Riemann conditions – Laplace equation in two dimensions – Expression for  $\exp z$  – Euler's formula – Generalisation of trigonometrical and hyperbolic functions – Cauchy's theorem – Cauchy integral formulae – Zeros and poles – Taylor series and Laurent series – Residue theorem – Applications of complex variables: Resolution into partial fractions – Zeros of normalized Butterworth polynomials and Butterworth poles in the s-plane – Circuit Analysis – Evaluation of real integrals using contour integration – Application in transfer functions.

### **UNIT 2 FOURIER TRANSFORMS:**

Fourier integral theorem – Generation of a table of Fourier transforms – Fourier cosine and sine transforms – Form Fourier integral to Laplace transform – Simple applications in digital signal processing.

### **UNIT 3 LAPLACE TRANSFORMS:**

Generation of a Table of Laplace transforms – Inverse Laplace transform using calculus of residues – Solution linear differential equations with constant coefficients – Simple applications in feedback control systems, electrical network, circuits with L,C,R for periodic and non-periodic signals, poles and zeroes of network functions, time and frequency domain response from pole zero plot – Voltage transfer function.

### **UNIT 4 :SETS, FUNCTIONS AND PROBABILITY**

Set theory: - Relationships between sets – Operations on sets – Set identities – Principle of inclusion and exclusion – Minsets. Relations: - Binary relations – Partial orderings – Equivalence relations. Functions: - Properties of functions – Composition of functions – Inverse functions – Permutation functions.

**DISCRETE PROBABILITY:** Finite probability – Probability distributions – Conditional probability – Independence – Bayes' theorem – Mathematical expectation.

### **Books for study:**

1. M. Abramowitz and I.A. Stegun, 1972, Handbook of Mathematical Functions, Dover, NY.
2. M.D. Greenberg, Advanced Engineering Mathematics, 2<sup>nd</sup> Ed., International Ed., Prentice-Hall, NJ.
3. E. Kreyszig, 1999, Advanced Engineering Mathematics, 8<sup>th</sup> Ed., Wiley, NY.
4. B. Grob, 1989, Basic Electronics, 6<sup>th</sup> Ed., International Ed., McGraw-Hill, NY
5. J. Millman and CC Halkias, 1991, Integrated Electronics: Analog and Digital Systems, Tata McGraw-Hill, New Delhi
6. A.V. Oppenheim, A.S. Willsky, and S.H. Nawab, 1995, Signals and Systems, 2<sup>nd</sup> Ed., Prentice Hall of India, New Delhi.
7. R.T. Stefani, C.J. Savant, Jr, B. Shahian, and G.H. Hostier, 1994, Design of Feedback Control Systems, 3<sup>rd</sup> Ed., Saunders College, NY.
8. M.L. Boas, 2002, Mathematical Methods in Physical Sciences, Wiley.
9. Judith L. Gersting, 2003, Mathematical Structures for Computer Science, 5<sup>th</sup> Ed., W.H. Freeman and Company, NY.
10. W.H. Hayt, Jr. (late), J.E. Kemmerly (late) and S.M. Durbin, 2002, Engineering Circuit Analysis, 6<sup>th</sup> edition, Tata McGraw-Hill, New Delhi.

### **Books for Reference:**

1. E. Butkov, 1968, Mathematical Physics, Addison-Wesley, Reading, MA.
2. H.K. Crowder & S.M. McCuskey, 1964, Topics in Higher Analysis Macmillan, NY.
3. R.P. Feynman, R.B. Leighton, and M. Sands, 1997, Chapters 22-25, The Feynman Lectures on Physics, Vol. 1, Narodsa, New Delhi.
4. A.H. Robbins and W.C. Miller, 1995, Circuit Analysis: Theory and Practice, Delmar, NY.
5. L.A. Pipes and L.R. Harvill, 1971, Applied Mathematics for Engineers and Physicists, 3<sup>rd</sup> Ed., McGraw-Hill, NY.
6. W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery, 1993, Numerical Recipes in C, 2<sup>nd</sup> Ed., Cambridge University Press, 1992; First Indian Edition, Foundation Books, New Delhi.

7. J.G. Prokis and D.G. Monolakis, 1996, Digital Signal Processing, Prentice-Hall of India, New Delhi.
8. L.R. Rabiner and B. Gold, 1993, Theory and Applications of Digital Signal Processing, Prentice-Hall of India, New Delhi.
9. M.R. Spiegel, 1981, Complex Variables, Schaum's Series, McGraw-Hill, NY.
10. M.R. Spiegel, 1974, Fourier Analysis, Schaum's Series McGraw-Hill, NY.
11. M.R. Spiegel, 1986, Laplace Transforms, Schaum's Series, McGraw-Hill, NY.
12. G.P. Tolstov, 1962, Fourier Series, Prentice-Hall, NJ.
13. M.E. Van Valkenburg, 1997, Network Analysis, 3<sup>rd</sup> Ed., Prentice-Hall of India, New Delhi.
14. C.R. Wylie and L.C. Barrett, 1995, Advanced Engineering Mathematics, 6<sup>th</sup> Ed., International Ed., McGraw-Hill, NY.
15. S. Hassani, 2000, Mathematical Methods, Springer, NY.

### **PAPER III – ADVANCED DIGITAL ELECTRONICS**

#### **Objectives of the Course**

##### **The students will learn the**

- i) various logic families and a comparative account of their performance.
- ii) Design of arithmetic logic units, programmable logic array, Synchronous counter and registers etc.,
- iii) Design and active filters.
- iv) Working of D/A and A/D converters, display systems and recorders, and
- v) Trouble shooting and maintenance of equipment.

### **COURSE OUTLINE**

#### **UNIT 1 LOGIC FAMILIES AND CIRCUITS:**

DTL, TTL, ECL, I<sup>2</sup>L, CMOS circuits – CMOS devices – Inverters, NAND and NOR gates – Comparative study – TTL to CMOS and CMOS to TTL interfacing – IC technology – Monolithic, thin film and hybrid technologies – Fabrication constraints and design guidelines – Level of IC complexity – Packaging of IC – Limitations in IC Technology

#### **UNIT 2 CONTROL DIGITAL CIRCUITS AND APPLICATIONS:**

Multi plexer – Demultiplexer – Applications – Encoder and Decoder – Design of ALU – Programmable Logic Array (PAL) – Design of counters – Design of synchronous MOD 3, MOD 5 and MOD 10 counters – Design of random sequence counters – Serial and parallel registers – shift registers – Applications Controlling an industrial process (Descriptive) – Sampling and analog signal – Reconstruction of an analog signal – Digital Processing of an analog signal – Sample data – Control system.



### **UNIT 3 FILTERS:**

Introduction to filtering – Butterworth and chebyshev polynomials – Low-pass, High-pass, band-pass, filter design – First and second order active filters – Examples – Single OP AMP band-pass & notch filters.

### **UNIT 4 SYSTEM DESIGN COMPONENTS:**

Basic counter circuitry – Modes of operation – Frequency counter – Basic timers – Accuracy – Examples – D/A and A/D converters – Display systems – 7-segment LED display – LCD – Dot matrix display – Bar-graph display using LEDs

### **UNIT 5 TROUBLE SHOOTING AND MAINTENANCE OF EQUIPMENT:**

Components testing – PCB testing – Test equipment usage – Elements of electronic instrument fabrication techniques – In-circuit testing and trouble shooting – Electronic circuit drawing software packages.

### **BOOKS FOR STUDY:**

1. Malvino and Leach, Digital Principles and Applications, 4<sup>th</sup> Ed., McGraw-Hill.
2. Millman and Halkias, 1972, Integrated Electronics, McGraw-Hill.
3. M.M. Mano, 1995, Digital Design, Prentice-Hall of India, New Delhi
4. A.S. Bouwens, 2000, Digital Instrumentation, TMH.
5. W.C. Bosshart, 1994, Printed Circuit Boards Design and Technology, Tata McGraw-Hill.
6. R.A. Gayakwad, 1994, OPAMPS and Linear Integrated Circuits, 3<sup>rd</sup> Ed., PHI.
7. B.S. Sode, 1980, Introduction to System Design Using Integrated Circuits, Wiley Eastern.
8. J.R. Johnson, 1994, Introduction to Digital Signal Processing, Prentice-Hall of India, New Delhi.

### **BOOKS FOR REFERENCE:**

1. T.L. Floyd, 1993, Digital Fundamentals, 5<sup>th</sup> Ed., Macmillan
2. Deboo and Burrous, 1987, Integrated Electronics and Semiconductor Devices, Theory and Applications, McGraw-Hill International Ed.
3. Taub and Shilling, Digital Electronics.
4. G.C. Barney, 1998, Intelligent Instrumentation, Prentice Hall of India.
5. A.K. Sawhney, A Course in Electrical and Electronics Measurements and Instrumentation, Dhanpat Rai & Sons.
6. E.O. Doebelin, Measurement System Application and Design, TMH, New Delhi.
7. A.D. Helprick and W.D. Cooper, 1996, Modern Electronic Instrumentation and Measurement Techniques, PHI.
8. Morris, 1994, Principles of Measurements and Instrumentation, Prentice-Hall.

## **CORE PAPER IV – PRACTICAL – I APPLIED ELECTRONICS**

### **Objectives**

After performing these experiments, the students will be able to

- i) design active filters and synchronous counters,
- ii) understand the encoding and decoding operations,
- iii) interface 8085 microprocessor with peripheral devices, and
- iv) carry out the data transfer operations

Any Twelve Experiments to be done

1. OP AMP – Design of voltage controlled oscillator
2. OP AMP – Single pole and double pole active filters (Butterworth and Chebyshev)
3. Digital to analog converter using IC 741 and R/2R ladder.
4. Active filters – Low pass, high pass, band pass and band reject.
5. Up/Down counters using IC 7476/7473.
6. Design of synchronous counters – MOD 3, MOD 5 and MOD 10
7. Encoders and decoders 8085 Microprocessor Experiments
8. LED interface (single LED ON-OFF – Binary counter, BCD counter, ring counter and Johnson counter (8-bit)
9. Seven-segment display using buffers and LUT
10. DAC 0800 interface and wave form generation
11. ADC construction using DAC and OP AMP comparator
12. ADC 0809 interface
13. Hex keyboard interface
14. Stepper motor interface
15. Serial data transfer between two microprocessor kits using 8251
16. Parallel data transfer between two microprocessor kits using 8255

## **SEMESTER I Elective Courses**

### **ELECTIVE PAPER I – ANALOG CIRCUIT DESIGN**

#### **Objectives:**

The students will learn the

- i) principles, design and working of discrete electronic circuits, and
- ii) analysis of external circuit blocks of integrated circuits.

#### **UNIT 1 DESIGN OF TRANSISTOR AMPLIFIERS:**

Design of single transistor amplifier stage i.e., CE, CB, and CC – Their equivalent circuits – Two port representation and applications – Similar consideration for JFET circuit designs and applications – Two stage transistor amplifier stages i.e., CC-CE, CC-CB and Darlington configurations: Design, analysis and applications – Cascade amplifier (CE-CB) design and applications. Design of differential amplifier: DC transfer characteristics – Emitter degeneration – Small signal analysis – Common mode input resistance – Common mode and differential mode gains – Source coupled JFET pairs – Device mismatch effects in differential amplifiers – Basic MOS sub circuits.

#### **UNIT 2 OP AMP CIRCUITS:**

Frequency response of OP AMP : Dominant – Pole compensation, Pole-zero compensation and lead compensation – Differential DC amplifier – Integrated circuit tuned amplifier – Video amplifier – Stable AC coupled amplifier – Comparators – Sample-and-hold circuit – Precision AC/DC converters – Logarithmic amplifiers – Schmidt trigger.

#### **UNIT 3 ANALYSIS AND DESIGN OF ACTIVE DEVICE CIRCUITS:**

Design of transistor current sources and active loads – Simple current source – Current source with current gain – Widlar current source – Cascade current source – Wilson current source – Current mirrors and doublers – Design of CE amplifier with active load – Emitter coupled pair with active load – Matching consideration in transistor current sources – Design of supply independent and temperature independent biasing – Zener reference bias circuits – Band-gap reference bias circuits – Problems in low level current sources – Design of level shifting networks – Bipolar and FET input stage circuits – Design of internal circuits of simple operational amplifier.

#### **UNIT 4 PULSE CIRCUITS:**

Transient response characteristics of semiconductor diodes and transistors – Triggered transistorized blocking oscillator – Monostable circuit with base timing and circuit with emitter tuning along with their designing – Recovery and loading consideration – Astable transistor blocking oscillator design and applications. Design of time base generators (Sweep circuits): General features of time base signals and methods of generating a time base waveform – Free running and triggered time base generators – Transistor constant current sweep – Miller sweep and bootstrap sweep.

#### **UNIT 5 PHASE LOCKED LOOPS:**

Concept with block diagram – capture transient – Look and capture range – effect of low pass filter on loop performance – Internal circuits of VCO 566 and balanced modulator and demodulator (1496) and their working principles – Study of PLL 565, 562 and their applications.

#### **Books For Study:**

1. Millman and Taub, 1991, Pulse, Digital and switching waveforms, Tata McGraw Hill, New Delhi
2. Paul R. Gray and R.G. Meyer, 1991, Analysis and design and analog integrated circuits, second edition, Jhon Wiley and Sons.
3. Jacob Millman and C.C. Halkias, 1971, Integrated Electronics, McGraw Hill, New Delhi.
4. B. Ghosh, 2005, Fundamental Principles of Electronics, Books and Allied (P) Ltd., Kolkata.

#### **Books For Reference:**

1. F.C. Fitchen Van Nonstrand Reinhold, Transistor circuit analysis and design
2. Texas instruments staff, 1987, Transistor circuit design, McGraw Hill
3. Millman and Grable, 1992, Microelectronics, McGraw Hill.
4. Signetics, 1992, Linear IC's Applications.
5. M. Ghausi, 1985, Electronics circuits, Van Nonstrand Reinhold,
6. Howowitz and Hill 1992, Art of electronics, Cambridge University Press.
7. Williams, 1994, TMH, Practical transistor circuit design edition.

**SEMESTER II  
CORE COURSES**

**CORE PAPER V – ELECTROMAGNETIC THEORY AND APPLIED  
ELECTROMAGNETICS**

**Objectives**

The Students will be able to

- i) understand the concepts of electrostatics, magnetostatics and electromagnetics as applicable to electronics,
- ii) apply Maxwell's equations to circuit theory
- iii) understand the theory of wave guides and
- iv) electromagnetic wave propagation.

**Unit 1 ELECTROSTATICS AND MAGNETOSTATICS:**

Electrostatic field - Divergence and curl of electrostatic fields - Electric potential - Laplace equation - Method of images - Multipole expansion - Lorentz force law - Biot-Savart law - Divergence and curl of  $\mathbf{B}$  - Magnetic vector potential.

**Unit 2 ELECTROSTATIC AND MAGNETOSTATIC FIELDS IN MATTER:**

Polarization - Field of polarized object - Electric displacement - Linear dielectrics - Magnetization - Field of magnetized object - Auxiliary field  $\mathbf{H}$  - Linear and non-linear media.

**Unit 3 MAXWELL'S EQUATIONS AND ELECTROMAGNETIC WAVES:**

Correspondence of field equations and circuit equations – Applications of circuit and field theory – Series Circuit – Maxwell's equations – Generalisation of circuit equations – Maxwell's equations in free space and for harmonically varying fields – Continuity equations – Poynting theorem – Uniform plane wave – Concept of intrinsic impedance of free space – Boundary conditions

**Unit 4**

Uniform plane wave propagation in good conductor, in poor conductor, in lossy dielectric – Plane wave propagation in metallic film coating - Plastic substrate and application to thin film technology - Oscillating electric dipole – Power radiated by current element - Radiation resistance.

#### **Unit 5 GUIDED WAVES AND WAVE GUIDES:**

**Guided waves:** Transverse electric (TE) waves - Transverse magnetic (TM) waves - Transverse electromagnetic (TEM) waves - Velocity of propagation - Attenuation in parallel-plane guides - Wave impedances. Wave Guides: Rectangular guides (RGs) - TM waves and TE waves in RGs - Impossibility of TEM wave in wave guides - TM and TE waves in circular guides - Wave impedances and characteristic impedances - Dielectric slab wave guide.

#### **Books For Study:**

1. D. J. Griffiths, 2002, Introduction to Electrodynamics, 3<sup>rd</sup> Ed., Prentice-Hall of India, New Delhi.
2. E. C. Jordan and K. G. Balmain, 1995, Electromagnetic Waves & Radiating Systems, 2<sup>nd</sup> Ed., Prentice-Hall of India, New Delhi.
3. John D. Kraus, 1992, Electromagnetics, 4<sup>th</sup> Ed., McGraw Hill International.
4. V.V. Sarawate, 1993, Electromagnetic Fields and Waves, Wiley Eastern Limited.

#### **Books For Reference:**

1. D. Jackson, 1993, Classical Electrodynamics, 2<sup>nd</sup> Ed., Wiley Eastern, New Delhi.

2. B. Laud, 1995, Electromagnetics, 2<sup>nd</sup> Ed., New Age International, New Delhi.
3. Lorrain and D. R. Corson, 1986, Electromagnetic Fields and Waves, 2<sup>nd</sup> Ed., CBS, New Delhi.
4. R. Reitz, F. J. Milford and R. W. Christy, 1988, Foundation of Electromagnetic Theory, 3<sup>rd</sup> Ed., Narosa, New Delhi.
5. Samuel and Y. Liao, 1994, Microwave Devices and Circuits, 3<sup>rd</sup> Ed., Prentice Hall of India.

## **CORE PAPER VI – QUANTUM AND OPTO ELECTONICS**

### **Objectives**

The students will be able to

- i) understand the theory of lasers,
- ii) learn various types of lasers,
- iii) understand the basic principles of holography and optical data storage techniques,
- iv) understand the fiber optic transmission theory and transmission characteristics of optical fibers, and
- v) understand the concept of nonlinear optics and Soliton wave propagation.

### **Unit 1 LASER THEORY:**

Einstein coefficients - Population inversion - Laser rate equation for three level Laser - Resonator - Vibrational modes - Open resonator - Threshold condition - Optimum output coupling - Line broadening mechanism - Q-switching and mode - Locking.

### **Unit 2 TYPES OF LASERS:**

Solid state lasers - Ruby, Nd-YAG, and Nd-glass semiconductor lasers - Gas lasers - He-Ne, CO<sub>2</sub>, Ar-ion - Liquid lasers - Dye lasers.

### **Unit 3 LASERS IN OPTICAL STORAGE:**

Basic principles of holography - Recording and reconstruction techniques - Optical data storage techniques - Holographic optical data storage - Optical computing

### **Unit 4 FIBER OPTIC SENSORS:**

Fiber optic transmission theory - Different types of fibers - Transmission characteristics of optical fibers - Dispersion, attenuation, absorption, scattering losses - Fiber materials -

Sensors - Intensity and phase modulated sensors - Displacement, temperature, pressure, flow, magnetic and electric field sensors.

## **Unit 5**

**INTRODUCTION TO NONLINEAR OPTICS:** Origin of nonlinear optics - Second harmonic generation - Phase matching - Raman and Brillouin scattering - Qualitative treatment of self-focusing - Phase conjugation - Soliton wave propagation.

### **Books For Study:**

1. B. B. Laud, 1991, Laser and Nonlinear Optics, Wiley Eastern, New Delhi.
2. D. C. O'shea, W. R. Callen, and W. T. Rhodes, 1978, Introduction to Lasers and their Applications, Addison-Wesley, Reading, MA.
3. K. Thyagarajan and A. K. Ghatak, 1991, Lasers: Theory and Applications, Macmillan, Madras.
4. D. A. Krohne, 1988, Fiber Optics Sensors - Fundamentals and Applications, Instrument Society of America.

### **Books For Reference:**

1. J. T. Verdeyen, 1993, Laser Electronics, Prentice-Hall of India, New Delhi.
2. A. Yariv, 1991, Optical Electronics, Harcourt Brace Jovanovich College Publishers.
3. J. Gower, 1995, Optical Communication Systems, Prentice-Hall of India, New Delhi.
4. G. Venkataraman, 1995, The Quantum Revolution (3 Vols.), Vignettes in Physics Series, University Press, Hyderabad.
5. G. Venkataraman, 1992, Bose and His Statistics, Vignettes in Physics Series, University Press, Hyderabad.
6. G. Venkataraman, 1993, At the Speed of Light, Vignettes in Physics Series, University Press, Hyderabad.

## **CORE PAPER VII – ELECTRONICS INSTRUMENTATION**

### **Objectives**

The students will be able to

- i) learn the characterization of a measuring instrument
- ii) understand the accuracy and precision in measurements.
- iii) study the theory of various transducers and sensors.
- v) study the various testing and measuring instruments.



## **Unit 1 CHARACTERISTICS OF AN INSTRUMENT**

Functional elements of a measurement system – Static characteristics – Accuracy, precision, bias, linearity, threshold, resolution, hysteresis, dead space, scale readability, span, static stiffness, input impedance, repeatability and reproducibility - Errors and calculation of errors in overall system – Dynamic characteristics – Zero, first and second order instruments - Responses for step, impulse, ramp and sinusoidal inputs.

## **Unit 2 TRANSDUCERS AND SENSORS**

Definition of transducer and sensor – Classification of transducers – Pressure (strain gauge, piezoelectric transducer), displacement (potentiometric, LVDT), temperature (thermometer, thermistor, thermocouple) and photosensitive (Vacuum & gas filled phototubes, photomultiplier, photoconductive cell, photovoltaic cell) transducers.

## **Unit 3 BRIDGE MEASUREMENTS**

Introduction - Wheatstone bridge - Kelvin bridge – Guarded Wheatstone bridge - AC bridges and their applications – Maxwell bridge – Hay bridge - Schering bridge - Wien bridge.

## **Unit 4 TESTING INSTRUMENTS**

Oscilloscopes – Block diagram – CRT Circuits – Vertical and horizontal deflection systems – Delay line, Multiple trace – Probes – Special oscilloscopes.

## **Unit 5 MEASURING INSTRUMENTS**

Galvanometer – DC Ammeter & Voltmeter – Series and shunt type ohm meters – Calibration of DC Instruments - Multimeter – Alternating current indicating instruments - Watt-hour meter – Power factor meters – Pen recorders – Servo-recorders – Magnetic recorders- Digital voltmeter – Multimeter – DMM circuits – Accuracy of digital voltmeters - Guarding techniques.

### **Books for Study:**

1. C. S. Rangan, G. R. Sarma and V. S. V. Mani, 1999, Instrumentation Devices and Systems, *Tata McGraw-Hill, New Delhi*.
2. A. D. Helfrick and W. D. Copper, 1992, Modern Electronic Instrumentation and Measurement Techniques, *Prentice-Hall of India, New Delhi*.
3. A. K. Sawhney, A Course in Electrical and Electronic Measurement and Instrumentation, *Dhanpat Rai & Sons*.

### **Books for Reference:**

1. E. O. Doebelin, 1983, Measurement Systems Application and Design, *International Edition, 3<sup>rd</sup> Ed., McGraw-Hill, NY*.
2. D. V. S. Moorthy, 1995, Transducer and Instrumentation, *Prentice-Hall of India, New Delhi*.
3. J. W. Dalley, W. F. Riley and K. G. McConnel, 1993, Instrumentation for

- Measurements, Wiley, NY.
3. B. C. Nakre and K. K. Chaudry, Instrumentation Measurements and Analysis, Tata McGraw-Hill, New Delhi.
  5. D. A. Skoog, Principles of Instrumental Analysis, 3<sup>rd</sup> Ed., Saunders College Publishing.

## **CORE PAPER VIII - PRACTICAL II - COMPUTATIONAL METHODS – C/C++ PROGRAMMING**

### **Objectives**

After performing these experiments the students will be able to appreciate the mathematical methods learnt in the First Semester

(Tables of Legendre, Lagrange, Chebyshev and Hermite Polynomials will be given)

1. Zeros of the Legendre Polynomials  $P_n(x)$  (or roots of the equation  $P_n(x) = 0$  or nodes of the Gauss-Legendre quadrature),  $2 \leq n \leq 6$ , with Algorithm, Flow-chart, C PROGRAM, and output.
2. Zeros of the Laguerre Polynomials  $L_n(x)$  (or roots of the equation  $L_n(x) = 0$  or nodes of the Gauss-Laguerre quadrature),  $2 \leq n \leq 6$ , with Algorithm, Flow-chart, C PROGRAM, and output.
3. Zeros of the Hermite Polynomials  $H_n(x)$  (or roots of the equation  $H_n(x) = 0$  or nodes of the Gauss-Hermite quadrature),  $2 \leq n \leq 6$ , with Algorithm, Flow-chart, C PROGRAM, and output.
4. Zeros of the Chebyshev Polynomials  $T_n(x)$  (or roots of the equation  $T_n(x) = 0$  or nodes of the Gauss-Chebyshev quadrature),  $2 \leq n \leq 6$ , with Algorithm, Flow-chart, C PROGRAM, and output.
5. Lagrange interpolation with Algorithm, Flow-chart, C PROGRAM, and output.
6. Newton forward interpolation with Algorithm, Flow-chart, C PROGRAM, and output.
7. Newton backward interpolation with Algorithm, Flow-chart, C PROGRAM, and output.
8. Curve-fitting: Least-squares fitting with Algorithm, Flow-chart PROGRAM, and output.
9. Numerical integration by the trapezoidal rule, with Algorithm, Flow-chart, C PROGRAM, and output.
10. Numerical integration by the Simpson rule, with Algorithm, Flow-chart, C PROGRAM, and output.

11. Numerical solution of ordinary first-order differential equations by the Euler method,  
with Algorithm, Flow-chart, C PROGRAM, and output.
12. Numerical solution of ordinary first-order differential equations by the Runge-Kutta method, with Algorithm, Flow-chart, C PROGRAM, and output.

### **ELECTIVE PAPER III - WIRELESS AND FIBER OPTICS COMMUNICATION**

#### **Objectives:**

To provide an understanding of modern telecommunication systems and the protocols  
To provide a good knowledge of the principles and technology of fibre optics communication.

#### **Unit I : MODERN TELECOMMUNICATION SYSTEMS**

Telephone communication Electronics: manual and automatic switching networks -  
Overview of early systems of Strowger, Crossbar and Stored program switching -  
Exchanges: analog and digital exchanges - speech digitization and transmission - traffic engineering, numbering plan, - WLL, radio paging services.

#### **Unit II: MOBILE COMMUNICATION SYSTEMS:**

Cellular concepts - role of base station and mobile switching centers - Hand-off considerations – Communication frequency bands - frequency reuse – roaming - SMS, GSM, GPRS, CDMA and EDGE - Speech coding techniques - Vocoders.  
Satellite communication principles and GPS.

#### **Unit III: FUNDAMENTALS OF FIBRE OPTICS**

Optical fiber theory and applications - parameters and types of optical fibers - single and multimode fibers, dispersion – intermodal and intramodal - step and graded index fibers - construction of optical fiber cables, loss mechanisms - absorption and scattering, connector types and splices, misalignment and mismatch losses, power budget of optical fiber link.

#### **Unit IV: OPTICAL COMMUNICATION DEVICES AND PROCESSES.**

Optical fiber testing and parameter (cut off wavelength, loss per unit length, numerical aperture, bending loss, connector/splice loss) measurement. Power meter, OTDR- principle and uses. Spectrum analyzer.  
Optical Amplifiers, semiconductor optical amplifiers, EDFA, Raman Amplifier. WDM and DWDM systems

#### **Unit V: FIBER COMMUNICATION:**

System: design: considerations for point to point link - System architecture - optical transmitters and receivers - electro optic modulators, Non-linear effects and system performance, Dispersion management, Soliton propagation. Analog and digital modulation, bit error rate, eye diagram. Optical add-drop multiplexers. .

Optical fiber networks, SONET, SDH.

**Books for Study:**

1. Telecommunication , T.Vishwanathan, PHI
2. Mobile Cellular Telecommunications, W.C.Y. Lee, McGraw Hill.
3. Introduction to Fiber Optics , A.Ghatak and K.Thyagrajan, Cambridge Univ. Press
4. Optical Fiber Communication Principles and Systems, A. Selvarajan, S.Kar and T.Srinivas, TMH
5. Optical Fiber Communications, Keiser, G. McGraw Hill, Int. Student Ed.

**Books for Reference**

1. Future Developments in Telecommunication, J. Martin, Prentice Hall
2. Fiber Optic Communication systems, G.P.Aggarwal, Wiley Eastern
- 3 Fiber optics and Optoelectronics, R.P. Khare, Oxford Press
4. Introduction to Optical Electronics, K.A. Jones, Harper & Row
5. Principles and Applications of Optical communications, M.K.Liu, McGraw Hill

## **ELECTIVE PAPER IV - NUMERICAL METHODS AND PROGRAMMING**

**Objectives**

After undergoing this course the students will be able to solve practical problems that cannot be solved exactly by analytical methods.

**Unit 1 SOLUTION OF EQUATIONS:**

Determination of zeros of polynomials - Roots of nonlinear algebraic equations and transcendental equations - Bisection and Newton-Raphson methods - Convergence of solutions.

**Unit 2 LINEAR SYSTEMS:**

Solution of simultaneous linear equations - Gaussian elimination - Matrix inversion - Eigenvalues and eigenvectors of matrices - Power and Jacobi Methods.

**Unit 3 INTERPOLATION AND CURVE FITTING:**

Interpolation with equally spaced and unevenly spaced points (Newton forward and backward interpolations, Lagrange interpolation) - Curve fitting - Polynomial least-squares fitting - Cubic spline fitting.

**Unit 4 DIFFERENTIATIONS, INTEGRATION AND SOLUTION OF DIFFERENTIAL EQUATIONS:**

Numerical differentiation - Numerical integration - Trapezoidal rule - Simpson's rule - Error estimates - Gauss-Legendre, Gauss-Laguerre, Gauss-Hermite and Gauss-Chebyshev quadratures - Numerical solution of ordinary differential equations - Euler and Runge-Kutta methods.

## **Unit 5 PROGRAMMING WITH C:**

Introduction to C programming - C Fundamentals – Structures – Memory concepts - Data types – Constants – Variables – Arrays declarations – Pointers – Structures and unions – File handling – String manipulation - Operators and expressions – Sample programs - Programs for the following computational methods: (a) Zeros of polynomials by the bisection method, (b) Zeros of polynomials/non-linear equations by the Newton-Raphson method, (c) Lagrange Interpolation, (d) Trapezoidal and Simpson's Rules, (e) Solution of first order differential equations by Euler's Method.

### **Books For Study:**

1. S. S. Sastry, 1992, Introductory Methods of Numerical Analysis, 2<sup>nd</sup> Ed., Prentice Hall, New Delhi,.
2. V. Rajaraman, 1993, Computer Oriented Numerical Methods, 3<sup>rd</sup> Ed., Prentice Hall, New Delhi.
3. M. K. Jain, S. R. Iyengar and R. K. Jain, 1995, Numerical Methods for Scientific and Engineering Computation, 3<sup>rd</sup> Ed., New Age International, New Delhi.
4. F. Scheid, 1998, Numerical Analysis, 2<sup>nd</sup> Ed., Schaum's Series McGraw-Hill, NY.
5. W. H. Press, S. A. Teukolsky, W. T. Vetterling and B. P. Flannery, 1993, Cambridge University Press, 1992, Numerical Recipes in FORTRAN, 2<sup>nd</sup> Ed.,; First Indian Edition, Foundation Books, New Delhi,.
6. J. H. Mathews, 1994, Numerical Methods for Mathematics, Science, and Engineering, 2<sup>nd</sup> Ed., Prentice-Hall, New Delhi,.
7. V. Rajaraman, Fortran Programming.
8. E. Kreyszig, 1999, Advanced Engineering Mathematics, 8<sup>th</sup> Ed., Wiley, NY,.

### **Books For Reference:**

1. M. A. Abramowitz and I. Stegun (Editors), 1972, Handbook of Mathematical Functions, Dover, NY.
2. S. D. Conte and C. de Boor, 1981, Elementary Numerical Analysis, An Algorithmic Approach, 3<sup>rd</sup> Ed., International Ed., McGraw-Hill, NY.
3. A. F. Gerald and P. O. Wheatley, 1994, Applied Numerical Analysis, 5<sup>th</sup> Ed., Addison Wesley, Reading, MA.
4. F. B. Hildebrand, 1993, Introduction to Numerical Analysis, 2<sup>nd</sup> Ed., Tata McGraw-Hill, New Delhi.
5. B. Carnahan H. A. Luther and J. O. Wilkes, 1969, Applied Numerical Methods, Wiley, NY.
6. S. S. Kuo, 1996, Numerical Methods and Computers, Addison-Wesley, London.
7. W. H. Press, S. A. Teukolsky, W. T. Vetterling and B. P. Flannery, 1993, Cambridge University Press, 1992, Numerical Recipes in C, 2<sup>nd</sup> Ed.,; First Indian Edition, Foundation Books, New Delhi.
8. Banerjee, 2004, Numerical methods, Probability and Statistics, Books and Allied (P) Ltd. Kolkata.



## **2. M.Sc. DEGREE COURSE IN APPLIED MICROBIOLOGY**

### **SYLLABUS**

#### **SEMESTER - I**

##### **PAPER I MICROBIAL TAXONOMY**

##### **UNIT I**

Taxonomy, systematics, identification: Taxonomical hierarchy- species-type strains: culture collections; binomial nomenclature; system of classification- phenetic, numerical taxonomy- similarity matrix, dendograms with examples; phylogenetic with examples; general characteristics used in classification- five kingdom, six kingdom and eight kingdom systems.

##### **UNIT II**

Classification of bacteria according to Bergey's Manual of systematic bacteriology 9<sup>th</sup> edition (up to level of section); characteristics of major sections; classification of archae, photosynthetic bacteria, *Entrobacteriaceae*, *Mollicutes*.

##### **UNIT III**

Classification of Fungi- characteristics of zygomycetes, ascomycetes, basidiomycetes, and dueteromycetes.

## **UNIT IV**

Classification of Protozoa- classical 1980; official system & 1993 cavalier-smith. Distinguishing characteristics- ciliates; flagellates; sporozoa; heliozoans; amoeba.

## **UNIT V**

Classification of Algae- major characteristics of chlorophycophyta, crisophycophyta, cryptophycophyta, euglinophycophyta & rhodophycophyta. Classification of viruses- animal viruses, plant viruses and phages.

## **PAPER II - GENERAL MICROBIOLOGY AND LABORATORY**

### **ANIMAL SCIENCE**

## **UNIT I**

Microscopy – Its principles and application in the field of Microbiology including the following: Dark field, Phase contrast, Fluorescence microscopy. Transmission and scanning electron microscopy. Principles, operation and maintenance of: refrigerated and ultracentrifuges, spectrophotometer. Lyophilizers. Staining methods – Gram, Acid fast, Metachromatic granules, nuclear staining, capsule, silver impregnation, Flagella and other special staining methods. Sterilization and disinfection methods and their quality control.



## UNIT II

Bacterial Anatomy, Structure, properties and biosynthesis cellular components of bacteria – sporulation and its mechanics – Growth and nutrition – Nutritional requirements – Autotrophs, heterotrophs – Enrichment cultures – Growth curve – Kinetics of growth – Batch culture – Synchronous growth – Measurement of growth and enumeration of cells – Techniques of pure culture.

## UNIT III

Distribution of Algae - Thallus structure in algae - Reproduction in alga - Life cycle patterns in algae - *Chlamydomonas* – *Volvox* (Green algae) - *Nostoc* – *Spirogyra* (BGA) - *Ectocarpus* – *Sargassum* (Brown algae) - *Poly siphonia* – *Batrachospermum* (Red algae) - Algal biotechnology.

## UNIT IV

Laboratory Animal Science. Modern methods of care, managements, breeding and maintenance of laboratory animals. Detailed account of nutrition, proper handling, use of different species of Laboratory animals like rabbits, mice, rats, guinea pigs, monkeys, hamsters, fowl, sheep.

## UNIT V

Breeding and handling of specific pathogen free Gnotobiotic animals and their maintenance and uses. Transgenic animal models – Basic – Methodology and uses. Disposal of animal house wastes and used animals. Laboratory uses of

animals with special reference to microbiology, pathogenicity testing, antibody production, toxin/toxoid testing, hypersensitivity testing, maintenance of microbes in animals.

### **PAPER III      IMMUNOLOGY**

#### **UNIT I**

History and scope of immunology: types of immunity – Innate, acquired, passive and active, Physiology of immune response – Humoral immunity and cell mediated immunity – Lymphoid organs.

#### **UNIT II**

Antigen: Types – properties and functions: Immunoglobulin: structure, function and techniques of purification, - Antibody production – regulation and diversity – polyclonal and monoclonal antibodies.

#### **UNIT III**

Antigen – antibody reaction including agglutination and precipitation reactions – enzyme immunoassays –Radio immune assays, Immunofluorescence, Immunoperoxidase. Serodiagnosis Immunohaematology of blood groups. ABO and RH incompatibility.

## **UNIT IV**

Complement and its role in immune responses. Hypersensitivity – anaphylaxis, cytotoxic reaction – Cell – mediated – hypersensitivity – Autoimmunity. Transplantation immunology and tumor immunology. HLA tissue typing – major histocompatibility complex.

## **UNIT V**

Vaccines: Principles underlying the preparation of live and attenuated vaccines. Synthetic peptide vaccines. Immunization, its rationale, schedules and its importance in public health.

## **PAPER IV**

### **GENERAL MICROBIOLOGY, PHYSIOLOGY AND IMMUNOLOGY - PRACTICALS - I**

## **UNIT I**

Microscopic Techniques: Light microscopy: Hay infusion broth. Wet mount to show different types of microbes, hanging drop. Dark field microscopy: To show motility of spirochetes and others. Phase contrast microscopy: To show Eukaryotic Cell division, morphology etc. Fluorescence microscopy: Fluorescent staining for mycobacteria, auramine, staining, Fluorescent antibody techniques.

## **UNIT II**

Washing and cleaning of glass wares: Sterilization principles methods: Moist heat, Dry heat, Filtration, filtration of sera and antibiotic solutions. Quality control check for each method:

## **UNIT III**

Staining Techniques: Smear preparation, simple staining, Gram's staining, Acid fast staining, Metachromatic granule staining, Cell wall, spore, capsule, Flagella, Silver impregnation methods.

## **UNIT IV**

Media Preparation: Preparation of liquid, solid and semisolid media. Agar deeps, slants, plates. Preparation of basal, enriched, selective, enrichment media. Quality control and uses. Preparation of Biochemical test media, media to demonstrate enzymatic activities.

## **UNIT V**

Microbial Physiology: Purification and maintenance of microbes. Streak plates, pour plate, and slide culture technique. Aseptic transfer, growth and growth requirements: Cell number, and cell proteins. Direct counts, viable counts, pour plate, streak plate. Bacterial growth curve – Turbidimetry, Anaerobic culture methods.

## **UNIT VI**

Preparation of Bacterial Antigens (Crude preparation) by homogenization or sonication. Raising polyclonal antisera in experimental animals. Rabbit or Mouse with bacterial antigens, RBC (Demonstration)

## **UNIT VII**

Agglutination & Haemagglutination reactions: Latex Agglutination -RF, ASLO, CRP, Blood grouping, RH -Typing/IHA/RPHA. Precipitation reactions in gels: SRID -single radial immunodiffusion. Double immunodiffusion. Immuno electrophoresis and staining of precipitation lines. ELISA technique -HbsAg/ or other Viral Markers.

## **UNIT VIII**

Preparation of Lymphocytes from peripheral blood by density gradient centrifugation. Purification of Immunoglobulins: Ammonium sulphate precipitation. Separation of IgG by chromatography using DEAE cellulose or Sephadex. Anaphylactic reactions in Guinea pigs; Arthus reaction in rabbits (Demonstration only). Skin tests.

## **ELECTIVE PAPER - I    METABOLIC PATHWAYS**

### **UNIT I**

Naming Enzymes – Enzyme components - Mechanism of enzyme reactions  
- Factors influencing enzymatic activity - Inhibition of enzyme action - Metabolic channeling – Control of enzyme activity – Regulation of enzyme synthesis.

### **UNIT II**

Principles of Bio energetics - Oxidation –reduction reactions - Generation of energy –Substrate Level and oxidation phosphorylation - Electron transport chain

### **UNIT III**

Carbohydrate catabolism – Glycolysis – Pentose phosphate pathway – ED pathway – The Kreb`s cycle – Energy yield in glucolysis and aerobic respiration – Anaerobic respiration – Lactic acid fermentation – Alcohol fermentation.

### **UNIT IV**

Lipid Metabolism – Oxidation of lipids; biosynthesis of fatty acids; triglycerides; phospholipids; sterols. Protein and amino acid catabolism – Oxidation of inorganic molecules – Photophosphorylation.

## **UNIT V**

Bio chemical pathways of energy use – Photosynthetic fixation of CO<sub>2</sub> – Biosynthesis of peptidoglycan – Biosynthesis of lipids – Biosynthesis of amino acids -proline, arginine, aspartic acid, histidine- Interconversions-therionine, isoleucine and methionine; isoleucine ,valine and leucine; serine and lysine; Aspartate and pyruvate. Bio synthesis of purines and pyrimidines.

## **SEMESTER II**

### **PAPER V VIROLOGY**

#### **UNIT I**

Brief outline of virology- discovery of virus- general properties of viruses- general methods of diagnosis and serology- virioids, prions, satellite RNAs and virusoids.

#### **UNIT II**

Bacterial viruses-OX 174, M13, MU, T4, lambda, Pi; structural organization-lifecycle-transcription-DNA replication and phage production. Lysogenic cycle-typing and application in bacterial genetics.

#### **UNIT III**

Plant viruses-TMV- general characters- morphology-replication-RNA as its initiators of infection. Cauliflower mosaic virus; Transmission of plant viruses;

common viral diseases of crop plants- paddy, cotton, tomato, and sugarcane.  
Viruses of cyanobacteria, algae, fungi and insects.

#### **UNIT IV**

DNA Viruses- Pox viruses, Herpes viruses, Adeno viruses, Papova viruses and Hepadna viruses; RNA Viruses- Picorna, Orthomyxo, Paramyxo, Toga and other arthropod borne viruses, Rhabdo, Rota, HIV and other Hepatitis viruses.

#### **UNIT V**

Epidemiology, Diagnosis and Treatment of Viral Diseases; Viral Vaccines and Antiviral agents.

### **PAPER VI – SYSTEMATIC MEDICAL BACTERIOLOGY**

#### **UNIT I**

Philosophy and General approach to clinical conditions of various syndromes – General and specific syndromes. Indigenous normal microbial flora of human body. General attributes and virulence factors of Bacteria causing infections.

#### **UNIT II**

Host Parasite relationships – Nonspecific host immune mechanisms. Ground rules for collection and dispatch of clinical specimens for microbiological diagnosis.



### **UNIT III**

Morphology, classification, cultural characteristics, Pathogenicity, pathology, Laboratory diagnosis and prevention – Control and treatment of diseases caused by the following organisms: Staphylococci, Streptococci, Pneumococci, Neisseriae (Gonococci & Meningococci), Corynebacterium, Mycobacterium, Clostridium. Bacillus.

### **UNIT IV**

Studies on Salmonella, shigella, Vibrios, Brucella, Gram negative anaerobes Spirochetes, Rickettsiae, Chlamydiae, Mycoplasmas and ureoplasmas.

### **UNIT V**

Zoonotic diseases and their control – Hospital acquired infections – Hospital Infection control committee – functions – Hospital waste disposal – Ethical committee – functions.

## **PAPER VII MYCOLOGY AND PARASITOLOGY**

### **UNIT I**

Historical introduction to mycology structure and cell differentiation. Lichens – ascolichens, basidiolichens, deuterolichens. Mycorrhiza – ectomycorrhiza, endomycorrhiza vesicular arbuscular mycorrhiza, fungi as insect symbiont.

## **UNIT II**

Morphology, Taxonomy, Classification of fungi, detection and recovery of fungi from clinical specimens. Dermatophytes and agents of superficial mycoses. Yeasts of medical importance, Mycotoxins, Antifungal agents, testing methods and quality control.

## **UNIT III**

Dimorphic fungi causing systematic mycoses. Dimatiaceous fungi, opportunistic hyaline hyphomycetes, agents of zygomycosis. Fungi causing Eumycotic mycetoma. Newer methods in diagnostic mycology. Immunity to fungal infections.

## **UNIT IV**

Medical Parasitology: Introduction to Medical parasitology – classification, host-parasite relationships, pathogenic mechanisms, transmission life cycle, lab diagnosis, treatment etc. for the following: Protozoa – Entamoeba, Aerobic and Anaerobic amoebae causing human diseases. Toxoplasma, cryptosporidium and other protozoan parasites causing infections in man. Leishmania, Trypanasoma, Giardia, Trichomonas, Balantidium.

## **UNIT V**

Classification, Life cycle, Transmission, pathogenicity, Lab. Diagnosis and treatment for the following parasites:

Helminths – cestodes – Taenia solium – T.saginata – T. echinococcus – Trematodes – Fasciola hepatica – Fasciolopsis buski – Paragonimus – Schistosomes. Nematodes – Ascaris, Ankylostoma, Trichuris, Trichuris, Trichinella, Enterobius, Strongyloides, Wuchereria – other parasites causing infections in immunocompromised hosts and AIDS.

## **PAPER VIII - SYSTEMATIC BACTERIOLOGY, MYCOLOGY, PARASITOLOGY AND VIROLOGY – PRACTICALS-II**

### **UNIT I**

Collection and transport of clinical specimens -Prerequisites -Proforma - Methodologies. Direct examinations -wetfilms/stainings for Faeces (V.cholerae, shigella, Salmonella) Pus, Sputum, throat/ear/nasal/wound swabs, CSF and other body fluids. Simple, differential and special staining methods.

### **UNIT II**

Cultivation methods -Transport media -Isolation methods -Basal Differential Enriched, selective media & special media for the pathogenic bacteria. Biochemical identification tests for the respective bacteria up to species level.

### **UNIT III**

Antibiotic sensitivity tests -Stokes & Kirby Bauer methods -Disc diffusion - Dilution -Agar dilution & broth dilution -MBC/MIC -Quality Control for antibiotics and standard strains.

### **UNIT IV**

KOH preparation of skin / nail scrapings for fungi and for scabies mites Hair infected under UV light. LPCB mount. Special stains for fungi -Gomori, PAS and Methanamine silver stain for sections. Cultivation of fungi and their identification -Mucor -Rhizopus, Aspergillus, Penicillium, Candida, Trichophyton, Microsporum, Epidermophyton -SDA/corn meal agar. Slide culture method -Germ tube method -Sugar assimilation/fermentation tests for yeast.

### **UNIT V**

Examination of parasites in clinical specimens -ova/cysts in Faeces -Direct and concentration: methods -Formal Ether and Zinc sulphate methods -Saturated salt solution method. Blood smear examination for malarial parasites. Thin smear by Leishman's stain -Thick smear by J.B. stain. Wet film for Microfilariae Identification of common arthropods of medical importance -spotters of Anopheles, Glossina, Phlebotomus, Aedes, etc. Ticks and mites.

## **UNIT VI**

Isolation and characterization of bacteriophage from natural sources – phage titration-T4. Study of virus infected plants- Animal tissue culture – chick embryo isolation- fibroblast culture – preparation (demonstration). Spotters of viral inclusions and CPE- stained smears. Viral serology- HAI-ELISA kits, Western Blotting.

## **ELECTIVE II - BIOSTATISTICS AND BIOINFORMATICS**

### **UNIT I**

Nature and scope of statistical methods and their limitations compilation, classification, tabulation and application in life sciences-graphical representation – measure of average and dispersion stem and leaf plots; box and whisker plots, coplots. Introduction to probability theory and distributions (concepts without derivation) binomial, poisson and normal (only definition and problems).

### **UNIT II**

Correlation and regression – concepts of sampling and sampling distribution – tests of significance based on t-test, chi-square and F-test for means, proportions variations and correlation coefficient, theory of attributes and tests of independence of contingency tables.

### **UNIT III**

Sampling methods- simple random, stratified, and systemic and cluster sampling procedures, sampling and non-sampling errors, principles of scientific experiments- analysis of variance- one way and two way classification.

### **UNIT IV**

Overview of bioinformatics- database types. Genomics and human genome project. Computer tools for sequence analysis; finding and retrieving tools similarity searching.

### **UNIT V**

Pair wise and multiple sequence alignment. Structure function relationships. DNA micro array.

### **TEXT BOOKS**

1. Davis, B.D., Delbecco, R., Eisen, H.N. and Ginsburg, H.S. (1990) *Microbiology*, 5th Edn. Harper & Row, New York.
2. Arora, D.R. (2003) *Text Book of Microbiology*, 2nd Edn. CBS Publishers & Distributors, New Delhi.
3. Dubey, R.C. and Maheswari, D.K. (2003) *A Text Book of Microbiology*, 1st Edn. S. Chand & Co. Ltd., New Delhi.
4. Boyd, R.F. (1998) *General Microbiology*. Times Mirror, Mosby College Publishing, St Louis.
5. Prescott, L.M., Harley, J.P. and Klein, D.A. (1999) *Microbiology*. McGraw Hill, New Delhi.

6. Roitt, I.M. (1998) *Essential Immunology*. Blackwell Scientific Publications, Oxford.
7. Weir, D.M. and Steward J. (1993) *Immunology*, 7th Edn. ELBS, London.
8. Abbas, A.K., Lichtman, A.H. and Pober, J.S. (1994) *Cellular and Molecular Immunology*, 2nd Edn. WB Saunders, USA.
9. Humphrey, J.H. and White, R.G. (1995) *Immunology for Students of Medicine*, 5th Edn. ELBS, London.
10. Jagadish Chander (1996) *A Text Book of Medical Mycology*. Interprint, New Delhi.
11. Greenwood, D., Slack, R.B. and Peutherer, J.F.(2002) *Medical Microbiology*, 16th Edn. Churchill Livingstone, London.
12. Finegold, S.M. (2000) *Diagnostic Microbiology*, 10th Edn. C.V. Mosby Company, St. Louis.
13. Parija, S.C. (1996) *Text Book of Medical Parasitology*. Orient Longman, Chennai.
14. Chatterjee (1986) *Medical Parasitology*. Tata McGraw Hill, Calcutta.
15. Easwari Nayar (1974) *Hand Book on Medical Entomology*. Kalpana Printing House, Delhi.
16. Arora. D.R. and Arora, B. (2002) *Medical Parasitology*, 1st Edn. CBS Publishers & Distributors, New Delhi.
17. Ananthanarayanan, R. and Jayaram Panicker C.K. (2004) *Text book of Microbiology*. Orient Longman, Hyderabad.
18. Gerhardt, P., Murray, R.G., Wood, W.A. and Kreig, N.R. (Eds) (1994) *Methods for General and Molecular Bacteriology*. ASM Press, Washington, DC.
19. Collee, J.C., Duguid, J.P., Fraser, A.C. and Marimon, B.P. (1996) *Mackie and McCartney Practical Medical Microbiology*, 14th Edn. Churchill Livingstone, London.
20. Dubey, R.C. and Maheshwari, D.K. (2002) *Practical Microbiology*, 1st Edn. S. Chand & Co. Ltd., New Delhi.

21. Morag, C. and Timbury, M.C. (1994) *Medical Virology*, 10th Edn. Churchill Livingstone, London.
22. Dimmock, N.J. and Pimbrose, S.B. (1994) *Introduction to Modern Virology*, 4th Edn. Blackwell Scientific Publications, Oxford.
23. Conrat, H.F., Kimball, P.C. and Levy, J.A. (1994) *Virology*, 3rd Edn, Prentice Hall, New Jersey.
24. Snedecar, G.W. and Cochran, W.G.(1967) *Statistical Methods*. Oxford Press,London.
25. Daniel, W.W. (1995) *Biostatistics : A foundation for analysis in health sciences*,6th Edn. John Wiley & Sons, New York.
26. Cotton, T. (1974) *Statistics in Medicine*. Little Brown, Boston.
27. Arunagirinathan, N. and Rajendran, P.(2006) *Allergy*, 1st Edn. Rahul Publication,Arcot,Vellore.
28. Kannan, I. (2007) *Immunology*. MJP Publishers, Chennai.
29. Daniel, J.C. (1996) *Environmental Aspects of Microbiology*. Bright Sun Publication, Chennai.
30. Meena Kumari, S. (2006) *Microbial Physiology*. MJP Publishers, Chennai.
31. Arunagirinathan, N. and Aswini, L. (2006) *Biotechniques* ,1st Edn. Rahul Publication,Arcot,Vellore.
32. Cappuccino, J. and Sherman, N. (2002) *Microbiology: A Laboratory Manual*, 6th Edn. Pearson Education Publication, New Delhi.
33. Vijaya Ramesh, K (2007) *Food Microbiology*. MJP Publishers., Chennai.

## REFERENCE BOOKS

1. Wolfgang, Joklik and Smith, D.T. (1990) *Zinsser Microbiology*, 16th Edn. Appleton Century Crafts, New York.
2. Cowan and Steel (1995) *Manual for Identification of Medical Bacteria*, 4th Edn. Cambridge University Press, London.
3. Ingraham, J.L. and Ingraham, C.A. (2000) *Introduction to Microbiology* 2nd Edn. Books/Cole Thomson Learning, UK.



4. Weir, D.M. (1995) *Experimental Techniques in Immunology*. Blackwell Scientific Publications, Oxford.
5. Topley and Wilson (1995) *Principles of Bacteriology Virology and Immunity*. 9th Edn. Vol I, Edward Arnold, London.
6. Jawetz, E., Melnick, J.L. and Adelberg, E.A. (1998) *Review of Medical Microbiology*, 19th Edn. Lange Medical Publications, U.S.A..
7. Murray, P.R., Baron, E.J., Jorgensen, J.H., Tenover, M.C. and Tenover, R.H. (2003) *Manual of Clinical Microbiology*, 8th Edn. Vol 1&2, ASM Press, Washington, D.C.
8. Balows, A., Hausler, W.J., Tenover, J.C. and Tenover, R.H. (Eds) (1988) *Laboratory Diagnosis of Infectious Diseases: Principles and Practice*, Vol 1 Springer-Verlag, New York.
9. Holt, J.S., Krieg, N.R., Sneath, P.H.A. and Williams, S.S.T. (1994) *Bergey's Manual of Determinative Bacteriology*, 9th Edn. Williams & Wilkins, Baltimore.
10. Jayapal, V. (2007) *Fundamentals of Medical Immunology*. Jay Pee Brothers Medical Publications, New Delhi.
11. George Pinchuk (2002) *Immunology* (Schaum's Outlines). McGraw Hill, New York.

### 3. M.SC DEGREE COURSE IN BIO-CHEMISTRY

## SYLLABUS

### SEMESTER I

Title of the paper		Chemistry of Biomolecules -Core-1	
Category: Core	Year & Semester First year & First Semester	Credits 4	Subject code
Pre-requisites	Bachelor degree in any life science discipline		
Objective	To understand structure- function relationship of Biomolecules		

#### Course outline: (Chemistry of Biomolecules)

#### UNIT I

Definition, nomenclature, classification, structure, chemistry and function of carbohydrate; lipids; aminoacids; peptides; protein.

#### UNIT II

Primary structure of proteins and its determination, secondary structure – the  $\alpha$  helix,  $\beta$  pleated sheet and turns. Super secondary structures- helix-loop helix, hair pin,  $\beta$ -motif,  $\beta$  - $\alpha$ - $\beta$  motif. Tertiary structure –quaternary structure. Peptide synthesis, organization of amino acids in the peptide chain of protein.

#### UNIT III

##### Nucleic acids

Structure of Purine, Pyrimidine, nucleosides and nucleotides, DNA double helical structure, A,B, and Z forms of DNA. Triple and quadruple structure. DNA super coiling and linking number. Properties of DNA – Buoyant density, viscosity, hypochromicity, denaturation and renaturation, Cot curve, C value paradox. Chemical and enzymatic methods of sequence analysis. Chemical synthesis of oligonucleotides. Major classes of RNA, their structure and biological role.

#### **UNIT IV**

Structure and function of triglycerides, structural lipids in membranes, glycerophospholipids, sphingolipids –structure and functions, role of sphingolipids in biological recognition, intracellular messenger, IP, phosphatidyl inositol (structure and function)

#### **UNIT V**

Structure, composition, transport and metabolism of lipoproteins. Structure and function of important steroids. Methods of isolation, purification and characterization of protein. Conformational study on the lysozyme, hemoglobin, myoglobin, collagen, actin and myosin.

#### **Reference Books**

- Principles of Biochemistry - A.L. Lehninger, 4<sup>th</sup> edition, 2005, W.H. Freeman.
- Biochemistry – Voet.D & Voet. J.G, 3<sup>rd</sup> edition, 2004, John Wiley & Sons, Inc.
- The chemical reactions of living cells – Metzler D.E. 2<sup>nd</sup> edition, 2001, Academic Press.
- Biochemistry – Zubay G.L, 4<sup>th</sup> edition, 1998, Mc Graw-Hill.

#### **Indian Books**

- Principles of Biochemistry – Nelson D.L, Cox M.M, 2<sup>nd</sup> edition, 1993, CBS publishers & Distributors, Delhi.
- Biochemistry – Sathyanarayana U, 2002, Arunabha Sen Books & Allied (P) Ltd, Kolkata.

### Recommended Texts

- Biochemistry – Stryer L, 4<sup>th</sup> edition, 1999, W.H. Freeman & Company, New York.
- Biochemistry – Voet.D & Voet. J.G, 1st edition, 1990, John Wiley & Sons, Inc.

### web Sites

<http://golgi.harvard.edu/biopages.html>

[www.whfreeman.com/biochem](http://www.whfreeman.com/biochem)

<http://www.harcourtcollege.com>

Title of the paper	Biochemical Techniques - Core-2		
Category: Core	Year & Semester First year & First Semester	Credits 4	Subject code
Pre-requisites	Bachelor degree in any life science discipline		
Objective	To understand the principles of techniques used in Biochemical studies		

### Course outline: (Biochemical Techniques)

#### UNIT I

General approaches to biochemical investigation. Organ and tissue slice technique, cell distribution and homogenization techniques, cell sorting, and cell

counting, tissue culture techniques. Cryopreservation, microscopy, and manometric techniques. Electrochemical techniques- principles of redox reactions, pH electrode. Clark's oxygen electrode and their applications.

## **UNIT II**

Principle of Spectroscopy, UV, Visible, IR, ESR, NMR, Raman and mass spectroscopy. Basic laws of light absorption, ORD, CD, X-ray diffraction. Turbidometry, Nephelometry and Luminometry. Radiochemical methods, basic concepts, detection, counting methods and applications, autoradiography (Cerenkov radiation).

## **UNIT III**

**Chromatography:** Theory and practice, column chromatography, column efficiency and resolution. Types of adsorption chromatography-hydroxy apatite chromatography and hydrophobic interaction chromatography (HIC). Types of partition chromatography-normal and reverse phase liquid chromatography, chiral and counter current chromatography. Paper chromatography, ion-exchange chromatography. Exclusion chromatography. Chromatofocussing, affinity chromatography. Principles and applications of GLC, LPLC and HPLC. Selection of chromatographic systems.

## **UNIT IV**

General principles of electrophoresis, support media, factors affecting electrophoresis, high voltage and low voltage electrophoresis, SDS-PAGE, isoelectric focusing, isotachopheresis, 2D PAGE and capillary electrophoresis. Cellulose acetate, and continuous flow electrophoresis, electrophoresis of nucleic acids, pulse field gel electrophoresis, blotting techniques-western, southern, northern-principle of working and applications.

## **UNIT V**

Centrifugation basic principles and laws of sedimentation. Preparative and analytical ultracentrifuges. Sedimentation equilibrium methods. Types of separation methods in preparative centrifuges. Differential and density gradient centrifugation. Analysis of subcellular fractions. Estimation of purity of macromolecules and detection of conformational changes. Cytophotometry and flow cytometry. Molecular biology and immunological techniques- PCR, RT-PCR, Immunohistochemistry, immunofluorescence, ELISA.

### **Reference Books**

Practical biochemistry: principles and techniques ( 5 th edition, 2000).  
Keith Wilson and John Walker. Cambridge University Press

Analytical biochemistry (Longman scientific and technicals, England, III edition, 1998)- Holme and H.Pec.

### **Recommended Books**

- A biologists guide to principles and techniques to practical biochemistry ( III Edition, 1986)
- Biochemical calculations (Liss, Newyork, 1991)-Irwin H.Saegal
- An introduction to practical biochemistry- Plummer
- Instrumental methods of chemical analysis (7<sup>th</sup> edition)- Chatwal and Anand

### **Indian Books**

- Analytical Biochemistry and separation techniques- a Laboratory manual for B.Sc., and M.Sc., students (3<sup>rd</sup> edition )-P.Palanivelu
- Introductory practical biochemistry (Narosa Publishing House, 2000) K.Sawhney and Randhir Singh

Title of the paper	<b>Practical I -Core-3</b>		
Category: Core	Year & Semester First year & First Semester	Credits 4	Subject code
Pre-requisites	Bachelor degree in any life science discipline		
Objective	To get hands on training in the Biochemical methods		

**Course outline: (Practical I)**

1. Biochemical studies and estimation of macromolecules

- Isolation and estimation of glycogen from liver
- Isolation and estimation of DNA from animal tissue
- isolation and estimation of RNA from yeast
- Separation of starch from plant source and assessment of its purity
- Determination of N and C terminal amino acids (only demonstration)
- Adsorption studies with protein and DNA
- Denaturation of DNA and UV absorption studies

2. Colorimetric estimation

- Estimation of pyruvate
- Estimation of lactate
- Estimation of tryptophan
- Estimation of protein by Lowry's method

3. Subcellular fractionation of cell by differential centrifugation and assay of markers (any two fractions sufficient) Nucleus(DNA), Mitochondria (SDH),

cytosol (LDH), Lysosome (Acid phosphatase) and microsome (Glucose 6 phosphatase)

## REFERENCE BOOKS

- Varley's Practical Clinical Biochemistry by Alan H Gowenlock, Published by CBS Publishers and distributors, India Sixth Edition (1998).
- Tietz Fundamentals of Clinical chemistry- Burtis and Ashwood, Fifth Edition, WB saunders Company. Oxford Science Publications USA, (2001)
- Practical Biochemistry – Keith Wilson & John Walker, fifth Edition, Cambridge University Press, UK (2000).
- Analytical Biochemistry & separation Techniques- Palanivelu Third edition (2004)
- Biochemical calculations- Irwin H Segel, second edition, John Wiley & sons, USA (1976).
- Introductory practical biochemistry (Narosa Publishing House, 2000) K.Sawhney and Randhir Singh
- Experiments in Biochemistry- A Hands on Approach by Shawn O Farrell and Ryan T Ranallo, Thomson Learning Inc., USA (2000)

## RECOMMENDED BOOKS

- Principles of Instrumental analysis- Skoog, Holler, Nieman, fifth edition Published by Harcourt College Publishers, Singapore (2001).
- Essentials of Practical Biochemistry By Lalit M Srivastava, Nibhriti Das, Subrata Sinha, Published by CBS Publishers and Distributors, India, (2002).



Title of the paper	Human Physiology-Elective -1		
Category: Elective	Year & Semester First year & First Semester	Credits 3	Subject code
Pre-requisites	Bachelor degree in any life science discipline		
Objective	To understand the human physiology		

Course outline: ( Human Physiology)

## UNIT I

Types, structure and functions of - epithelial connective and nerve tissues. Morphological, functional and biochemical maturation of tissues. Muscle - types and mechanism of contraction.

## UNIT II

Composition and functions of blood, lymph and CSF. Circulatory system. Development and functions of red and white blood cells and platelets. Blood coagulation. Structure and functions of heart. Cardiac cycle. ECG, blood pressure, cardiac output. Spleen and lymphoid cells. Structure and functions of lungs and mechanism of respirations.

## UNIT III

Structure and functions of digestive system- stomach, liver, pancreas, gall bladder and intestine. Digestion, absorption and excretion. Structure and functions of excretory system-kidney. Formation and composition of urine, Micturition, GFR. Renal regulation of fluid and acid base balance.

## UNIT IV

Structure and functions of central nervous system- brain, spinal cord, nerves and neurons, transmission of nerve impulses and neurotransmitters.

## **UNIT V**

Structure and function of reproductive system. Physiology of pregnancy, parturition and lactation.

## **RECOMMEDED BOOKS**

1. Human Physiology – Best and taylor
2. Human Physiology – C.Chatterjee
3. Harper's Physiological Biochemistry –Harper et al
4. Text book of Medical Physiology - Guyton

<b>Title of the paper</b>	<b>Nutritional Biochemistry-Elective-2</b>		
Category: Elective	Year & Semester First year & First Semester	Credits 3	Subject code
Pre-requisites	Bachelor degree in any life science discipline		
Objective	To understand the human nutrition		

## **Course outline: ( Nutritional Biochemistry)**

## **UNIT I**

Definition for nutrition, nutrients, body weight, body composition. Measurement of energy expenditure, basal metabolic rate, calorific value,

respiratory quotient, nutritional requirements of carbohydrates, proteins and lipids. Deficiency states of carbohydrate, proteins and lipid, RDA.

## **UNIT II**

Nutritional requirements of vitamins (fat and water soluble) - structure, functions, deficiency states, dietary source, RDA.

## **UNIT III**

Nutritional requirements of minerals- functions, deficiency states, dietary source, RDA.

## **UNIT IV**

Nutrition and Body's defense- Dietary guidelines for disease prevention. The process of cancer development, the body's defense system and nutritional therapy.

## **UNIT V**

Dietary management with special reference to diabetes mellitus, cardiovascular diseases, nephritis, cirrhosis, jaundice, ulcer and malnutrition (kwashiorkor and marasmus).

## **RECOMMENDED BOOKS**

1. Human nutrition and Dietetics – Davidson and Passmore
2. Food science – M.S. Swaminathan.
3. Nutritional Biochemistry – Tom Brody, 1994, Academic press, USA.
4. Antioxidant status, diet, nutrition and health - Andreas M Pappas, 1996. Published by CRC Press. Washington, DC.

5. Text book of Physiology and Nutrition- M. Swaminathan.

## **SEMESTER II**

<b>Title of the paper</b>	<b>Enzyme Technology -Core-4</b>		
Category: Core	Year & Semester First year & Second Semester	Credits 4	Subject code
Pre-requisites	Bachelor degree in any life science discipline		
Objective	To introduce the students to various aspects of Enzyme Technology		

### **Course outline: (Enzyme Technology)**

#### **UNIT I**

Enzyme nomenclature, and classification; general properties of enzymes and the factors that affects their activity and associated changes; extraction assay and purification of enzymes. Enzyme activity, Enzyme assays, Methods for determination of enzyme activity, expression of enzyme activity, coupled reactions. Fast reaction and stopped flow techniques. Activity staining and zymography, intracellular localization of enzymes.

#### **UNIT II**

Reaction rate, order of reaction, energy of activation. Progress curve of enzyme catalyzed reaction. Factors influencing velocity of enzyme reaction, effect of enzyme concentration, effect of substrate, pH, temperature, Michaelis-Menton equation and Briggs Haldane modification, single and double reciprocal plots, determination of  $K_m$  and  $V_{max}$ . Kinetics of bisubstrate reactions (Alberty's equation). Single and double displacement reactions. Diagnostic plots for bisubstrate reactions. Scatchard plot for ligand-protein binding, enzyme

inhibition, types of inhibition, kinetics of competitive, non-competitive and uncompetitive inhibition. Diagnostic plots for inhibitors. Determination of  $K_I$  and  $K_m$ . Allosteric enzymes with AT case as an example, Sigmoidal kinetics, Hill's plot, feedback inhibition.

### **UNIT III**

Coenzymes and cofactors, structure and function of coenzymes, reactions involving CoA, TPP, PLP, NAD/NADP, FMN/FAD, biotin, folic acid, cobamide enzymes. Multienzymes systems-occurrence, isolation and properties, mechanism of action and regulation of multienzymes, Metalloenzymes.

### **UNIT IV**

Enzyme specificity, active site of enzymes, mapping of active sites, chemical modifications, site directed mutagenesis of enzymes, mechanism of enzyme activity- covalent catalysis, proximity and oriental effects, acid-base catalysis, electronic strain. Structure and mechanism of action of representative enzymes like chymotrypsin and ribonuclease.

### **UNIT V**

Industrial uses of enzymes-food and pharmaceutical industries. Designer enzymes, abzymes, biosensors, ribozymes. Immobilized enzymes- methods of immobilization and applications.

### **Reference Books**

- Biochemistry - Geoffrey L, Zubay, 1998, 4<sup>th</sup> edition.
- Fundamentals of Biochemistry - Donald Voet, Judith Voet and Pratt, 1995, 2<sup>nd</sup> edition.

- Harper's Biochemistry - Murray et al, 2000, 25<sup>th</sup> edition, Appleton and Lange Publishers.
- Principles of Biochemistry with human focus - Garrett and Grisham, 2002, HarcourtCollege Publishers, Orlando, Florida, USA.
- Principles of Biochemistry - Lehninger, Nelson and Cox, 2005, 4<sup>th</sup> edition, WH Freeman and Company, New York, USA.

### Recommended Books

- Enzymes – Dixon & Webb.
- Enzymes – Palmer.

### Web Sites :

[www.lsbu.ac.uk/biology/enztech/](http://www.lsbu.ac.uk/biology/enztech/)

[www.lsbu.ac.uk/biology/enzyme](http://www.lsbu.ac.uk/biology/enzyme)

<http://www.aetlted.com/tech/applications.html>

Title of the paper	Intermediary Metabolism I -Core-5		
Category: Core	Year & Semester First year & Second Semester	Credits 4	Subject code
Pre-requisites	Bachelor degree in any life science discipline		
Objective	To understand the pathways of synthesis and breakdown of biomolecules and the enzymes involved		

### Course outline: (Intermediary Metabolism I)

#### UNIT I

##### Biological oxidation

High energy phosphates, Components of electron transport chain and the sequence of electron transport. Oxidative phosphorylation- the chemiosmotic theory. Mechanism of ATP synthesis. Uncoupling of oxidative phosphorylation,

mitochondrial transport systems, ATP/ADP exchange, malate/glycerol phosphate shuttle

## **UNIT II**

Photosynthesis- chloroplasts as photosynthetic apparatus. Light reactions –Hill reaction, cyclic and non-cyclic photophosphorylation. Dark reactions –Calvin cycle. Control of Calvin cycle, photorespiration and C4 cycle (Hatch slack path way). Starch biosynthesis and degradation, bioluminescence.

## **UNIT III**

Carbohydrate metabolism

Aerobic glycolysis and fermentation –energetics of glycolysis and fermentation. Gluconeogenesis. Substrate cycle and reciprocal regulation of glycolysis and gluconeogenesis. Metabolism of glycogen and regulation. Maintenance of blood sugar by liver.

## **UNIT IV**

Citric acid cycle and its regulation-energetics. The amphibolic nature of the citric acid cycle, HMP shunt, uronic acid pathway, Cori cycle, glyoxylate pathway. Metabolism of fructose, galactose and mannose. Lactose synthesis and glycoprotein synthesis. Synthesis of bacterial cell wall polysaccharides.

## **UNIT V**

Integration of Metabolism - Interrelationship of carbohydrate, protein and fat metabolism-role of acetyl CoA and TCA cycle. Interconversion of major food stuff. Metabolic profile of the principal organs and their relationships.

## **Reference Books**

- Biochemistry - Geoffrey L, Zubay, 1998, 4<sup>th</sup> edition.

- Fundamentals of Biochemistry - Donald Voet, Judith Voet and Pratt, 1995, 2<sup>nd</sup> edition.
- Harper's Biochemistry - Murray et al, 2000, 25<sup>th</sup> edition, Appleton and Lange Publishers.
- Principles of Biochemistry with human focus - Garrett and Grisham, 2002, HarcourtCollege Publishers, Orlando, Florida, USA.
- Principles of Biochemistry - Lehninger, Nelson and Cox, 2005, 4<sup>th</sup> edition, WH Freeman and Company, New York, USA.

### Recommended Books

- Enzymes – Dixon & Webb.
- Enzymes – Palmer.

### Web Sites :

[www.lsbu.ac.uk/biology/enztech/](http://www.lsbu.ac.uk/biology/enztech/)

[www.lsbu.ac.uk/biology/enzyme](http://www.lsbu.ac.uk/biology/enzyme)

<http://www.aetlted.com/tech/applications.html>

Title of the paper	Intermediary Metabolism II - Core-6		
Category: Core	Year & Semester First year & Second Semester	Credits 4	Subject code
Pre-requisites	Bachelor degree in any life science discipline		
Objective	To understand the pathways of synthesis and breakdown of biomolecules and the enzymes involved		

### Course outline: (Intermediary Metabolism –II)



## **UNIT I**

Lipid metabolism - Oxidation of saturated and unsaturated fatty acids. Oxidation of fatty acids with even and odd numbered carbon atoms.  $\alpha$ ,  $\beta$  and  $\omega$  oxidation. Ketogenesis. Biosynthesis of saturated and unsaturated fatty acids, regulation of fatty acid metabolism. Mitochondrial chain elongation. Metabolism of triacylglycerol, phospholipids and sphingolipids.

## **UNIT II**

Cholesterol biosynthesis and regulation, degradation of cholesterol-cholesterol transport, excretion. Lipoprotein metabolism. The cycle and linear pathways of arachidonic acid metabolism.

## **UNIT III**

Degradation of amino acids- transamination, oxidative and non-oxidative deamination, decarboxylation-urea cycle and its regulation. Catabolism of amino acids - carbon skeleton of amino acids to amphibolic intermediates, key role of glutamate dehydrogenase in nitrogen metabolism.

## **UNIT IV**

Biosynthesis of non –essential amino acids. Conversion of amino acids to specialized products. Serotonin, gamma aminobutyric acid, dopamine, epinephrine, nor-epinephrine, melanin, creatinine, creatine.

## **UNIT V**

Metabolism of nucleotides, denovo synthesis of purine nucleotides, salvage pathway, degradation of purine nucleotides. Denovo synthesis of pyrimidine nucleotides, salvage pathway, degradation of pyrimidine nucleotides. Regulation

of purine and pyrimidine nucleotides biosynthesis. Inhibitors. Metabolism of porphyrin. Biosynthesis and degradation of prophyrin. Heme, bile pigment formation transport and excretion.

### Reference Books

- Biochemistry - Geoffrey L, Zubay, 1998, 4<sup>th</sup> edition.
- Fundamentals of Biochemistry - Donald Voet, Judith Voet and Pratt, 1995, 2<sup>nd</sup> edition.
- Harper's Biochemistry - Murray et al, 2000, 25<sup>th</sup> edition, Appleton and Lange Publishers.
- Principles of Biochemistry with human focus - Garrett and Grisham, 2002, Harcourt College Publishers, Orlando, Florida, USA.
- Principles of Biochemistry - Lehninger, Nelson and Cox, 2005, 4<sup>th</sup> edition, WH Freeman and Company, New York, USA.

### Recommended Books

- Enzymes – Dixon & Webb.
- Enzymes – Palmer.

### Web Sites

[www.lsbu.ac.uk/biology/enztech/](http://www.lsbu.ac.uk/biology/enztech/)

[www.lsbu.ac.uk/biology/enzyme](http://www.lsbu.ac.uk/biology/enzyme)

<http://www.aetlted.com/tech/applications.html>

Title of the paper	Practical II - Core-7		
Category: Core	Year & Semester First year & Second Semester	Credits 4	Subject code

Pre-requisites	Bachelor degree in any life science discipline
Objective	To get hands on training in Biochemical methods

### **Course outline: (Practical II)**

#### **1. Enzyme studies**

- a) isolation, purification and kinetic studies of alkaline phosphatase of rat kidney or intestine
- b) assay of ATPase, creatine phosphokinase, glucuronidase, LDH(spectrophotometric assay)
- c) kinetic studies of amylase and acid phosphatase

#### **2. Food analysis**

- a) proximate analysis of food material for protein, carbohydrate, fat.
- b) ash content and moisture content of food
- c) Estimation of Calcium and Fe from ash
- d) Estimation of vitamin – riboflavin, thiamine

#### **3. Separation procedures**

- a) Separation of lipids by TLC
  - b) Separation of amino acids and sugars by chromatography
  - c) Separation of plant pigments by column chromatography
  - d) Separation of proteins by gel filtration and molecular weight determination
4. Separation of amino acids, proteins and protein hydrolysate by ion exchange chromatography. Separation by SDS-PAGE and determination of its molecular weight. Isolation, separation and determination of molecular weight of plasmid DNA. PCR, ELISA, western blotting.

5.

## REFERENCE BOOKS

- Varley's Practical Clinical Biochemistry by Alan H Gowenlock, Published by CBS Publishers and distributors, India Sixth Edition (1998).
- Tietz Fundamentals of Clinical chemistry- Burtis and Ashwood, Fifth Edition, WB Saunders Company. Oxford Science Publications USA, (2001)
- Practical Biochemistry – Keith Wilson & John Walker, fifth Edition, Cambridge University Press, UK (2000).
- Analytical Biochemistry & separation Techniques- Palanivelu Third edition (2004)
- Biochemical calculations- Irwin H Segel, second edition, John Wiley & sons, USA (1976).
- Introductory practical biochemistry (Narosa Publishing House, 2000) K.Sawhney and Randhir Singh
- Experiments in Biochemistry- A Hands on Approach by Shawn O Farrell and Ryan T Ranallo, Thomson Learning Inc., USA (2000)

## RECOMMENDED BOOKS

- Principles of Instrumental analysis- Skoog, Holler, Nieman, fifth edition Published by Harcourt College Publishers, Singapore (2001).
- Essentials of Practical Biochemistry By Lalit M Srivastava, Nibhriti Das, Subrata Sinha, Published by CBS Publishers and Distributors, India, (2002).

	<b>Essentials of Biochemistry - Elective-3</b>
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<b>Title of the paper</b>			
Category: Extra Disciplinary	Year & Semester First year & Second Semester	Credits 3	Subject code
Pre-requisites	Bachelor degree in any life science discipline		
Objective	To understand the chemistry of living organisms		

## UNIT I

Hydrogen ions, molarity, molality and normality, pH, acids and bases, buffers, Henderson-Hasselbach equation, biologically important buffers.

Osmosis, osmotic equilibrium, Donnan membrane equilibrium. Surface tension, viscosity, vapour pressure and their biological application.

## UNIT II

Carbohydrates-Structure, properties and function of monosaccharides (glucose and fructose), disaccharides (sucrose, lactose, maltose) and polysaccharides (starch, glycogen and cellulose). Glycosaminoglycans, glycoproteins, glycolipids and bacterial cell wall polysaccharides.

## UNIT III

Amino acids- zwitter ions, pI, naturally occurring amino acids, their classification, structure and their bio-active derivatives.

Proteins- classification based on their structure and functions. Denaturation of proteins- salting in and salting out. Primary structure, sequencing

of proteins and comparing with existing sequences in data banks. Forces stabilizing protein structure and their significance in biological functions. Ramachandran plot. Secondary, tertiary and quaternary structure of proteins.

#### **UNIT IV**

Lipids – Classification, structure and functions, properties of fatty acids and fats, lipoproteins.

Vitamins – Functions and deficiency states of water and fat soluble vitamins. Minerals ( Ca, P, Na, K and Mg) and trace elements ( Fe, Cu, Zn and Se) - deficiency states.

#### **UNIT V**

Purine and pyrimidine bases, Structure of different types of DNA and RNA. Properties of DNA, sequencing of Nucleic acids.

#### **REFERENCE BOOKS**

- Biochemistry - Geoffrey L, Zubay, 1998, 4<sup>th</sup> edition.
- Fundamentals of Biochemistry - Donald Voet, Judith Voet and Pratt, 1995, 2<sup>nd</sup> edition.
- Harper's Biochemistry - Murray et al, 2000, 25<sup>th</sup> edition, Appleton and Lange Publishers.

#### **RECOMMENDED BOOKS**

- Principles of Biochemistry with human focus - Garrett and Grisham, 2002, Harcourt College Publishers, Orlando, Florida, USA.
- Principles of Biochemistry - Lehninger, Nelson and Cox, 2005, 4<sup>th</sup> edition, WH Freeman and Company, New York, USA.

## INDIAN BOOKS

- Biochemistry – Sathyanarayana U, 2002, Arunabha Sen Books & Allied (P) Ltd, Kolkata.
- Fundamentals of Biochemistry JL Jain, 2005, Sixth edition, S.Chand & Company Ltd., New Delhi.

## 4. M.Sc DEGREE COURSE IN BIOINFORMATICS

### SYLLABUS

#### SEMESTER-I

Title of the Paper	Paper 1 : Biochemistry		
Category of the Course	Year	Semester	Credits
Core	1	I	4

### COURSE OUTLINE

#### Unit 1:

Carbohydrates: Classification, Structures-open chain forms, cyclic forms, glycosidic linkages, glycoproteins-structures and physiological functions. Amino acids: Classification (based on nature and metabolism), Zwitter-ion, optical activity and chelate

formation. Stereochemistry of amino acids. Classification structure and functions of lipids.

#### **Unit 2:**

Protein chemistry: Peptide bond-formation and geometry; Classification of proteins based on shape, composition, function and stability; Denaturation of proteins, Cleavage of disulfide bonds and separation of polypeptide chains, complete hydrolysis of poly peptide chains, identification of C and N terminal residues, partial hydrolysis, Ordering of peptide fragments, assignment of the positions disulfide linkages. Protein folding pathways, Ramachandran Diagram.

#### **Unit 3:**

Enzymes- Active site, cofactors, Enzyme specificity, factors affecting enzyme activity. Enzyme kinetics- Michaelis – Menten equation, LB plot, Determination of  $K_m$ , Inhibitors, Allosteric enzymes, General mechanisms of action of enzymes, Regulation of enzyme activity, Enzymes on solid support- methods of enzyme immobilization, properties of immobilized Enzymes

#### **Unit 4:**

Metabolic Pathways: Metabolism of glucose – glycolysis, TCA cycle, glycogenesis, glycogenolysis and gluconeogenesis, Pentose phosphate shunt, Protein metabolism- transamination, oxidative deamination and urea cycle. Interconnection of pathways, metabolic regulation

#### **Unit 5:**

Separation and Purification of Macromolecules-Extraction and purification of proteins and enzymes.

Centrifugation – differential, isopycnic and ultra centrifugation.

Chromatography- Gel filtration, ion-exchange chromatography, Affinity chromatography  
Electrophoresis- Principles, SDS-PAGE, Agarose Gel Electrophoresis, Capillary electrophoresis, 2D gel electrophoresis, isoelectric focusing

#### **Recommended Texts:**

1. Lehninger, AL, Nelson, DL, Cox, M, M M (2004), “**Principles of Biochemistry**”, 4<sup>th</sup> edition, W.H. Freeman & Co., New York.
2. Berg, JM, Stryer, L, Tymoczko, JL (2002), “**Biochemistry**” 5<sup>th</sup> edition, W.H. Freeman & Co., New York.
3. Voet, D, Voet, JG, Pratt, C.W. (2005) “**Fundamentals of Biochemistry**” 2<sup>nd</sup> edition, John Wiley & Sons, USA.

#### **Reference Books:**

1. Voet, D (2004), “**Biochemistry**”, 3<sup>rd</sup> edition, Wiley, USA.
2. Horton, R, Moran, L, Scrimgeour, G, Perry, M, Ravon, D (2005) “**Principles of Biochemistry**”, 4<sup>th</sup> edition, Prentice-Hall of India, Kolkata
3. Satyanarayana, U (2005) “**Biochemistry**”, Books Allied (P) Ltd, Kolkata.



4. Talwar, GP, Srivastava LM, (Editor) (2003) **“Textbook of Biochemistry and Human Biology”**, 3<sup>rd</sup> edition, Prentice-Hall of India Pvt Ltd, New Delhi
5. Palmer, T (2004) **“Enzyme: Biochemistry, Biotechnology, Clinical Chemistry”**  
Affiliated-East-West Press, India.

Title of the Paper	Paper 2 : Biophysical Chemistry		
Category of the Course	Year	Semester	Credits
Core	1	I	4

## COURSE OUTLINE

### Unit 1

Classical and quantum mechanics: Elementary introduction to Lagrangian and Hamiltonian formulation of mechanics – breakdown of classical mechanics – Planck theory of blackbody radiation – photoelectric effect – Bohr model of the atom – atomic spectra – De Broglie theory of matter waves – Schrodinger wave equation – interpretation of wave function – atomic orbitals – molecular orbitals – hybrid orbitals – valency of carbon atom – covalent bond – bond order – resonance structure of benzene – partial double bond character of peptide bond.

### Unit 2

Thermodynamics and energetics: Thermodynamics systems – laws of thermodynamics – statement and applications – concepts of entropy and enthalpy – chemical potentials – free energy – Gibb and Helmholtz free energy – ATP as energy currency in biological systems – free energy of hydrolysis of ATP and other organophosphates.

### Unit 3

Molecular mechanics and dynamics: Basic principles – molecular representations – force fields – atom-atom pair potentials – bond length and bond angle and torsion angle potential – van der Waals and electrostatic potential – hydrogen bonding terms – MM3, AMBER, GROMOS, ECEPP/3 force fields – minimization techniques – line search and elementary introduction to gradient techniques – concepts of molecular dynamics – introduction to time-step integration algorithms – dynamics protocols – equilibration and data collection – trajectories and their analyses – graphical representations of trajectories of geometrical parameters.

### Unit 4

Protein and nucleic acid structure: Levels of protein structure – primary, secondary, tertiary and quaternary with examples – alpha helix, beta sheet and beta turn – domains and structural motifs – Rossmann fold, Immunoglobulin fold – Double helical structure of DNA – DNA polymorphism – RNA secondary and tertiary structure, with particular

reference to tRNA and ribosomal RNA – Structure of macromolecular complexes – ribosome, viruses – TMV, TBSV and HIV

## Unit 5

X-ray crystallography and spectroscopy:

Elementary description of crystallography – crystal growth, data collection, structure solution, refinement and interpretation – concept of resolution – IR spectroscopy – UV-Visible spectroscopy – hyperchromism and hypochromism – Raman spectroscopy – ‘fingerprinting’ using Raman spectra – complementarity of Raman and IR spectroscopy Fluorescence spectroscopy – NMR spectroscopy – chemical shift – NOW – Fourier transform NMR spectroscopy - elementary introduction to COSY and NOESY – protein structure determination using NMR

### Recommended Texts:

1. Vasantha Pattabhi and N.Gautham (2001) **‘Biophysics’** Narosa Publishing Company, New Delhi
2. P.Narayanan (1999) **‘Introductory Biophysics’** New Age Publishing Co., Mumbai, India

### Reference Books:

1. C.R.Cantor and P.Schimmel (1985) **‘Biophysical Chemistry, Vol.I, II and III’** W.H.Freeman and Company, New York, USA.
2. D.Freifelder (1982) **‘Physical Biochemistry’** W.H.Freeman and Company, New York, USA.
3. E.Ackerman, L.B.M.Ellis and L.E.Williams (1979) **‘Biophysical Science’** Prentice Hall Inc., New Jersey, USA
4. F.W.Sears, M.W.Zemansky and H.D.Young (1985). **‘College Physics’** Addison Wesley Publishing Company, Massachusetts, USA
5. C.N.Banwell (1983) **‘Fundamentals of Molecular Spectroscopy’** Tata McGraw-Hill Publishing Company Lt., New Delhi, India
6. G.M.Barrow (1962) **‘Molecular Spectroscopy’** McGraw-Hill Book Company Inc., New York, USA
7. D.Sherwood (1976) **‘Crystals, X-rays and Proteins’** Longman Group Lts., London, UK
8. A.R.Leach (1996) **‘Molecular Dynamics Simulation’** John Wiley and Sons, New York, USA
9. J.M.Haile (1992) **‘Molecular Dynamics Simulation’** John Wiley and Sons, New York, USA
10. C.Branden and J.Tooze (1991) **‘Introduction to Protein Structure’** Garland Publishing Company, New York, USA

Title of the Paper	Paper 3 : Biostatistics		
Category of the Course	Year	Semester	Credits

<b>Core</b>	<b>1</b>	<b>I</b>	<b>4</b>
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## **COURSE OUTLINE**

### **Unit 1**

Statistics – Scope –collection, classification, tabulation of Statistical Data – Diagrammatic representation – graphs – graph drawing – graph paper – plotted curve – Sampling method and standard errors –random sampling –use of random numbers – expectation of sample estimates – means – confidence limits – standard errors – variance.

### **Unit 2**

Measures of central tendency – measures of dispersion – skewness, kurtosis, moments – Correlation and regression – correlation table – coefficient of correlation – Z transformation – regression – relation between regression and correlation

### **Unit 3**

Probability – Markov chains applications – Probability distributions – Binomial (Gaussian distribution) and negative binomial, compound and multinomial distributions – Poisson distribution – Normal distribution – graphic representation – frequency curve and its characteristics –measures of central value, dispersion, coefficient of variation and methods of computation – Basis of Statistical Inference –Sampling Distribution – Standard error – Testing of hypothesis – Null Hypothesis –Type I and Type II errors

### **Unit 4**

Tests of significance for large and small samples based on Normal, t, z distributions with regard to mean, variance, proportions and correlation coefficient – chi-square test of goodness of fit – contingency tables –  $\chi^2$  test for independence of two attributes – Fisher and Behrens ‘d’ test – 2×2 table – testing heterogeneity – r X c table – chi-square test in genetic experiments – partition X 2 – Emerson’s method – Tests of significance –t tests – F tests – Analysis of variance – one way classification – Two way classification, CRD, RBD, LSD.

### **Unit 5**

Spreadsheets – Data entry –mathematical functions – statistical function – Graphics display – printing spreadsheets – use as a database word processes – databases – statistical analysis packages graphics/presentation packages.

### **Recommended Texts:**

1. Zar, J.H. (1984) **“Bio Statistical Methods”**, Prentice Hall, International Edition
2. Sundar Rao P. S.S., Jesudian G. & Richard J. (1987), **“An Introduction to Biostatistics”**, 2<sup>nd</sup> edition, Prestographik, Vellore, India,.
3. Warren,J; Gregory,E; Grant,R (2004), **“Statistical Methods in Bioinformatics”**,1<sup>st</sup> edition, Springer

**References Books:**

1. Milton,J.S.(1992),, “**Statistical methods in the Biological and Health Sciences**”, 2<sup>nd</sup> edition ,Mc Graw Hill,
2. Rosner,B (2005), “**Fundamentals of Biostatistics**”, Duxbury Press

<b>Title of the Paper</b>	<b>Paper 4 : Theory and practice of computer science and programming (Practicals)</b>		
<b>Category of the Course</b>	<b>Year</b>	<b>Semester</b>	<b>Credits</b>
<b>Core</b>	<b>1</b>	<b>I</b>	<b>4</b>

**COURSE OUTLINE****Unit 1**

Program structure-components of a program-program compilation and execution-flow charts-arrays (single and multi dimensional) and string functions-user defined functions and function categories-input/output devices

**Unit 2**

Mathematical foundations-Data structures-reasoning about correctness-complexity analysis-implementation techniques

**Unit 3**

Internet- communication types on the internet-hypertext, www, client programs-accessing internet resources via a web browser- static and dynamic web pages-wireless application protocol, network computing and grid computing-downloading using ftp-examples

**Unit 4**

UNIX-understanding the UNIX system-fundamentals of using the UNIX system-mastering the special features of the UNIX system

Text processing: commonly used UNIX commands-resources for users of the UNIX system-interacting with the UNIX system-essentials of system administration-octal equivalents to ASCII-different file editors-handling files-introduction to Linux

**Unit 5**

C++ programming- introduction to programming in C++ - The ASCII code- C++ keywords-C++ operators-C++ types-conditional statements and integer types-interaction and floating types.

Functions-arrays-pointers and references-strings-classes-overloading-operators-A string class-composition and inheritance-stream I/O - simple programs which demonstrates inheritance, operator overloading and polymorphism

**Reference Books:**

1. Hubbard, John (2000) **“Programming with C++”**, Schaum’s outline series, Tata McGraw Hill International
2. Thomas, Rebecca and Jean Yates (1987), **“A user Guide to the UNIX system,”** Tata McGraw Hill International
3. Arnold Robbins & Daniel Gilly, (1999) **“Unix in a Nutshell”**, O’Rielly and Associates
4. Kay. A Robbins, Steven Robbins, Kay. Ret. Robbins and Steve Robbins (1999) **“The C programming language”**, Prentice Hall

Title of the Paper	Paper 5 : Cell Biology		
Category of the Course	Year	Semester	Credits
Elective	1	I	3

**COURSE OUTLINE****Unit1**

Architecture of prokaryotic and eukaryotic cells and tissues. Biomembranes and the subcellular organization of eukaryotic cells. Cell motility and shape, Eukaryotic cytoskeleton- microfilaments-microtubules - intermediate filaments, Cell division-mitosis and meiosis, eukaryotic cell cycle and its regulation

**Unit 2**

The mitochondrion- structure, electron transport chain, oxidative phosphorylation, Chemiosmotic process. Chloroplasts-photosynthesis-photosystems, Calvin cycle, Dark reactions.

**Unit 3**

Intracellular traffic- membrane transport-principles, active transport, ion channels. Protein sorting-an overview of targeting proteins to mitochondria, nucleus, endoplasmic reticulum, lysosomes and plasma membrane.

**Unit 4**

Cell signaling-Hormone-receptor interactions, G protein-coupled receptors and their effectors, Second messengers, Receptor tyrosine kinases, MAP kinase pathways. Cell-cell interactions in development

**Unit 5**

Basic immunology- Types of immunity-innate, acquired, active and passive, antigen-antibody reactions, elements of the immune system:  
T cells, B cells, antigen presenting cells, helper and suppressor cells, natural killer cells, cell-mediated and humoral immunity

**Recommended Texts:**

1. Gerald Karp (Editor) (2005) **“Cell and Molecular Biology: Concepts and Experiments”**, 4th edition, Wiley Publishing Co, USA
2. Lodish, H, Scott, M.P, Matsudaira P, Darnell, J, Zipursky, L, Kaiser, CA, Berk, A, Krieger, M, (2003) **“Molecular Cell Biology”**, 5<sup>th</sup> edition, W.H. Freeman and Co, New York.

**Reference Books:**

1. Alberts, B; Johnson, A; Lewis, J; Raff, M; Roberts, K; Walter, P (2002) **“Molecular Biology of the Cell”**, 4<sup>th</sup> edition, Garland Science, Taylor and Francis group, USA
2. Verma, PS; Agarwal, VS (2005) **“Cell Biology, Genetics, Molecular Biology, Evolution and Ecology”**, 14<sup>th</sup> edition, S.Chand & Company Ltd, New Delhi
3. Alberts, B; Johnson, A; Lewis, J; Raff, M; Bray, D; Hopkin, K; Roberts, K; Walter, P (2003), **“Essential Cell Biology”**, 2<sup>nd</sup> edition, Garland Science, Taylor & Francis Group, USA
4. [Becker](#), WM ; [Kleinsmith](#), LJ ; [Hardin](#), J (2005), **“World of the Cell”** 6<sup>th</sup> edition, Benjamin Cummings

Title of the Paper	Paper 5 : Introduction to Mathematical Methods		
Category of the Course	Year	Semester	Credits
Elective	1	I	3

**COURSE CONTENTS**

**Unit 1**

2D Co-ordinate geometry, equation of a line, circle, parabola, hyperbola.  
 3D Co-ordinate geometry, equation of sphere, cone  
 Cartesian, cylindrical and spherical polar co-ordinate systems

**Unit 2**

Trigonometric functions. Sin, Cos, Tan, Series expansion of these functions and other related functions

### Unit 3

Vectors and matrices-matrix additions, subtraction, multiplication and inversion.  
Matrix transformations

### Unit 4

Calculus: Differentiation and Integration: Limits, complete differentials, partial differentials of functions with one variable and multiple variables. Definite and non-definite integral, Series, Logarithms

### Unit 5

Set theory, Fourier series and transforms,  
Bar diagrams, Pie diagram, Pictograms, Histograms

### Recommended Texts:

- 1.Narayanan,S ; Manicavachaagam Pillai,TS (1993) “**Calculus, Vol I and II**”, Viswanathan Printers and Publishers
- 2.Veerarajan,T “ **Engineering mathematics**”,3rd edition, Tata McGraw-hill Publishing Co Ltd, New Delhi
3. Veerarajan,T “**Trigonometry, Algebra and Calculus**”, 3<sup>rd</sup> edition, Tata McGraw-Hill Publishing Co Ltd, New Delhi

### Reference Books:

1. [Sharma](#), AK (2005) “**Text Book of Integral Calculus** ”,Discovery Publishing House,
2. Ramachary, SKVS; Bhaskar Rao, PB ; Bhujanga Rao; M;Subramanyam PS (2005) “**Mathematical Methods**” BS Publications
- 3.Grewal, BS (2000)“**Higher Engineering Mathematics**”, 37<sup>th</sup> edition, Khanna Publishers, New Delhi

## SEMESTER II

Title of the Paper	Paper 6 : Introduction to Bioinformatics		
Category of the Course	Year	Semester	Credits
Core	1	II	4

### Unit 1

Basics of computing: Introduction to operating systems – WINDOWS, UNIX, LINUX; Advantages of security installation; Use of internet; Graphics – visualization techniques; softwares and hardwares; Computer networking – LAN, WAN, MODEM, Optical vs electronic networking, firewalls; Ethernet and TCP/IP family of protocols.

### Unit 2

Data warehousing, data capture, data analysis; Introduction to Nucleic Acid and Protein Sequence Data Banks; Nucleotide databases (Genbank, EMBL, DDBJ); Protein databases (Swiss-Prot, Tr-EMBL, PIR\_PSD, Expasy); Derived Databases (Prosite, PRODOM, Pfam, PRINTS); Sequence submission Methods and tools (Sequin, Sakura, Bankit); Sequence retrieval systems (Entrez & SRS); Sequence File Formats and Conversion tools; Genome (NCBI, EBI, TIGR, SANGER), Metabolic Pathway database (KEGG, EMP, EcoCyc, BioCyc and MetaCyc); Specialized database (IMGT, Rebase, COG, LIGAND, BRENDA); Structural database.

### **Unit 3**

Internal and external co-ordinate system; Generation of co-ordinates of biopolymers in Cartesian and cylindrical polar co-ordinate system; Genome Anatomy, Prokaryotic genomes structures, Eukaryotic genomes structures, Gene density, Gene Ontology, Gene Order (synteny), Plasticity zone, Gene Network, tandem repeats, Transposable elements, Pseudogenes, Gene Clusters, Segmental duplication, non-coding conservation, Comparative genomics, Importance of Full Genome Alignments, Concepts & applications of Suffix tree in comparative genomics, Algorithms for BLAST2, MegaBlast, MUMmer.

### **Unit 4**

Analysis of protein and nucleic acid sequences, multiple alignment programs, Development of programs for analysis of nucleic acid sequences, Pairwise Sequence Alignment - Similarity, Identity and Homology, Global Alignment, Local Alignment; database search methods and scoring matrices ; Dynamic Programming, Heuristic approach, Scoring Matrices and Affine Gap costs; Detailed method of derivation of the PAM & BLOSUM Matrices; Differences between Distance & Similarity Matrix; Assessing the Significance of Sequence Alignments.

Multiple Sequence Alignment - Multiple alignment programs, Development of programs for analysis of nucleic acid sequences, Conversion of various file formats; Phylogenetic Analysis - Concept of dendrograms; Strings and Evolutionary trees; Ultrametric trees and Ultrametric distances; Additive - Distance trees; Methods of Construction of Phylogenetic trees-Maximum Parsimony Method, Maximum likelihood method and Distance Methods, Reliability of trees.

### **Unit 5**

Analysis of structures and correctness of structures, Submission of data to PDB: atomic coordinates and electron density maps; Anatomy of Proteins - Ramachandran plot, Secondary structures, Motifs, Domains, Tertiary and quaternary structures; Calculation of conformational energy for bio-macromolecules; Methods for Prediction of Secondary and Tertiary structures of Proteins - Knowledge-based structure prediction, Fold recognition, Ab initio methods for structure prediction; Methods for comparison of 3D structures of proteins; Molecular interactions of - Protein – Protein, Protein – DNA, Protein – carbohydrate, DNA – small molecules etc.; Docking of Molecules; Molecular Design.



**Recommended Texts:**

1. Lesk, A.M. (2002) "Introduction to Bioinformatics", 1<sup>st</sup> Edition, Oxford University Press, Oxford, UK
2. N. Gautham (2006) "Bioinformatics", Narosa Publishing Company, New Delhi
3. Westhead, D. R., Parish, J.H and Twyman, R.M (2003) "Instant Notes Series – Bioinformatics" 1<sup>st</sup> Edition, Viva Books Private Limited, New Delhi, India
4. Bernhard Haubold and Thomas Wiehe (2006) "Introduction to Computational Biology – An Evolutionary Approach" Birkhauser Verlag, Switzerland

**Reference Books:**

1. Krane, DE; Raymer, ML (2003), "Fundamental concepts of Bioinformatics", Benjamin Cummings
2. Ignacimuthu, S (2005) "Basic Bioinformatics", 1<sup>st</sup> Edition, Narosa Publishing House, New Delhi, India
3. P. Baldi and S. Brunak (2003) "Bioinformatics" Affiliated East-West Press, New Delhi, India

<b>Title of the Paper</b>	<b>Paper 7 : Molecular Biology and Biotechnology</b>		
<b>Category of the Course</b>	<b>Year</b>	<b>Semester</b>	<b>Credits</b>
<b>Core</b>	<b>1</b>	<b>II</b>	<b>4</b>

**COURSE CONTENTS****Unit 1**

DNA is the genetic material-structure –DNA polymerases-replication –telomerases, DNA repair mechanisms, genetic recombination –Holliday model, transposons and retrotransposons

**Unit 2**

Gene expression;-Prokaryotic and Eukaryotic RNA polymerases, Initiation of transcription, termination of transcription, regulation of gene expression, lac operon and tryptophan operon, hormonal regulation of gene expression, translation-gene regulatory proteins, DNA methylation.

**Unit 3**

Post transcriptional modifications-RNA splicing and ribozymes, gene control in development

Translation-initiation ,elongatio and termination, inhibitors, post translational modifications

#### Unit 4

Cloning and expression vectors-plasmids-cosmids-phages-viruses-YAC, BAC-Molecular probes-gene library-restriction enzymes-restriction mapping-southern, northern, western blotting-screening of cDNA libraries

#### Unit 5

Antisense RNA technology-DNA finger printing-foot printing-gene amplification-Basic PCR-its modifications-RT- PCR- applications-RAPD. Introduction to nanotechnology, commercial applications of nanotechnology. Immunotechnology- Hybridoma technology –production of Interferon – vaccines –DNA vaccines.

#### Recommended Texts:

- 1.Benjamin Lewin (2004) “**Genes VIII**” ,8th edition, Pearson Education International
2. Glick,BR; Pasternak, JJ (2003), “ **Molecular Biotechnology;Principles and Applications of Recombinant DNA**”,3rd edition,American Society of Microbiology
3. Satyanarayan,U (2005) “**Biotechnology**”, Books and Allied (Pvt) Ltd Calcutta

#### References Books:

- 1.Watson, J; Zoller, M ;Gilman, M; Witkowski, J (1992), “**Recombinant DNA**”,2nd edition,W.H. Freeman
- 2.Old,RW ; Primrose, SB (1994), “ **Principles of Gene Manipulation-An Introduction to Genetic Engineering**” 5th edition, Blackwell Science
- 4.Brown ,TA (2001) “**Gene Cloning and DNA analysis-an introduction**”,4th edition,Blackwell Science
- 5.Poole,C; Owens, FJ (2003) “**Introduction to Nanotechnology**”, John Wiley and Sons

Title of the Paper	Paper 8 : Biochemistry & Molecular Biology Lab (Practicals)		
Category of the Course	Year	Semester	
	Credits		
Core	1	II	4

#### COURSE CONTENTS

##### Unit 1

Preparation of Buffers, determination of pH, Assay of protein by Lowry's method and Bradford method, Assay of glucose by orthotoluidine method, Assay of DNA

Enzyme assay: Determination of specific activity of alkaline phosphates, Effect of pH and substrate concentration on alkaline phosphatase activity

## Unit 2

Cell fractionation and Isolation of cell organelles, Disruption of cells, Isolation of sub-cellular organelles, Isolation of plasmid DNA, Amplification of DNA by PCR..

## Unit 3

Chromatographic techniques: Gel filtration, Ion-exchange and Thin layer chromatography

## Unit 4

Electrophoretic techniques: SDS PAGE and Agarose gel electrophoresis , molecular weight determination of plasmid DNA, Western Blotting and Southern blotting.

## Unit 5

Immunological methods based on antigen-antibody – Precipitation reaction based assays, Agglutination based tests, Enzyme linked immunosorbent assay (ELISA)

## Reference Books:

1. Wilson, K; Walker, J (Editors) (2005) “**Principles and techniques of Biochemistry and Molecular Biology**” 6<sup>th</sup> edition, CUP
2. Sambrook, J ; Russel, DW (2001) “ **Molecular Cloning**”, 3<sup>rd</sup> edition ,Cold Spring Harbor Laboratory Press,.
3. Sadasivam, S; Manickam, A (1996) “**Biochemical Methods**”, 2<sup>nd</sup> edition, New Age International Pvt Ltd

Title of the Paper	Paper 9 :Theory and Practice of Computer Programming – PERL and CGI (Practicals)		
Category of the Course	Year	Semester	Credits
Core	1	II	4

## COURSE CONTENTS

### Unit 1

Introduction to Perl 5; Variable Types; Data Types Operators; File Test Operators; Control Structures; Subroutines, Hash Traversal Functions; Other Useful Functions; Regular Expressions.

Launching External Programs; Special Variables; File Functions; Special Conditionals; Command Line Args; Basic I/O.

## **Unit 2**

How Perl Replaces Other Utilities; Packages; Environment Variables, Signals; Getopts and Timelocal Libraries; Perl Debugging, Setuid/setgid Perl Scripts; Random Number Generation, CGI

## **Unit 3**

Introduction; Creating a static HTML files by a Perl Programme, Creating a Web Page “on the fly” by a CGI – Programme, Guidelines for HTML page generation by a CGI-Program

## **Unit 4**

Receiving CGI – programme arguments from the URL, Using CGI.pm for parsing the query string, Receiving CGI-program arguments from a Web

## **Unit 5**

HTML-structure tags-tag attributes-linking to other web pages-preparing images for the web page-adding more style to the web page-developing pages for the institution, laboratory details

## **Reference Books:**

1. Doyle Paul, Micheal O Foghlu, David Harlan, Shelly Powers, Matthew D. Healy; (1996). **“Using Perl for Web Programming”**
2. James. D. Tosdall. (2000) , **“Beginning Perl for Bioinformatics”** 1<sup>st</sup> edition, O’Rielly and Associates.
3. Larry Wall, Tom Christiansen Jon Orwant, (2000). **“Programming Perl “** 3<sup>rd</sup> edition, O’Rielly and Associates
4. Randall. L. Schwartz & Tom Phoenix.( 2000). **“ Learning Perl “**1<sup>st</sup> edition, O’Rielly and Associates
5. Scott Guelich, Shishir Gundavaram, Gunther Birzneits and Linda Mui,(2000), **“CGI Programming”** ,2<sup>nd</sup> edition, O’Rielly and Associates

<b>Title of the Paper</b>	<b>Paper 10 : Programming in JAVA</b>		
<b>Category of the Course</b>	<b>Year</b>	<b>Semester</b>	<b>Credits</b>
<b>Elective</b>	<b>1</b>	<b>II</b>	<b>3</b>

## **COURSE CONTENTS**

### **Unit 1**

An introduction to JAVA programming – OOPS and JAVA - Java basics - Working with objects – creating classes and application in JAVA- More about methods  
Conditionals and Loops

## **Unit 2**

Array and strings - Java applets Basics – Threads – Streams and I/O

## **Unit 3**

Graphics, fonts and color – Simple animation – More animation, Images and sound – Managing simple events and interactivity – creating user Interfaces with AWT Windows, Networking and other Tidbits – Modifiers, Access control and class Design

## **UNIT 4**

Packages and Interfaces – Exception and Managing errors – Multithreading

## **UNIT 5**

Using Native Methods and Libraries – Under the Hood – Java programming tools – Working with Data structures and Java

### **Recommended Texts:**

1. [Patrick Niemeyer](#), P; Knudsen,J (2002) **Learning JAVA**, 2<sup>nd</sup> edition,O'Reilly Pub
2. Liang,YD (2002) Introduction to JAVA Programming,4<sup>th</sup> edition,Prentice Hall

### **Reference Books:**

1. Crawford,W; Farley,J (2005), Java in a nutshell ,3<sup>rd</sup> edition,O'reilly Publishers

<b>Title of the Paper</b>	<b>Paper 11 : Basics of Computer-aided drug design</b>		
<b>Category of the Course</b>	<b>Year</b>	<b>Semester</b>	<b>Credits</b>
<b>Elective(Extra Disciplinary)</b>	<b>1</b>	<b>II</b>	<b>3</b>

## **COURSE CONTENTS**

### **Unit 1**

Drug Discovery: Introduction, Conventional drug design approaches, irrational vs. rational, various steps of drug design process-Lipinski rule-pharmacophore kinetics and dynamics-ADME properties, Lipinski rule-Examples uses of computer based drug discovery-benefits

## **Unit 2**

Introduction to Bioinformatics: What is bioinformatics-sequence database and their uses - analysis of sequence-multiple sequence analysis-secondary structure prediction-uses of different bioinformatics tools and applications

## **Unit 3**

Biomacromolecular structure and function :Various levels of protein structure, Ramachandran Plot, Protein folding, Structure of DNA-protein-protein interaction, protein-DNA interactions-enzyme kinetics-inhibitors

## **Unit 4**

Introduction to molecular modeling: Molecular structure, bonding, Various types of Forces responsible for stabilization of biomolecules and their interaction- Potential energy surface-force field-molecular mechanics method –Structure activity relationship-de novo drug design pharmacophore-and docking- scoring

## **Unit 5**

Quantitative structure activity relationship: QSAR, concept, and properties of organic molecules- various descriptors used in the QSAR,multiple linear regression, and its applications to drug design

### **Recommended Texts:**

1. Gautham N (2006) “Bioinformatics”, Narosa Publishing Company, New Delhi
2. Vasantha Pattabhi and N.Gautham (2001) ‘**Biophysics**’ Narosa Publishing Company, New Delhi
3. Lesk, A.M. (2002). “**Introduction to Bioinformatics**”, 1<sup>st</sup> Edition, Oxford University Press, Oxford, UK
4. Andrew R. Leach (2001) “Molecular Modeling: Principles and Applications” Printive Hall
5. Charifson P.S (1997) “Practical Application of Computer Aided Drug Design” Dekker, New York

## 05. M.Sc. DEGREE COURSE IN BIOTECHNOLOGY

### SYLLABUS

Paper – 1			
Title of the paper	Biochemistry and Biomolecules		
Category of the course	Year	Semester	Credits
Core	I	I	4

### COURSE OUTLINE

#### Unit – 1:

pH, pK, acids, bases, weak bonds, Biological Buffers system, Principles of Thermodynamics, High energy compounds.

#### Unit – 2:

Carbohydrates – Definition, classification, structure, chemistry & properties  
Amino acids – Definition, classification, structure, chemistry & properties; Proteins – Definition, classification, structure, chemistry & properties; Lipids – Definition, classification, structure, chemistry & properties; Nucleic acids – purines, pyrimidines, nucleosides & nucleotides, poly-nucleotides. Methods for isolation & characterization of proteins, chemical synthesis of peptides, study of specific proteins like hemoglobin, myoglobin and plasma proteins; Classification of porphyrins, their structure & properties. Structure of haeme & chlorophyll.

#### Unit – 3:

Metabolism of carbohydrates, lipids, proteins, purines and pyrimidines – their biosynthesis and degradation, their bioenergetics. Electron transport chain, Oxidative Phosphorylation – mechanism, inhibitors and photophosphorylation, hormonal regulation of mammalian metabolism. Eicosanoids, Urea cycle.

#### Unit – 4:

Separation methods – Tissue homogenate, cell fractionation by differential centrifugation, ultra-centrifugation and density gradient centrifugation, medium for centrifugation. Chromatography – paper, adsorption, ion –exchange, thin layer, gas, reverse phase, affinity, HPLC, gel –filtration.

### **Unit – 5:**

Electrophoresis – moving boundary , paper , starch, agarose, polyacrylamide, disc, slab gel electrophoresis, 1D& 2D electrophoresis , pulse field electrophoresis, immunoelectrophoresis high voltage electrophoresis.

### **Recommended Texts:**

1. Lehninger, A.L .2005, Principles of Biochemistry, 4 th Edition, W.H.Freeman, New York.
2. Voet, D.and Voet .J.G.2004 .Biochemistry, 3 rd Edition, John Wiley and Sons, Inc.
3. Lubert stryer, 2001, Biochemistry, 5 th Edition, W.H .Freeman & company.

<b>Paper – 2</b>			
<b>Title of the paper</b>	<b>Molecular Genetics</b>		
<b>Category of the course</b>	<b>Year</b>	<b>Semester</b>	<b>Credits</b>
<b>Core</b>	<b>I</b>	<b>I</b>	<b>4</b>

## **COURSE OUTLINE**

### **Unit – 1:**

Genes and chromosomes, Genes and enzymes, structure of DNA and RNA, Role of messenger RNA, Colinearity of Genes and Proteins, Genetic code, Identification of DNA as the genetic material.

### **Unit – 2:**

The complexity of eukaryotic genome (introns, exons, repetitive DNA sequence, gene duplication and pseudogenes), Replication of DNA, DNA repair, Gene expression and regulation in prokaryotes and eukaryotes.

### **Unit – 3:**

Mutation: Spontaneous and virus induced mutation, Radiation induced mutation – Ionizing radiation, UV radiation, DNA repair mechanisms, (photoreactivation, excision, SOS, recombination and heat shock responses), xerodermapigmentosum, chemically



induced mutation – Base analogs Nitrous acid, Acridines, Alkylating and hydroxylating agents. Chromosomal Abnormalities, Recombination - models.

#### **Unit – 4:**

Discovery – early experiments of McClintoc in maize – Insertion sequences in prokaryotes – complex transposons (ex. Tn3, Tn5, Tn9 and Tn10) – Mechanisms, control consequences and application of transposition by simple and complex elements.

#### **Unit – 5:**

Allele frequencies and genotype frequencies, systems of mating, inbreeding, genetics and evolution – mutation and migration, random genetic drift, developmental genetics using *Drosophila* as a model system.

#### **Recommended Texts:**

1. The Cell – A molecular approach. 3<sup>rd</sup> edition by Geoffrey M. Cooper, Robert E. Hausman. 2003.
2. Principles of Genetics. 8<sup>th</sup> edition by Gardner, Simmons and Snustad. 2002.
3. Molecular Biology of Genes. 4<sup>th</sup> edition by Watson, Hopkins, Roberts, Steitz, Weiner. 2004.
4. Biochemistry. 4<sup>th</sup> edition by Geoffret L. Zubay. 2003.
5. Genetics Schaum's outline series. 4<sup>th</sup> edition by Susan Elrod – Tata McGraw Hill. 2002.
6. Human Genetics – Concepts and applications by Lewis, R. 2001.
7. Microbial Genetics by S.R. Maloy, J.E. Cronan, D. Freifelder, Jones and Barlett Publishers. 1994.
8. Molecular genetics of bacteria by J.W.Dale. Wiley and Sons.1994.
9. Basic genetics by D.L.G. Hartl, Jones and Publishers. 1991.

<b>Paper – 3</b>			
<b>Title of the paper</b>	<b>Molecular Cell Biology</b>		
<b>Category of the course</b>	<b>Year</b>	<b>Semester</b>	<b>Credits</b>
<b>Core</b>	<b>I</b>	<b>I</b>	<b>4</b>

## **COURSE OUTLINE**

### **Unit – 1:**

The molecules of a cell; Organelles of the eukaryotic cell and its functions; Biomembranes - structural organization, transport across membrane (Passive, Active and Bulk transport); Cell-Cell adhesion- Cell junctions ( Tight junctions, gap junctions, desmosomes, adherens); Extra cellular matrix (ECM)- components and role of ECM in growth.

### **Unit – 2:**

Microscopy- Bright field, Phase contrast, fluorescence; Electron (TEM, SEM and Tunneling SEM), Histochemistry – Microtomy, Fixation, embedding, sectioning and staining of tissues. Hybridization-FISH; Flow cytometry; Cell fractionation.

### **Unit – 3:**

Organization of Eukaryotic DNA in to chromosomes; DNA replication – mechanism; Transcription- basic mechanism in prokaryotes and eukaryotes; Post and co-transcriptional modifications; Translation in prokaryotes and eukaryotes; Post translational modifications; Protein sorting and secretion; Protein folding and degradation.

### **Unit – 4:**

Molecular basis of eukaryotic cell cycle, Regulation and cell cycle check points; Programmed cell death (Apoptosis); Cell-Cell signaling-signaling molecules, types of signaling, signal transduction pathways (GPCR-cAMP, IP<sub>3</sub>, RTK, MAP Kinase, JAK-STAT, Wnt Pathway); Cancer-multistage cancer development, carcinogens, oncogenes and proto-oncogenes, tumor suppressor genes-Rb, p53.

### **Unit – 5:**

Microfilaments – Actin structure, Dynamics of actin assembly, Myosin and molecular motors. Intermediate filaments- types and functions. Microtubules- structure and dynamics, kinesin and dynein powered motors, focal adhesion points, microvilli and pseudopodial extensions.

### Recommended Texts:

1. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter. 2002. Molecular Biology of the Cell, Fourth edition. Garland Science.
2. Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Kaiser, A., Kreiger, Scott, and Darnell, J. 2004. Molecular Cell Biology. Media Connected, Fifth edition. W.H. Freeman and Company
3. Geoffrey M. Cooper, Robert E. Hausman. 2007. The Cell-A Molecular Approach, Fourth edition. Sinauer Associates.
4. T. Fleming. 2002. Cell interactions: A practical approach – Second edition.
5. Weaver. 2002. Molecular Biology, Second edition. McGraw-Hill.
6. Karp, G., 2002, Cell and Molecular Biology, Third edition, John Wiley & Sons, New York.
7. Luiz Carlos Uchoa, Janqueira, Jose, Carneiro. 2005. Basic Histology- Text and Atlas. McGraw-Hill Professional.

Paper – 4 Practical I			
Title of the paper	(A) Biochemistry & Biomolecules, (B) Molecular Genetics and (C) Molecular Cell Biology		
Category of the course	Year	Semester	Credits
Core	I	I	4

### COURSE OUTLINE

#### (A) Biochemistry & Biomolecules Practicals

1. pH meter and buffers
2. Colorimetric estimation of
  - Protein by Lowry's method and Bradford method.
  - DNA by Diphenyl amine method
  - RNA by Orcinol method
  - Carbohydrate by Anthrone method
3. Absorption studies with protein & DNA
4. Thin layer chromatography
  - Sugars, Amino acids, Lipids, Alkaloids

5. Ammonium sulphate precipitation
6. Dialysis
7. SDS-PAGE

#### **Demo Experiments**

1. Gel permeation chromatography, Affinity chromatography, Ion-exchange chromatography
2. Western blotting

#### **(B) Molecular Genetics Practicals:**

1. Isolation of DNA (from bacteria, plants, animal tissue and blood)
2. Plasmid DNA isolation.
3. Isolation of RNA
4. Restriction digestion of DNA
5. Radiation or chemical induced genetic damage assessment (Root meristem of *Allium cepa*).
6. Preparation of metaphase chromosomes from blood (G-banding and karyotyping).

#### **(C) Molecular Cell Biology Practicals**

1. Microtomy – Fixation, Embedding, Sectioning and Staining (H & E) of tissues.
2. Histochemical staining to localize proteins, carbohydrates and lipids in fixed tissue sections.
3. Subcellular fractionation and marker enzyme detection (mitochondria).
4. Giant chromosome studies in Chironomous larvae.
5. Meiotic study in flower buds and cockroach or grasshopper.

<b>Paper – 5 Elective</b>			
<b>Title of the paper</b>	<b>Biophysics and Biostatistics</b>		
<b>Category of the course</b>	<b>Year</b>	<b>Semester</b>	<b>Credits</b>
<b>Elective</b>	<b>I</b>	<b>I</b>	<b>3</b>

#### **COURSE OUTLINE:**

##### **Unit – 1:**

Introduction to Biophysics – Proteins : Amino acids – classification, structure, conformations, Ramachandran plot, peptide-peptide bond isomerisation. Molecular organization, different levels, organization of proteins - primary, secondary, tertiary and quaternary structure.

##### **Unit – 2:**

Sequencing of proteins and nucleic acids. Protein-DNA interactions. Physical and chemical methods for immobilization of small and macro molecules. Glyco and lipo – proteins – Structure and function. Nucleic acid hybridization – structural analysis and biological studies.

### **Unit – 3:**

Laws of thermodynamics, chemical equilibrium, electron microscopy, sedimentation and viscosity, chromatography, X-ray diffraction. Spectroscopy: Absorption and emission spectroscopy- Beer- Lambert's Law, Principles – instrumentation and applications of Visible, UV, Mass, Florescence, Raman Spectroscopy, IR, AAS, NMR, and ESR. Microarray technology.

### **Unit – 4:**

Biometry, Collection, classification and tabulation of data, graphical and geometrical representation, scale diagrams , histograms, frequency polygons, frequency curves, Measures of central tendency- Mean (Arithmetic, harmonic and geometric), Median and Mode. Measures of dispersions - standard deviation, quartile deviation and mean deviation. Standard error and standard curve.

### **Unit – 5:**

Probability theory - Probability distribution, Binomial, Poisson and Normal distribution, Correlation coefficient and Regression analysis. Test of Significance, t-test, chi-square test, one way and two way ANOVA. Introduction to software packages SPSS, SAS, MINITAB, MATLAB etc.,

### **Recommended Texts:**

1. Creighton, T.E, 2002, Proteins – Structure and molecular properties. Second edition. W.H.Freeman and company, New York.
2. Principles of Instrumental Analysis. 5<sup>th</sup> Edition. D.A.Skoog, F.J.Holler and T.A.Nieman. 2004.
3. Tanford, C., Physical chemistry of macromolecules, John Wiley and Sons. 2003.
4. Biophysical Chemistry, Cantor, W.H.Freeman. 2003.
5. Gupta.S.P. 2002, Biostatistical methods, S.Chand and sons, New Delhi.
6. Zar, J.H. 1984. Biostatistics analysis. Prentice Hall, New Jersey.

Paper – 6 Elective			
Title of the paper	Molecular Developmental Biology		
Category of the course	Year	Semester	Credits
Elective	I	I	3

## COURSE OUTLINE

### Unit – 1:

Gamete cells: Dynamics of the Sperm and Egg, Spermatogenesis, Oogenesis, Sperm and oocyte maturation, Instructive and permissive interactions, competence, epithelial- mesenchymal interactions. Important signaling pathways in vertebrate development.

### Unit – 2:

Fertilization: Fate Maps, Nieuwkoop center, molecular role of organizer, Types of fertilization, Molecular recognition of egg and sperm, fusion and prevention of polyspermy, rearrangement of egg cytoplasm and activation of egg.

### Unit – 3:

Cleavage and gastrulation: Cleavage in *Xenopus*, Chick and mammals, Regulation of cleavage cycle. Morphogenetic movements, Gastrulation in *Xenopus*, chick and mammals.

### Unit – 4:

Vertebrate Development: Formation of the neural tube, mechanism of vertebrate eye development, myogenesis, and hematopoiesis.

### Unit – 5:

*Drosophila* Maternal effect genes, induction at single cell level - differentiation of photoreceptors in ommatidia. Developmental disorders – Spina bifida, Anencephaly, and craniorachischis, Cyclopia, Thanotrophic dysplasia.

### Recommended Texts:

1. Scott F. Gilbert. (2006). Developmental Biology Sinauer Associates.
2. Wolpert, L. (1998) Principles of Development. Oxford Publications, New York.
3. Richard M. Twynman, (2001) Developmental Biology. (2<sup>nd</sup> edition), Viva Publications, New Delhi.

Subramoniam, T. (2002) Developmental Biology. (1<sup>st</sup> edition.) Narosa publications.

Paper – 7			
Title of the paper	Plant Biotechnology		
Category of the course	Year	Semester	Credits
Core	I	II	4

## COURSE OUTLINE

### Unit – 1:

History of plant Biotechnology, Global impact of Biotechnology in Agriculture. Conservation of Plant using Biotechnology. Plant – genome organization and Plant gene structure.

### Unit – 2:

Genetics of Chloroplast and Mitochondria. Plant mitochondrial DNA, Mitochondrial protein synthesis, mt DNA and cytoplasmic male sterility. Import of proteins into mitochondria. Nuclear encoded and chloroplast, mitochondria encoded genes for proteins. Seed storage proteins.

### Unit – 3:

Phytohormones - Auxins, Gibberlins, Cytokinnins, Ethylene and Abscissic acid. Gene Expression during plant development. Differential regulation of gene expression. Genetic determinants of module formation, functions of Rhizobium genes, Plant nodule gene expression. Genetic transformation of plants by *Agrobacterium*. Transformation process. Regeneration of transformed plants. Direct transformation.

### Unit – 4:

Inducible gene expression: use of tissue specific, copper-controllable gene expression in plants. Plant Vectors. Transgenic plants and applications. Genetically engineered plants for virus, fungi, insect and herbicide resistance (one example each). GM plants for vaccine, drug and protein development.

### Unit – 5:

Basic techniques in plant tissue culture. Methods of plant cell, tissue and organ culture. Micropropagation, cell suspension culture, Somatic embryogenesis, protoplast

culture. Somatic hybridization. Production of haploid and triploid plants. Application of plant tissue culture in agriculture, Horticulture and forestry.

### **Recommended Texts:**

1. H.K. Dass. 2005, Text book of Biotechnology, Second Edition, Wiley Dreamtech, India (P) Ltd.
2. H.Kreuzer & A.Massey. 2001. Recombinant DNA and Biotechnology: A guide for teachers Second Edition. ASM press, Washington.
3. Trevan. 2001. Biotechnology, Tata McGraw Hill.
4. M.Sudhir. 2000. Applied Biotechnology & Plant Genetics. Dominant publishers & Distributors.
5. Reynolds, P.H.S. 1999. Inducible gene expression in plants. CABI publishing, U.K.
6. M.J.Chrispeels and D.F. Sadasiva, 1994. Plants, genes and agriculture. Jhones and Bartlett.
7. J.D.Watson, N.Gillman, J.Witkowski and M.Zoller, 1992. Recombinant DNA. Second Edition Scientific American Books, NY.
8. Ignatchimuthu, 1996. Applied Biotechnology, Tata McGrawHill.

<b>Paper –8</b>			
<b>Title of the paper</b>	<b>Genetic Engineering</b>		
<b>Category of the course</b>	<b>Year</b>	<b>Semester</b>	<b>Credits</b>
<b>Core</b>	<b>I</b>	<b>II</b>	<b>4</b>

### **COURSE OUTLINE**

#### **Unit – 1:**

Gene cloning – Genetic engineering tools – Nucleic acid manipulating enzymes. Promoters, Selectable markers and reporters used in rDNA technology. Restriction digestion, Ligation, Transformation, Selection of Recombinants. Construction of gene libraries.

#### **Unit – 2:**



E.Coli vectors - pBR322 and its derivatives; Cloning vectors for gram-negative bacteria; Lambda bacteriophage vectors, filamentous phages, Cosmids, Phasmids, Phagemids. Cloning in gram-positive bacteria (*Bacillus subtilis*).

### **Unit – 3:**

Cloning in yeast *Saccharomyces cerevisiae* – Life cycle and types of vectors; Eukaryotic vectors – SV40 (molecular genetics and expression); Specialized cloning vector for cDNA; Synthesis of specific RNA in vitro; Vectors for cloning promoters and terminators; vectors with adjustable copy number.

### **Unit – 4:**

Nucleic acid hybridization techniques; Molecular probes (Types of probes and its construction); probe labeling – Nick translation, End labeling and Random primer labeling. Polymerase chain reaction and its variants; DNA fingerprinting; DNA sequencing (Maxam and Gilbert sequencing, Sanger's Dideoxy sequencing, Pyrosequencing, PCR based sequencing and hybridization sequencing); Site directed mutagenesis; DNA microarray; chromosome walking and jumping.

### **Unit – 5:**

Molecular techniques in prenatal diagnosis gene therapy, Pharmaceutical products (Vaccine, Humulin, etc), Agriculture and animal husbandry – Crop improvement and GM foods. Impact of gene cloning and Bioethics.

### **Recommended Texts:**

1. Gene cloning by T.A.Brown – 2001.
2. Principles of Gene Manipulation – Old and Primrose – 2003.
3. Vectors – A survey of molecular cloning vectors and their uses – Raymond Rodriguez and David T.Denhart – 2003.
4. From genes to clones – Introduction to Gene Technology, Errst-L. Winnacker – 2003.
5. Gene Expression technologies. Methods in enzymology (Vol.185) – Ed. David V. Geoddel – 2002.
6. Methods in Gene Biotechnology – William Wu, Michael J.Welsh, Peter B.Kaufmar, Helen H.Zhang – 2001.
7. Maximizing Gene Expression – William Rezmikff, Lamy Gold – 2002.
8. Genes IX, Oxford University Press, Lewin – 2007.

Paper – 9			
Title of the paper	Microbiology and Immunology		
Category of the course	Year	Semester	Credits
Core	I	II	4

## COURSE OUTLINE

### Unit – 1:

Size, shape, composition and structure of prokaryotic (bacteria, actinomycetes, archaea and blue green algae) and eukaryotic cells (algae, fungi and protozoans). Nutritional requirements for growth. Growth media and pure culture techniques. Symbiosis, Mutualism, Parasitism, Commensalism and endophyte. Structure of virus and prions. Classification of microbes using DNA analysis, proteins, rRNA analysis and phylogeny.

### Unit – 2:

Role of microorganisms in food production (SCP) dairy and non-dairy products. Fuel (ethanol), pharmaceuticals (antibiotics), biofertilizers (BGA), biopesticides (*Bacillus thuringiensis*), biopolymers, biosurfactants, vitamin B12, protease, glutamic acid. Secondary metabolites. Biogas production, biocomposting, vermicompost, biotransformation.

### Unit – 3:

Biology of the immune system; innate immunity; acquired immunity; Organization and structure of lymphoid organs; cells of the immune system. Molecular components of an immune system; Nature and biology of antigens; structure, classes and functions of antibodies; Antigens receptors; Effectors components of an immune response-pathways of complement systems.

### Unit – 4:

Antigen and antibodies interactions- Antibody affinity-avidity-specificity-cross reactivity; Antigen processing and presentation through MHC I and II and BCR; Immunological tolerance. Generation of T cell clones; HLA typing. Types of hypersensitivity-assessment of delayed hypersensitivity reactions. Antigen-Isolation, purification and characterization of various antigens and haptens from pathogens and other biological molecules by biophysical, chemical and affinity separation methods.

## **Unit – 5:**

Hybridoma and monoclonal antibody production. Biology and assay of cytokines; Vaccine technology including DNA vaccines; Identification of T and B epitopes for vaccine development; immunotechnology and infectious diseases. Immunoscreening of recombinant library.

### **Recommended Texts:**

1. Michael J. Pelczar, IR., E;C;S;Chan and Noel R.Kreig., 2004., fifth Ed., 27<sup>th</sup> reprint. Microbiology, Tata McGRAW – Hill, New Delhi.
2. Prescott, Harley & Klein, 2002, Microbiology, fifth edition, McGraw Hill, New York.
3. Tak W.Mak and Mary Saunders 2005, The Immune Response, Basic and Clinical Principles; First Edition : Academic Press.
4. R.A.Goldsby, T.J.Kindt & B.A.Osborne. 2000. Immunology, Freeman and Company.
5. Janes Kuby, 1997. Immunology, Third edition, W.H. Freeman and company, New York.
6. Roitt. 1996. Immunology. Black well Scientific Publications.
7. KleinDonald, A. Prescott Lansing M. Harley John, P. 2003. Microbiology. Fifth Edition McGrawHill, Boston.
8. J.L. Ingraham & C.A. Ingraham. 2000. Introduction to Microbiology, Second edition, Brooks/ cole, Thomson Learning, USA.
9. Rittman Bruce, E., Mc Carty Perry, L, 2001. Environmental Biotechnology. Principles and applications, McGraw Hill, Boston.
10. Casida, 1997. Industrial Microbiology, John Wiley & Sons.
11. H. Zola. 2000. Monoclonal antibodies. Bios Scientific Publishers ltd.
12. Joshi, K.R & Osama, N.O., 1998, Immunology, Agro Botanica Bikaner.
13. Ivan M. Roitt and Peter J. Delvis, 1997. Essential Immunology, Ninth edition. Blackwell Science Pub., USA.
14. Ransohoff Richard et al., 1996, Cytokines and the CNS, CRC Press Boca Raton.
15. Tizard Ian, R., 1995, Immunology an Introduction, Saunders College Pub., Philadelphia.
16. Current Protocols in Immunology, 3 Volumes, Wiley Publications, 1994.
17. D.M.Weir. 1992, Immunological techniques. Vol 3. Black well Scientific Publication.
18. Lesley Janes Eales, Immunology For Life Scientists, Second edition, Wiley Pub.

<b>Paper – 10 Practical II</b>			
<b>Title of the paper</b>	<b>(A) Plant Biotechnology, (B) Genetic Engineering, (C) Microbiology and Immunology</b>		
<b>Category of the course</b>	<b>Year</b>	<b>Semester</b>	<b>Credits</b>
<b>Core</b>	<b>I</b>	<b>II</b>	<b>4</b>

## **COURSE OUTLINE**

### **Plant Biotechnology Practicals:**

1. Plant tissue culture media preparation and sterilization techniques.
2. Generation of Callus from explants (leaf, root, bud and shoot apex) and maintenance of callus culture.
3. Cell suspension culture (batch and continuous), anther, pollen and embryo culture.
4. Isolation and culture of plant protoplast. Protoplast viability test. Localization of nucleus using nuclear stain.
5. *Agrobacterium* culture maintenance and isolation of plasmid DNA.

### **Genetic Engineering Practicals**

1. Preparation of plasmid DNA by alkaline lysis method.
2. Elution of DNA from agarose gel.
3. Restriction enzyme digestion.
4. Restriction mapping of plasmid DNA.
5. Ligation
6. Competant cell preparation, transformation and selection of recombinants.
7. Amplification of DNA
8. Determination of molecular weight of DNA.
9. Southern blotting
10. Northern blotting

### **Demonstration Experiments:**

1. Cloning of GFP
2. Southern hybridization

### **Microbiology and Immunology Practicals:**

1. Isolation of microbes from soil, water, air and plant surface.

2. Media preparation and sterilization
3. Isoaltion of pure culture of *E.coli*, *Aspergillus niger*, phage and *Streptomyces*.
4. Gram staining and morphological characterization of microbes.
5. Development of RAPD and RFLP map using microbial DNA.
6. Lymphocyte separation.
7. Immunodiagnosics: Widal, VDRL, Blood grouping, ELISA.
8. Radial Immunodiffusion, Ouchterlony Immunodiffusion, Immunoelectrophoresis, Counter current immunoelectrophoresis.

Paper – 11 Elective			
Title of the paper	Introduction to Bioinformatics & Computer Applications		
Category of the course	Year	Semester	Credits
Elective	I	II	3

## COURSE OUTLINE

### Unit-1:

Fundamentals of Bioinformatics : Definition – Bioinformatics in industrial applications, importance of Bioinformatics , Genomic –Types of Genomics, Proteomics- Sequence analysis, Sequence alignment, Hidden Markov Model , Types of Alignment – BLAST, FASTA, Interpro-cog.

### Unit-2:

Biocomputing and Bioprogramming : Rasmol, Clustaw , Biological databases – Nucleotide sequence database, Protein sequence database- EMBL.DDBJ, Genalysis – introduction to PERL and Bio-PERL, Introduction to SQL commands

### Unit-3:

Applied Bioinformatics: Commercial Bioinformatics- Definition for Bioinformatics company, Transcriptome – SNP's and their applications, Patenting and data base generation from patent literature for commercial benefits, PR and Bioinformatics.

### Unit-4:

Linux and Unix for Bioinformatics: Basic Unix commands, Basic Linux commands, web resources in Bioinformatics.

### Unit-5:

Computer-oriented Statistical techniques – Frequency table of single discrete variable, Bubble sort, Computation of mean, variance and standard deviations

**Recommended Texts:**

V.R.Srinivas, 2005 , Bioinformatics-A modern approach , prentice Hall of India, NewDelhi.

A.Batiza,A.Finney , Schacter, Bernia Mullis,Kary B, 2005 , Bioinformatics, Genomics, Proteomics ,Chelsea House publications , New Delhi .

Cynthia Gibas, Per Jambeck ,2001 , Developing Bioinformatics computer software, O'Reilly publications, Sebastopol , USA .

Paper – 12 Elective			
Title of the paper	Pharmaceutical Biotechnology		
Category of the course	Year	Semester	Credits
Elective	I	II	3

**COURSE OUTLINE**

**Unit – 1:**

Introduction to concepts and technologies in pharmaceutical biotechnology and industrial applications.

**Unit – 2:**

Biopharmaceuticals expressed in plants. Industrial development and production process. Scientific, technical and economic aspects of vaccine research and development.

**Unit – 3:**

DNA vaccines: from research tools in mice to vaccines for humans. Characterization and Bioanalytical aspects of recombinant proteins as pharmaceutical drugs-Biogeneric drugs.

**Unit – 4:**

Therapeutic proteins – special pharmaceutical aspects. Pharmaceutical and pharmacodynamics of biotech drugs- Formulation of biotech products- Rituximab: clinical development of the first therapeutic antibody for cancer.

**Unit – 5:**

Somatic gene therapy – advanced biotechnology products in clinical development-Nonviral gene transfer systems in somatic gene therapy-Xenotransplantation in pharmaceutical biotechnology, Pharmaceutical enzymes

#### **Recommended Texts:**

1. Daniel Figey (Ed.). 2005. Industrial Proteomics: Applications for Biotechnology and Pharmaceuticals. Wiley, John & Sons, Incorporated.
2. Kayser, O and Muller R.H.. 2004. Pharmaceutical Biotechnology-Drug Discovery and Clinical Applications. WILEY-VCH
3. Heinrich Klefenz. 2002. Industrial pharmaceutical biotechnology.
4. Leon Shargel, Andrew B. C. Yu, Susanna Wu-Pong, and Yu Andrew B. C. 2004. Applied Biopharmaceutics & Pharmacokinetics. McGraw-Hill Companies
5. Stefania Spada, Garywalsh. 2004. Directory of approved biopharmaceutical
6. Gary Walsh. 2003. Biopharmaceutical, Biochemistry & Biotechnology.
7. Thomas Lengauer (Ed.). 2002. Bioinformatics – from Genomes to Drugs. Volume I& II. Wiley-VCH.
8. John F. Corpenier (editor), Mark C. Manning. 2002. Rational Design of stable formulation Theory and Practice (Pharmaceutical Biotechnology). Plenum, US. 1st edition.
9. D.I.A. Crommelin, et al., 2002. Pharmaceutical Biology. Amazon prime publications.
10. Werner Kalow, Urs A Meyer and Rachel F Tyndale .2001. Pharmacogenomics. CPL press.

<b>Extra Disciplinary Elective</b>			
<b>Title of the paper</b>	<b>Principles of Gene Manipulation Technology</b>		
<b>Category of the course</b>	<b>Year</b>	<b>Semester</b>	<b>Credits</b>
<b>Elective</b>	<b>I</b>	<b>II</b>	<b>3</b>

#### **Unit – 1:**

Restriction enzymes, DNA modifying enzymes, cloning vectors, prokaryotic hosts-Creating Recombinant DNA Molecules-Isolation and Cloning of genes.- Construction of representative cDNA and genomic libraries-polymerase chain reaction (PCR) and applications-Southern / Northern blotting analysis.

#### **Unit – 2:**

Construction of representative cDNA and genomic libraries- polymerase chain reaction (PCR) and applications- Southern/Northern blotting analysis, RFLP, RAPD, AFLP analysis. Genomics- Structural genomics-Gene mapping-Comparative genomics - Functional genomics -Gene expression -EST's-DNA arrays.

### **Unit – 3:**

Gene transfers - Introduction of Foreign Genes into Cells: electroporation, biolistic transfer, Transfection, selectable markers, microinjection, embryonic stem cells, reporter transgenes, Homologous recombination - "knock-ins / outs".

### **Unit – 4:**

Transgenics- Approaches to transgenesis: Microinjection / Embryonic stem cells/Sperm- mediated transfer -Mammalian cloning by nuclear transfer - "Dolly" as an example. Production of transgenic sheep, cattle, pigs and plants. - BT cotton, Transgenesis and growth- performance in farm livestock, & plants-The growth hormone in both bovine and porcine systems.

### **Unit – 5:**

Edible vaccines, Disease resistance in transgenic organisms, Pest and herbicide resistant plants. The Mx gene system for anti-viral disease resistance in animals. Issues in Genetic Engineering - Biosafety of transgenic organisms.-Food safety of GMOs- Environmental safety .

### **Recommended Texts:**

1. Old, R.W. and Primrose, S.B., Principles of Gene Manipulation (5th edition). Blackwells Scientific Publications, Oxford, U.K. 1998.
2. Strachan, T. and Read, A.P. Human Molecular Genetics 2 ( 2nd edition), BIOS Scientific Publications, John Wiley and Sons , Toronto, Canada. 1999
3. Watson, J.D., Gilman, M., Witkowski, J., and Zoller, M., Recombinant DNA (2nd edition),Scientific American Books, W.H. Freeman and Co., New York, N.Y., U.S.A. 2001.
4. Cantor and Smith (1999). Genomics. Wiley & Sons.
5. T.A. Brown (1999). Genomes. Bios Publishers.
6. K.Dharmalingam (1987). M13 cloning manual. MacMillan, Chennai.



**06. M.Sc. DEGREE COURSE IN BIOTECHNOLOGY AND  
MANAGEMENT**

**SYLLABUS**

<b>Paper – 1</b>			
<b>Title of the paper</b>	<b>Biochemistry and Biomolecules</b>		
<b>Category of the course</b>	<b>Year</b>	<b>Semester</b>	<b>Credits</b>
<b>Core</b>	<b>I</b>	<b>I</b>	<b>4</b>

**COURSE OUTLINE**

**Unit – 1:**

pH, pK, acids, bases, weak bonds, Biological Buffers system, Principles of Thermodynamics, High energy compounds.

**Unit – 2:**

Carbohydrates – Definition, classification, structure, chemistry & properties  
Amino acids – Definition, classification, structure, chemistry & properties; Proteins - Definition, classification, structure, chemistry & properties; Lipids – Definition, classification, structure, chemistry & properties; Nucleic acids – purines, pyrimidines, nucleosides & nucleotides, poly-nucleotides. Methods for isolation & characterization of proteins, chemical synthesis of peptides, study of specific proteins like hemoglobin, myoglobin and plasma proteins; Classification of porphyrins, their structure & properties. Structure of haeme & chlorophyll.

**Unit – 3:**

Metabolism of carbohydrates, lipids, proteins, purines and pyrimidines – their biosynthesis and degradation, their bioenergetics. Electron transport chain, Oxidative Phosphorylation – mechanism, inhibitors and photophosphorylation, hormonal regulation of mammalian metabolism. Eicosanoids, Urea cycle.

**Unit – 4:**

Separation methods - Tissue homogenate, cell fractionation by differential centrifugation, ultra-centrifugation and density gradient centrifugation, medium for centrifugation. Chromatography –paper, adsorption, ion –exchange, thin layer, gas, reverse phase, affinity, HPLC, gel –filtration.

**Unit – 5:**

Electrophoresis – moving boundary , paper , starch, agarose, polyacrylamide , disc, slab gel electrophoresis, 1D& 2D electrophoresis , pulse field electrophoresis, immunoelectrophoresis high voltage electrophoresis.

**Recommended Texts:**

4. Lehninger, A.L .2005, Principles of Biochemistry, 4 th Edition, W.H.Freeman, New York.
5. Voet, D.and Voet .J.G.2004 .Biochemistry, 3 rd Edition, John Wiley and Sons, Inc.
6. Lubert stryer, 2001, Biochemistry, 5 th Edition, W.H .Freeman & company.

<b>Paper – 2</b>			
<b>Title of the paper</b>	<b>Management Principles</b>		
<b>Category of the course</b>	<b>Year</b>	<b>Semester</b>	<b>Credits</b>
<b>Core</b>	<b>I</b>	<b>I</b>	<b>4</b>

**COURSE OUTLINE****Unit -1:**

The evolution of management sciences, management defined-Basic principles and Process of Management.

#### **Unit - 2:**

Planning : Planning as the first process of management cycle, basic techniques of planning ,basic factors of planning , key planning points, psychological hazards to rational planning, strategic considerations in planning; policy making as a guide to action in the organization , general and specific policies , basic areas of policy making, management by objectives.

#### **Unit -3:**

Need for organization, organizational hierarchy in large concerns, top management organization, staff units and committees, factors to be considered in establishment of an organization. Authority and relationship line, functional and staff relationship, basics of departmentation, delegation of authority and responsibility, centralization and decentralization of authority, use of organizational charts and manuals, span of control.

#### **Unit – 4:**

Co-ordination and control need for co-ordination, techniques for securing coordination, application of the process of control at different levels of management, integrated control system in the organization.

#### **Unit – 5:**

Theories of motivation, Maslow, Mc Gregor, Herzberg, McClelland, leadership styles, emerging trends in management.

#### **Recommended Text**

1. Koontz O Donnel, Principles of Management , McGraw Hill, 2001.
2. Stephen P, Robbins and David. A, Decenzo, Fundamentals of management, Pearson Education, Third edition 2001.
3. J.S,Chandan, Management concepts and strategies, Vikas Publishing House 2002

<b>Paper – 3</b>			
<b>Title of the paper</b>	<b>Molecular Genetics</b>		
<b>Category of the course</b>	<b>Year</b>	<b>Semester</b>	<b>Credits</b>
<b>Core</b>	<b>I</b>	<b>I</b>	<b>4</b>

#### **COURSE OUTLINE**

#### **Unit – 1:**

Genes and chromosomes, Genes and enzymes, structure of DNA and RNA, Role of messenger RNA, Colinearity of Genes and Proteins, Genetic code, Identification of DNA as the genetic material.

#### **Unit – 2:**

The complexity of eukaryotic genome (introns, exons, repetitive DNA sequence, gene duplication and pseudogenes), Replication of DNA, DNA repair, Gene expression and regulation in prokaryotes and eukaryotes.

#### **Unit – 3:**

Mutation: Spontaneous and virus induced mutation, Radiation induced mutation – Ionizing radiation, UV radiation, DNA repair mechanisms, (photoreactivation, excision, SOS, recombination and heat shock responses), xerodermapigmentosum, chemically induced mutation – Base analogs Nitrous acid, Acridines, Alkylating and hydroxylating agents. Chromosomal Abnormalities, Recombination - models.

#### **Unit – 4:**

Discovery – early experiments of McClintock in maize – Insertion sequences in prokaryotes – complex transposons (ex. Tn3, Tn5, Tn9 and Tn10) – Mechanisms, control consequences and application of transposition by simple and complex elements.

#### **Unit – 5:**

Allele frequencies and genotype frequencies, systems of mating, inbreeding, genetics and evolution – mutation and migration, random genetic drift, developmental genetics using *Drosophila* as a model system.

#### **Recommended Texts:**

10. The Cell – A molecular approach. 3<sup>rd</sup> edition by Geoffrey M. Cooper, Robert E. Hausman. 2003.
11. Principles of Genetics. 8<sup>th</sup> edition by Gardner, Simmons and Snustad. 2002.
12. Molecular Biology of Genes. 4<sup>th</sup> edition by Watson, Hopkins, Roberts, Steitz, Weiner. 2004.
13. Biochemistry. 4<sup>th</sup> edition by Geoffrey L. Zubay. 2003.

14. Genetics Schaum's outline series. 4<sup>th</sup> edition by Susan Elrod – Tata McGraw Hill. 2002.
15. Human Genetics – Concepts and applications by Lewis, R. 2001.
16. Microbial Genetics by S.R. Maloy, J.E. Cronan, D. Freifelder, Jones and Barlett Publishers. 1994.
17. Molecular genetics of bacteria by J.W.Dale. Wiley and Sons.1994.
18. Basic genetics by D.L.G. Hartl, Jones and Publishers. 1991.

<b>Paper – 4 Practical I</b>			
<b>Title of the paper</b>	<b>(A) Biochemistry and Biomolecules, (B)Molecular Genetics</b>		
<b>Category of the course</b>	<b>Year</b>	<b>Semester</b>	<b>Credits</b>
<b>Core</b>	<b>I</b>	<b>I</b>	<b>4</b>

## **COURSE OUTLINE**

### **Biochemistry & Biomolecules**

1. pH meter and buffers
2. Colorimetric estimation
3. Protein by Lowry's method and Bradford method.  
DNA by Diphenyl amine method  
RNA by Orcinol method  
Carbohydrate by Anthrone method
4. Absorption studies with protein & DNA
5. Thin layer chromatography  
Sugars, Amino acids, Lipids, Alkaloids
6. Ammonium sulphate precipitation
7. Dialysis
8. SDS-PAGE

### **Demo Experiments**

1. Gel permeation chromatography, Affinity chromatography, Ion–exchange chromatography
2. Western blotting

**Molecular Genetics Practicals:**

1. Isolation of DNA (from bacteria, plants and blood)
2. Plasmid DNA isolation.
3. Isolation of RNA
4. Restriction digestion of DNA
5. Radiation or chemical induced genetic damage assessment (Root meristem of *Allium cepa*).
6. Preparation of metaphase chromosomes from blood (G-banding and karyotyping).

Paper – 5 Elective			
Title of the paper	Biophysics and Biostatistics		
Category of the course	Year	Semester	Credits
Elective	I	I	3

**COURSES OUTLINE:****Unit – 1:**

Introduction to Biophysics – Proteins : Amino acids – classification, structure, conformations, Ramachandran plot, peptide-peptide bond isomerisation. Molecular organization, different levels, organization of proteins - primary, secondary, tertiary and quaternary structure.

**Unit – 2:**

Sequencing of proteins and nucleic acids. Protein-DNA interactions. Physical and chemical methods for immobilization of small and macro molecules. Glyco and lipo – proteins – Structure and function. Nucleic acid hybridization – structural analysis and biological studies.

**Unit – 3:**

Laws of thermodynamics, chemical equilibrium, electron microscopy, sedimentation and viscosity, chromatography, X-ray diffraction. Spectroscopy: Absorption and emission spectroscopy- Beer- Lambert Law, Principles – instrumentation

and applications of Visible, UV, Mass, Florescence, Raman Spectroscopy, IR, AAS, NMR, and ESR. Microarray technology.

#### **Unit – 4:**

Biometry, Collection, classification and tabulation of data, graphical and geometrical representation, scale diagrams, histograms, frequency polygons, frequency curves, Measures of central tendency- Mean (Arithmetic, harmonic and geometric), Median and Mode. Measures of dispersions - standard deviation, quartile deviation and mean deviation. Standard error and standard curve.

#### **Unit – 5:**

Probability theory - Probability distribution, Binomial, Poisson and normal distribution, Correlation coefficient and Regression analysis. Test of Significance, t-test, chi-square test, one way and two way ANOVA. Introduction to software packages SPSS, SAS, MINITAB, MATLAB etc.,

#### **Recommended Texts:**

1. Creighton, T.E, 2002, Proteins – Structure and molecular properties. Second edition. W.H.Freeman and company, New York.
- 2.Principles of Instrumental Analysis. 5<sup>th</sup> Edition. D.A.Skoog, F.J.Holler and T.A.Nieman.
3. Tanford, C., Physical chemistry of macromolecules, John Wiley and Sons.
4. Biophysical Chemistry, Cantor, W.H.Freeman.
5. Gupta.S.P. 2002, Biostatistical methods, S.Chand and sons, New Delhi.
6. Zar, J.H. 1984. Biostatistics analysis. Prentice Hall, New Jersey.

<b>Paper – 6 Elective</b>			
<b>Title of the paper</b>	<b>Molecular Developmental Biology</b>		
<b>Category of the course</b>	<b>Year</b>	<b>Semester</b>	<b>Credits</b>
<b>Elective</b>	<b>I</b>	<b>I</b>	<b>3</b>

#### **COURSE OUTLINE**

##### **Unit – 1:**

Gamete cells: Dynamics of the Sperm and Egg, Spermatogenesis, Oogenesis, Sperm and oocyte maturation, Instructive and permissive interactions, competence, epithelial- mesenchymal interactions. Important signaling pathways in vertebrate development.

## Unit – 2:

Fertilization: Fate Maps, Nieuwkoop center, molecular role of organizer, Types of fertilization, Molecular recognition of egg and sperm, fusion and prevention of polyspermy, rearrangement of egg cytoplasm and activation of egg.

## Unit – 3:

Cleavage and gastrulation: Cleavage in *Xenopus*, Chick and mammals, Regulation of cleavage cycle. Morphogenetic movements, Gastrulation in *Xenopus*, chick and mammals.

## Unit – 4:

Vertebrate Development: Formation of the neural tube, mechanism of vertebrate eye development, myogenesis, and hematopoiesis.

## Unit – 5:

*Drosophila* Maternal effect genes, induction at single cell level - differentiation of photoreceptors in ommatidia. Developmental disorders – Spina bifida, Anencephaly, and craniorachischis, Cyclopia, Thanotrophic dysplasia.

## Recommended Texts:

1. Scott F. Gilbert. (2006). Developmental Biology Sinauer Associates.
2. Wolpert, L. (1998) Principles of Development. Oxford Publications, New York.
3. Richard M. Twynman, (2001) Developmental Biology. (2<sup>nd</sup> edition), Viva Publications, New Delhi.
4. Subramoniam, T. (2002) Developmental Biology. (1<sup>st</sup> edition.) Narosa publications.

Paper – 7			
Title of the paper	Plant Biotechnology		
Category of the course	Year	Semester	Credits
Core	I	II	4

## COURSE OUTLINE

### Unit – 1:



History of plant Biotechnology, Global impact of Biotechnology in Agriculture. Conservation of Plant using Biotechnology. Plant – genome organization and Plant gene structure.

#### **Unit – 2:**

Genetics of Chloroplast and Mitochondria. Plant mitochondrial DNA, Mitochondrial protein synthesis, mt DNA and cytoplasmic male sterility. Import of proteins into mitochondria. Nuclear encoded and chloroplast, mitochondria encoded genes for proteins. Seed storage proteins.

#### **Unit – 3:**

Phytohormones - Auxins, Gibberlins, Cytokinnins, Ethylene and Abscissic acid. Gene Expression during plant development. Differential regulation of gene expression. Genetic determinants of module formation, functions of Rhizobium genes, Plant nodule gene expression. Genetic transformation of plants by *Agrobacterium*. Transformation process. Regeneration of transformed plants. Direct transformation.

#### **Unit – 4:**

Inducible gene expression: use of tissue specific, copper-controllable gene expression in plants. Plant Vectors. Transgenic plants and applications. Genetically engineered plants for virus, fungi, insect and herbicide resistance (one example each). GM plants for vaccine, drug and protein development.

#### **Unit – 5:**

Basic techniques in plant tissue culture. Methods of plant cell, tissue and organ culture. Micropropagation, cell suspension culture, Somatic embryogenesis, protoplast culture. Somatic hybridization. Production of haploid and triploid plants. Application of plant tissue culture in agriculture, Horticulture and forestry.

#### **Recommended Texts:**

1. H.K. Dass. 2005, Text book of Biotechnology, Second Edition, Wiley Dreamtech, India (P) Ltd.
2. H.Kreuzer & A.Massey. 2001. Recombinant DNA and Biotechnology: A guide for teachers Second Edition. ASM press, Washington.
3. Trevan. 2001. Biotechnology, Tata McGraw Hill.
5. M.Sudhir. 2000. Applied Biotechnology & Plant Genetics. Dominant publishers & Distributors.
6. Reynolds, P.H.S. 1999. Inducible gene expression in plants. CABI publishing, U.K.

7. M.J.Chrispeels and D.F. Sadasiva, 1994. Plants, genes and agriculture. Jhones and Bartlett.
8. J.D.Watson, N.Gillman, J.Witkowski and M.Zoller, 1992. Recombinant DNA. Second Edition Scientific American Books, NY.
9. Ignatchimuthu, 1996. Applied Biotechnology, Tata McGrawHill.

<b>Paper – 8</b>			
<b>Title of the paper</b>	<b>Marketing Management</b>		
<b>Category of the course</b>	<b>Year</b>	<b>Semester</b>	<b>Credits</b>
<b>Core</b>	<b>I</b>	<b>II</b>	<b>4</b>

## **COURSE OUTLINE**

### **Unit – 1:**

Frame work of marketing management , marketing management , philosophies , introduction to marketing, concepts of marketing , marketing management process, analysis of marketing opportunities , selecting target consumers, developing marketing mix, analysis of micro and macro environment.

### **Unit – 2:**

Market research and Consumer Behaviour, Market Research as an aid to Marketing, Marketing Research Process, Sales Forecasting Techniques. Buyer behavior, Influencing factors on Consumer Behaviour, Buying Situation, Buying Decision Process, Industrial Buyer Behavior

### **Unit – 3:**

Market Segmentation, Targeting & Positioning Competitive Marketing Strategies.

### **Unit – 4:**

Product & Pricing Product Policies, Consumer & Industrial Product Decisions, Branding, Packaging & Labeling, New product. Development & Product Life Cycle Strategies, Pricing, Pricing Strategies & Approaches.

### **Unit – 5:**

Distribution, Nature of Channels, Decision Retailing & Wholesaling. Promotions, Advertising, Scope, Designing Copy, Media Selection, Sales Promotion Strategies.

**Recommended Texts:**

1. Philip Kotler, Marketing Management, Millennium edition, New Delhi, Prentice Hall of India.
2. Srinivasan, Case studies in Marketing, 2 nd Edition, PHI 2002

Paper – 9			
Title of the paper	Genetic Engineering		
Category of the course	Year	Semester	Credits
Core	I	II	4

**COURSE OUTLINE**

**Unit – 1:**

Gene cloning – Genetic engineering tools – Nucleic acid manipulating enzymes. Promoters, Selectable markers and reporters used in rDNA technology. Restriction digestion, Ligation, Transformation, Selection of Recombinants. Construction of gene libraries.

**Unit – 2:**

E.Coli vectors - pBR322 and its derivatives; Cloning vectors for gram-negative bacteria; Lambda bacteriophage vectors, filamentous phages, Cosmids, Phasmids, Phagemids. Cloning in gram-positive bacteria (*Bacillus subtilis*).

**Unit – 3:**

Cloning in yeast *Saccharomyces cerevisiae* – Life cycle and types of vectors; Eukaryotic vectors – SV40 (molecular genetics and expression); Specialized cloning vector for cDNA; Synthesis of specific RNA in vitro; Vectors for cloning promoters and terminators; vectors with adjustable copy number.

**Unit – 4:**

Nucleic acid hybridization techniques; Molecular probes (Types of probes and its construction); probe labeling – Nick translation, End labeling and Random primer

labeling. Polymerase chain reaction and its variants; DNA fingerprinting; DNA sequencing (Maxam and Gilbert sequencing, Sanger's Dideoxy sequencing, Pyrosequencing, PCR based sequencing and hybridization sequencing); Site directed mutagenesis; DNA microarray; chromosome walking and jumping.

#### **Unit – 5:**

Molecular techniques in prenatal diagnosis gene therapy, Pharmaceutical products (Vaccine, Humulin, etc), Agriculture and animal husbandry – Crop improvement and GM foods. Impact of gene cloning and Bioethics.

#### **Recommended Texts:**

1. Gene cloning by T.A.Brown – 2001.
2. Principles of Gene Manipulation – Old and Primrose – 2003.
3. Vectors – A survey of molecular cloning vectors and their uses – Raymond Rodriguez and David T.Denhart – 2003.
4. From genes to clones – Introduction to Gene Technology, Errst-L. Winnacker – 2003.
5. Gene Expression technologies. Methods in enzymology (Vol.185) – Ed. David V. Geoddel – 2002.
6. Methods in Gene Biotechnology – William Wu, Michael J.Welsh, Peter B.Kaufmar, Helen H.Zhang – 2001.
7. Maximizing Gene Expression – William Rezmikff, Lamy Gold – 2002.
8. Genes IX, Oxford University Press, Lewin – 2007.

<b>Paper – 10 Practical II</b>			
<b>Title of the paper</b>	<b>(A)Plant Biotechnology, (B)Genetic Engineering,</b>		
<b>Category of the course</b>	<b>Year</b>	<b>Semester</b>	<b>Credits</b>
<b>Core</b>	<b>I</b>	<b>II</b>	<b>4</b>

#### **COURSE OUTLINE**

##### **Plant Biotechnology Practicals:**

- 1Plant tissue culture media preparation and sterilization techniques.
- 2.Generation of Callus from explants (leaf, root, bud and shoot apex) and maintenance of callus culture.

3. Cell suspension culture (batch and continuous), anther, pollen and embryo culture.
4. Isolation and culture of plant protoplast. Protoplast viability test. Localization of nucleus using nuclear stain.
5. *Agrobacterium* culture maintenance and isolation of plasmid DNA.

### **Genetic Engineering Practicals**

1. Preparation of plasmid DNA by alkaline lysis method.
2. Elution of DNA from agarose gel.
3. Restriction enzyme digestion.
4. Restriction mapping of plasmid DNA.
5. Ligation
6. Competant cell preparation, transformation and selection of recombinants.
7. Amplification of DNA
8. Determination of molecular weight of DNA.
9. Southern blotting
10. Northern blotting

### **Demonstration Experiments:**

1. Cloning of GFP
2. Southern hybridization

Paper – 11 Elective			
Title of the paper	Immunology		
Category of the course	Year	Semester	Credits
Elective	I	II	3

## COURSE OUTLINE

### Unit – 1:

Biology of the immune system; innate immunity; acquired immunity; Organization and structure of lymphoid organs; cells of the immune system.

### Unit – 2 :

Molecular components of an immune system; Nature and biology of antigens; structure, classes and functions of antibodies; Antigens receptors; Effectors components of an immune response-pathways of complement systems.

### Unit – 3:

Antigen and antibodies interactions- Antibody affinity-avidity-specificity-cross reactivity; Antigen processing and presentation through MHC I and II and BCR; Immunological tolerance. Generation of T cell clones; HLA typing. Types of hypersensitivity-assessment of delayed hypersensitivity reactions.

### Unit – 4:

Antigen-Isolation, purification and characterization of various antigens and haptens from pathogens and other biological molecules by biophysical and chemical and affinity separation methods.

### Unit – 5:

Hybridoma and monoclonal antibody production. Biology and assay of cytokines; Vaccine technology including DNA vaccines; Identification of T and B epitopes for vaccine development; immunotechnology and infectious diseases. Immunoscreening of recombinant library.

**Recommended Texts:**

1. Michael J. Pelczar, IR., E;C;S;Chan and Noel R.Kreig., 2004., fifth Ed., 27<sup>th</sup> reprint Microbiology, Tata McGRAW – Hill, New Delhi.
2. Presscot, Harley & Klein, 2002, Microbiology, ffithe edition, McGraw Hill, Newyork.
3. Tak W.Mak and Mary Saunders 2005, The Immune Response, Basic and Clinical Principles; First Edition : Academic Press.
4. R.A.Goldsby, T.J.Kindt & B.A.Osborne. 2000. Immunology, Freeman and Company.
5. Janes Kuby, 1997. Immunology, Third edition, W.H. Freeman and company, NewYork.
6. Roitt. 1996. Immunology. Black well Scientific Publications.

Paper – 12 Elective			
Title of the paper	Pharmaceutical Biotechnology		
Category of the course	Year	Semester	Credits
Elective	I	II	3

**COURSE OUTLINE****Unit – 1:**

Introduction to concepts and technologies in pharmaceutical biotechnology and industrial applications.

**Unit – 2:**

Biopharmaceuticals expressed in plants. Industrial development and production process. Scientific, technical and economic aspects of vaccine research and development.

**Unit – 3:**

DNA vaccines: from research tools in mice to vaccines for humans.Characterization and bioanalytical aspects of recombinant proteins as pharmaceutical drugs-Biogeneric drugs.

**Unit – 4:**

Therapeutic proteins – special pharmaceutical aspects. Pharmaceutical and pharmacodynamics of biotech drugs- Formulation of biotech products- Rituximab: clinical development of the first therapeutic antibody for cancer.

## **Unit – 5:**

Somatic gene therapy – advanced biotechnology products in clinical development-Nonviral gene transfer systems in somatic gene therapy-Xenotransplantation in pharmaceutical biotechnology, Pharmaceutical enzymes

### **Recommended Texts:**

1. Daniel Figeys (Ed.). 2005. Industrial Proteomics: Applications for Biotechnology and Pharmaceuticals. Wiley, John & Sons, Incorporated.
2. Kayser, O and Muller R.H.. 2004. Pharmaceutical Biotechnology-Drug Discovery and Clinical Applications. WILEY-VCH
3. Heinrich Klefenz. 2002. Industrial pharmaceutical biotechnology.
4. Leon Shargel, Andrew B. C. Yu, Susanna Wu-Pong, and Yu Andrew B. C. 2004. Applied Biopharmaceutics & Pharmacokinetics. McGraw-Hill Companies
5. Stefania Spada, Garywalsh. 2004. Directory of approved biopharmaceutical
6. Gary Walsh. 2003. Biopharmaceutical, Biochemistry & Biotechnology.
7. Thomas Lengauer (Ed.). 2002. Bioinformatics – from Genomes to Drugs. Volume I& II. Wiley-VCH.
8. John F. Corpenner (editor), Mark C. Manning. 2002. Rational Design of stable formulation Theory and Practice (Pharmaceutical Biotechnology). Plenum, US. 1st edition.
9. D.I.A. Crommelin, et al., 2002. Pharmaceutical Biology. Amazon prime publications.
10. Werner Kalow, Urs A Meyer and Rachel F Tyndale .2001. Pharmacogenomics. CPL press.



## 7. M. Sc. DEGREE COURSE IN BOTANY

### SYLLABUS

Title of the Course/ Paper	<b>M. Sc. BOTANY PAPER-I Plant Diversity- I- Phycology, Mycology, Lichens and Bryology</b>		
Category of the Course	Year/ Semester I Year I Semester	Credit-4	Subject Code

### **Plant Diversity- I- Phycology, Mycology, Lichens and Bryology**

#### **PHYCOLOGY**

##### **UNIT I**

Distribution, Pigmentation, flagellation, storage products and cell wall composition of various divisions of algae. General account and classification of algae (Fritsch and Christensen systems).

Range of structure, reproduction, life histories and phylogeny of the following genera: *Hydrodictyon*, *Scenedesmus*, *Chlorella*, *Codium*, *Ulva*, *Navicula*, *Padina*, *Gelidium*, *Gracilaria*, *Spirulina*, *Anabaena*, *Scytonema*, *Microcystis*

Algae as environmental indicators - Algal blooms, Algae in agriculture. Algae as sources of food, animal feed and pharmaceuticals. Fossil algae,

#### **MYCOLOGY**

##### **UNIT II**

Classification of fungi (Alexopoulos and Mims, Ainsworth). Structure including ultra structure, reproduction, phylogeny and inter relationships of various groups. Heterothallism in fungi - sexuality in fungi, Parasexuality - sex hormones in fungi.

Structure, reproduction and life histories of the following.  
Myxomycotina : *Plasmodiophora*.

Mastigomycotina : *Saprolegnia*, *Phytophthora*.

Zygomycotina	:	<i>Rhizopus.</i>
Ascomycotina	:	<i>Taphrina.</i> <i>Claviceps</i>
Basidiomycotina	:	, <i>Polyporus, Peziza.</i>
Deuteromycotina	:	<i>Alternaria, Septoria., Cercospora</i>

Cultivation of mushrooms - *Pleurotus*. Mycorrhizal Fungi. Its application in agriculture and forestry. Economic importance of fungi.

### UNIT- III

#### LICHENS

Lichens- Nature and composition-habit and habitat-Classification-Vegetative and sexual reproduction -Lichen Physiology and Economic importance. ***Usnea, Cladonia***

#### UNIT IV BRYOLOGY

Classification (Watson, 1971). Range of gametophytes and sporophytes in Bryophytes- Reproduction-asexual and sexual –Life history- .

#### UNIT V

Structure, reproduction and life history of the following:

*Targionia, Reboulia, Lunularia, Porella, Pogonatum, Polytrichum, Funaria,*.

Phylogeny., Economic importance of Bryophytes.

#### Reference Books

Alexopoulos, C. J. And Bold, H. C. Algae and Fungi. The Macmillan Co. London

Bold, H. C and Wynne, M. J. 1978. Introduction to the Algae: Structure and Function. Prantice Hall of India New Delhi

Chapman, V. J. 1962. The Algae. Macmillan and Co. Ltd. New York.

Dioxn, P. S. 1973. Biology of Rhodophyta. Hafner Press. New York.

Dodge, J. E. The Fine Structure of Algal Cells. AP London

Fogg, G. E. 1953. The Metabolism of Algae. Methuen & Co. London

Fott, B. 1959. Studies in Phylogeny. Academia Prague

Fritsch, F. E. 1935. The Structure and Reproduction of Algae, Vol. I. University Press Cambridge

Fritsch, F. E. 1945. The Structure and Reproduction of Algae, Vol II. I. University Press Cambridge

Harley, J. L. 1969. The Biology of Mycorrhiza Leonard Hill. London

Kumar H. D and H. N. Singh.1982. A text Book on Algae. Affiliated East-West Press Pvt. Ltd

Morris, I. 1968. An Introduction to the Algae, Hutchinson University Library, London

Phillips, J. M. and Hayman, D. S. 1970.Improved procedures for clearing roots and staining parasitic and vesicular arbuscular mycorrhizal fungi for rapid assessment and infection. Trans. Br. Mycol.Soc. 55:158-161.

Pickett\_Heaps, J. D.1975. Green Algae. Sinauer Associates, Sunderland, Mass

Prescott, G. W. 1969.The Algae: A Review. Thomson Nelson & Sons. London

Round, F. E. 1973. The Biology of Algae. Edward Arnold. London

Schenck,N. C. and Perez,Y. 1990.Manual for the identification of VA mycorrhizal fungi. Publications, Gainesville, Florida USA pp283

Smith, G. M.1951. Manual of Phycology. Chronica Botanica Co., Waltham Mass

Smith, G. M.1955. Cryptogamic Botany Vol. I Mc Graw – Hill Co. New York

Smith, S and Reed, D. J.1997. Mycorrhizal Symbiosis Academic Press.

Stein, J. R. Hand Book of Phycological Methods. University Press. Cambridge

Kumar . H. D. and H. N. Singh. A text book of Algae. Affiliated Esat West Press. Pvt. Ltd. New Delhi (1971)

Gangulee and Khar. College Botany The New Central Book Agency Calcutta

Chapman . V. J and H. J. Chapman .The Algae. 2 nd Edition (1961)

Alexopoulos. Introduction to mycology. Wiley Eastern Pvt. Ltd. New York (1973)

Elizabeth Moore and Lander Fundamentals of Fungi. Prantice hall New Jersey

Reimer, H.1954. Bryophyta. Moose, In: H. Melchoir and E. Werdermann (eds) A. Engler's Syllabus der Pflanzenfamilien 12 ed. 218-268 Berlin

Title of the Course/ Paper	<b>PAPER-II</b> <b>PLANT DIVERSITY – II -PTERIDOPHYTES,</b> <b>GYMNOSPERMS AND PALEOBOTANY</b>		
Category of the Course	Year/ Semester I Year I Semester	Credit 4	Subject Code

**PLANT DIVERSITY- II-PTERIDOPHYTES, GYMNASPERMS AND  
PALEOBOTANY**

## **PTERIDOPHYTES**

### **UNIT I**

General characteristics and classification (Reimer, 1954).  
Structure, reproduction and life histories of the following genera: *Isoetes*,  
, *Lygodium*, *Angiopteris*, *Alsophila*, *Osmunda*, *Pteris*, *Polypodium* ,  
*Salvinia*.

### **UNIT- II**

Origin and evolution of stele and soral evolution.- Heterspory and seed habit, Telome theory, Evolution of gametophytes in Pteridophytes, Economic importance-Morphogenetic studies

## **GYMNOSPERMS**

### **UNIT III**

General characters-Range of structure-Anatomy- Rreproduction- Phylogeny and Classification (K.R.Sporne 1954).

Structure( Exomorphic and endomorphic)- reproduction and life histories of the following genera:, *Araucaria*, *Podocarpus*, *Cupressus*, *Cryptomeria* ,  
*Gnetum*, *Ephedra*.

Phylogeny and Economic importance of Gymnosperms

## PALEOBOTANY

### UNIT IV

Origin and evolution of seed habit. Gondwana Flora of India.

Contribution of Birbal Sahni to Paleobotany. Study of fossils in understanding evolution.

Economic importance of fossils - fossils for fuel and as industrial raw materials.

Study of organ genera: , *Calamites*, *Sphenophyllum*, *Calamostachys*,

Study of organ genera

### UNIT- V

Study of structures of organ genera of the following :

*Lyginopteris*, *Medullosa*, *Pentoxylon*, *Lagenostroma*, *Cordaitea*, *Cardiocarpus*.

1. Eames.A., 1963 – Morphology of lower vascular plant, McGraw Hill
2. Forster and Gifford, 1959 – Comparative Morphology of a Vascular Plants.
3. Pandey B.R., 1977 – A text book of Botany, Pteridophytes and Gymnosperms, K. Nath & Meerut.
4. Parihar. N.S., 1967 – An introduction of Embriyophyta, Vol.III – Pteridophyta, Central book depot, Allahabad.
5. Smith.G.M., 1955- Cryptogamic Botany, Volume-III – McGraw Hill
6. Sporne.K.L., 1976 – Morphology of Pteridophytes, 4<sup>th</sup> edition, B.I.Publication.
7. Vashista.P.C., 1971 – Botany for Degree students : Pteridophyta. S.Chand&Co
8. Chainberlain.C.J. – Gymnosperms structure and evolution, Chicago.
9. Sporne. K.R., - Morphology of Gymnosperms, Hutchinson University Library.
10. Gupta.M.N., 1972, - The Gymnosperms (2<sup>nd</sup> Edition) Shiva Lal Agarwala & Co., Agra.
11. Vashista, 1976, Gymnosperms, S.Chand & Co.

Title of the Course/ Paper	<b>PAPER-III</b> <b>PLANTS DIVERSITY- III-TAXONOMY AND ECONOMIC BOTANY OF ANGIOSPERMS</b>		
Category of the Course	Year/ Semester I Year I Semester	Credit 4	Subject Code

## PLANT DIVERSITY- III-TAXONOMY AND ECONOMIC BOTANY OF ANGIOSPERMS

### UNIT I

Taxonomy and systematics, objectives of plant systematics, hierarchy, concepts of characters: qualitative, quantitative, analytical and synthetic. Good and bad characters

Systems of classification – Linnaeus, Bentham and Hooker, Engler and Prantl Hutchinson and Takhtajan, Dahlgren.

### UNIT II

Modern trends in Taxonomy - numerical taxonomy - chemotaxonomy - Biosystematics. Botanical Survey of India- its organization and role. ICBN - Importance and principles of binomial nomenclature - Valid and effective publication, Citation, rejection and retention of names ,Typification, Limitations to priority – A general account of keys,

### UNIT III

A detailed study of the following families and their interrelationships and phylogeny:

1. Menispermaceae
- 2 Portulacaceae
3. Capparidaceae
4. Meliaceae
5. Rhamnaceae
6. Vitaceae
7. Sapindaceae
8. Aizoaceae
- 9 Combretaceae
10. Moringaceae

## UNIT IV

- 11 Turneraceae
- 12 Oleacea
13. Boraginaceae
- 14 Bignoniaceae
15. Solanaceae
- 16 Acanthaceae
17. Lamiaceae
18. Casuarinaceae
- 19 Commelinaceae
20. Amaryllidaceae

## UNIT V

### **Economic Botany**

Origin , evolution, botany, cultivation and uses of (i) food, ( Wheat, rice, Potato, Sugarcane : forage and fodder crops( Sorgham, bajra, Gram), (ii)Fibre crops ( Cotton, Jute Sunhemp ). (iii) Medicinal and aromatic plants ( *Atropa belladonna*, *Rauwolfia serpentine*, *Withania somifer*, and *Phyllanthus amarus* ,and (iv) vegetable oil yielding plants ( Groundnut. Soybean,Safflower, mustard)

Important fibre –wood and timber yielding plants and non-wood forest products ( NWFPs) such as bambooa, rattens, raw materials for paper making, gums, tannins, dyes, resins and fruits

Plants used as avenue trees for shade, pollution control and aesthetics

### **Text books**

1. Lawrence.G.H.M, 1985 – An Introduction to Plant Taxonomy, Central Book Depot, Allahabad.
2. Porter.C.L., 1982 – Taxonomy of Flowering Plants, Eurasia Publications House, New Delhi
3. Rendle.A.B., 1980 – The Classification of Flowering Plants (Vol. I & II), Vikas Students Education.
4. Pandely.B.P., 1987 – Taxonomy of Angiosperms.
5. Pandey.B.P. (1987) – Economic Botany.
6. Verma. V (1984) – Economic Botany.
7. Hill.A.W. (1981) – Economic Botany, McGraw Hill Pub.
8. Willis.T.E(1994) – Text Book of Pharmacognosy. Tata McGraw Hill Publishers.
9. Gokhale.S.B (1992) – Pharmacognosy. S.Chand & Co.
10. Ansari.S.H. (1993) – Pharamacognosy S.Chand & Co.

Title of the Course/ Paper	<b>PAPER-IV</b> <b>ELECTIVE- I- MICROBIOLOGY</b>		
Category of the Course	Year/ Semester I Year I Semester	Credit 3	Subject Code

## ELECTIVE- I- MICROBIOLOGY

### UNIT.1

#### **Virology**

1. *General account:* .. Virus structure ,. Ultrastructure of virions; Classification and general properties of major families of viruses - modes of replication. - transmission of viruses - Any two plant viral diseases and control

### UNIT II

#### **Bacteriology**

Bacteria - Occurrence, nutritional types, kinetics of growth, asexual and sexual reproduction, modes of genetic recombination- conjugation, transformation, transduction and economic importance- Any two bacterial diseases on plants and their control Phytoplasma: General characteristics and role in causing plant diseases .

### UNIT III

#### **Environmental and Agricultural Microbiology**

Microbes in terrestrial, aquatic, -microbes in the extreme environments and their adaptations; - methods for the determination of microbial numbers, biomass and activities.- Significance of microbial activities in the environment

Role of microorganisms in the cycling of bio elements (carbon, nitrogen, phosphorus, sulphur.); microbial degradation of pesticides, petroleum and hydrocarbons;

Microbial inoculants in agricultural; microbes as biological control agents .



## UNIT IV

### **INDUSTRIAL MICROBIOLOGY**

\_ Introduction to industrial microbiology- suitability of microbes in industrial processes and their source, types of fermentation and bioreactors- Design of a fermenter

## UNIT V

### **FOOD MICROBIOLOGY**

Brief history of microorganism in food stuffs; source types and role of microorganisms in foods; spoilage of fruits and vegetables, fresh and processed meats and poultry, and miscellaneous foods such as eggs, bakery products, dairy products, beer and wines, fermented foods, and canned foods

Reference Books

G. Tortora, B. Funke and C. Case. **Microbiology: An Introduction**. 5th ed. Menlo Park, CA: Benjamin/Cummings, 1995

J. Ingraham and C. Ingraham. **Introduction to Microbiology**. Belmont, CA:Wadsworth, 1995.

T.D. Brock, M.T. Madison, J. M. Martinko and J. Parker. **Biology of Microorganisms**. 7th ed. Englewood Cliffs, N.J: Prentice-Hall, 1994.

Title of the Course/ Paper	<b>PAPER-V PRACTICAL- I ( COVERING THEORY PAPERS I AND II)</b>		
Category of the Course	Year/ Semester I Year I Semester	Credit 4	Subject Code

### **ALGAE**

Study of algae in the field and laboratory of the genera included in theory. Identification at generic level. Using algal Monographs. Study of EM pictures of some algae.

### **FUNGI**

Study of morphological and reproductive structures of the genera mentioned in theory. Isolation and identification of fungi from soil, air, and Baiting method.. Preparation of culture media

### **LICHENS**

Study of morphological and reproductive structures of the genera mentioned in theory

### **BRYOLOGY**

External morphology and internal anatomy of the vegetative and reproductive organs of genera given in the theory.

Bonafide record of practical work done should be submitted for the practical examination. The Practical examination is followed by viva-voce examination

Title of the Course/ Paper	<b>PAPER-VI PRACTICAL- II ( COVERING THEORY PAPER III)</b>		
Category of the Course	Year/ Semester I Year I Semester	Credit- 4	Subject Code

Description of a species, based on herbarium and live specimens of the families mentioned in the theory. Identification of Key characters, both qualitative and quantitative. Preparation and use of keys at generic and specific levels.

Diagnostic characters of families and their use in the preparation of key.  
Solving nomenclature problems

Field visits for at least 2-3 days to collect specimens on the spot in Tamil Nadu. Submission of not less than 20 herbarium sheets representing the families studied

Bonafide record of practical work done should be submitted for the practical examination. The Practical examination is followed by viva-voce examination

Title of the Course/ Paper	<b>PAPER-VII</b> <b>ENVIRONMENTAL BOTANY</b> <b>PHYTOGEOGRAPHY AND REMOTE SENSING</b>		
Category of the Course	Year/ Semester I Year II Semester	Credit-4	Subject Code

## **ENVIRONMENTAL BOTANY , PHYTOGEOGRAPHY AND REMOTE SENSING**

### **UNIT I**

Basic ecological principles: definition of ecology and environment - components and characters of ecosystem – homeostasis.  
Ecosystem: Composition, structure, and function. Diversity of plant life - analytical and synthetic characters - growth forms, life form - community classification diversity, dominance and similarity indices of plant communities.

### **UNIT II**

Flow of energy in ecological system, quality of energy - solar energy - prime source of energy, energy - units and measurement -  
Major types of biomes: world .Terrestrial ecosystem: tundra - arctic - alpine - montane - temperate sub-tropical - tropical ecosystems including grasslands and deserts.  
Aquatic ecosystems: Fresh water ecosystems - lentic - lotic - wetland ecosystem. Marine ecosystems.

### **UNIT III**

Abiotic factors: Soil: classification, salinity, conditions, influence on plant distribution, erosion rate and the effects of plants on soils.  
Biogeochemical cycles CO<sub>2</sub>, N<sub>2</sub>, H<sub>2</sub>O, S and P  
Plant demography and species distribution. Population characteristics: Population density, structure, mortality, natality, age and distribution - species diversity -  
Environmental pollution: air, water and soil. Noise pollution - effects and control measures. Disaster management: Floods, earthquake, Cyclone and landslides and Tsunami

## UNIT IV

Non-conventional sources of energy-wind, tidal, geothermal, biomass based energy.

Biological diversity: Introduction- origin- Diversity and ecological stability distribution and measurement of biological diversity - loss of biodiversity, endangered plants of India - IUCN category of endangered species.

Conservation - in situ and ex situ. Gene bank.

## UNIT V

Brief account of the following: A forestation, social forestry, agroforestry, Man and Biosphere (MAB),

Study of geographical patterns- world flora- types – patterns-and distribution. Age and area hypothesis. Continental drift-.

Remote sensing- Principle of remote sensing- photon and radiometric parameters- Processing and classification of remotely sensed data- Pattern recognition; approach to data/image interpretation- application of remote sensing in Agriculture and forestry

## REFERENCE BOOKS

- 1) Ambasht, R.S. 1990. A text book of plant ecology.
- 2) Shukla, R.S. and F.S. Chandel. 1996. Plant ecology and soil science.
- 3) Dash. 1995. Fundamentals of Plant ecology.
- 4) Cain, S.S. 1988. Fundamental of plant geography.
- 5) Odum, E.P. 1978. Fundamentals of ecology.
- 6) Odum, E.P. 1978. Basic principles of ecology.
- 7) Agarwal, U.P. 1988. Forests in India.
- 8) Misra, R.1968. Ecology work book.
- 9) Ambasht, R.S. 1990. Environment \* Pollution.
- 10) Krishnan Kannan. 1990. Fundamentals of Environmental pollution.
- 11) Matghur, V.P. 1968. Forest Management.
- 12) Nayar, M.P. and Aastri , a.R.K. 1987. Red data book of Indian plants.
- 13) Jain Mehra. 1983. Conservation of Tropical resources.
- 14) Ronald Good. 1974. The geography of flowering plants.
- 15) Velentin. 1978. Taxonomy, Phytogeography and Evolution.
- 16) Polunin, N. 1992 Principles of Plant Geography.
- 17) Chacho, 1985. Sampling techniques.
- 18) Champion, H.G. and Griffith. 1967. General Silviculture.
- 19) Troupe. 1975. Silviculture of Indian trees.
20. Kormandy. . E. J. 1984. Concept of Ecology. Prentice New Delhi.

Title of the Course/ Paper	<b>PAPER-VIII</b> <b>DEVELOPMENTAL BOTANY- ANATOMY,</b> <b>EMBRYOLOGY AND PALYNOLOGY OF</b> <b>ANGIOSPERMS</b>		
Category of the Course	Year/ Semester I Year II Semester	Credit-4	Subject Code

## DEVELOPMENTAL BOTANY – ANATOMY EMBRYOLOGY AND PALYNOLOGY OF ANGIOSPERMS

### ANATOMY

#### UNIT I

Organization and theories regarding shoot, root and reproductive meristems.

Vascular cambium - origin, development and types. Cambial activity - normal and anomalous. Cork cambium, Periderm, polyderm, rhytidome, lenticels. Anomalous thickening in monocotyledons - Dracaena stem. Xylem-differentiation, xylary elements - Maceration technique- tracheids, vessels, fibre and parenchyma Patterns of secondary wall. Tyloses; reaction wood, heart wood and sap wood. Growth rings. Phloem - primary and secondary elements - ontogeny-differentiation. Structural variations and characteristics of phloem components.

#### **UNIT II**

Secretory cells and tissues; their structure, classification and significance. Types- external and internal secretory structures.

Nodal anatomy - uni , tri & multilacunar

Ontogeny and histogenesis of bifacial leaf - Hibiscus, unifacial leaf - grass. Kranz anatomy

Stomata - development and types

Experimental anatomy - PGR and tissue differentiation. Applied plant anatomy in paper and fibre industry.

### EMBRYOLOGY

#### UNIT III

Microsporogenesis., Morphology, cytology and physiology of tapetum  
Microgametogenesis – microspore, division of generative cell, pollen wall  
morphogenesis and structural variability. Pollen fertility and sterility,  
Pollen germination, Pollen storage.

Ovule-types, megasporogenesis - megagametogenesis, Embryosac types,  
ultrastructure of egg, synergids and antipodals..

#### UNIT- IV

Fertilization - Heterospermy, discharge and movement of sperms.  
Syngamy and triple fusion; post-fertilization changes. Heterofertilization.

Endosperm - types, endosperm haustoria, Embryogeny -Laws of  
Embryogeny-Classification – mono and dicot embryos - variations and  
differences in development,. Apomixis. Polyembryony. Embryology in  
relation to Taxonomy.

### **PALYNOLOGY**

#### **UNIT V**

Introduction to Palynology – Pollen analysis aeropalynology - pollen  
allergy and palynological calendars.

#### **Reference Books**

- Bhojwani. S. S. and Bhatnagar. S. P. 1981 Embryology of Angiosperms.  
Vikas Pub. Co. Ltd  
Cronquist. A. .1968The evolution and Classification of Flowering Plants.  
Davies . P. H. and Heywood. V. H. 1967Principles of Angiosperm  
taxonomy. Oliver and Boyd. Edinburgh  
.Davies. G. L Systemic Embryology of Angiosperms,  
Dixon. A. 1985. Plant Cell Culture- A practical Approach IRL press.  
Oxford  
Ertman.G. 1954. An Introduction to Pollen Analysis. Cronica Botanica.  
Hutchinson. J. 1973. The Families of Flowering Plants. Oxford Uni.  
Press.  
Johri. B. M. 1984. Embryology of Angiosperms. Springer Verlaug.  
Lawrence. G. H. Introduction to Vascular Plants. Oxford. IBH.  
Delhi.Maheswari.P. Embryology of Angiosperms. Oxford. IBH. Delhi  
Nair. P. K. K. Essential of Palynology  
Narayanaswamy. S. 1994. Plant Cell and Tissue Culture. Tata McGraw  
Hill Ltd. New Delhi

Reinert. J. Bajaj. T. P. S. Applied and Fundamental Aspects of Plant cell, tissue and organ Culture. Springer – Verlag.

Sivarajan. S. 1989. Introduction to Principles of Taxonomy. Oxford. IBH New Delhi.

Carlquist. S. 1961. Comparative Plant Anatomy. Holt Rinehart Cutter. E. G. Plant Anatomy- Experimental and Interpretation

Easw. K. 1987. Anatomy of Seedling Plants. Wiley Pub.

Fahn. A. 1989. Plant Anatomy. Mac Millan

Gray. P. 1964. Hand Book of Plant Microtechnique.

Jensen. W. A. 1962. Botanical Histochemistry. The Benjamin/ Cummings

Title of the Course/ Paper	<b>PAPER-IX</b> <b>ELECTIVE- II</b> <b>WOOD TECHNOLOGY</b>		
Category of the Course	Year/ Semester I Year II Semester	Credit-3	Subject Code

### **ELECTIVE II: WOOD TECHNOLOGY**

#### Unit –I

Factors affecting cambial activity- wood formation –role of hormones, water, internal and external factors - Growth rings- Heart wood and sap wood, juvenile and reaction wood.- Vessels- length, shape, lateral wall pittings, perforations, intervessel pits, tyloses  
Tracheids, size and wall characteristics- rays-classification and types

#### Unit-2

Density and specific gravity of the wood – significance- Calculation of moisture content and specific heat of wood- Principles of wood preservation- Preservatives- Process of preservation( pressure and non pressure methods)- Seasoning of wood.

#### Unit 3

Mechanical properties of wood-tensile strength-compression strength-shearing strength- bending strength- stiffness-shock resisting capacity-hardness. Factors affecting mechanical properties of wood.

#### Unit -4

Chemical properties of wood- Cellulose- hemicellulose-, lignin, mineral matter- essential oil, tannins,



## Unit 5

Wood products- Timber, rail road ties, venees plywood- furnitures, wood fuel- lead pensils- matches, tooth picks- paper pulp-filaments and yarn cellulose- gums, resins, turpentine- resinsbarks, tannins and dyes.

## References

1. Bailey, I. W. 1954 Contribution to plant Anatomy. Chronica Botanica Waltham Mass
2. Brown, H. P Text Book of Wood Technology Vol –I McGraw Hill Book Co. New York
3. Gamble, J. S. Manual of Indian Timbers London
4. Pearson, R. S. Commercial Timbers of India Govt of India Publications
5. Metcalfe, C. R. 1962. Anatomy of Dicotyledons Vol 2 Claredon Press London

Title of the Course/ Paper	<b>PAPER-X</b> <b>ELECTIVE- III</b> <b>PLANT RESEARCH METHODOLOGY</b>		
Category of the Course	Year/ Semester I Year II Semester	Credit-3	Subject Code

### **PLANT RESEARCH METHODOLOGY**

#### **UNIT. I**

Introduction-Light-Lens-Compound Microscope-Principle-  
Instrumentation-Types of Light microscopes-Electron microscopes-  
Scanning Probe Microscopes-  
Microtomy- Killing and Fixation- Fixatives -Dehydration-Paraffine  
sectioning-Types of rotary microtome-Ultramicrotome-Stain-Methods of  
staining.

#### **UNIT II**

Centrifugation- pH and pH meter-Chromatography- -Paper  
Chromatography-Thin layer Chromatography- Column Chromatography-  
Gas Chromatography- Liquid Chromatography.  
Electrophoresis — Types of electrophoresis and their applications --  
polyacrylamide gel electrophoresis – Agarose electrophoresis-  
Isoelectrophoresis-

#### **UNIT III**

Principles of Photometry- Principle of Colorimeter and  
spectrophotometer- Applications

Photography- -Digital photography- Microphotography

#### **UNIT- IV**

Laboratory Safety – Introduction- Biohazardous agents- Risk groups and  
Biosafety levels – Laboratory acquired infections – Safety measures –  
Additional hazardous – Electrical hazards- Safety in Genetic engineering-  
Safety of laboratory animals.

## UNIT- V

Writing the research report- The components a research report- Title- Authors and address- abstract- summary-synopsis-key words- introduction-materials and methods-results-discussion- acknowledgements General introduction and General discussion-

### References:

Anderson, J.B.H. Durston and M. Poole, Thesis and Assignment Writing, Wiley Eastern Private Limited, New Delhi, 1970.

Cromwell, L.F.J. Weibell, and E. A. Pfeiffer, Biomedical Instrumentation and Measurements (Second Edition), Prentice-Hall of India Pvt Ltd, New Delhi, 1980.

Day, R.A. How to write and publish a scientific paper, 3<sup>rd</sup> edition, Oryx Press, Phoenix, Arizona, 1988.

Gurumani, N. An Introduction to Biostatistics (Second edition). MJP Publishers, Chennai 2005.

Jayaraman, J. Laboratory manual of Biochemistry, Wiley Eastern Limited, New Delhi 110 002, 2000.

Johansen. D. A. Plant Microtechnique Tata Mc Graw Publishing Company New Delhi

Johansen. D. A Dehydration and infiltration Science 82:253-254.

Johansen. D. A Tertiary butyl alcohol methods. El Palo Alto News 1:1-2

Prescott, L.M.J.P. Harley, and D.A. Klein, Microbiology (Sixth edition) McGraw-Hill, New York, 2005.

Ray, K. And the dispute goes on... Deccan Herald, Tuesday, January 13, DH News Service, New Delhi, 2004.

Sharma, K.R. Research methodology. National publishing house, Jaipur and New Delhi, 2002.

Webster, J.G. Bioinstrumentation, John Wiley & Sons (Asia) Pvt Ltd. Singapore 2004.

Title of the Course/ Paper	<b>PAPER-XI</b> <b>PRACTICAL- III ( COVERING THEORY</b> <b>PAPERS VII AND VIII)</b>		
Category of the Course	Year/ Semester I Year I Semester	Credit- 4	Subject Code

### **ENVIRONMENTAL BOTANY AND REMOTE SENSING**

1. Determination of air temperature at different altitudes (Ground Level 50, 100 and 150m).
2. Determination of air temperature at 2 hourly interval starting from 6 am to 6p.m.
3. Determination of the minimum size of quadrat by species area curve (for grazing land, forest) field study for at least 3 days.
4. Determination of the quantitative characters of a plant community by random quadrat method(abundance, density, dominance, species diversity, frequency) in grazing land, forests.
5. Determination of the quantitative characters by belt transect method
6. Evaluation of life form classes of the local flora and preparation of biological spectrum of land.
7. Estimation of above ground and below ground biomass in a grazing land employing minimum size of quadrat.
8. Determination of soil moisture content by oven drying method.
9. Determination of water holding capacity.
10. Determination of pH of soil and water by universal indicator(or) pH meter.
11. Mapping of World vegetation  
Mapping of Indian vegetation.  
Studying remote sensing through satellite pictures and visit to remote sensing laboratory ( at Anna University, Meteorological Centre at Meenambakkam )

### **ANATOMY**

Laboratory work on the basis of topics listed under angiosperm anatomy theory.  
Micrometry in anatomical studies-ocular, stage and camera lucida-types.

Techniques in making temporary and permanent microscopic preparations - free hand, peelings, clearing, maceration and wood section.

## **EMBRYOLOGY AND PALYNOLOGY**

Preparation of dissected whole mounts of embryo. Study of pollen {Acetolysis/and nonactolysis) Collection and Identification of local aerospora. Study from permanent preparation: - Development and structure of anther, Pollen, Ovule, megasporogenesis, embryosac, endosperm and embryo.

Bonafide record of practical work done should be submitted for the practical examination. The Practical examination is followed by viva-voce examination

## **08. M.Sc. DEGREE COURSE IN CHEMISTRY SYLLABUS**

### **1. THE GENERAL OBJECTIVE**

In the last few years, there is a great demand for Post Graduate students in Chemistry in Pharma, Paint and Refinery industries. Chemistry has diversified into a multidisciplinary subject taking an active role in chemical and pharmaceutical industries, biotechnology and nano technology. Taking into consideration these facts, the syllabus of the M.Sc course is designed in such a way that a student would have a thorough knowledge on the fundamental aspects of chemistry and also expose him-self/ herself to research. After completion of the course with a M. Sc. degree in Chemistry, he/she can have a career in the following areas: (i) take up a teaching job at the college for science and engineering courses, (ii) take up a job in a Scientific laboratory & R&D Institutions, (iii) pursue a research career in an academic institution or a National Institute/laboratory, (iv) even start one's own industry and be a entrepreneur. All the topics in the NET/SLET syllabus for Chemistry are incorporated, as passing the NET/SLET is a prerequisite for UGC/CSIR research fellowship and teaching jobs in Universities and several colleges and an added qualification for many research positions.

**SEMESTER I**  
**CORE 1 - ORGANIC CHEMISTRY - I (90 HOURS)**

**OBJECTIVES**

This course aims to explain basic concepts in stereo chemistry and conformational analysis of organic molecules. In addition the reaction mechanism and synthetic application of aliphatic and aromatic substitution reaction in organic synthesis is will be discussed in detail.

**UNIT I - STEREOCHEMISTRY**

Optical activity and chirality. Classification of chiral molecules as asymmetric and dissymmetric. A brief study of dissymmetry of allenes, biphenyls, spiro compounds, trans cyclooctene and cyclononene and molecules with helical structures. Absolute configuration - R, S notation of biphenyls and allenes. Fischer projection. Inter conversion of Sawhorse, Newman and Fischer projections. Molecules with more than one asymmetric center (restricted to five carbons) E.g. Erythro and threo compounds. Asymmetric synthesis, Cram's rule.

Geometrical isomerism. E, Z nomenclature of olefins, Geometrical and optical isomerism (if shown) of disubstituted cyclopropane, cyclobutane and cyclopentanes. Identification of enantiotopic, homotopic, diastereotopic hydrogens and prochiral carbons in compounds containing up to ten carbons only, Stereo specific and stereo selective reactions.

**UNIT II - CONFORMATIONAL ANALYSIS:**

Conformation of some simple, 1, 2-disubstituted ethane derivatives. Conformational analysis of disubstituted cyclohexanes and their stereo chemical features [geometric and optical isomerism (if shown) by these derivatives]. Conformation and reactivity of substituted cyclohexanols (oxidation andacylation), cyclohexanones (reduction) and cyclohexane carboxylic acid

derivatives (esterification and hydrolysis). Conformation and stereochemistry of cis and trans decalin and 9-methyl decalin.

### **UNIT III - ALIPHATIC NUCLEOPHILIC SUBSTITUTION REACTIONS:**

Kinetic and Non-Kinetic methods of determining organic reactions mechanisms. Hammett equation. Derivation and free energy relationship. Simple problems. Taft equation

SN1, SN2 and SNi mechanism - Neighbouring group participation - reactivity, structural and solvent effects - substitution in norbornyl and bridgehead systems - substitution at allylic and vinylic carbons - substitution by ambident nucleophiles such as CN, NO<sub>2</sub>, phenoxide and ambident dianions - substitution at carbon doubly bonded to oxygen and nitrogen - alkylation and acylation of amines, halogen exchange, Von-Braun reaction, alkylation and acylation of active methylene carbon compounds, hydrolysis of esters, Claisen and Dieckmann condensations.

### **UNIT IV - NUCLEOPHILIC SUBSTITUTION REACTIONS :**

Nucleophilic substitution at carbon doubly bonded to oxygen and nitrogen - alkylation and acylation of amines, halogen exchange, Von-Braun reaction, alkylation and acylation of active methylene carbon compounds, hydrolysis of esters, Claisen and Dieckmann condensations

Aromatic Nucleophilic Substitution Methods for the generation of benzyne intermediate and reactions of aryl anion intermediate - Nucleophilic substitution involving diazonium ions. Aromatic Nucleophilic substitution of activated halides. Ziegler alkylation. Chichibabin reaction.

### **UNIT V - AROMATIC ELECTROPHILIC SUBSTITUTION REACTIONS :**

#### **Electrophilic Substitutions**

The arenium ion mechanism. Orientation and reactivity (ortho, meta and para directing groups). Typical reactions to be studied - nitration, halogenation,



alkylation, acylation and diazonium coupling. Formylation reactions - Gatterman, Gatterman-Koch, Vilsmeier-Hack & Reimer-Tiemann Reaction. Synthesis of di & tri substituted benzenes (symmetrical tribromobenzene, 2-Amino-5-methylphenol, 3-nitro-4-bromobenzoic acid, 3, 4-dibromonitrobenzene, 1, 2, 3 - trimethylbenzene) starting from benzene or any mono substituted benzene. Electrophilic substitution of furan, pyrrole, thiophene pyridine and pyridine-N-oxide.

**TEXT BOOKS :**

1. E. Eliel, S.H. Wilen and L.N. Mander, 1994, Stereochemistry of Carbon Compounds, 2nd Edition, John Wiley & Sons, New York
2. D. Nasipuri, 1994, Stereochemistry of Organic Compounds, 2nd Edition, Wiley Eastern Ltd, New Delhi
3. P.S. Kalsi, 1993, Stereochemistry, Conformation Analysis and Mechanism, 2nd Edition, Wiley Eastern Limited, Chennai
4. P.S. Kalsi, 1994, Stereochemistry and Mechanism Through Solved Problems Wiley Eastern Ltd.
5. Niel Isaacs, 1987, Physical Organic Chemistry, ELBS Publications
6. R. Bruckner, 2002, Advanced Organic Chemistry, Reaction Mechanism, Elsevier, New Delhi
7. F.A. Carey and R.J. Sundberg, 2001, Advanced Organic Chemistry, Part A and Part-B, 4<sup>th</sup> Edition, Plenum Press, New York
8. J. March, 1992, Advanced Organic Chemistry, 4<sup>th</sup> Edition, John Wiley & Sons, Singapore.

9. T.L. Gilchrist and C.W. Rees, Carbenes, Nitrenes and Arynes, Thomas Nelson and Sons Ltd., London.
10. T.L. Gilchrist, 1992, Heterocyclic Chemistry, 2nd Edition, Longman, Essex, England
11. J.A.Joule and K.Mills, 2000, Heterocyclic Chemistry, 4th Edn, Backwell Science Publishers, England

**WEBSITES:**

1. <http://info.dome.sdsu.edu/research/guides/science/orgchemistryblr.html>
2. <http://www.liv.ac.uk/chemistry/links/reactions.html>
3. <http://orgchem.chem.uconn.edu/namereact/named.html>
4. [www.gcocities.com/chempen software/reactions.html](http://www.gcocities.com/chempensoftware/reactions.html)

## **CORE 2 - INORGANIC CHEMISTRY - I (90 HOURS)**

**OBJECTIVES :**

To impart the theories about bonding and structure of various inorganic compounds and few analytical techniques. The basics of reaction Mechanisms in coordination chemistry are also introduced.

**UNIT I-BONDING IN INORGANIC COMPOUNDS:**

Poly acids: Isopolyacids and heteropolyacids of vanadium, chromium, molybdenum and tungsten.

Inorganic Polymers: Silicates, structure - properties - correlation and applications - molecular sieves polysulphur - nitrogen compounds and poly - organophosphazenes.

## **UNIT II**

Boron hydrides: Polyhedral boranes, hydroborate ions, carboranes and metallo carboranes.

Metal Clusters: Chemistry of low molecularity metal clusters (upto) trinuclear metal clusters; multiple metal-metal bonds.

## **UNIT III - THEORIES OF COORDINATION :**

1 Crystal field theory and its limitations, d-orbital splittings, LFSE, spectrochemical series, evidences for metal ligand orbital overlap, molecular orbital theory and energy level diagrams, concept of weak and strong fields, Jahn-Teller distortion, charge-transfer spectra.

## **UNIT IV**

Spectral and magnetic properties of complexes.

Term states for  $d^n$  - ions, energy diagrams, d-d transitions, Orgel and Sugano - Tanabe diagrams, -spin orbit coupling, nephelauxetic effect, spectral and magnetic characteristics of transition metal complexes.

Applications of IR, RAMAN, ESR, Massbauer, ORD to study of Coordination compounds.

## **UNIT V - STABILITY AND STEREO ISOMERISM OF COORDINATION COMPLEXES :**

Stability of complexes: thermodynamic stability – stepwise and overall

stability constants, their relationships, factors affecting the stability of the complexes, HSAB approach, chelate effect, importance of chelates.

Macrocyclic ligands; types; schiff bases; crown ethers; cryptands;

Chelating agents; types of EDTA titrations; direct and back titrations; replacement titrations; masking and demasking reagents.

Determination of stability constants by spectrophotometric, polarographic and potentiometric methods.

Stereochemical aspects; Stereoisomerism in inorganic complexes; isomerism arising out of ligand and ligand conformation; chirality and nomenclature of chiral complexes; optical rotatory dispersion and circular dichroism.

#### **TEXT BOOKS ;**

1. J.E. Huheey, 1993, Inorganic Chemistry - Principles, Structure and Reactivity; IV Edition, Harper Collins, NY.
2. F.A. Cotton and G. Wilkinson, 1988, Advanced Inorganic Chemistry - A Comprehensive Text, V. Edition, John Wiley & Sons.
3. K.F. Purcell and J.C. Kot, 1977, Inorganic Chemistry - WB Saunders Co., USA.
4. M.C. Day and J. Selbin, 1974, Theoretical Inorganic Chemistry, Van Nostrand Co., NY.
5. G.S. Manku, 1984, Inorganic Chemistry, TMG Co.,
6. D.A. Skoog, 1985, Principles of Instrumental methods of Analysis, III Edition, Saunders College Publication.
7. Willard Merrit, Dean and Settle, 1986, Instrumental methods of Analysis, VI Edition CBS Publication.

8. A.I. Vogel, 1985, 1976, Text Book of Qualitative Inorganic Analysis, ELBS III Edition, and IV Edition.
9. D.A. Skoog D.M. West, 1982, Fundamental of Analytical Chemistry, IV Edition, Holt Reinheart & Winston Publication.
10. P.C. Jurns, 1987, Basic Programming for Chemists, T.L. Isehowr and C.C. Wilkinsons, JW & Sons.
11. K.V. Raman, 1993, Computer in Chemistry, Tata McGraw Hill, New Delhi.
12. K. Ebert, H. Ederes and T.L. Isenhowr, Computer Applications in Chemistry, VCH.

#### **SUGGESTED REFERENCE BOOKS :**

1. D.F. Shrivvers, P.W. Atkins and C.H. Langfor 1990, Inorganic Chemistry, CH Langford, OUP
2. N.N. Greenwood and Earnshaw, 1984, Chemistry of the Elements, Pergamon Press, NY.
3. F.A. Kettle, 1973, Coordination Chemistry, ELBS.
4. K. Burger, 1973, Coordination Chemistry, Burtterworthy.
5. Basolo and R.G. Pearson, 1967, Mechanism of Inorganic Reactions, Wiley, NewYork.
6. R.Sarker, general and Inorganic chemistry, (Parts I and II), New Book Agency, Calcutta
7. G.D. Christian & J.E.O. Reily, 1986, Instrumental Analysis, II Edition, Allegn Becon.

8. H.A. Strobel, 1976, Chemical Instrumentation, Addison - Wesley Publ. Co.
9. Kolthoff and Elwing (all series), Treatise on Analytical Chemistry.
10. Wilson and Wilson series, Comprehensive Analytical Chemistry.
11. R.C. Kapoor and B.S. Aggarwal, Ms. 1991, Principles of Polarography, Wiley Eastern Limited.

### **CORE 3 - PHYSICAL CHEMISTRY - I (90 HOURS)**

#### **OBJECTIVES:**

To learn the basic concepts in chemical kinetics and group theory and the need for quantum mechanics and appreciate their significance.

#### **UNIT I - CHEMICAL KINETICS - I :**

Effect of temperature on reaction rates-collision theory of reaction rates-molecular beams-collision cross sections-effectiveness of collisions-probability factors-potential energy surfaces-partition functions and activated complex. Eyring equation-estimation of free energy, enthalpy and entropy of activation and their significance.

#### **UNIT II - CHEMICAL KINETICS - II:**

Reactions in solutions-effect of pressure, dielectric constant and ionic strength on reactions in solutions-kinetic isotope effects-linear free energy relationships-Hammett and Taft equations-Acid base catalysis-mechanism of acid base catalysed reactions-Bronsted catalysis law.

#### **UNIT III - GROUP THEORY I :**

Symmetry elements and symmetry operations-point groups-identification and determination-reducible and irreducible representations-Direct product representation-orthogonality theorem and its consequences-character table.

#### **UNIT IV - GROUP THEORY II :**

Hybrid orbital in non-linear molecules ( $\text{CH}_4$ ,  $\text{XeF}_4$ ,  $\text{BF}_3$ ,  $\text{SF}_6$  and  $\text{NH}_3$ ).  
Determination of representations of vibrational modes in non-linear molecules ( $\text{H}_2\text{O}$ ,  $\text{CH}_4$ ,  $\text{XeF}_4$ ,  $\text{BF}_3$ ,  $\text{SF}_6$  and  $\text{NH}_3$ )

Symmetry selection rules for infrared, Raman and electronic Spectra.  
Electronic Spectra of Ethylene and formaldehyde-application of group theory.

#### **UNIT V: QUANTUM CHEMISTRY - I :**

Inadequacy of classical theory -, black body radiation, photo electric effect - the Compton effect - Bohr's Quantum theory and subsequent developments - wave particle duality- de Broglie equation, Heisenberg uncertainty principle.

#### **TEXT BOOKS:**

1. G.K. Vemulapalli, 2000, Physical Chemistry, Prentice - Hall.
2. J. Rajaram and J.C. Kuriacose, 1993, Kinetics and mechanism of chemical transformations, MacMillan India Ltd.
3. K.J. Laidler, 1987, Chemical Kinetics, Harper and Row, New York.
4. K. L. Kapoor, 2001, A Text book of Physical Chemistry, Macmillan India Ltd.
5. V. Ramakrishnan and M.S. Gopinathan, 1988, Group Theory in Chemistry, Vishal Publications.

6. P.W. Atkins, 1990, Physical Chemistry, Oxford.
7. K.V. Raman, 1990, Group theory and its applications to Chemistry, Tata McGraw Hill.
8. D.A. McQuarrie, 1983, Quantum Chemistry, University Science Books, Mil Valley, California.
9. I.N. Levine, 1983, Quantum Chemistry, Allyn and Bacon, Boston.
10. R. Anantharaman, 2001, Fundamentals of quantum chemistry, Macmillan India Limited.
11. R.K. Prasad, 1992, Quantum Chemistry, New Age, India.

#### **SUGGESTED REFERENCE BOOKS:**

1. W.J. Moore, 1972, Physical Chemistry, Orient Longman, London.
2. L.K. Nash, 1962, Elements of Chemical Thermodynamics, Addison Wesley.
3. G.M. Barrow, 1988, Physical Chemistry, McGraw Hill.
4. R.G. Frost and Pearson, 1981, Kinetics and Mechanism, Wiley, New York.
5. Moore and R.G. Pearson, 1981, Kinetics and Mechanism.
6. I. Amdur and G.G. Hammes, 1968, Chemical Kinetics, Principles and selected topics, McGraw Hill, New York.
7. G.M. Harris, 1966, Chemical Kinetics, D.C. Heath and Co.
8. F.A. Cotton, 1971, Chemical Application of Group Theory, John Wiley and Sons Inc., New York.
9. Alan Vincent, 1977, Molecular symmetry and Group theory-programmed introduction to Chemical Applications, Wiley, New York.



## **CORE 4 - INORGANIC CHEMISTRY PRACTICAL (180 HOURS)**

### **OBJECTIVES:**

To train the candidate in inorganic compound preparation, separation of the two metal ions by chromatographic method and deduction identification of cations by semi micro method.

Semi micro qualitative analysis of mixtures containing two common and two rare cations. The following are the rare cation to be included: W, Mo, Ti, Te, Se, Ce, Th, Zr, V, U and Li.

- a. Complexometric titrations (EDTA) - Estimation of Ca, Mg and Zn.
- b. Preparation of the following:  
Potassium tris (oxalato) aluminate (III) trihydrate.
  1. Tris (thiourea) copper (I) chloride
  2. Potassium tris (oxalato) chromate (III) trihydrate
  3. Sodium bis (thiosulphato) cuprate (I)
  4. Tris (thiourea) copper (I) sulphate
  5. Sodium hexanitrocobaltate (III)
  6. Chloropentammine cobalt (III) chloride
  7. Bis (acetylacetonato) copper (II)
  8. Hexaminenickel (II) chloride

9. Bis (thiocynato) pyridine manganese, (II)

c. Separation of a mixture of two metal ions by paper chromatography.

Separation of zinc and magnesium on an anion exchanger.

## QUANTITATIVE ANALYSIS OF COMPLEX MATERIALS

To impart the techniques of analysis of ores, alloys and preparation the analysis inorganic complex compounds and interpretation given spectra.

### d. Analysis of Ores:

1. Determination of percentage of calcium and magnesium in dolomite.
2. Determination of percentage of  $MnO_2$  in pyrolusite.
3. Determination of tin and lead in solder.
4. Determination of copper and zinc in brass.
5. Determination of chromium and nickel in stainless steel.

### e. Analysis of Alloys:

1. Estimation of tin and lead in solder.
2. Estimation of copper and zinc in brass.
3. Estimation of chromium and nickel in stainless steel.

### f. Analysis of Inorganic Complex Compounds:

1. Preparation of cis and trans potassium bis (oxalato) diaquochromate and analysis of each of these for chromium.
2. Preparation of potassium tris (oxalato) ferrate (III) and analysis for iron and oxalate.

### i. Quantitative analysis:

Quantitative analysis of mixtures of iron and magnesium; iron and nickel; copper and nickel and copper and zinc.

**j. Colorimetric analysis:**

(Using) Photoelectric method: Estimation of iron, nickel, manganese, copper.

**k. Biarnperometric titrations (with dead stop endpoint) :**

Thiosulphate - iodine system and Iron (II) - cerium (IV) system.

**l. List of spectra to be given for interpretation.**

1.  $^{31}\text{P}$  NMR Spectra of methylphosphate
2.  $^{31}\text{P}$  NMR Spectra of  $\text{HPF}_2$
3.  $^{19}\text{F}$  NMR Spectra of  $\text{ClF}_3$
4.  $^1\text{H}$  NMR Spectra of Tris (ethylthioacetoacetanato) cobalt (III)
5. Expanded high resolution NMR spectra of (N-propylisonitrosoacetylacetoneiminato) (acetylacetoneiminato) Nickel (II)
6. ESR Spectra of the aqueous  $\text{ON}(\text{SO}_3)_2^-$  ion.
7. ESR Spectra of the H atoms in  $\text{CaF}_2$
8. ESR Spectra of the  $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$  ion
9. ESR Spectra of the bis (salicyladiminato) copper (II)
10. IR Spectra of the sulphato ligand
11. IR Spectra of the nitro and nitropentaminecobalt (III) chloride
12. IR Spectra of the dimethylglyoxime ligand and its Nickel (II) complex.
13. IR Spectra of carbonyls
14. Mossbauer spectra of  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$
15. Mossbauer spectra of  $\text{FeCl}_3$
16. Mossbauer spectra  $[\text{Fe}(\text{CN})_6]_3$
17. Mossbauer spectra  $[\text{Fe}(\text{CN})]^{4-}$

**TEXT BOOKS:**

1. Vogel, Text book of Inorganic quantitative analysis.
2. Douglas A. Skoog, Principles of Instrumental Analysis, 3rd Edition.

**ELECTIVE 1 – CHROMATOGRAPHIC TECHNIQUES  
(60 HOURS)****OBJECTIVES**

This paper enables a student to understand the basic principles of various chromatographic techniques and also about instrumentation in chromatography.

**UNIT I :**

Chromatographic methods, general aspects of chromatography, classification and types, mechanism.

**UNIT II:**

Column chromatography, construction and operation of column, choice of adsorbent elements, applications. Ion exchange chromatography : Anion & cation exchangers techniques applications.

**UNIT III :**

Paper chromatography: Mechanism of separation, development & applications. Thin layer chromatography: Techniques, choice of adsorbent solvents & applications.

**UNIT IV:**

Gas-liquid Chromatography, Principles, Retention Volumes, Instrumentation, Carrier Gas, Columns, Stationary Phase, Detectors, Thermal Conductivity, Flame Ionization, Electron Capture, application of G.L.C.

**UNIT V :**

High Performance Liquid chromatography: Scope, Column efficiency, Instrumentation, Pumping Systems, Columns, Column packing, Detectors, Applications.

**TEXT BOOKS :**

1. Vogel's, 2000, Text book of Quatitative Chemical Analysis, Sixth Edition, Pearson Education Limited, London.
2. D. A. Skoog and J. J. Leary, 1971, Principles of Instrumental Analysis, Fourth Edition, Saunders College Publishing, US.

**ELECTIVE 2 – BIOORGANIC CHEMISTRY (60 HOURS)****OBJECTIVES:**

This course aims to explain the basic concepts in Chemistry and Metabolism of Carbohydrates, amino acids, Proteins and Lipids. In addition to this, the student can gain the full understanding of various types of Nucleic acids and classification of Vitamins and Enzyme.

**UNIT I - CHEMISTRY AND METABOLISM CARBOHYDRATES**

Definition, classification and biological role of carbohydrates.

Monosaccharides Linear and ring structures (Haworth formula) of ribose, glucose, fructose and mannose (structural determination not required) physical and chemical properties of glucose and fructose.

Disaccharides: Ring structures (Haworth formula) - occurrence, physical and chemical properties of maltose, lactose and sucrose.

Polysaccharides: Starch, glycogen and cellulose - structure and properties.

Glycolysis of carbohydrates.

## **UNIT II - CHEMISTRY AND METABOLISM OF AMINO ACIDS AND PROTEINS**

Amino acids : Various classifications, essential amino acids, physical properties (amphoteric nature and isoelectric point) and reactions.

Proteins : Classifications (based on shape, composition and solubility), physical properties.

Primary structure - End group analysis (N- terminal analysis- Edman's method, dansyl chloride method ; C - terminal analysis- hydrazinolysis and bio - chemical methods)

Biological functions of proteins, Deamination, transamination reactions, Urea cycle.

## **UNIT III - CHEMISTRY AND METABOLISM OF LIPIDS :**

Definition, classification- simple lipids (fatty acids), compound lipids and derived lipids. Properties : saponification number, Acetyl number.

Sterols : Cholesterol (structure not needed), biological importance and chemical properties. Bile acids- functions. Biological functions of lipids.

#### **UNIT IV - NUCLEIC ACIDS :**

Purine and pyrimidine bases, nucleosides, nucleotides, polynucleotides, DNA structure - various types, RNA structure - various types.

Biological functions of DNA and RNA, Genetic code.

#### **UNIT V - VITAMINS:**

Vitamins: Definition, classification- water-soluble vitamins (B<sub>1</sub>, B<sub>2</sub>, B<sub>3</sub>, B<sub>6</sub>, B<sub>12</sub> and vitamin-C) and fat-soluble vitamins (A, D, E and K) - occurrence, structure, deficiency diseases, biochemical roles and daily requirements

#### **SUGGESTED REFERENCE BOOKS:**

1. Biochemistry C.B. Powar and G.R. Chatwal.
2. Elements of Biochemistry Ragunatha Rao
3. Essential Biochemistry U. Sathyanarayanan
4. Essential Biochemistry J.L. JAIN

### **SEMESTER II**

#### **CORE 5 - ORGANIC CHEMISTRY - II (90 HOURS)**

#### **OBJECTIVES:**

This paper explains the basic concepts of addition reaction of carbon carbon double bond and elimination reaction. In addition mechanism of some of the important rearrangements in organic chemistry will be discussed. The last part of the course brings forth the salient features of oxidation and reduction reactions in organic synthesis.

#### **UNIT I - ADDITION TO CARBON-CARBON AND CARBON-HETERO MULTIPLE BONDS:I**

Electrophilic, nucleophilic and neighbouring group participation mechanism- Addition of Halogen and nitrosyl chloride to olefins. Hydration of Olefins and acetylenes. Hydroboration, Hydroxylations, Michael addition

#### **UNIT II - ADDITION TO CARBON-CARBON AND CARBON-HETERO MULTIPLE BONDS:II**

Diels Alder Reaction, 1, 3-dipolar additions. Carbenes and their addition to double bonds - Simmon Smith Reaction. Mannich, Stobbe, Darzen, Wittig, Wittig-Horner and benzoin reactions. Stereochemical aspects to be studied wherever applicable. Nitrene : Methods for generating nitrenes and their reactions

#### **UNIT III - ELIMINATION REACTIONS:**

$B_{\nu}$   $E_2$  and  $E1cB$  mechanism -  $E1$ ,  $E2$  and  $E1cB$  spectrum - Orientation of the double bond -Hoffman and Saytzeff rule - competition, elimination and substitution. Typical eliminations to be studied - dehydration, dehydro-halogenation and similar reactions. Stereochemistry of  $E2$  eliminations in cyclohexane systems. Mechanism of pyrolytic eliminations. Examples : Chugaev and Cope Elimination.

#### **UNIT IV - MOLECULAR REARRANGEMENTS:**



A detailed study with suitable examples of the mechanism of the following rearrangements: Pinacol-Pinacolone (examples other than tetramethyl ethylene glycol) - Wagner-Meerwein, Demjanov, dienone-phenol, Favorski, Baeyer-Villiger, Wolf, Stevens (in cyclic systems) and Von Richter rearrangements. (A few examples in each rearrangement to be studied).

## **UNIT V - OXIDATION AND REDUCTION:**

Mechanism - study of the following oxidation reactions - oxidation-of alcohols - use of DMSO in combination with DCC or acetic anhydride in oxidizing alcohols - oxidation of methylene to carbonyl -oxidation of aryl methanes - allylic oxidation of olefins- Reductions: Selectivity in reduction of 4-t-butyl cyclohexanone using selectrides hydride reductions - Synthetic importance of Clemensen and Wolf-Kishner reductions- Modifications of Wolf-Kishner reduction-Birch reduction, MPV reduction.

## **TEXT BOOKS:**

1. R.Bruckner, 2002, Advanced Organic Chemistry, Reaction Mechanism, Elsevier, New Delhi
2. F. A . Carey and R.J. Sundberg, 2001, Advanced Organic Chemistry, Part A and Part-B, 4th Edition, Plenum Press., New York
3. J.March, 2002, Advanced Organic Chemistry, 4th Edition, John Wiley & Sons Singapore.
4. T.L. Gilchrist and C.W. Rees, Carbenes, Nitrenes and Arynes, Thomas Nelson and Sons Ltd., London.
5. Niel Issacs, 1987, Physical Organic Chemistry, ELBS Publications.
6. W. Carruthers, 1993, Some Modern Methods of Organic Synthesis, 3rd Edition, Cambridge University Press.

7. H.O. House, 1972, Modern Synthetic Reactions, The Benjamin Cummings Publishing Company, London.

**WEBSITES:**

1. <http://info.dome.sdsu.edu/research/guides/science/orgchemistrybl.html>
2. <http://www.liv.ac.uk/chemistry/links/reactions.html>
3. <http://orgchem.chem.uconn.edu/namereact/named.html>
4. [www.gcocities.com/chempen software/reactions.html](http://www.gcocities.com/chempensoftware/reactions.html)

## **CORE 6 - INORGANIC CHEMISTRY - II (90 HOURS)**

### **OBJECTIVES:**

The student can gain the full knowledge and understanding of all aspects of inorganic polymers, solid state chemistry, and nuclear chemistry

### **UNIT I - COORDINATION CHEMISTRY - REACTION MECHANISMS :**

Electron transfer reactions; outer and inner sphere processes; atoms transfer reaction, complementary and non-complementary reactions.

Formation and rearrangement of precursor complexes, the binding ligand, successor complexes, Marcus theory.

### **UNIT II- SUBSTITUTION REACTIONS IN COORDINATION COMPOUNDS**

Substitution Reactions : Substitution in square planar complexes, reactivity of platinum complexes, influences of entering, leaving and other groups, the trans-effect, substitution of octahedral complexes of cobalt and chromium, replacement, of coordinated water, solvolytic (acids and bases) reactions applications in synthesis (platinum and cobalt complexes only).

Rearrangement in 4 and 6 coordinate complexes : reaction at coordinated ligands-template effect.

### **UNIT III THE CHEMISTRY OF SOLID STATE**

Structure of Solids; Comparison of X-Ray, Neutron and Electron Diffraction; Structure of ZnS, Rutile, Perovskite, Cadmium iodide and nickel arsenide; spinels and inverse spinels; defects in solids, non-stoichiometric compounds. Use of X-ray powder diffraction data in identifying inorganic crystalline solids, details for cubic systems.

Band theory, Semiconductors, Superconductors, Solid State Electrolytes, Types of Magnetic Behaviour - Dia, Para, Ferro, Antiferro and Ferrimagnetism, Hysteresis, Solid State Lasers, Inorganic Phosphorus, Ferrites, Garnets.

Reactions in Solid State and Phase Transitions, Diffusion, Diffusion Coefficient, Diffusion Mechanisms, Vacancy and Interstitial Diffusion, Formation of Spinel.

Solid Solutions: Order-Disorder Transformations and Super Structure.

## **UNIT-IV**

### **Nuclear Chemistry:**

Models of radioactive decay: orbital electron capture: nuclear isomerism, internal conversion, detection and determination of activity by cloud chamber, nuclear emulsion, bubble chamber, G.M., Scintillation and Cherenkov counters.

Nuclear reaction: Types, reactions, cross section, Q-value, threshold energy, compound nucleus theory: high nuclear reactions, nuclear fission and fusion reactions as energy sources; direction reactions, photonuclear and thermo nuclear reactions. Components of nuclear reactors – the breeder reactor – nuclear reactors in India.

## **UNIT-V**

*Lanthanides and actinides:* Occurrence and isolation of the metals, electronic structure - Lanthanide contraction and significance. Oxidation states magnetic and spectral properties - Important co-ordination compounds of lanthanide -nuclear and non-nuclear applications of lanthanides including use of lanthanides as shift reagents.

*Radioactive tracers:* Preparations - principles underlying tracer technique - application of tracers in the study of reaction mechanism and in analytical chemistry - neutron activation analysis, isotope dilution analysis - radio chemical determination of age of geological specimen. Tracers as applied to industry and agriculture - radioactive tracer in the diagnosis and treatment in the field of medicine.

Text Books:

1. K.F. Purcell and J.C. Kotz, 1977, Inorganic Chemistry WB Saunders Co., U.S.A.
2. J.E. Huheey, 1993, Inorganic Chemistry, IV Edition, Harper and Collins, NY.
3. F.A. Cotton and G.W. Wilkinson, 1988, Advanced Inorganic Chemistry - A Comprehensive Text; John Wiley & Sons.
4. B.E. Douglas DH MX Daniels and Alexander, 1983, Concepts and Models of Inorganic Chemistry, Oxford IBH.
5. W.U. Mallik, G.D. Tul, R.D. Madan, 1992, selected topics in Inorganic Chemistry, S. Chand & Co., New Delhi.
6. A.R. West, 1991, Basic Solid State Chemistry, John Wiley.
7. W.E. Addison, 1961, Structural Principles in Inorganic Chemistry, Longman.
8. M. Adams, 1974, Inorganic Solids, John Wiley Sons.

9. S. Glasstone, Source Book on Atomic Energy, East West Press.
10. C.R. Choppin and J. Ryd Berg: Nuclear Chemistry - Theory and Applications, Pergamon Press.
- 11.. B.G. Harvey, Introduction to Nuclear Physics and Chemistry Prentice Hall, 1962.

#### **SUGGESTED REFERENCE BOOKS:**

1. S.F.A. Kettle, 1973, Coordination Chemistry, ELBS.
2. B.N. Figgis, 1966, Introduction to Ligand Fields, Interscience.
3. M.N. Hughes, 1982, The Inorganic Chemistry of Biological processes, II Edition, Wiley London
4. D. Nicholas, 1974, Complexes of First Row Transition Elements.
5. M.C. Shrivvers, PW. Atkins, CH Langford, 1990, Inorganic Chemistry, OUR
6. M.C. Day and J. Selbin, 1974, Theoretical Inorganic Chemistry, Van Nostrand Co., NY.
7. G.S. Manku, 1984, Inorganic Chemistry, TMH.
8. U. Sathyanarayana - Essentials of Biochemistry, Books and Allied (P) Ltd.
9. A.F. Wells, - 1984, Structural Inorganic Chemistry, V. Edition, Oxford
10. A.R. West, 1990, Solid State Chemistry, John Wiley.
11. G.D.Christian & J.E.O. Reily, 1986, Instrumental Analysis, II Edition, Allegn Recon.
12. H.A. Strobel, 1976, Chemical Instrumentation, Addition- Wesely Publ. Co.

13. Kolthoff and Elwing (All Series) - Treatise on Analytical Chemistry.
14. Willson Series - Comprehensive Analytical Chemistry.
15. H.A.O. Hill and P. Day, 1968, Physical methods in Advanced Inorganic Chemistry, JohnWiley.
16. K. Burger, 1973, Coordination Chemistry, Experimental methods, Butterworths.
17. C.N.R. Rao, J.R. Ferraro, 1970, Spectroscopy in Inorganic Chemistry, Vol. I and Vol. II, Academic Press.
18. G. Aruldas, Molecular Structure and Spectroscopy, Prentice Hall.
19. E.L. Muttarties, 1975, Polyhedral Borneds, Academic Press, NY.
20. NH Ray, 1978, Inorganic Polymers, Academic Press.
21. C. Kellter: Radiochemistry, Ellis Hardwood Ltd., John Wiley and Sons.
22. G.R. Chopin, Experimental Nuclear Chemistry, Prentice Hall, 1962.
23. G. Friedlander, J.W. Kennedy, and J.M. Miller, Nuclear and Radio Chemistry, John Wiley.

## **CORE 7 - PHYSICAL CHEMISTRY - II (90 HOURS)**

### **OBJECTIVES:**

To learn the concepts in enzyme kinetics, surface reactions and fast reactions, and also to understand the applications of quantum mechanics in atomic and molecular structure.

### **UNIT I - CHEMICAL KINETICS - III :**

Catalysis by Enzymes-rate of enzyme catalyzed reactions, effect of substrate concentration, pH and temperature on enzyme catalyzed reactions-inhibition of enzyme catalyzed reactions.

Langmuir and BET adsorption isotherms- adsorption coefficient and its significance kinetics and mechanism of surface reactions-catalysis by metals, semiconductor oxides.

### **UNIT II - CHEMICAL KINETICS - IV:**

Kinetics of complex reactions - reversible reaction, consecutive reactions, parallel reactions, chain reactions - general treatment of chain reactions. Rice Herzfeld Mechanism and explosion limits.

Study of fast react ions-relaxation methods-temperature and pressure jump methods-stopped flow and flash photolysis, methods.

### **UNIT III - QUANTUM CHEMISTRY - II :**

Quantum mechanical postulates-the Schrodinger equation-elementary applications of Schrodinger's equation-the particle in a box (one, two and three dimensional cases)- particle in a ring.

### **UNIT IV - QUANTUM CHEMISTRY - III :**

The harmonic oscillator- the rigid rotor- the hydrogen atom- the Schrodinger equation for hydrogen atom (no derivation is required) -the solution-the origin of quantum number (angular momentum and spin) -their physical significance.

### **UNIT V : QUANTUM CHEMISTRY - IV :**



Approximation methods-perturbation and variation method-application to hydrogen, helium atoms-R.S.Coupling and term symbols for atoms in the ground state - Slater orbital and HF-SCF methods.

Born-Oppenheimer approximation-valence bond theory for Hydrogen molecule-LCAO-MO theory for di and poly atomic molecules-concept of hybridization-Huckel theory for conjugated molecules (ethylene, butadiene and benzene) - semi-empirical methods.

## **TEXT BOOKS**

1. J.Rajaram and J.C.Kuriakose, 1993, Kinetics and mechanism of chemical transformations, Macmillan India Ltd.
2. K.J.Laidler, 1987, Chemical Kinetics, Harper and Row, New York.
3. D.A. McQuarrie, 1983, Quantum Chemistry, University Science Books, Mil Valley, California.
4. I.N. Levine, 1983, Quantum Chemistry, Allyn and Bacon, Boston.
5. R. Anantharaman, 2001, Fundamentals of quantum chemistry, Macmillan India Limited.
6. R.K. Prasad, 1992, Quantum Chemistry, Wiley Eastern, New Delhi.

## **SUGGESTED REFERENCE BOOK**

1. R.G.Frost and Pearson, 1961, Kinetics and Mechanism, Wiley, New York.
2. W.J.Moore and R.G.Pearson 1981, Kinetics and Mechanism.
3. R.K.Prasad, 1992, Quantum Chemistry, Wiley Eastern, New Delhi.
4. J.Goodman, 1997, Contemporary Quantum Chemistry, An Introduction, Plenum Press, New York.
5. R.Mcweeny, 1979, Coulon's Valence, ELBS Oxford University Press.
6. F.J.Bockhoff, 1976, Elements of Quantum theory, Addison Wesley, Reading Mass.
7. P.W.Atkins, 1990, Physical Chemistry, Oxford University Press.

8. H.Eyring, J.Walter and G. Gimball, 1944, Quantum Chemistry, John Wiley and Sons, New York.
9. L.S.Pauling and F.B.Wilson, 1935, Introduction to Quantum mechanics, Mc Graw Hill Book Company, New York.
10. P.W.Atkins, 1983, Molecular Quantum Mechanics, Oxford University Press, Oxford.

## **CORE 8 – ORGANIC CHEMISTRY PRACTICAL (180 HOURS)**

### **OBJECTIVES:**

This comprises of Three parts

#### **I. Analysis of a mixture of the organic mixture.**

The practical is designed as to give the students exposure to lab techniques in

analysis of organic molecules and organic.

1. Identification of components in a two component mixture and preparation of their derivatives.
2. Determination of b.p./ m.p. for components and m.p. for the derivatives.

#### **II. Synthesis of an organic molecule involving one or two steps.**

##### **a. Any six preparation from the following.**

1. Preparation of o-benzylbenzoic acid
2. p-Nitrobenzoic acid from p-Nitrotoluene
3. Anthroquinone from anthracene
4. Benzhydrol from benzophenone
5. m-Nitroaniline from m-dinitrobenzene
6. 1, 2, 3, 4-Tetrahydrocarbozole from cyclohexanone

7. p-chlorotoluene from p-toluidine
8. 2, 3-Dimethylindole from phenyl hydrazine and 2-butanone (boiling acetic acid)
9. Methyl orange from sulphanilic acid
10. Diphenyl methane from benzyl chloride

**b. ANY SIX PREPARATIONS FROM THE FOLLOWING INVOLVING TWO STAGES:**

1. Sym-Tribromobenzene from aniline.
2. p-nitro aniline from acetanilide
3. m-Nitrobenzoic acid from methyl benzoate.
4. 2, 4-Dinitrobenzoic acid from p-nitro toluene.
5. m-Nitro benzoic acid from benzaldehyde
6. p-bromoaniline from acetanilide
7. Anthraquinone from phthalic anhydride.
8. Phthalide from phthalic anhydride
9. 2-phenyl indole from phenylhydrazine
10. 2-4, Dinitrophenyl hydrazine from p-nitrochlorobenzene.

**III. Quantitative estimation of organic compounds using known methods, basic training for extraction of compounds from natural products and then chromatographic separations.**

**a. ANY TWO EXERCISES IN THE EXTRACTION OF NATURAL PRODUCTS:**

1. Caffeine from tea leaves
2. Lactose from milk
3. Citric acid from lemon
4. Piperine from black pepper

**b. CHROMATOGRAPHIC SEPARATIONS :**

1. Column chromatography - separation of anthracene and acid from anthracene picrate.
2. Thin layer chromatography separation of green leaf pigments.
3. Paper chromatography
- 4 Identification of amino acids.

**c. ANY FIVE ESTIMATIONS:**

1. Estimation of aniline
2. Estimation of phenol
3. Estimation of glucose (Bertrands Methods)
4. Saponification of fat or an oil.
5. Iodine value of an oil.
6. Estimation of Ketone.
7. Estimation of amino group.

8. Estimation of amide group
9. Estimation of sulphur in an organic compound.

**d. SPECIAL INTERPRETATION OF ORGANIC COMPOUNDS. UV, IR, PMR AND MASS SPECTRA OF 15 COMPOUNDS.**

- 1- 1, 3, 5-Trimethylbenzene
2. Pinacolone
3. propyl amine
4. p-Methoxybenzyl alcohol
5. Benzyl bromide
6. Phenyl acetone
7. 2-Methoxyethyl acetate
8. Acetone
9. Isopropyl alcohol
10. Acetaldehyde diacetate
11. 2-N, N-Dimethylamino ethanol
12. Pyridine
13. 4-Picoline
14. 1, 3 dibromo-1, 1-dichloropropene
15. Cinnamaldehyde

**RECOMMENDED BOOKS**

1. Arthur I. Vogel, A Text Book of Practical Organic Chemistry.
2. Raj K. Bansal, Laboratory Manual of Organic Chemistry, Wiley Eastern Limited.

3. Mann and Saunders, Laboratory manual of Organic Chemistry

## **ELECTIVE 3 - ANALYTICAL TECHNIQUES IN CHEMISTRY**

### **UNIT I**

Colourimetric analysis and UV-Visible spectroscopy: Beer Lambert's law, Principles of single and double beam instruments – applications for analysis of inorganic and organic samples.

Infrared spectrophotometric analysis – principle and instrumentation and molecular structure determination.

Raman Spectra – principle, basic instrumentation – structural analysis.

### **UNIT II**

Nuclear Magnetic Resonance – Principle, instrumentation, structure determination. NMR of  $^1\text{H}$ ,  $^{13}\text{C}$ ,  $^{31}\text{P}$ ,  $^{19}\text{F}$ .

NQR - Nitrosyl compounds, Mossbauer of Fe and Sn systems.

### **UNIT- III**

Electron Spin Resonance – Principle, instrumentation, applications to coordination compounds.

Magnetic Susceptibility and measurements- Guoy method, Faraday method- applications

### **UNIT IV**

Thermo gravimetric and differential thermal analysis, thermometric titrations, differential scanning colourimetry – basic instrumentation and applications.

Mass Spectrometry- Principle, basic instrumentation, fragmentation patterns – organic molecular structural determination

### **UNIT V**

Atomic absorption spectroscopy: Theory, Atomizers, Flame and Electro thermal. Radiation sources, Instrumentation, spectral and chemical interferences, application

Photoelectron spectroscopy (UV and X-Ray)-photo electron spectra-Koopman's theorem, fine structure in PES, chemical shift and correlation with electronic charges.

Text Books:

1. D.A .Skoog, 1985, Principles of Instrumental Methods of analysis, III Edition, Saunders College Publ.
2. Willard Merrit, Dean and Settle, 1986, Instrumental methods of analysis, VI Edition, CBS Publ.
3. A.I. Vogel, 1976, Textbook of Qualitative Inorganic Analysis, III Edition, ELBS.
4. D.A. Skoog and D.M. West, 1982, Fundamentals of Analytical Chemistry, IV Edition, old Reinhold & Winston, Publication.

**SUGGESTED REFERENCE BOOKS:**

1. G.D.Christian & J.E.O. Reily, 1986, Instrumental Analysis, II Edition, Allegen Recon.
2. H.A. Strobel, 1976, Chemical Instrumentation, Addition- Wesely Publ Co.
3. Kolthoff and Elwing (All Series) - Treatise on Analytical Chemistry.
4. Willson Series - Comprehensive Analytical Chemistry.
5. H.A.O. Hill and P. Day, 1968, Physical methods in Advanced Inorganic Chemistry, JohnWiley.
6. K. Burger, 1973, Coordination Chemistry, Experimental methods, Butterworths.



7. C.N.R. Rao, J.R. Ferraro, 1970, Spectroscopy in Inorganic Chemistry, Vol. I and Vol. II, Academic Press.
8. G. Aruldas, Molecular Structure and Spectroscopy, Prentice Hall.

## **ELECTIVE 4 – BIOINORGANIC CHEMISTRY**

### **UNIT-I**

Thermodynamics and biology – Basic concepts of structure and functionality – membranes – structure, function transport properties, aspects of electrochemical phenomena – active transport, ionophores, biological energy storage and Phosphate hydrolysis.

### **UNIT-II**

Enzymes - Nomenclature and classification, chemical kinetics, the free energy of activation and the effects of catalysts, kinetics of enzyme catalysed reactions – Michelis - Menton equation - Effect of pH, temperature on enzyme reactions, Factors contributing to the catalytic efficiency of enzymes, Study by spectroscopic methods.

### **UNIT -III**

Essential and trace metal ions.

Coenzymes - Vitamin B<sub>12</sub> coenzymes, carboxypeptidase and Superoxide dismutase.

Heme-enzyme - Peroxidase and catalases.

Oxygen carriers - Hemeproteins - Hemoglobin, myoglobin - Structure Oxygenation and stereochemistry - Bohr effect. Non-heme oxygen carriers - Hemerythrin and hemocyanin.

### **UNIT- IV**

Nitrogen fixation - Introduction, types of nitrogen fixing micro organisms.  
Nitrogenase enzyme - Metal clusters in nitrogenase - redox property - Dinitrogen complexes - transition metal complexes of dinitrogen - nitrogen fixation via nitride formation and reduction of dinitrogen to ammonia.

Biological redox systems: Cytochromes -Classification, cytochrome a, b and c.  
Cytochrome P-450.

Iron - sulphur proteins - rubredoxin and ferredoxin.

Photosynthesis and chlorophyll's.

## **UNIT-V**

### **Bioanalytical Chemistry**

Toxicity & medicine.

Toxicity of Hg, Cd, Zn, Pb, As, Sb.

Anti cancer agents.

Metal ion poisoning : Failure of metal ion control systems, role of metal ion diagnosis and treatment - use of radio isotopes.

Pollution studies : Effluents and treatment.

Inorganic plant nutrition and indicator plants for mineral exploration.

Text Books:

1. Williams, D.R. - Introduction to Bioinorganic Chemistry
2. Fiabre, F.M., and Williams D.R. - The Principles of Bioinorganic Chemistry, Royal Socety of Chemistry, Monograph for Teachers - 31.
3. Purcell, K.F. and Kotz, J.C., - Inorganic Chemistry
4. Elements of Bioinorganic Chemistry - G.N. Mughherjee and Arabinda Das, 1993.
5. Bioinorganic Chemistry - M. Satake and Y. Mido, Discovery Publishing House, New Delhi (1996).

Reference Books:

1. G. Eichorn, G. - Inorganic Bio-Chemistry Vol. I and II, Elsevier, 1973.
2. J.W. Huheey - Inorganic Chemistry, Harper and Row.
3. Metal ions in Biological Systems, Vol. I to XV, H. Siegel (Ed.)
4. R.W. Hay - Bio Inorganic Chemistry.

**9. M.SC. DEGREE COURSE IN COMPUTER SCIENCE  
SYLLABUS**

Title of the Course/ Paper	Design and Analysis of Algorithms		
Core -1	First Year & First Semester	Credit: 4	
Objective of the course	This course gives insight into the design and analysis for selected problems.		
Course outline	Unit 1: Introduction - Definition of Algorithm – pseudocode conventions – recursive algorithms – time and space complexity –big-“oh” notation – practical complexities – randomized algorithms – repeated element – primality testing - Divide and Conquer: General Method - Finding maximum and minimum – merge sort.		
	Unit 2: Divide and conquer contd. – Quicksort, Selection, Strassen's matrix multiplication – Greedy Method: General Method –knapsack problem - Tree vertex splitting - Job sequencing with dead lines – optimal storage on tapes.		
	Unit 3: Dynamic Programming: General Method - multistage graphs – all pairs shortest paths – single source shortest paths - String Editing – 0/1 knapsack. Search techniques for graphs – DFS-BFS-connected components – biconnected components.		

	Unit 4: Back Tracking: General Method – 8-queens - Sum of subsets - Graph Coloring – Hamiltonian cycles. Branch and Bound: General Method - Traveling Salesperson problem.
	Unit 5: Lower Bound Theory: Comparison trees - Oracles and advisory arguments - Lower bounds through reduction - Basic Concepts of NP-Hard and NP-Complete problems.

1. Recommended Texts

- (i) E. Horowitz, S. Sahni and S. Rajasekaran, 1999, Computer Algorithms, Galgotia, New Delhi.

2. Reference Books

- (i) G. Brassard and P. Bratley, 1997, Fundamentals of Algorithms, PHI, New Delhi.
- (ii) A.V. Aho, J.E. Hopcroft, J.D. Ullmann, 1974, The design and analysis of Computer Algorithms, Addison Wesley, Boston.
- (iii) S.E. Goodman and S.T. Hedetniemi, 1977, Introduction to the Design and Analysis of algorithms, Tata McGraw Hill Int. Edn, New Delhi.

3. Website, E-learning resources

- (i) <http://www.cise.ufl.edu/~raj/BOOK.html>

Title of the Course/ Paper	Advanced Java Programming		
Core -2	First Year & First Semester	Credit: 4	
Objective of the course	This course gives an insight into advanced features of Java		
Course outline	Unit 1: Servlet overview – the Java web server – your first servlet – servlet chaining – server side includes- Session management – security – HTML forms – using JDBC in servlets – applet to servlet communication.		
	Unit 2: Java Beans: The software component assembly model- The java beans development kit- developing beans – notable beans – using infobus - Glasgow developments - Application Builder tool- JAR files-Introspection-Bound Properties-Persistence-customizers - java beans API.		
	Unit 3: EJB: EJB architecture- EJB requirements – design and implementation – EJB session beans- EJB entity beans-EJB Clients – deployment tips, tricks and traps for building distributed and other systems – implementation and future directions of EJB-Variable in perl- perl control structures and operators – functions and scope		

	Unit 4: RMI – Overview – Developing applications with RMI:Declaring & Implementing remote interfaces-stubs & skeletons,Registering remote objects,writing RMI clients – Pushing data from RMI Servlet – RMI over Inter-ORB Protocol
	Unit 5 : JSP –Introduction JSP-Examining MVC and JSP - JSP scripting elements & directives-Working with variables scopes-Error Pages - using Java Beans in JSP Working with Java Mail-Understanding Protocols in Javamail-Components-Javamail API-Integrating into J2EE-Understanding Java Messaging Services-Transactions.

1. Recommended Text:

- (i) J. McGovern,R. Adatia,Y. Fain, 2003, J2EE 1.4 Bible, Wiley-dreamtech India Pvt. Ltd, New Delhi
- (ii) H. Schildt, 2002, Java 2 Complete Reference, 5<sup>th</sup> Edition, Tata McGraw-Hill, New Delhi.

2. Reference books:

- (i) **K. Moss, 1999, Java Servlets, Second edition, Tata McGraw Hill, New Delhi.**
- (ii) D. R.Callaway, 1999, Inside Servlets, Addison Wesley, Boston
- (iii) Joseph O’Neil, 1998, Java Beans from the Ground Up, Tata McGraw Hill, New Delhi.
- (iv) TomValesky, Enterprise JavaBeans, Addison Wesley.
- (v) Cay S Horstmann & Gary Cornell, Core Java Vol II Advanced Features, Addison Wesley.

Title of the Course/ Paper	System Software		
Core -3	First Year & First Semester	Credit: 4	
Objective of the course	This course introduces the basic concepts language processors required for computing related applications.		
Course outline	Unit 1: Language processors – Language processing activities and fundamentals – Language specification – Development Tools – Data Structures for Language processing- Scanners and Parsers.		
	Unit 2: Assemblers: Elements of Assembly language programming - Overview of the Assembly process - Design of a Two-pass Assembler - A single pass Assembler for the IBM PC.		
	Unit 3: Macros and Macro processors – Macro definition, call , and expansion – Nested macro calls – Advanced macro facilities - Design of a macro preprocessor - Compilers: Aspects of compilation .		

	Unit 4: Compilers and Interpreters – Memory allocation - Compilation of Expressions and Control structures - Code optimization – Interpreters.
	Unit 5: Linkers: Linking and Relocation concepts – Design of a linker – Self relocating Programs – A linker for MS DOS - Linking for over-lays – loaders - Software tools: Software tools for program development - Editors - Debug monitors - Programming environments – User interfaces.

#### 1. Recommended Texts

- (i) D. M. Dhamdhere, 1999, Systems Programming and Operating Systems, Second Revised Edition, Tata McGraw-Hill, New Delhi.

#### 2. Reference Books

- (i) L. L. Beck, 1996, System Software An Introduction to System Programming, 3<sup>rd</sup> edition, Addison-Wesley.

Title of the Course/ Paper	Practical I: Advanced Java Programming Lab.		
Core -4	First Year & First Semester	Credit: 2	
Objective of the course	This course gives practical training in Advanced java programming		
Course outline	<ol style="list-style-type: none"> <li>1. HTML to Servlet Applications</li> <li>2. Applet to Servlet Communication</li> <li>3. Designing online applications with JSP</li> <li>4. Creating JSP program using JavaBeans</li> <li>5. Working with Enterprise JavaBeans</li> <li>6. Performing Java Database Connectivity.</li> <li>7. Creating Web services with RMI.</li> <li>8. Creating and Sending Email with Java</li> <li>9. Building web applications</li> </ol>		

Title of the Course/ Paper	Practical – II: Operating systems Lab		
Core -5	First Year & First Semester	Credit: 2	
Objective of the course	This course trains the students programming skills in solving operating systems problems.		
Course outline	<p>Students can refer the following book for further details. Charles Crowley - Operating Systems ( A Design Oriented Approach) - TMH - 1998.</p> <ol style="list-style-type: none"> <li>1. Inter Process Communication (IPC) using Message Queues.</li> <li>2. IPC using pipes.</li> <li>3. Implementation of wait and signal using counting semaphores.</li> <li>4. Implementation of wait and signal using binary semaphores.</li> <li>5. Atomic Counter update problem.</li> <li>6. Counting Semaphores at the user level using binary semaphores.</li> <li>7. Signaling processes.</li> <li>8. Deadlock detection (for processes passing messages)</li> <li>9. Process Scheduling: FCFS</li> <li>10. Process Scheduling: Least Frequently Used.</li> <li>11. Process Scheduling: Round Robin.</li> <li>12. Producer-Consumer problem with limited buffers.</li> <li>13. Dining-Philosopher Problem.</li> <li>14. Reader-Writer problem.</li> <li>15. Two Process Mutual Exclusion.</li> </ol>		

Title of the	Theoretical Foundations of Computer Science
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Course/ Paper			
Non Major Elective -1	First Year & First Semester	Credit: 4	
Objective of the course	This course introduces the fundamental concepts of Theoretical Computer Science		
Course outline	Unit 1: Propositions and Compound Propositions – Logical Operations – Truth Tables –Tautologies and Contradictions – Logical Equivalence –Algebra of Propositions – Conditional and Biconditional Statements –Arguments – Logical Implication – Quantifiers – Negation of Quantified Statements – Basic Counting Principles – Factorial – Binomial Coefficients – Permutations – Combinations – Pigeonhole Principle – Ordered and Unordered Partitions.		
	Unit 2: Order and Inequalities – Mathematical Induction – Division Algorithm – Divisibility – Euclidean Algorithm – Fundamental Theorem of Arithmetic – Congruence Relation – Congruence Equations – Semigroups – Groups – Subgroups – Normal Subgroups – Homomorphisms – Graph Theory: basic definitions-paths, reachability, connectedness matrix representation of graphs, trees.		
	Unit 3: Finite Automata and Regular Expressions: Finite State Systems – Basic definitions – Non-deterministic finite automata – Finite automata with $\epsilon$ -moves – Regular expressions.		
	Unit 4: Properties of Regular sets: Pumping lemma – Closure properties – Decision Algorithms – Myhill – Nerode Theorem – Context Free Grammars – Derivation Trees.		
	Unit 5: Simplifying Context free grammars - Chomsky normal forms – Greibach Normal forms – Pushdown automata and context-free languages.		

#### 1. Recommended Texts

- (i) J.P.Tremblay and R.Manohar, 1997, DiscreteMathematical Structures with applications to Computer Science, Tata McGraw-Hill, New Delhi.
- (ii) P.Linz, 1997, An Introduction to Formal Languages and Automata, Second Edition, Narosa Pub. House, New Delhi.
- (iii) S. Lipschutz and M. Lipson, 1999, Discrete Mathematics, Second Edition, Tata McGraw-Hill, New Delhi.
- (iv) J.E.Hopcraft and J.D.Ullman, 1993, Introduction to Automata Theory, Languages and Computation, Narosa Publishing House, New Delhi.

#### 2. Reference Books

- (i) D.C.Kozen, 1997, Automata and Computability, Springer-Verlag, New York.
- (ii) J. Martin, 2003, Introduction to Languages and the Theory of Computation, 3<sup>rd</sup> Edition, Tata McGraw-Hill, New Delhi.



Title of the Course/ Paper	Computer Networks		
Core -6	First Year & Second Semester	Credit: 4	
Objective of the course	This course gives an insight into various network models and the general network design issues and related algorithms.		
Course outline	Unit 1: Introduction – Network Hardware – Software – Reference Models – OSI and TCP/IP models – Example networks: Internet, ATM, Ethernet and Wireless LANs - Physical layer – Theoretical basis for data communication - guided transmission media		
	Unit 2: Wireless transmission - Communication Satellites – Telephones structure –local loop, trunks and multiplexing, switching. Data link layer: Design issues – error detection and correction.		
	Unit 3: Elementary data link protocols - sliding window protocols – Data Link Layer in the Internet - Medium Access Layer – Channel Allocation Problem – Multiple Access Protocols.		
	Unit 4: Network layer - design issues - Routing algorithms - Congestion control algorithms – IP protocol – IP Address – Internet Control Protocol.		
	Unit 5: Transport layer - design issues - Connection management - Addressing, Establishing & Releasing a connection – Simple Transport Protocol – Internet Transport Protocol (TCP) - Network Security: Cryptography.		

### 1. Recommended Texts

- (i) A. S.Tanenbaum, 2003, Computer Networks, Fourth Edition, Pearson Education, (Prentice hall of India Ltd), New Delhi.

### 2. Reference Books

- (i) B. Forouzan, 1998, Introduction to Data Communications in Networking, Tata McGraw-Hill, New Delhi.
- (ii) F. Halsall, 1995, Data Communications, Computer Networks and Open Systems, Addison Wessley, Boston.
- (iii) D. Bertsekas and R. Gallager, 1992, Data Networks, Prentice hall of India, New Delhi.
- (iv) Lamarca, 2002, Communication Networks, Tata McGraw Hill, New Delhi.

### 3. Website, E-learning resources

- (i) <http://authors.phptr.com/tanenbaumcn4/>

Title of the Course/ Paper	Distributed Database Systems		
Core -7	First Year & Second Semester	Credit: 4	
Objective of the course	This course introduces the concepts of distributed database system.		

Course outline	Unit 1: Features of Distributed versus Centralized Databases – Why Distributed Databases – Distributed Database Management Systems (DDBMSs)- Review of Databases – Review of Computer Networks- Levels of Distribution Transparency- Reference Architecture for Distributed Databases – Types of Data Fragmentation – Distribution Transparency for read-only Applications – Distribution transparency for Update Applications – Distributed Database Access Primitives – Integrity Constraints in Distributed Databases - A Framework for Distributed Database Design – The Design of Database Fragmentation – The Allocation of Fragments.
	Unit-2: Equivalence Transformations for Queries – Transforming Global Queries into Fragment Queries – Distributed Grouping and Aggregate Function Evaluation – Parametric Queries -Optimization of Access Strategies - A Framework for Query Optimization – Join Queries – General Queries. A Framework for Transaction Management – Supporting Atomicity of Distributed Transactions – Concurrency Control for Distributed Transactions – Architectural Aspects of Distributed Transactions
	Unit 3: Foundations of Distributed Concurrency Control – Distributed Deadlocks – Concurrency Control Based on Timestamps – Optimistic Methods for Distributed Concurrency Control - Reliability – Basic Concepts Nonblocking Commitment Protocols – Reliability and Concurrency Control – Determining a Consistent View of the Network – Detection and Resolution of Inconsistency – Checkpoints and Cold Restart - Distributed Database Administration – Catalog Management in Distributed Databases – Authorization and Protection.
	Unit-4: Distributed object database management systems – Fundamental object concepts and Models – Object – Abstract Data Types – Composition (Aggregation) – Class – Collection – Subtyping and Inheritance. – Object Distribution Design – Horizontal Class Partitioning – Vertical Class Partitioning – Path Partitioning – Class Partitioning Algorithms – Allocation – Replication – Alternative Client / Server Architectures – Cache Consistency – Object Identifier Management – Pointer Switching Object Migration – Distributed Object Storage – Object Query Processor Architectures – Query Processing Issues – Query Execution – Correctness Criteria – Transaction Models and Object Structures – Transactions Management in Object DBMSs – Transactions as Objects – Conclusion – Bibliographic Notes – Exercises.

	Unit-5 : Parallel Database Systems – Database Server Approach – Database Servers and Distributed Databases – Parallel System Architectures – Objectives – Functional Aspects – Parallel Data Processing – Parallel Query Optimization – Data Placement – Query Parallelism – Parallel Execution Problems – Initialization – Interferences and Convoy Effect – Load Balancing – Parallel Execution for Hierarchical Architecture – Problem Formulation – Basic Concepts – Load Balancing Strategy – Performance Evaluation – Conclusion – Bibliographic Notes – Exercises.
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1. Recommended Texts

- (i) **Stefano Ceri, Giuseppe Pelagatti, Distributed Databases Principles & Systems, McGraw-Hill.**
- (ii) M.Tamer Ozsü, Patrick Valduriez, Distributed database systems, 2<sup>nd</sup> Edition, Prentice Hall of India, New Delhi.

Title of the Course/ Paper	Practical – III: RDBMS Lab		
Core -8	First Year & Second Semester	Credit: 2	
Objective of the course	This course trains the students the programming skills in solving database system application problems.		
Course outline	<p>Students are advised to use the concepts like Data Normalization, Link between table by means of foreign keys and other relevant data base concepts for developing databases for the following problems. The implementation of each problem should have necessary input screen Menu-driven query processing and pleasing reports. The choice or RDBMS is left to the students. Necessary validations must be done after developing database.</p> <ol style="list-style-type: none"> <li>1. Library Information Processing.</li> <li>2. Students Mark sheet processing.</li> <li>3. Ballot counting system.</li> <li>4. Gas booking and delivering system.</li> <li>5. Income Tax calculations.</li> <li>6. Bank Transactions.</li> <li>7. Pay roll processing.</li> <li>8. Airline / Railway reservation system.</li> <li>9. Question Database and conducting quiz.</li> <li>10. Inventory system.</li> </ol>		

Title of the Course/ Paper	Bio-informatics		
Non-Major Elective	First Year & Second Semester	Credit: 3	
Objective of the course	This course introduces the concepts of Bio-informatics		
Course outline	<p>Unit 1: Fundamental Of Biological Systems: Cell- cell organelles- Eukaryotic, Prokaryotic cell- Cell division- Mitosis- Meiosis- Macromolecules: Carbohydrates- Protein- Lipids- Nucleic acid- Structure of DNA and RNA- Virology- Structure of HIV- AIDS- Cancer/ Oncogenes</p> <p>Unit 2: Fundamentals Of Bioinformatics: Definition- Bioinformatics in industrial applications- Importance of Bioinformatics- Genomics- Types of Genomics- Proteomics- Sequence analysis- Sequence alignment- Hidden Markov Model- Types of Alignment- BLAST- FASTA- Interpro- Cog</p>		

	Unit 3: Biocomputing And Bioprogramming: Rasmol- Clustalw- Biological databases- Nucleotide sequence database- Protein sequence database- EMBL- DDBJ- Genalysis- Introduction to PERL and Bio-PERL- Introduction to SQL commands.
	Unit 4: Linux And Unix For Bioinformatics: Basic Unix commands- Basic Linux commands- Web resources in Bioinformatics.
	Unit 5: Applied Bioinformatics: Commercial Bioinformatics- Definition for Bioinformatics company- Transcriptome- SNP's and their applications-Patenting and data generation from Patent literature for commercial benefits- PR and Bioinformatics.

### 1. Recommended Texts

- (i) V. R.Srinivas, 2005, Bioinformatics – A modern approach, Prentice Hall of India, New Delhi.
- (ii) J Watson, Molecular Biology of the Cell. (Unit – 1)
- (iii) A. Batiza, A. Finney, Schacter, Bernia Mullis, Kary B, 2005, Bioinformatics, Genomics, Proteomics: Getting the Big Picture, Chelsea House Publications, New York, (Unit – 2)
- (iv) H. Rashidi, 2000, Bioinformatics Basics, CRC Press Ltd. (Unit - 2)
- (v) Moorhouse, Michael Barry, Paul, 2004, Bioinformatics, Biocomputing and Perl: An Introduction to Bioinformatics Computing Skills and Practice, John Wiley & Sons. (Unit – 3)
- (vi) Cynthia Gibas, Per Jambeck, 2001, Developing Bioinformatics Computer software, O'Reilly Publications, Sebastopol, USA (Unit – 3)

### 2. Reference Books

- (i) N. Arumugham , Cell Biology, Manjusha Publications.
- (ii) Arthur M.M Lesk 2002, Introduction to Bioinformatics, Oxford University.
- (iii) Dan E.Krane, Michael L Raymer, Elaine Nicpon, Marieb 2002, Introduction to Bioinformatics.
- (iv) James Tisdal, 2001, Beginning Perl for Bioinformatics, O'Reilly Publications Sebastopol, USA.
- (v) Werner Kalowurs a.Meyer Rachael Tyndale 2001, Pharmacogenomics.
- (vi) Lengauer, Thomas, 2003, Bioinformatics: From Genes to Drugs: John Wiley & Sons Publications.
- (vii) Mount David W, 2004, Bioinformatics: Sequence & Genome Analysis, 2<sup>nd</sup> Edition, Coldspring Harbor Laboratory Press.
- (viii) S.B Primrose & R.M Twyman, 2002, Principles of Genome Analysis and Genomics, 3<sup>rd</sup> Edition, Blackwell Publications.

### 3. Websites, E-learning materials

- (i) <http://www.bioinformaticsonline.org/ch/cho1/index.html>

## Elective – I

Title of the	Multimedia Systems
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Course/ Paper			
Elective	First Year & Second Semester	Credit: 3	
Objective of the course	This course introduces the basic concepts of Multimedia Systems.		
Course outline	Unit 1: Introductory Concepts: Multimedia – Definitions, CD-ROM and the Multimedia Highway, Uses of Multimedia, Introduction to making multimedia – The Stages of project, the requirements to make good multimedia, Multimedia skills and training, Training opportunities in Multimedia. Motivation for multimedia usage, Frequency domain analysis, Application Domain.		
	Unit 2: Multimedia-Hardware and Software: Multimedia Hardware – Macintosh and Windows production Platforms, Hardware peripherals – Connections, Memory and storage devices, Media software – Basic tools, making instant multimedia, Multimedia software and Authoring tools, Production Standards.		
	Unit 3: Multimedia – making it work – multimedia building blocks – Text, Sound, Images, Animation and Video, Digitization of Audio and Video objects, Data Compression: Different algorithms concern to text, audio, video and images etc., Working Exposure on Tools like Dream Weaver, Flash, Photoshop Etc.,		
	Unit 4: Multimedia and the Internet: History, Internet working, Connections, Internet Services, The World Wide Web, Tools for the WWW – Web Servers, Web Browsers, Web page makers and editors, Plug-Ins and Delivery Vehicles, HTML, VRML, Designing for the WWW – Working on the Web, Multimedia Applications – Media Communication, Media Consumption, Media Entertainment, Media games.		
	Unit 5 : Multimedia-looking towards Future: Digital Communication and New Media, Interactive Television, Digital Broadcasting, Digital Radio, Multimedia Conferencing, Assembling and delivering a project-planning and costing, Designing and Producing, content and talent, Delivering, CD-ROM technology.		

#### 1. Recommended Texts

- (i) S. Heath, 1999, Multimedia & Communication Systems, Focal Press, UK.
- (ii) T. Vaughan, 1999, Multimedia: Making it work, 4<sup>th</sup> Edition, Tata McGraw Hill, New Delhi.
- (iii) K. Andleigh and K. Thakkar, 2000, Multimedia System Design, PHI, New Delhi.

#### 2. Reference Books

- (i) Keyes, “Multimedia Handbook”, TMH, 2000.
- (ii) R. Steinmetz and K. Naharstedt, 2001, Multimedia: Computing, Communications & Applications, Pearson, Delhi.
- (iii) S. Rimmer, 2000, Advanced Multimedia Programming , PHI, New Delhi..

Title of the Course/ Paper	Practical IV: Multimedia Systems Lab.		
Elective	First Year & Second Semester	Credit: 2	
Objective of the course	This course gives practical training in various multimedia software		
Course outline	<p>List of Practicals in Flash :</p> <ol style="list-style-type: none"> <li>1. To Move an object, to move an object in the path</li> <li>2. Text flip, Text color change,</li> <li>3. Creating a link using texts and objects, change the color of the object.</li> <li>4. Shape Tweening and Using shape hints, Motion tweening, hybrid tweening.</li> <li>5. Character Animation, Object Animation, Drawing Images</li> <li>6. An application to show the masking effect.</li> <li>7. Slide show presentation.</li> </ol> <p>List of Practicals in Photoshop:</p> <ol style="list-style-type: none"> <li>1. To create a greeting card, Create background picture</li> <li>2. Text effects, photo effects</li> <li>3. Color , Buttons</li> <li>4. Editing Images</li> <li>5. Designing web page</li> </ol> <p>List of practicals in Dream weaver</p> <ol style="list-style-type: none"> <li>1. Text Management</li> <li>2. Tables – Layers</li> <li>3. Creating menubar</li> <li>4. Creating Pages and sites</li> <li>5. Animation in images</li> </ol>		

Title of the Course/ Paper	Network Programming		
Elective	First Year & Second Semester	Credit: 3	
Objective of the course	This course introduces the basic concepts of Network Programming.		
Course outline	Unit 1: Overview of ActiveX Scripting – Java Scripting- Stand-Alone Scripts- ActiveX Controls- Creating ActiveX Controls.		
	Unit 2: ActiveX Documents- ActiveX Document Architecture- Creating ActiveX Documents.		
	Unit 3: URL Monikers- Hyperlinking- Hyperlink Interface- Working with URL Monikers- Overview of ISAPI- ISAPI Extension- ISAPI Filter.		
	Unit 4: Designing IIS Applications - Building IIS Applications- Building Data Driven DHTML Applications.		
	Unit 5: ActiveX Documents - Technology – Migration Wizard- Modifying Code- Launching and Testing Document- Testing the DLL.		

#### 1. Recommended Texts

- (i) John Paul Muller – Visual C++ 5 from the GroundUp- Tata McGraw Hill Edition – 1998 (For first three units).
- (ii) Noel Jerke – Visual Basic 6 (The Complete Reference) – Tata McGraw Hill Edition –1999(For fourth and fifth units).



Title of the Course/ Paper	Practical IV: Network Programming Lab.		
Elective	First Year & Second Semester	Credit: 2	
Objective of the course	This course gives practical training in Network programming		
Course outline	1.Working with Java Scripts. <ol style="list-style-type: none"> <li>1. Creating ActiveX Controls.</li> <li>2. OLE Server.</li> <li>3. OLE Container.</li> <li>4. Working with URL Monikers.</li> <li>5. Creating an ISAPI Extension.</li> <li>6. Creating an ISAPI Filter.</li> <li>7. Building IIS Application.</li> <li>8. Data- Driven DHTML Application.</li> <li>9. ActiveX Documents.</li> </ol>		

Title of the Course/ Paper	Windows Programming		
Elective	First Year & Second Semester	Credit: 3	
Objective of the course	This course introduces the concepts of Windows Programming.		
Course outline	Unit 1: Windows Fundamentals – Programming Concepts and Vocabulary for Windows – Windows Development Tools – Resource Information		
	Unit 2: Application Framework- Project Utility – Writing Windows Programming (Procedure Oriented) – Pie-chart Application		
	Unit 3: MFC Library – MFC Design Considerations – Key features of MFC Library – C Object – Simple Application and Template- Drawing in Client Area- Fourier Series application with Resources- Bar Chart with Resources.		
	Unit 4: Graph Applications – Word Processor Applications – OLE Features and Specifications - Container Application.		
	Unit 5: Active X Controls – Create simple Active X Controls with MFC – Customizing Controls – COM – DHTML- ATL vs. ActiveX.		

1. Recommended Texts

- (i) L. Klander, 2000, Core Visual C++ 6, First Indian reprint, Addison Wesley, Boston.

2. Reference Books

- (i) C.H.Pappas and W.H.Murray, 1999, Visual C++ 6 (The Complete Reference), Tata McGraw Hill, New Delhi.
- (ii) H. Schildt, 1999, Windows 98 Programming from the GroundUp, Tata McGraw Hill, New Delhi.

Title of the Course/ Paper	Practical IV: Windows Programming Lab.		
Elective	First Year & Second Semester	Credit: 2	
Objective of the course	This course gives practical training in windows programming		
Course outline	<ol style="list-style-type: none"> <li>1. SDK program for window creation and display.</li> <li>2. Window Creation using CFrame wind</li> <li>3. Usage of Mouse Routines.</li> <li>4. Creating Menus for windows.</li> <li>5. Implementing keyboard Accelerator.</li> <li>6. Checking/ Unchecking and Enabling/Disabling Menus.</li> <li>7. Inserting and Removing Menus at Runtime.</li> <li>8. Floating Pop-up Menus.</li> <li>9. MDI with cascaded and tiled window.</li> <li>10. Creating modal and modeless Dialog box.</li> <li>11. Creating Status Bar.</li> <li>12. Using List Box with CList Box Class.</li> <li>13. Using Edit Box with CEdit Class.</li> <li>14. Working of Spin Button Controls.</li> <li>15. Creating Graphics Editor.</li> </ol>		

**10. M.Sc. DEGREE COURSE IN  
COMPUTER SCIENCE AND TECHNOLOGY  
(FIVE YEAR INTEGRATED COURSE)**

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**SYLLABUS**

Title of the Course/ Paper	Mathematics - I		
Allied I: Paper I	First Year & First Semester	Credit: 5	
Objective of the course	This course introduces Mathematics –I		
Course outline	Unit 1: Algebra: Binomial, exponential and Logarithmic series (without proof of theorems) - Problems on summation, approximations and finding coefficients using binomial, exponential and logarithmic series.		
	Unit 2: Trigonometry : Expansion of $\sin nx$ , $\cos nx$ in terms of $\sin x$ , $\cos x$ - expansion of $\tan t$ Expansion of $\sin hx$ , $\cos hx$ in terms of sines or cosines of multiples of $x$ .		
	Unit 3: Power series expansion of $\sin x$ , $\cos x$ , $\tan x$ - Hyperbolic and inverse hyperbolic functions - Logarithmic of complex numbers.		
	Unit 4: Applications of Differential Calculus: Curvature in Cartesian and polar co-ordinates, circle of curvature - evolute, involute and envelopes.		
	Unit 5 : Taylor's expansion for a function of two variables - Maxima and minima of a function of two variables - constrained maxima and minima - Lagrange's method of undetermined multipliers.		

**1. Reference Books**

- (i) Venkatraman M.K., 1981, Engineering Mathematics, (VII and II), The National Pub.Co.
- (ii) Narayanan S., Manickavachagam Pillai T.K., Ramanian G., 1986, Advanced Mathematics for Engineering Students (Vol I), S.Viswanathan (Printers and Publisher)Pvt.Ltd..
- (iii) Kandaswamy P., Thilagavathy K., and Gunavathy K. , 1990, Engineering Mathematics (Vol I and II), S.Chand Co., New Delhi Vol- II.
- (iv) Engineering Mathematics, JJ Publications, Madurai 1996.

Title of the Course/ Paper	Applied Physics -I		
Allied II:Paper I	First Year & First Semester	Credit: 5	
Objective of the course	This course introduces the concepts of applied Physics		
Course outline	Unit 1: SEMICONDUCTOR DIODE: Introduction- pn junction-current voltage characteristic of a semiconductor Diode-Zener diode- Zener diode as a voltage Regulator-Tunnel diode-Schottley diode- Optoelectronic devices-Light emitting diode-photo diodes		
	Unit 2: THE BASIC TRANSISTORS:- The bipolar junction transistor- Transistor biasing-Transistor circuit configurations-Common base(CB) Common emitter (CE) Common collector (CC) configurations- CB;CE;CC static characteristics-construction of OR,AND and NOR gates using transistors-Logic gate parameters-Logic families-Resistor Transistor Logic(RTL)-Diode Transistor Logic(DTL)-Transistor Transistor Logic(TTL)-Fabrication of ICS		
	Unit 3: ELECTRONIC INSTRUMENTS: Introduction- multimeter-multimeter as voltmeter-multimeter as ammeter-multimeter as ohm meter-Applications of multimeter-Sensitivity of multimeter-Merits and Demerits of multimeter-Cathode Ray Oscilloscope		
	Unit 4: LASERS:- Atomic structure - Bohr's atomic model -Energy levels - Energy bands in solids - Basic principle of Laser operation - population Inversion - Construction and working of He-NeLaser -CO2 Laser - Ruby Laser - Semiconductor Laser - Applications.		
	Unit 5 : FIBER OPTIC COMMUNICATION SYSTEMS:- Introduction to communication - Types of Optical fibers - single and bundled fibers - Fibers materials - Attenuation - Dispersion fiber optic light sources - Detectors - Fiber optic communications.		

#### 1. Recommended Texts

- (i) M.K. Bagde and S.P.Singh, 1987, Elements of Electronic - S.Chand & Company (Pvt) Ltd, New Delhi.
- (ii) B.C. Theraja, 1995, Basic Electronics solid state, S.Chand & Company, New Delhi.
- (iii) V.K.Mehta , 1997, Principles of Electronics, S.Chand & Company Ltd, New Delhi.

Title of the Course/ Paper	<b>Fundamentals of Digital Computers</b>		
Core –Paper I	First Year & First Semester	Credit: 4	
Objective of the course	This course introduces the concepts of digital computer fundamentals		
Course outline	Unit 1: Number System - Converting numbers from one base to another - Complements - Binary Codes – Binary logic - Logic gates – Truth Tables.		
	Unit 2: Boolean Algebra- Axioms- Theorems- Simplification of Boolean functions- Map Method- (upto 5 variables) - McClusky Tabulation Method.		
	Unit 3: Sequential Logic – RS,JK,D and T Flip-Flops – Registers - Shift Registers - Counters - Ripple Counters -Synchronous counters - Design of Counters.		
	Unit 4: Adders-Subtractors-Decoders-Encoders-Multiplexer-Demultiplexer- Design of circuits using decoders/multiplexers-ROM-PLA-Designing circuits using ROM/PLA		
	Unit 5 : Design of ALU – Design of Status Register - Design of Accumulator – Introduction to Computer design		

#### 1. Recommended Texts

- (i) M. Morris Mano, 1994, Digital Logic and Computer Design, PHI, New Delhi.
- (ii) T.C. Bartee, 1991, Computer Architecture and Logical design, Tata McGraw-Hill, New Delhi.

Title of the Course/ Paper	<b>Mathematics – II</b>		
Allied I: Paper II	First Year & Second Semester	Credit: 5	
Objective of the course	This course introduces the concepts of Mathematics - II		
Course outline	Unit 1: Theory of Equations : Relations between roots and coefficient of polynomials - formation of equations - decreasing and increasing the roots - reciprocal equation, Horner's methods to find the roots of polynomial equation.		
	Unit 2: Evaluation of multiple integrals - Double and Triple integrals - geometrical meaning of double integrals - change of order of integration - double integrals in polar co ordinates-problems.		
	Unit 3: Application of multiple integrals to find area and volume of solid.		
	Unit 4: Vector Calculus : Differential of vectors - gradient, divergence and curl - Directional derivative - irrotational and solenoidal fields.		

	Unit 5 : Vector Integration: Line, surface and volume integrals - Green's theorem in a plane, Gauss divergence theorem and stoke's theorem (without proof) - simple applications.
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### 1. Recommended Texts

- (i) Venkatraman M.K., 1981, Engineering Mathematics, (VII and II), The National Pub.Co.
- (ii) Narayanan S., Manickavachagam Pillai T.K., Ramanian G., 1986, Advanced Mathematics for Engineering Students (Vol I), S.Viswanathan (Printers and Publisher) Pvt.Ltd..
- (iii) Kandaswamy P., Thilagavathy K., and Gunavathy K. , 1990, Engineering Mathematics (Vol I and II), S.Chand Co., New Delhi Vol- II.
- (iv) Engineering Mathematics, JJ Publications, Madurai 1996.

Title of the Course/ Paper	Applied Physics -II		
Allied II:PaperII	First Year & Second Semester	Credit: 5	
Objective of the course	This course introduces the concepts of Applied Physics – II		
Course outline	Unit 1: Electrical Properties: Free electron of Drude and Lorentz - Weidman Franz Law - Distinction between conductor, semi conductors, and insulators on the basis of baud theory - factors affecting resistivity of a conductor : Temperature, Allowing, pressure, strain, magnetic field and environment.		
	Unit 2: Magnetic Materials: Magnetic materials - classification of magnetic materials, ferromagnetism: Domain theory - Hysteresis - Hard and soft magnetic materials -curie -Weiss law - Magnetostriction , ferrites: Preparation, properties. Applications - Magnetic bubble memory. Magnetic recording - writing magnetic data - Reading magnetic data - storage of magnetic data.		
	Unit 3: Dielectric materials: Qualitative study of three types of polarization -effect of temperature and frequency on dielectric constant – dielectric loss -Ferro electric materials - Behaviour of barium titanate - Pieze - electric materials - Breakdown mechanisms - Classification of insulating materials on temperature basis.		
	Unit 4: Super Conductors: Qualitative study of the phenomenon - Critical temperature and critical field. Meissner effect - Type I and II superconductors. BCS theory of superconductivity (Qualitative) - High temperature superconductor. Applications: Crypton, magnetic levitation - Superconducting magnets.		

	Unit 5 : Modern Engineering materials: Metallic glasses as transformer core material - Nanophase materials - synthesis - Variation of physical properties with Geometry - shape memory alloys - Characteristics of SMA - Thermomechanical behaviour - commercial SMA - Applications - Biomaterial.
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1. Recommended Texts

1. R.Raghavan, 1991, Materials Science and Engg A first Course, PHI, New Delhi.
2. M. Arumugam, 1994, Materials Science, Anuradha Pub.
3. P.K.Palanisamy 2002, Materials Science, Scitech.
4. Seth & Gupta, 1990, Course in electrical Engg materials, Dhanpat Raj & Sons.

Title of the Course/ Paper	Practical –I: Digital - Lab.		
Core –Paper – II	First Year & Second Semester	Credit: 4	
Objective of the course	This course gives training in digital logic circuits.		
Course outline	<ol style="list-style-type: none"> <li>1. Study of logic gates <ol style="list-style-type: none"> <li>a. Logic gates using discrete components</li> <li>b. Verification of truth table for AND, OR, NOT, NAND, NOR and EXOR gates</li> <li>c. Realisation of NOT, AND , OR, EX-OR gates with only NAND gates</li> <li>d. Realisation of NOT, AND , OR, EX-OR gates with only NOR GATES</li> </ol> </li> <li>2. Implementation of logic circuits <ol style="list-style-type: none"> <li>a. Verification of associative law for AND, OR GATES</li> <li>b. Karnaugh's map reduction and logic circuit implementation</li> </ol> </li> <li>3. Adder and subtractor <ol style="list-style-type: none"> <li>a. Verification of Demorgan's law</li> <li>b. Implementation of Half-adder and Half –subtractor</li> <li>c. Implementation of Full-adder and full-subtractor</li> <li>d. Four bit binary adder</li> <li>e. Four bits binary subtractor using 1s and 2s complement</li> </ol> </li> <li>4. Shift registers <ol style="list-style-type: none"> <li>a. Implementation of shift register, serial transfer</li> <li>b. Ring counter</li> <li>c. 4 – bit binary counter</li> <li>d. BCD Counter</li> <li>e. Counters for arbitrary sequence</li> </ol> </li> </ol>		



**NON – MAJOR ELECTIVES**  
( I SEMESTER AND II SEMESTER)

Title of the Course/ Paper	Flash Lab		
Core		Credit: 2	
Objective of the course	This course introduces the techniques used in FLASH		
Course outline	1.Drawing a Semi Circle by snap tool, a sine wave , 24 spokes on a wheel, five pointed star using , a flower by changing the center coordinates 2.Placing a text along a curved path. 3. Changing on objects shape using shape tweening , text tweening, 4. Application using buttons, animating the button 5. Tweening a using the shape hints , motion tweening 6. An application to show the masking effect in Flash 7.Slide show presentation (minimum 5 slides) 8.Creating smudge effect for an image using Hybrid Tweening. 9.Applications using Action scripts 10. Usage of textbox, dynamic text box, buttons with action scripts		

Title of the Course/ Paper	FLASH		
Core		Credit: 2	
Objective of the course	This course introduces the techniques used in FLASH		
Course outline	<p>Unit – I : Introduction to Flash – simple drawing techniques – adding some easy animations – learning the tools - buttons</p> <p>Unit – II : Controlling drawing object – creating symbols – instances- making use of Library – painting – motion guide path.</p> <p>Unit – III : Flash tweening – using masking techniques – layers and frames.</p> <p>Unit – IV : Overview of animation -Animating your production – sound – video - publish flash movies – importing.</p> <p>Unit – V : Introduction to scripting - Action script applications</p> <p>Books for Reference :</p> <ol style="list-style-type: none"> <li>1. Mr. K. K. Thyagarajan, A.P., . B. <b>Anbumani</b>, K.K, “<b>Flash 2004</b>” .4</li> <li>2. Robert Reinhardt, Flash 5 Bible</li> </ol>		

Title of the Course/ Paper	Web Applications		
Core		Credit: 2	
Objective of the course	This course introduces the tools and menus to master PHOTOSHOP and Dream Weaver		
Course outline	<p>Unit – I : Basics of Adobe Photoshop – Getting started with Photoshop – title bar – Menu bar - option bar – tool box – screen modes.</p> <p>Unit – II Introduction to digital Image editing , Create your own painted images – Edited scanned images – import rendered visuals – Working with images and colors</p> <p>Unit – III : Using tools and palettes – selection tools, Painting and editing tools – menu commands – creating type – change the type settings – styles</p> <p>Unit – IV : Methods and Techniques of Adobe photoshop - Layers – working with layers – merging layers –linking layers –transforming layers and layer effects- filters</p> <p>Unit – V : Getting started with Dreamweaver – creating web applications with Dreamweaver.</p> <p>Books for Reference :</p> <ol style="list-style-type: none"> <li>1. Photoshop – The Complete reference – Greenberg – TMH</li> <li>2. Dream Weaver – Complete reference</li> </ol>		

Title of the Course/ Paper	Web Applications lab		
Core		Credit: 2	
Objective of the course	This course introduces the techniques used in Photoshop		
Course Outline	1.Working with the clone stamp tool 2.Drawing Watch using custom shapes 3.Testing lab mode 4.Using multichannel mode 5.Using the sponge Tool 6. Antique framing 7. Creating a supernova 8. Adding an arrowhead. 9. Isolating a Complex Image 10.Removing an element from an image 11. Captain kirk myopia effect 12. Adjusting the focus 13.Creating an edge mask 14. Applying Transformations 15. Correcting brightness and contrast.		

Title of the Course/ Paper	HTML		
Core		Credit: 2	
Objective of the course	This course introduces to the tags used in HTML		
Course outline	<p>UNIT - I : Introduction :Web Basics: What is Internet – Web browsers – What is Web page – HTML Basics: Understanding tags.</p> <p>UNIT- II : Tags for Document structure( HTML, Head, Body Tag). Block level text elements: Headings paragraph(&lt;p&gt; tag) – Font style elements: (bold, italic, font, small, strong, strike, big tags)</p> <p>UNIT - III: Lists: Types of lists: Ordered, Unordered – Nesting Lists – Other tags: Marquee, HR, BR- Using Images – Creating Hyperlinks.</p> <p>UNIT - IV : Tables: Creating basic Table, Table elements, Caption – Table and cell alignment – Rowspan, Colspan – Cell padding.</p> <p>UNIT - V : Frames: Frameset – Targeted Links – No frame – Forms : Input, Textarea, Select, Option.</p> <p>Recommended Texts</p> <p>(i). HTML Complete Reference, Teach Yourself Web Publishing with HTML – Laura Lemay.</p> <p>Reference Books</p> <p>(i). HTML – E Stephen Mack, Janan Platt.</p>		

Title of the Course/ Paper	HTML LAB		
Core		Credit: 2	
Objective of the course	This course introduces to the programming in HTML		
Course outline	<p>01. Write a script to create an array of 10 elements and display its contents.</p> <p>02. Create a simple calculator using form fields. Have two fields for number entry and one field for the result. Allow the user to be able to use plus, minus, multiply and divide.</p> <p>03. Create a document and add a link to it. When the user moves the mouse over the link, it should load the linked document on its own. (user is not required to click on the link)</p> <p>04. Create a document which opens a new window without a toolbar, address bar or a status bar that unloads itself after one minute.</p> <p>05. Design an HTML page that includes document structure tags, title, line break, multiple headings and link to e-mail address.</p> <p>06. Create an HTML file which is the main page with an image and some text messages along with hyperlinks which is linked to various pages. The navigation should be such that the links take you to the appropriate page and then back to the main page.</p> <p>07. Create a HTML page to demonstrate the usage of Frames. Choose the content of the page on your own.</p> <p>08. Design an application for pay slip through HTML forms.</p>		

Title of the Course/ Paper	BUSINESS AND OFFICE APPLICATIONS		
Core		Credit: 2	
Objective of the course	This course introduces to the PC packages		

Course outline	<p>Unit – I : Word Processor – Introduction – Features of MSWord – components – create , Open &amp; Save Ms Word Documents. Navigation &amp; Selection in MS Word – editing Documents – printing documents – formatting .</p> <p>Unit – II : Advanced Formatting Techniques – Alignment – Tab settings – creating tables – working with table views. Mail merging – find &amp; replace – spell check – auto text – book marks – headers &amp; footers – word tools.</p> <p>Unit – III : Spread sheets – Introduction – concepts – excel features – entering and editing data – addressing techniques – simple formulas &amp; functions – formatting cells – aligning cells – copying and linking cell and sheets.</p> <p>Unit – IV : Working with fill methods – data analysis – charts – types of charts – converting data to chart – macros – forms – pivot table – goal seek – auditing - sorting – freezing panes – inserting objects &amp; pictures.</p> <p>Unit – V : MS Power point – Introduction to MS Power point - Features – Understanding slide types – creating &amp; viewing slides – creating slide shows. Applying special object – including objects &amp; pictures – adding navigation buttons – slide transition – animation effects –timing.</p> <p>Reference Books</p> <ol style="list-style-type: none"> <li>1. R.K. Taxali: PC Software for Windows, Tata McGraw Hill.</li> <li>2. The O'Leary Series, Microsoft Word 2000, Tata McGraw Hill.</li> <li>3. Content Development Group: Working with MS Office 2000, Tata McGraw Hill.</li> <li>4. Courter: Mastering Office 2000, BPB Publications.</li> <li>5. Bott and Leonhard: Using Microsoft Office 2000, Prentice Hall of India.</li> <li>6. First course in Computers , Sanjay Saxena, Vikas Publishing house Pvt Ltd., New Delhi</li> </ol>
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Title of the Course/ Paper	MS ACCESS		
Core		Credit: 2	

Objective of the course	This course introduces to the MS- Access
Course outline	<p><b>UNIT- I :</b> Introduction to database - What is a Database , Why use a Relational Database, Overview of database design – Data Normalization(Determining tables, Determining Fields, Determining Relationships)Integrity Rules (Primary/Foreign Key, One-to-Many, Many-to-Many, One-to-One) Introduction to MS Access .</p> <p><b>UNIT- II :</b> Create a Table in MS Access - Data Types, Field Properties , Fields:names, types, properties--default values, format, caption, validation rules Data Entry Add record delete record and edit text Sort, find/replace, filter/select, re-arrange columns, freeze columns . Edit a Tables- copy, delete, import, modify table structure find replace.</p> <p><b>UNIT – III :</b> Setting up Relationships- Define relationships, add a relationship, set a rule for Referential Integrity, change the join type, delete a relationship, save relationship Queries &amp; Filter – difference between queries and filter , filter using multiple fields AND,OR , advance filter Queries create Query with one table , find record with select query, find duplicate record with query , find unmatched record with query, run query ,save and change query.</p> <p><b>UNIT – IV :</b> Introduction to Forms Types of Basic Forms: Columnar, Tabular, Datasheet, Main/Subforms, add headers and footers, add fields to form, add text to form use label option button, check box ,combo box, list box Forms Wizard, Create Template.</p> <p><b>UNIT – V :</b> Introduction to Reports , Types of Basic Reports: Single Column,Tabular Report Groups/Total, single table report multi table report preview report print report, Creating Reports and Labels, Wizard</p> <p>Reference Books</p> <ol style="list-style-type: none"> <li>1. A first course in Computers , Sanjay Saxena, Vikas Publishing house Pvt Ltd.,New Delhi</li> <li>2. Ms Office XP complete BPB Publications</li> <li>3. Ms Access 2002 fast and easy by Faithe Wempen PHI</li> </ol>

Title of the Course/ Paper	BUSINESS AND OFFICE APPLICATIONS LAB		
Core		Credit: 2	



Objective of the course	This course gives an exposure to Various Software of Office Package
Course outline	<p><b>MSWORD</b></p> <ol style="list-style-type: none"> <li>1. Text Manipulations.</li> <li>2. Usage of Numbering, Bullets, Footer and Headers.</li> <li>3. Usage of Spell check, and Find &amp; Replace.</li> <li>4. Text Formatting.</li> <li>5. Picture insertion and alignment.</li> <li>6. Creation of documents, using templates.</li> <li>7. Creation templates</li> <li>8. Mail Merge Concepts</li> <li>9. Copying Text &amp; Pictures from Excel</li> </ol> <p><b>MS-EXCEL</b></p> <ol style="list-style-type: none"> <li>10. Cell Editing</li> <li>11. Usage of Formulae and Built-in Functions</li> <li>12. File Manipulations</li> <li>13. Data Sorting (both number and alphabets)</li> <li>14. Worksheet Preparation</li> <li>15. Drawing Graphs</li> <li>16. Usage of Auto Formatting</li> </ol> <p><b>POWER POINT</b></p> <ol style="list-style-type: none"> <li>1. Inserting Clip arts and Pictures</li> <li>2. Frame movements of the above</li> <li>3. Insertion of new slides</li> <li>4. Preparation of Organisation Charts</li> <li>5. Presentation using Wizards</li> </ol>

Title of the Course/ Paper	MS ACCESS LAB		
Core		Credit: 2	
Objective of the course	This course gives an exposure to MS ACCESS		
Course outline	<p><b><i>MS-ACCESS</i></b></p> <ol style="list-style-type: none"> <li>1. Pay Bill</li> <li>2. Electricity Bill</li> <li>3. Mark list preparation of a student</li> <li>4. Inventory report preparation</li> <li>5. Invoice report preparation</li> <li>6. Income tax preparation</li> </ol>		

## **11. M.Sc. DEGREE COURSE IN ELECTRONIC MEDIA SYLLABUS**

### **Semester I**

#### **Introduction to Human Communication**

- Unit 1: Nature and Scope of human communication
- Unit 2: Theories of Interpersonal Communication
- Unit 3: Theories of Persuasion
- Unit 4: Models of Mass Communication
- Unit 5: Media Effects: Theory and Research

#### **Television Production**

- Unit 1: Media Literacy Approach to Television Production
- Unit 2: Production Process and steps
- Unit 3: Programming Formats
- Unit 4: Production Management
- Unit 5: Hands on Training

#### **Writing for Media**

- Unit 1: Formats, Structure, Purpose, Audience-Plain Language
- Unit 2: Effective Writing: Grammar and Language Exercises, House Styles
- Unit 3: Critical Thinking: Arguments, Logical Reasoning
- Unit 4: Fact-Checking, Evidence and Verification
- Unit 5: Writing Exercises for different media /formats

#### **Videography**

- Unit 1: Visual Elements
- Unit 2: Language of Shots & Camera Angles
- Unit 3: Camera Movements
- Unit 4: Principles of Lighting
- Unit 5: Visual Narratives

### **Electives**

#### **Media Aesthetics**

- Unit 1: Principles of design and applied media aesthetics, contextualization and perception
- Unit 2: Structuring Light and Lighting
- Unit 3: Structuring color, functions, compositions and feel
- Unit 4: Structuring space-area and frames, depth and volume
- Unit 5: Study of two and three dimensional space and its visual possibilities

#### **Indian Cinema**

- Unit 1: Early Cinema-Indian Cinema Beginning to Independence
- Unit 2: Post Independence Era—1970s-Regional, Parallel Cinema
- Unit 3: European, Asian and Latin American Cinema-Directors
- Unit 4: Indian Films-Decades 1980s, 1990s
- Unit 5: Contemporary Indian Cinema-Directors

## **Semester II**

### **Film language**

- Unit 1: Film Language as a visual communication system, Image and Sound Technologies
- Unit 2: Basic elements and tools (Scene, shots, movement, distance,), Camera Movements
- Unit 3: Editing-Triangle Principles-dialogue editing matching, glances, visual punctuation
- Unit 4: Signs, Syntax, Montage Codes, Framed Images, Depth, Diachronic Shots, Scene motion
- Unit 5: Scene Design- mise-en-scene-Exercises-(Short Films)

### **Story Development & Scriptwriting**

- Unit 1: Story Problems-Terminology of Story Design
- Unit 2: Elements of Story (Structure, Genre, Character, Meaning)
- Unit 3: Principles of Story Design (Acts, Scene Design, Composition)
- Unit 4: Scriptwriting Tools and Techniques, Formats- Dialogue
- Unit 5: Script Analysis-,Exercises, Drills, Case Studies

### **Audio-Video Editing**

- Unit 1: Fundamentals Of Video Editing
- Unit 2: Narratives and Editing Techniques
- Unit 3: Sound and Sound Design
- Unit 4: Principles of Audio Editing
- Unit 5: Non-linear Editing Software—Hands on Training

### **Radio Production**

- Unit 1: Basics of Radio Programming
- Unit 2: Formats and style of Radio Production
- Unit 3: Writing for Radio-(Announcement, News Reading)
- Unit 4: Radio Organization and Production Management
- Unit 5: Hands on Training

## **Elective**

### **Visual Culture in India**

- Unit 1: Visual Culture in India-Cultural Studies Approach-Images, Ideology, Representation
- Unit 2: Film Culture (Celebrity/Hero-worship/Gender/Politics)
- Unit 3: Popular Culture in India, Folk Media and Narratives
- Unit 4: Cartoon and Comic Traditions in India,
- Unit 5: Contemporary Visual Culture/Urban Culture

### **World Cinema**

- Unit 1: Early Cinema-World-Indian Beginning to World War
- Unit 2: Post-War Films- Hollywood Cinema
- Unit 3: European Films and Film Makers
- Unit 4: Asian and Latin American Cinema-Directors
- Unit 5: Contemporary Cinema (e.g. Middle East, Korean, Russian)

**Recommended text:**

1. William L. Anderson, 1999, Immunology, First edition, Fence Creek Publishing LLC, Madrsen.

**Reference Book:**

1. Ivan Roitt, Jonathan Brostoff and David male ,1989, Immunology,Churchil livingstone, Edinburg, London.

**Website:**

<http://gslc.genetics.utah.edu/teachers/index.cfm>

## 12. M.SC. DEGREE COURSE IN FOODS SCIENCE NUTRITION AND DIETETICS

### SYLLABUS

#### General Objectives and objectives for each year

##### General Objectives:

- To enable students to
- Gain knowledge in the relationship between health, food and nutrition.
- Understand the role of nutrients in health and disease.
- Know the role of organisms in food.

##### Objectives for first year:

1. To learn the fundamentals of statistics.
2. To impart basic knowledge in the biological functions of the body and its relationship with nutrients.
3. To understand the relationship between Biochemistry and Nutrition.

##### Objectives and objectives for second year:

1. To impart the knowledge of research techniques.
2. To learn the lab techniques in determining the nutrients and gain expertise in planning, preparing and serving therapeutic diets.
3. To minimise the environmental effects of microbial growth and its relation to food processing and food preservation.

### FIRST SEMESTER

Title of the Course/Paper	<b>Applied Statistics</b>		
Category of the Course CORE PAPER I	Year & Semester I year 1 <sup>st</sup> semester	Credits 4	Subject Code MFN1, MFSM1,MFRM1,MHDFS1, and MTSFD1
Pre-requisites	B.Sc. Nutrition FSM D, B.Sc. CND, B.Sc. Home Science or any Science graduate with PG Diploma in Nutrition and Dietetics/ PG Diploma in Catering Technology		
Objectives of the Course	To enable students apply statistical procedures to analyse numerical data and draw inferences.		
Course Outline	Unit I Fundamentals and diagrammatic graphic representation of data: Scope, Meaning and limitations of statistics as a tool for decision making under uncertainty. Diagrammatic representation of data – bar chart, Pie diagram. Graphical representation of data – histogram, frequency polygon and curves, cumulative frequency curves – ogives – symmetric and skewed distribution – logarithmic graphs.		

	<p>Unit 2</p> <p>Measures of central tendency and variability. Mean, Median and mode and their relative merits. Measures of dispersion. Range, quartile deviation, Variance and standard deviation.</p> <p>Relative measures of dispersion</p> <p>Coefficient of variation, percentiles and percentile ranks.</p> <p>Skewness and kurtosis (Concepts only)</p>
	<p>Unit 3</p> <p>Probability concepts</p> <p>Rules of probability problems, simple problems, the meaning and importance of normal distributions.</p> <p>Correlation Methods</p> <p>Association of attributes, the meaning of correlation – product moment, co-efficient of correlation. Rank correlation, scatter diagram and Regression lines and their uses. Concepts of partial and multiple correlation (Meaning and interpretation of coefficient)</p>
	<p>Unit 4</p> <p>Sampling from infinite populations:</p> <p>Concept of sampling distribution and standard error. Relationship between sample size and standard error. Standard errors of sample mean. Sample variance, sample standard deviation and sample mean. Sample standard deviation and sample proportion and the differences of these values.</p>
	<p>Unit 5</p> <p>Tests of Significance:</p> <p>Shell hypothesis – calculation of ‘t’ test – critical ratio – chi – square, non parametric statistics. Testing hypothesis – proportion and means – large samples – small samples – testing chi square distributions – characteristic – F distribution – testing of population variance – Analysis of variance – one way and two way.</p>

**1. Recommended Texts:**

- Fisher R.A, (1948), “Statistical methods for research works” Harper Publishing Co.,
- Gupta S.P (1972), statistical methods, Sultan Chand and Sons.

**2. Reference Books:**

- Guilfer J.P (1965), Fundamental statistics in Psychology and education, New York, Mc Graw Hill book Co.
- Gauvet H.E (1958), “Statistics in Psychology and education. Asian student education.
- Sreedar G.V. (1981), “Statistical methods”, Allied Publishers Pvt. Limited

**3. Website, e-learning resources:**

[www.wikipedia.com](http://www.wikipedia.com)

Title of the Course/Paper	<b>Advanced Human Physiology</b>		
Category of the Course CORE PAPER II	Year & Semester I year 1 <sup>st</sup> semester	Credits 4	Subject Code MFN2, MFSM2
Pre-requisites	B.Sc. Nutrition FSM D, B.Sc. CND, B.Sc. Home Science or any Science graduate with PG Diploma in Nutrition and Dietetics/ PG Diploma in Catering Technology		
Objectives of the Course	<p>To enable the students to :</p> <ol style="list-style-type: none"> <li>Learn the pathological condition related to Nutritional disorders.</li> <li>Understand the recent advances in Applied Physiology.</li> </ol>		

	Unit 2. Endocrinology and reproductive function: Pituitary , thyroid, pancreas, adrenal – medulla and adrenal cortex. Development and functions of reproductive organs. Gastro-intestinal system: Digestion and absorption, regulation and gastro intestinal function. circulation: circulating body fluid – origin of heart beat and electrical activity of heart – ECG – interpretation. Latest development in cardiac condition. Angioplasty and echocardiogram. Cardio vascular regulatory mechanism and homeostasis.
	Unit 3. Respiration: Review of respiratory organs – pulmonary function – gaseous transport in lungs and tissues – regulation – respiratory adjustment in health and diseases.
	Unit 4. Excretory system Review of skin and kidney – renal function, latest findings in renal therapy.
	Unit 5. Immune system: Innate and acquired immunity – antigen – antibody reaction, role of lymphocytes, cell mediated immunity.

### 1. Recommended Texts:

- Guyton, A.C.,(2001), “Functions of the Human Body”, W.B. Saunders company, Philadelphia, Latest edition.
- Guyton, A.C. and Hall (2001), “Textbook of Medical Physiology”, X edition, Harcourt Asia Pvt. Ltd., Siingapore.
- Hoffman, J. F. and Jamieson, J. D. (1997), “Cell Physiology”, Oxford University Press, New York.
- Chakrabarti et al., (1994), “Human Physiology”, The New Book Stall Calcutta.
- Joshi, V. D. (1995), “Physiology – Preparation Manual for Undergraduates”, Churchill Livingstone, New Delhi.

### 2. Reference Books:

- Jain, A. K. (2003), “Textbook of Physiology”, Arichal Publishing Company.
- Chaudhri, A. R. (2000), “Textbook of Practical Physiology”, Paras Publilshing, Hyderabad.
- Brown, H. et al. (1997), “Physiology and Pharmacology of the Heart”, Oxford Blackwell Science, New York.
- Mackenna and Callender (1998), “Illustrated Physiology”, Churchill Livingstone, New York.

### 3. Website, e-learning resources:

- <http://members.aol.com/Bio50> - Human Physiology lecture notes  
<http://www.unomaha.edu/hpa> - Human Physiology and anatomy

Title of the Course/Paper	Advanced Food Science		
Category of the Course CORE PAPER III	Year & Semester I year 1 <sup>st</sup> semester	Credits 4	Subject Code MFN3, MFSM3
Pre-requisites	B.Sc. Nutrition FSM D, B.Sc. CND, B.Sc. Home Science or any Science graduate with PG Diploma in Nutrition and Dietetics/ PG Diploma in Catering Technology		
Objectives of the Course	To enable students to a. Understand the composition of various foods and the effects of cooking and processing on various components. Learn the food laws and standards. Learn the various scientific methods available for quality control of foods.		



Course Outline	<p>Unit 1. Cereals and millets: structure and composition of the grain – starch cookery . Rice and rice products – processing and nutritive value of wheat and wheat products – processing and nutritive value. Baked products – types and preparations. Breakfast foods from other cereals – corn, oats and ragi. Pulses: composition – processing – toxic constituents</p>
	<p>Unit 2. Nuts and oil seeds: Composition – processing – toxic constituents Sugar and jaggery: Types, nutritive value, properties – manufacture- sugar cookery. through other pathogenic organisms in food, symptoms, methods to control and prevent infection.</p>
	<p>Unit 3. Fats and oils: Types, composition, processing and properties – changes during cooking and storage – emulsions – role of fats in cookery. Vegetables and fruits : Composition – effect of cooking – effect of cooking on pigments and polyphenols – vegetables and fruit products – processing, preservation and nutritive value.</p>
	<p>Unit 4. Browning reactions in foods: Enzymatic and non-enzymatic Enrichment and fortification : Objectives – methods.</p>
	<p>Unit 5. Post harvest technology: General methods of food grains, vegetables and fruits. Food microbiology: sources of contamination of foods. Significance of organisms like clostridium, botulinum, staphylococci, perfringens in infection. Sources of infection</p>

### 1. Recommended Texts:

- Manay, S. and Shadaksharaswamy, M. (1997), Food Facts and Principles, New Age International Publishers, New Delhi.
- Bennion, M.(1980), Introductory Foods, 7<sup>th</sup> ed. Macmillan Publishing Co. USA
- . Sizer F. and Whitney, E. (2003), Hamilton and Whitney's Nutrition: concepts and controversies, ninth edition, Wadsworth Publishing Co.
- Finch C.F. (1984), Food Preparations, MacDonald and Evans Ltd. Plymouth.
- Lady Irwin College, (1986), Basic food preparation, Lady Irwin College, New Delhi.
- McGee, H (1984), Food and Cooking, Charles Schribners and Sons, New york.

### 2. Reference Books:

- Peckham, G.C. and Freeland-Graves, J.H. (1979), Foundations of Food Preparation, 4<sup>th</sup> ed. Macmillan Publishing Co. Inc. NewYork.
- Martland R.E and Welsby D.A (1980), Basic Cookery, Fundamental Recipes and variations, William Heinemann Ltd. London.
- B. Sivasankar, (2002), Food Processing and Preservation, Prentice Hall of India Pvt. Limited., New Delhi.
- Premlatha Mullick (1995), "Textbook of Home Science", Kalyani Publishers, India.

### 3. Website, e-learning resources:

[www.fao.org](http://www.fao.org) – Food and agricultural organisation

[www.wfp.org](http://www.wfp.org) - world food programme

[www.foodsafetycouncil.org](http://www.foodsafetycouncil.org) - International food safety council

[www.cfsan.fda.gov](http://www.cfsan.fda.gov) – Center for food safety and applied nutrition

Title of the Course/Paper	<b>Biochemistry</b>		
Category of the Course CORE PAPER IV	Year & Semester I year 1 <sup>st</sup> semester	Credits 4	Subject Code MFN4
Pre-requisites	B.Sc. Nutrition FSM D, B.Sc. CND, B.Sc. Home Science or any Science graduate with PG Diploma in Nutrition and Dietetics/ PG Diploma in Catering Technology		
Objectives of the Course	To enables the students to Understand the need for the study of biochemistry as the basis for nutritional sciences. Make students aware of metabolism of proximate principles and others.		
Course Outline	Unit I Biologic oxidation Enzymes and Co-Enzymes involved in Oxidation and Reduction. The respiratory Chain. The Role of High Energy Phosphates in Biologic Oxidation and Energy Capture. Role of the Respiratory Chain in energy Capture. Mechanism of Phosphorylation.		
	Unit 2 Metabolism of Carbohydrates: Glycolysis, formation and degradation of Glycogen, gluconeogenesis, The Citric Acid Cycle, The Hexose Monophosphate Shunt, Regulation of Carbohydrate Metabolism – Bioenergetics.		
	Unit 3 Metabolism of Lipids: Biosynthesis and oxidation of saturated and unsaturated fatty acids, essential fatty acids, biosynthesis and oxidation of glycerides, phospholipids, lipo proteins and cholesterol, ketone bodies, regulation of lipid metabolism – bioenergetics.		
	Unit 4 Protein and amino acid metabolism Deamination, decarboxylation and transamination of amino acids – biosynthesis of non-essential amino acids and it's regulation, catabolism of essential amino acids and urea cycle. Overview of intermediary metabolism The regulation of carbohydrates and lipid metabolism in the whole body.		
	Unit 5 Metabolism of nucleic acid Biosynthesis and degradation of purine and pyrimidine nucleotides. Regulation of biosynthesis, conversion to de-oxy nucleotide. DNA organisation and replication DNA replication, RNA synthesis – types and functions, processings and metabolism, protein synthesis and genetic code. Regulation of gene expression Recombinant DNA technology, genetic engineering.		

#### 1. Recommended Texts:

- Deb, A.C (1999), "Concepts of Biochemistry", Books and Allied (P) Ltd., Calcutta.
- Talwar g.P Sri Vatsava LN and Moudgil K.D (2003) – Textbook of Biochemistry and human biology – 3<sup>rd</sup> edition, Prentice Hall of India (P) Ltd. New Delhi – 1.
- P.Karison (1975) – Introduction to Modern biochemistry – Academic press, New York.

- d. Sadasivam, S and Manickam, A (1997), “Biochemical Methods”, 2<sup>nd</sup> Edition, New Age International Publishers, New Delhi.
- e. Karison and Peterson (1971), – Introduction to modern biochemistry Academic press, New York, London.
- f. Harper H.A. (1997), “Review of physiological chemistry, Lange Medical Publications, 21<sup>st</sup> edition, Los Angeles.
- g. West, Todd and Van Brouggan, (1986), “Text book of biochemistry”, The Macmillan Company, New York.
- h. Albert L. Lehninger (1992), “The molecular basic of cell structure and function”, Kalyani Publishers, New Delhi.

## 2. Reference Books:

- a. Rama Rao AVSS (1990) – Text book of biochemistry 5<sup>th</sup> edition LK and Publishers, Visakhapatnam.
- b. Conn EE and Stump P.K. (1981), – Outlines of Biochemistry – Wiley Eastern (P) Ltd. New Delhi,
- c. William P. J. (1972) An introduction to biochemistry, Nostrand Co., Inc. London.
- d. . Shanmugham Ambika (1985)– Fundamentals of bio-chemistry to medical students. NVA Bharat printers, and traders 56, Peters Madras – 86.

## 3. Website, e-learning resources:

- <http://www.gwu.edu/~mpb> - metabolic pathways of biochemistry
- <http://www.indstate.edu/thcme/mwking/inborn.html> - inborn errors of metabolism
- <http://www.worthington-biochem.com/introBiochem/introEnzymes.html> - enzymes
- <http://en.wikipedia.org/wiki/Biochemistry> - biochemistry encyclopedia

Title of the Course/Paper	<b>Community Nutrition</b>		
Category of the Course CORE PAPER V	Year & Semester I year 1 <sup>st</sup> semester	Credits 4	Subject Code MFN5, MFSMD5
Pre-requisites	B.Sc. Nutrition FSM D, B.Sc. CND, B.Sc. Home Science or any Science graduate with PG Diploma in Nutrition and Dietetics/ PG Diploma in Catering Technology		
Objectives of the Course	To enable the students to Know the various National and International organisations working for nutrition Know the prevalence of malnutrition in India Know the measures to overcome malnutrition		
Course Outline	Unit 1. Nutrition and national development. Human life cycle – recommended dietary allowances for Indians. National organizations concerned with food and nutrition – ICMR, State Nutrition Councils and Beaureaus – Central and State. Health education Boards, social welfare boards, women’s voluntary services, etc.		
	Unit 2. International organizations concerned with foods and nutrition, FAO, WHO, UNICEF, World Bank, etc. Assessing the food and nutrition problems in the community – Dietary survey, anthropometry, clinical examinations, laboratory examinations.		

	<p>Unit 3.</p> <p>Prevalence of malnutrition in India. Environmental and socio-economic factors related to malnutrition and family size and composition.</p> <p>Etiology of malnutrition – dietary patterns, food and nutrient intake, food losses, food waste, customs, habits, prejudice, ignorance, nutrition and infections.</p>
	<p>Unit 4.</p> <p>Measures to overcome malnutrition:</p> <p>a. Need for an integrated approach to solve the problems of nutrition.</p> <p>b. The package program of immunization, nutrition and education.</p> <p>C. feeding programs.</p>
	<p>Unit 5.</p> <p>Teaching and extension of better nutrition – nutrition education for the community – principles of planning, executing and evaluating nutrition education programmes.</p> <p>Food production and distribution.</p> <p>National nutritional policy.</p> <p>Nutrition in high altitudes, space, Antarctic and Arctic expeditions and during emergency.</p>

### 1. Recommended Texts:

- Jelliffe. D.B. (1996), The assessment of nutritional status on the community – WHO Monograph Series – No.53. Geneva.
- Reh, Emma. (1976), Manual on household food consumption Surveys. FAO. Nutritional studies, No.18. Rome.
- Shanti Ghosh (1977), The feeding and care of infants and young children. Voluntary Health association of India – New Delhi.

### 2. Reference Books:

- Ebrahim G.J. (1983), Nutrition in Mother and child health: London, Macmillan.
- Ritchey, S.J. and J.Taper (1983), Maternal and Child Nutrition. Harper and row Publishers, New York.
- McLarea, D.S. (Ed.). (1983), Nutrition in the community. John Wiley and sons.
- Shukla, P.K. (1982), Nutritional Problems of India – Prentice Hall of India Pvt. Ltd., New Delhi.

### 3. Website, e-learning resources:

<http://www.hsc.wvu.edu/library/U-links/community-nutrition.htm>  
[www.asns.org/njun04a.pdf](http://www.asns.org/njun04a.pdf)  
[www.fns.usda.gov/fsec/FILES/SafetyNet.pdf](http://www.fns.usda.gov/fsec/FILES/SafetyNet.pdf)  
[www.ext.vt.edu/actionforhealthykids/ assistanceguide/lesson5background.pdf](http://www.ext.vt.edu/actionforhealthykids/assistanceguide/lesson5background.pdf)

Title of the Course/Paper	Research Methodology		
Category of the Course CORE PAPER VI	Year & Semester I year 2 <sup>nd</sup> semester	Credits 4	Subject Code MFN6, MFSMD6, MFRM6,MHDFS6,MTSFD6
Pre-requisites	B.Sc. Nutrition FSM D, B.Sc. CND, B.Sc. Home Science or any Science graduate with PG Diploma in Nutrition and Dietetics/ PG Diploma in Catering Technology		
Objectives of the Course	To enable students to: 1. Understand the fundamental principles and techniques in Research Methodology 2. Get an overview of the methodologies used in educational research.		

Course Outline	<p>Unit I</p> <p>The meaning of research – Theory, hypothesis, purpose, assessment and evaluation</p> <p>Research report – style, manual, format, evaluating a research report, foot notes, plagiarism, technical and popular reports.</p>
	<p>Unit 2</p> <p>Methods and tools of research – reliability and validity of research tools, quantitative and qualitative studies, observation, questionnaire, interviews, opinionnaires (Thurstone technique and likert method).</p> <p>Collection of data – Primary and secondary, published and unpublished and editing of primary and secondary data.</p>
	<p>Unit 3</p> <p>Sampling</p> <p>Sampling and sample designs, law of statistical regularity, law of inertia of large numbers, methods of sampling, advantages and limitations of probability sampling, non probability sampling.</p> <p>Classification and tabulation of data – Types of classification – geographical, chronological, quantitative and qualitative. Discrete and continuous frequency distribution, relative and two way frequency distribution, tabulation of data, types of tables.</p>
	<p>Unit 4</p> <p>Diagrammatic and graphic presentation</p> <p>Types of diagrams, Graphs, Techniques of constructing graphs, Limitations of diagrams and graphs</p> <p>Interpolation and extrapolation – definition, significance, assumption- methods of interpolation – graphic method and list of other methods.</p> <p>Experimental and Quasi experimental research – principles of experimental research, variables, controlling extraneous variables, experimental validity, experimental design – three, two and quasi experimental design, factorial design, theory and hypothesis, experimental control.</p>
	<p>Unit 5</p> <p>Research Ethics</p> <p>ICMR guidelines for research on human subjects and animals, 2000, informed consent, standard of care, philosophy, law governing ethics, public health ethics, disaster research and ethics, community participation, vulnerable population, conflict of interest, publication ethics.</p>

**1. Recommended Texts:**

- a. S.P.Gupta (2001), “Statistical methods”, Sultan chand nd Co, Educational Publishers, Daryaganj, New Delhi
- b. A.N.Sadhu and Amarjit Singh, “Research Methodology in social sciences”, (1992), Himalaya Publishing house, Bombay

**2. Reference Books:**

- a. John W. Best and James V. Kahn, “Research in education” (2000), seventh edition, Prentice Hall of India Pvt Ltd, New Delhi.
- b. Lokesh Koul (1998), “Methodologyof educational research”, 3<sup>rd</sup> edition, Vikas Publishing house pvt ltd, New Delhi.
- c. Rajammal P.Devadas (1983), “A handbook on Methodology of research”, Latest edition, Sri Ramakrishna Mission.

**3. Website, e-learning resources:**

[www.wikipedia.com](http://www.wikipedia.com)

Title of the Course/Paper	<b>Labarotary Techniques -Practical</b>		
Category of the Course CORE PAPER VII	Year & Semester I year 2 <sup>nd</sup> semester	Credits 4	Subject Code MFN7
Pre-requisites	B.Sc. Nutrition FSM D, B.Sc. CND, B.Sc. Home Science or any Science graduate with PG Diploma in Nutrition and Dietetics/ PG Diploma in Catering Technology		
Objectives of the Course	To enable students to Learn the techniques of estimating the quantity of different nutrients present in food Master the technique of estimation of biochemical parameters in blood and urine.		
Course Outline	Unit 1 Estimation of Blood haemoglobin Estimation of Serum glucose, Urea, Creatinine and electrolytes Estimation of Serum total protein, albumin, A/G ratio Estimation of Urinary Creatinine		
	Unit 2 Estimation of protein content in food by the Macrokjeldahl method. Estimation of Serum triglycerides Estimation of Serum phospholipids Estimation of Serum cholesterol		
	Unit 3 Estimation of caloric value of food (dextrin) using the Bomb Calorimeter (group experiment). Estimation of moisture content in food using infrared moisture balance.		
	Unit 4 <b>DEMONSTRATION EXPERIMENTS</b> Estimation of fat content in food using the soxhlet ether extraction method. Estimation of total lipids in egg yolk. Estimation of protein content in food by the Microkjeldahl method. Estimation of ascorbic acid in food by the 2-4 dinitrophenylhydrazine method - Demonstration Estimation of thiamine/riboflavin in food by Fluoremetric method.		
	Unit 5 <b>DEMONSTRATION EXPERIMENTS</b> Estimation of dietary fibre (group experiment) Determination of BMR (group experiment) Estimation of glycogen. Paper chromatography of sugars (ascending) demonstration		

#### Recommended Texts :-

- a. Sadasivam, S and Manickam, A (1997), "Biochemical Methods", 2<sup>nd</sup> Edition, New Age International Publishers, New Delhi.
- b. Karison and Peterson (1971), – Introduction to modern biochemistry Academic press, New York, London.

#### 2. Reference Books:

- a. Deb A.C (1999), "Concepts of biochemistry", Books and Allied (P) Ltd., Calcutta

- b. Harper H.A. (1997), "Review of physiological chemistry, Lange Medical Publications, 21<sup>st</sup> edition, Los Angeles
- c. West, Todd and Van Brouggan, (1986), "Text book of biochemistry", The Macmillan Company, New York
- d. Albert L. Lehninger (1992), "The molecular basic of cell structure and function", Kalyani Publishers, New Delhi.

### 3. Website, e-learning resources:

<http://www.gwu.edu/~mpb> - metabolic pathways of biochemistry

<http://www.indstate.edu/thcme/mwking/inborn.html> - inborn errors of metabolism

<http://www.worthington-biochem.com/introBiochem/introEnzymes.html> - enzymes

<http://en.wikipedia.org/wiki/Biochemistry> - biochemistry encyclopedia

Title of the Course/Paper	<b>Nutrition through life cycle</b>		
Category of the Course CORE PAPER VIII	Year & Semester I year 2 <sup>nd</sup> semester	Credits 4	Subject Code MFN8,MFSM8,MFRM8, MHDFS8, and MTSFD8
Pre-requisites	B.Sc. Nutrition FSM D, B.Sc. CND, B.Sc. Home Science or any Science graduate with PG Diploma in Nutrition and Dietetics/ PG Diploma in Catering Technology		
Objectives of the Course	To enable the students to a. Understand the role of role of nutrition in maintaining good health. b. Understand the dietary modifications at different stages of family life cycle.		
Course Outline	Unit I Introduction to Life cycle, Role of nutrition – the nutrients. A brief reminder on diet influences during the life cycle – Nutritional needs. Nutrition and assessment basis – anthropometry, biochemical, clinical and dietary – importance of nutritional assessment.		
	Unit 2 Maternal malnutrition – the cause and outcome of pregnancy, physiology, stages of foetal growth, effects of malnutrition, effects of smoking, nausea, vomiting, constipation, heart burn, PIH, eclampsia and pre-eclampsia. Lactation Lactation and human milk – Physiology, the native of human milk, colostrums – composition of human milk. Diet for nursing mother, advantages of breast feeding, basic values, importance of breast feeding over artificial feeding, public health measures for pregnant and lactating women		

	<p>Unit 3</p> <p>Infancy – Nutritional assessment, nutrient needs, milk, lactose intolerance, infant formula – meaning, supplementary food- liquid, semi-solid and solid food choices, special nutritional concerns in infant feeding. Feeding the pre-mature infant, allergies and obesity. Nutritional disorders in infancy and childhood deficiency. PEM, Vitamin A Deficiency, Anaemia, Immunisation.</p> <p>Childhood</p> <p>Nutrient needs, factors influencing food choices, food acceptance, parental influences, pre-school children, normal food behaviour.</p>
	<p>Unit 4</p> <p>School age children</p> <p>Food patterns, meal patterns, prevention of nutrition and health problems. Iron deficiency anaemia, over weight and obesity, dental caries.</p> <p>Adolescence – Nutrient requirements, eating behaviour, irregular meals, factors influencing eating behaviour, eating disorders like anorexia, bulimia, obesity, adolescent pregnancy – hazards to the mother, to the infants, weight gain, assessment of needs of nutrition.</p>
	<p>Unit 5</p> <p>Ageing</p> <p>Physiological aspects, nutrition, digestion and absorption, nutrient requirements of older people, RDA, Food selection patterns of the older people, changes in life long food pattern, implications for nutrition education.</p> <p>Nutrition education – Principles, methods, individual counselling, group counselling, family counselling, computers in nutrition education.</p>

### 1. Recommended Texts:

- Caroline E. Townsend and Ruth A. Roth (2000), “Nutrition and diet therapy, 7<sup>th</sup> edition, Delmar, New York.
- Kathleen Mahan, L and Sylvia Escott – Stump (2002), Krause’s food, nutrition and diet therapy, 11<sup>th</sup> edition, Saunders, Philadelphia.
- Gordon, M.W and Paul M.Insel (1996), “Perspectives in nutrition, 3<sup>rd</sup> edition, Mosby, USA.
- Eleanor Noss Whitney, Sharon Rady Rolfes (2002), “Understanding nutrition”, 9<sup>th</sup> edition, Wadsworth Thomson Learning, Australia.
- Geoffrey P. Webb (2002), “Nutrition A. Health Promotion Approach, 2<sup>nd</sup> edition, Arnold, London.

### 2. Reference Books:

- Scroaff, M (2004), “Child health care programmes”, 1<sup>st</sup> edition, Adhyayam Publishers and distributors, Delhi.
- Mira Seth (2001), “Women and Development- The Indian experience”, Sage Publications, New Delhi.
- Francis Gienkiewicz Sizer, Eleanor Nass Whitney (2003), “Nutrition concepts and controversies”, 9<sup>th</sup> edition, Thomson Wadsworth, Australia.
- Michael, J.Gibney and Barri M. Margret (2004), Public Health Nutrition, Black Well Science UK.

### 3. Website, e-learning resources:

[www.bam.gov/](http://www.bam.gov/)  
[www.health.gov.healthypeople](http://www.health.gov.healthypeople)  
[www.ncemch.org](http://www.ncemch.org)  
[www.e-geriatric.net](http://www.e-geriatric.net)  
[www.cfsan.fda.gov](http://www.cfsan.fda.gov)



Title of the Paper	<b>Food Microbiology</b>		
Category of the Course Elective Inter – Disciplinary Core Paper IX	Year & Semester I Year 2 <sup>nd</sup> Semester	Credits 3	Subject Code MFN9,MFSM9, MFRM9,
Pre-requisites	B.Sc. Nutrition FSM D, B.Sc. CND, B.Sc. Home Science or any Science graduate with PG Diploma in Nutrition and Dietetics/ PG Diploma in Catering Technology		
Objectives of the Course	To enable the students to Gain knowledge of the role of micro-organisms in health and disease Understand the role of micro-organisms in health and disease Gain knowledge of micro-organisms in relation to food and food preservation.		
Course Outline	<p><b>Unit I</b> Introduction to microbiology and its relevance to everyday life.</p> <p><b>Unit 2</b> General characteristics of micro organisms-bacteria, viruses, yeasts, moulds, algae, protozoa. Morphology, classification, motility, nutrition, respiration and reproduction.</p> <p><b>PROTOZOA</b> Morphology, reproduction, motility and classification Entamoeba histolitica – Plasmodium Vivax – Balantidium Coli.</p> <p>Distribution and role of micro organisms in</p> <p>a) <u>Soil</u> i) Micro organisms in the soil ii) Nitrogen Cycle</p> <p>b) <u>Water</u> i) Micro organisms in water ii) Total bacterial count in water iii) Sanitary tests done on water iv) Listing of water borne infections.</p> <p>c) <u>Air</u> i) Micro-organisms present in air ii) Total bacterial count of air. iii) Listing of air borne infections.</p> <p>d) <u>Sewage</u> i) Composition of sewage ii) Effect of treatment of sewage by micro-organisms, septic tanks, and Activated sludge process.</p> <p>Destruction of Bacteria</p> <p>a) Sterilization i) Application of dry heat, burning, flaming and hot air oven. ii) application of moist heat, boiling, pasteurization, steam steriliser and autoclave. iii) Sterilization with the use of filters.</p> <p>b) Pasteurization Advantages involved in pasteurization/methods – holder, flash.</p> <p>c) Disinfection Methods of disinfection, natural, physical and chemical.</p>		

	<p>Unit 3</p> <p>Purification of water - industrial and domestic methods</p> <ul style="list-style-type: none"> <li>i) Industrial method of purification of water, sedimentation, filtration – slow sand filters and rapid sand filters. Differences between slow and rapid sand filters – disinfection of water with the use of chemicals.</li> <li>ii) Domestic method of water purification – involving simple techniques like straining water through muslin cloth, filtration of water by ‘three pitchers system and use of domestic filters like Pasteurs, Chamberland filters and Berkfield filters. Use of certain common chemicals like alum, quick lime and permanganate in filtration.</li> <li>iii) Micro-organism in infection, resistance and immunity</li> <li>iv) Different methods of spread of infection.</li> <li>v) Reaction of the body to infection cellular and chemical defences – phagocytoses- antigen – antibody,. 2 examples of antigen antibody reactions.</li> <li>vi) Immunity – active and passive – artificial and natural</li> </ul> <p>Allergy and hypersensitivity</p> <ul style="list-style-type: none"> <li>i) Different types of allergies like idiosyncrasies, allergy of infection, contact dermatitis and drug allergy.</li> <li>ii) Hypersensitivity – definition – anaphylaxis and serum sickness.</li> </ul> <p>Unit 4</p> <p>Chemotherapy and antibiotics</p> <ul style="list-style-type: none"> <li>i) Chemotherapy – use of sulphonamides, sulphones and PAS. Antibiotics – use of antibiotics, spectrum of activity, mode of administration, complication arising due to constant use of antibiotics, sensitivity tests done on antibiotics. Brief knowledge of any four common antibiotics.</li> </ul> <p>General principles underlying spoilage</p> <p>Chemical changes by Micro-Organism fitness or unfitness of food for consumption – causes of spoilage – classification of foods by the cause of spoilage – factors affecting – kinds and numbers of micro-organisms in food – growth and chemical changes – caused by micro-organisms.</p> <p>Unit 5</p> <p>Fermentation, Putrefaction and decay</p> <ul style="list-style-type: none"> <li>i) Fermentation – aerobic respiration, anaerobic respiration, products of fermentation.</li> <li>ii) Parts displayed by micro-organisms in putrefaction and decay.</li> </ul> <p>Microbiology of food poisoning, food infections and food borne diseases, principles of food preservation</p> <ul style="list-style-type: none"> <li>i) Microbial food poisoning by Staphylococci, Salmonella of food poisoning group and clostridium botulinum (Botulism). Measures to prevent microbial food poisoning.</li> <li>ii) Food infections – food borne diseases – dysenteries, diarrhoea, typhoid, Cholera.</li> </ul>
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### 1. Recommended Texts:

- a. Joshua A.K. (1971), Microbiology – India printing works, Madras.
- b. Carpenter, Microbiology – W.B. Saunders Co., London.
- c. Salie, A.J., Fundamental principles of Bacteriology – McGraw Hill Book Co.,

- d. R.C. Rubey and D.K. Maheshwari, A textbook of Microbiology
- e. Pelczar J. Michael, Microbiology concepts and application
- f. Ananthanarayanan. R. & Paniker C.K.J., Textbook of Microbiology.

## 2. Reference Books:

- a. Frazier. W.C, Food Microbiology – Mc Graw Hill Book and Co; New York.
- b. Smith and Water, (1975). Introductory food services – McGraw Hill Book and Co., New York
- Westwood and Harger (1966) :  
Food service in institutions., John Wiley and Sons, Incorporation, New York, London.
- c. Adams M.R and Moss M.O (1995), Food Microbiology, the Royal society of chemistry, Cambridge.
- d. Banart. G.J, Basic food Microbiology. Chapman and Hall, New York.
- e. Hobbs BC and Roberts. D, Food poisoning and food hygiene. Edward Arnold (a division of Hodder and Stoughton), London.

## 3. Website, e-learning resources:

[www.cfsan.fda.gov](http://www.cfsan.fda.gov) – Center for food safety and applied nutrition  
[www.foodsafetycouncil.org](http://www.foodsafetycouncil.org) - International food safety council  
[www.who.int/water\\_sanitation\\_health/hygiene/en/](http://www.who.int/water_sanitation_health/hygiene/en/) - Sanitation and hygiene  
<http://www.microbiol.org> – Microbiology network  
<http://mic.sgmjournals.org> – microbiology journal

Title of the Course/Paper	Experimental Foods		
Category of the Course EXTRA DISCIPLINARY PAPER X	Year & Semester I year 2 <sup>nd</sup> semester	Credits 3	Subject Code MFN10, MFSMD10
Pre-requisites	B.Sc. Nutrition FSM D, B.Sc. CND, B.Sc. Home Science or any Science graduate with PG Diploma in Nutrition and Dietetics/ PG Diploma in Catering Technology		
Objectives of the Course	To enable students to Evaluate foods using sensory organs Know the changes in food during different types of processing Know the different types of packaging and preservation of food		
Course Outline	Unit 1: Evaluation of foods: a) Factors affecting acceptability of foods; planning and conducting acceptability studies. Use of sensory organs in the evaluation of foods- visual, tactile, olfactory and gustatory. b) Principles of objective evaluation; Selection of taste panel, types of tests needed. c) Principles of Subjective evaluation; Methods for objective evaluation- recent studies; improvised methods for laboratory studies.		
	Unit 2: Changes in food during a) Preparation b) Cooking by different methods c) Browning reactions- enzymatic and non-enzymatic.		

	<p>Unit 3:</p> <p>Fats and oils- manufacture and properties of locally available fats and their uses in food preparation, rancidity. Factors affecting the absorption of fats and oils during frying.</p> <p>Enzymes in food industry. Classification, properties, enzyme applications and new developments.</p>
	<p>Unit 4:</p> <p>Food processing :</p> <p>Types and techniques, packaging material, shelf life of processed foods (cereals, nuts and oil seeds, pulses, flesh foods, instant foods, fruits and vegetables). Changes in food during processing. Determination of quality of processed foods.</p>
	<p>Unit 5 :</p> <p>Bio deterioration of foods :</p> <p>General aspects: microbial deterioration of carbohydrates, proteins and fats. Post harvest technology</p> <p>Visits : Regional Quality Control Laboratory, Central Food Technological Institute – food processing units.</p>

### 1. Recommended Texts:

- a. Paul P.C and Palmer H.H., 1972. Food theory and application, New York, John Wiley and Sons, Inc.,
- b. Mahan L.K. and Stump, S.E (2002), “Krause’s Food Nutrition and Diet Therapy”, 10<sup>th</sup> edition, W.B.Saunders company, Philadelphia.
- c. M. Swaminathan (2002), “Food and Nutrition”, BAPPCO, 88, Mysore Road Bangalore – 560 018.

### 2. Reference Books

- a.. Griswold R.M., 1963. The experimental study of foods. Boston, New York, Houghton Mifflin and Co.
- b. Bowers J., 1992. Food theory and applications, Maxwell Macmillan International edn.,

### 3. Website, e-learning resources:

- [www.fao.org](http://www.fao.org) – Food and agricultural organisation
- [www.wfp.org](http://www.wfp.org) - world food programme
- [www.foodsafetycouncil.org](http://www.foodsafetycouncil.org) - International food safety council
- [www.cfsan.fda.gov](http://www.cfsan.fda.gov)

## 13. M.SC. FOOD SERVICE MANAGEMENT AND DIETETICS

### General Objectives and objectives for each year:

#### General Objectives:

- To enable students to
- Gain knowledge in the relationship between health, food and nutrition.
- Understand the role of nutrients.
- Gain skills in Food industries as Consultant Nutritionist and in hospitals as Dietitians

#### Objectives for first year:

1. To learn the fundamentals of statistics.
2. To impart basic knowledge in the biological functions of the body and its relationship with nutrients.
3. To learn different methods of assessment of nutritional status.
4. To increase the ability to manage finance and promote marketing.
5. To impart the knowledge of research techniques.

#### Objectives for second year:

1. To learn the lay out of food industries.
2. To understand the nutrients and gain expertise in planning, preparing and serving therapeutic diets.
3. To learn the scope and importance, historical background, global impact of the biotechnology and achievements in biotechnology.
4. To enable students to write articles to journals – national and international.

Title of the Course/Paper	<b>Applied Statistics</b>		
Category of the Course CORE PAPER I	Year & Semester I year 1 <sup>st</sup> semester	Credits 4	Subject Code MFN1, MFSM1,MFRM1,MHDFS1, and MTSFD1
Pre-requisites	B.Sc. Nutrition FSM D, B.Sc. CND, B.Sc. Home Science or any Science graduate with PG Diploma in Nutrition and Dietetics/ PG Diploma in Catering Technology		

Objectives of the Course	To enable students apply statistical procedures to analyse numerical data and draw inferences.
Course Outline	<p>Unit I Fundamentals and diagrammatic graphic representation of data: Scope, Meaning and limitations of statistics as a tool for decision making under uncertainty. Diagrammatic representation of data – bar chart, Pie diagram. Graphical representation of data – histogram, frequency polygon and curves, cumulative frequency curves – ogives – symmetric and skewed distribution – logarithmic graphs.</p> <p>Unit 2 Measures of central tendency and variability. Mean, Median and mode and their relative merits. Measures of dispersion. Range, quartile deviation, Variance and standard deviation. Relative measures of dispersion Coefficient of variation, percentiles and percentile ranks. Skewness and kurtosis (Concepts only)</p> <p>Unit 3 Probability concepts Rules of probability problems, simple problems, the meaning and importance of normal distributions. Correlation Methods Association of attributes, the meaning of correlation – product moment, co-efficient of correlation. Rank correlation, scatter diagram and Regression lines and their uses. Concepts of partial and multiple correlation (Meaning and interpretation of coefficient)</p> <p>Unit 4 Sampling from infinite populations: Concept of sampling distribution and standard error. Relationship between sample size and standard error. Standard errors of sample mean. Sample variance, sample standard deviation and sample mean. Sample standard deviation and sample proportion and the differences of these values.</p> <p>Unit 5 Tests of Significance: Shell hypothesis – calculation of 't' test – critical ratio – chi – square, non parametric statistics. Testing hypothesis – proportion and means – large samples – small samples – testing chi square distributions – characteristic – F distribution – testing of population variance – Analysis of variance – one way and two way.</p>

1. **Recommended Texts:**

- a. Fisher R.A, (1948), "Statistical methods for research works" Harper Publishing Co.,
2. Reference Books: At least 2 Indian Authors; 2 Foreign Authors
  - a. Gupta S.P (1972), statistical methods, Sultan Chand and Sons.
  - b. Guilfer J.P (1965), Fundamental statistics in Psychology and education, New York, Mc Graw Hill book Co.
  - c. Gauvet H.E (1958), "Statistics in Psychology and education. Asian student education.
  - d. Sreedar G.V. (1981), "Statistical methods", Allied Publishers Pvt. Limited

V. Course Structure:

Title of the Course/Paper	<b>Advanced Human Physiology</b>		
Category of the Course CORE PAPER II	Year & Semester I year 1 <sup>st</sup> semester	Credits 4	Subject Code MFSMD2, MFN2
Pre-requisites	B.Sc. Nutrition FSM D, B.Sc. CND, B.Sc. Home Science or any Science graduate with PG Diploma in Nutrition and Dietetics/ PG Diploma in Catering Technology		
Objectives of the Course	To enable the students to : 1. Learn the pathological condition related to Nutritional disorders. 2. Understand the recent advances in Applied Physiology.		
Course Outline	<p>Unit 1. The General and Cellular Basis for Physiology :</p> <p>Body fluid compartment- membrane potential- inter cellular communication – Homeostasis- Aging.</p> <p>Nervous System :</p> <p>Excitable nerve and muscle tissue- transmission reflexes, cutaneous and deep visceral sensation, vision- central regulation of visual function, learning and equilibrium- smell and taste, Arousal mechanism – Techniques in determination of electrical activity of the brain- control of posture and movement – the autonomic nervous system – neural basis of instinctual behaviour and emotions.</p> <p>Unit 2. Endocrinology and reproductive function:</p> <p>Pituitary , thyroid, pancreas, adrenal – medulla and adrenal cortex. Development and functions of reproductive organs.</p> <p>Gastro-intestinal system:</p> <p>Digestion and absorption, regulation and gastro intestinal function.</p> <p>circulation:</p> <p>circulating body fluid – origin of heart beat and electrical activity of heart – ECG – interpretation. Latest development in cardiac condition. Angioplasty and echocardiogram. Cardio vascular regulatory mechanism and homeostasis.</p> <p>Unit 3. Respiration:</p> <p>Review of respiratory organs – pulmonary function – gaseous transport in lungs and tissues – regulation – respiratory adjustment in health and diseases.</p> <p>Unit 4. Excretory system</p> <p>Review of skin and kidney – renal function, latest findings in renal therapy.</p> <p>Unit 5. Immune system:</p> <p>Innate and acquired immunity – antigen – antibody reaction, role of lymphocytes, cell mediated immunity.</p>		

#### 1. Recommended Texts:

- f. Guyton, A.C.,(2001), “Functions of the Human Body”, W.B. Saunders company, Philadelphia, Latest edition.
- g. Guyton, A.C. and Hall (2001), “Textbook of Medical Physiology”, X edition, Harcourt Asia Pvt. Ltd., Siingapore.
- h. Hoffman, J. F. and Jamieson, J. D. (1997), “Cell Physiology”, Oxford University Press, New York.

- i. Chakrabarti et al., (1994), "Human Physiology", The New Book Stall Calcutta.  
 j. Joshi, V. D. (1995), "Physiology – Preparation Manual for Undergraduates", Churchill Livingstone, New Delhi.

**2. Reference Books:** Jain, A. K. (2003), "Textbook of Physiology", Arichal Publishing Company.  
 a. Chaudhri, A. R. (2000), "Textbook of Practical Physiology", Paras Publilshing, Hyderabad.  
 b. Brown, H. et al. (1997), "Physiology and Pharmacology of the Heart", Oxford Blackwell Science, New York.  
 c. Mackenna and Callender (1998), "Illustrated Physiology", Churchill Livingstone, New York.

**3. Website, e-learning resources: .**

<http://members.aol.com/Bio50> - Human Physiology lecture notes

<http://www.unomaha.edu/hpa> - Human Physiology and anatomy

Title of the Course/Paper	<b>Advanced Food Science</b>		
Category of the Course CORE PAPER III	Year & Semester I year 1 <sup>st</sup> semester	Credits 4	Subject Code MSFMD3, MFN3
Pre-requisites	B.Sc. Nutrition FSM D, B.Sc. CND, B.Sc. Home Science or any Science graduate with PG Diploma in Nutrition and Dietetics/ PG Diploma in Catering Technology		
Objectives of the Course	To enable students to a. Understand the composition of various foods and the effects of cooking and processing on various components. Learn the food laws and standards. Learn the various scientific methods available for quality control of foods.		
Course Outline	Unit 1. Cereals and millets: structure and composition of the grain – starch cookery . Rice and rice products – processing and nutritive value of wheat and wheat products – processing and nutritive value. Baked products – types and preparations. Breakfast foods from other cereals – corn, oats and ragi. Pulses: composition – processing – toxic constituents		
	Unit 2. Nuts and oil seeds: Composition – processing – toxic constituents Sugar and jaggery: Types, nutritive value, properties – manufacture- sugar cookery. through other pathogenic organisms in food, symptoms, methods to control and prevent infection.		
	Unit 3. Fats and oils: Types, composition, processing and properties – changes during cooking and storage – emulsions – role of fats in cookery. Vegetables and fruits : Composition – effect of cooking – effect of cooking on pigments and polyphenols – vegetables and fruit products – processing, preservation and nutritive value.		
	Unit 4. Browning reactions in foods: Enzymatic and non-enzymatic Enrichment and fortification : Objectives – methods.		



	Unit 5. Post harvest technology: General methods of food grains, vegetables and fruits. Food microbiology: sources of contamination of foods. Significance of organisms like clostridium, botulinum, staphylococci, perfringens in infection. Sources of infection
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### 1. Recommended Texts:

- Manay, S. and Shadaksharaswamy, M. (1997), Food Facts and Principles, New Age International Publishers, New Delhi.
- Bennion, M.(1980), Introductory Foods, 7<sup>th</sup> ed. Macmillan Publishing Co. USA
- . Sizer F. and Whitney, E. (2003), Hamilton and Whitney's Nutrition: concepts and controversies, ninth edition, Wadsworth Publishing Co.
- Finch C.F. (1984), Food Preparations, MacDonald and Evans Ltd. Plymouth.
- Lady Irwin College, (1986), Basic food preparation, Lady Irwin College, New Delhi.
- McGee, H (1984), Food and Cooking, Charles Schribners and Sons, New york.

### 2. Reference Books:

- Peckham, G.C. and Freeland-Graves, J.H. (1979), Foundations of Food Preparation, 4<sup>th</sup> ed. Macmillan Publishing Co. Inc. New York.
- Martland R.E and Welsby D.A (1980), Basic Cookery, Fundamental Recipes and variations, William Heinemann Ltd. London.
- B. Sivasankar, (2002), Food Processing and Preservation, Prentice Hall of India Pvt. Limited., New Delhi.
- Premlatha Mullick (1995), "Textbook of Home Science", Kalyani Publishers, India.

### 3. Website, e-learning resources:

[www.fao.org](http://www.fao.org) – Food and agricultural organisation  
[www.wfp.org](http://www.wfp.org) - world food programme  
[www.foodsafetycouncil.org](http://www.foodsafetycouncil.org) - International food safety council  
[www.cfsan.fda.gov](http://www.cfsan.fda.gov) – Center for food safety and applied nutrition

Title of the Course/Paper	<b>Financial and Marketing Management</b>		
Category of the Course CORE PAPER IV	Year & Semester I year 1 <sup>st</sup> semester	Credits 4	Subject Code MSFMD3
Pre-requisites	B.Sc. Nutrition FSM D, B.Sc. CND, B.Sc. Home Science or any Science graduate with PG Diploma in Nutrition and Dietetics/ PG Diploma in Catering Technology		
Objectives of the Course	To enable students to Understand the concepts of business Learn the accounting principles, different types of entry		
Course Outline	Unit 1. Financing of business: <ol style="list-style-type: none"> <li>Concepts, objectives and functions</li> <li>Capital budgeting; determining capital needs both long term and short term, capital structure, sources of finance, short term and long term.</li> <li>Cash budgets, cash and fund flow statements, break-even analysis.</li> <li>Management of working capital, financing of catering units.</li> <li>Entrepreneurship</li> </ol>		

	Unit 2. Financial accounting: Single and double entry – book keeping. Accounting practices from journal to balance sheet. Management accounting, decision making, discount rate, sinking fund, P.F. of money. Taxation Meaning and principles of taxation, kinds of taxes. Specific taxes in the Indian tax system, major central and state taxes. Reference of each tax to commercial catering establishments.
	Unit 3. Banking – Principles of banking – credit creation by commercial banks – role of commercial banks in promoting business with respect to catering industry – foreign exchange.
	Unit 4. Marketing and sales management : Marketing functions- functions of sales management. Advertising and sales promotion, scientific salesmanship. Principles of salesmanship. Importance of advertising, objectives of advertising, advertising campaign, media selection, arguments for and against advertisement. Principles and channels of distribution.
	Unit 5. Pricing policies: Importance of pricing, pricing policies, alternatives in price fixation. Factors affecting pricing of a product. Wholesale and retail pricing. Food and beverage costing and pricing.
	Group project: in any one of the above areas.

### 1. Recommended Texts:

- Kotas, R. and Davis, B. (1973), “Food Cost Control”, International Textbook Company Ltd. London.
- Jain, S. P. and Narang, K. L. (1990), “Cost Accounting”, Kalyani Publishers, New Delhi.
- Sethi Mohini and Surjeet Malhan, (1987), “Catering Management-An Integrated Approach”, Wiley Eastern Ltd.
- Kumar, H.L. (1986), “Personnel Management in the hotel and Catering Industry”, 1<sup>st</sup> Ed, Metropolitan Book Co, Delhi.
- Bhushan, Y. K. (1994), “Fundamentals of Business Organisation and Management, 13<sup>th</sup> Edition, Sulthan Chand and Sons, New Delhi.

### 2. Reference Books:

- David, A. and Stephen, P. (2002), “Personnel / Human Resource Management”, Prentice Hall of India Pvt. Ltd., New Delhi.
- Jain, S. P. and Narang, K. L. (1999), “Hotel Accountancy and Finance”, Kalyani Publishers, New Delhi.
- Flippo Edwin.B. (1984), “Personnel Management”, 6<sup>th</sup> edition, McGraw Hill Book Co, New York.
- Kinton and Casarani (1984), “Theory of Catering”, Butter and Tanner Ltd.
- Kotler P (1996), Marketing nmanagement, Prentice – Hall of India POvt Ltd, New Delhi, 110001.
- Riley M. (1979), “Understanding food cost control, Edward Arnold, London.
- Pareek Rao, Pastorjee, (1989), Behavioural process in organization, Oxford IBH.

### 3. Website, e-learning resources:

<http://www.cps.gov.uk/publications/humanresources/pmm.html> - Personnel management manual

<http://www.hrmguide.co.uk/hrm/chap1/ch1-links1.htm> - HRM guide

<http://dmc.engr.wisc.edu/courses/principles/AA04-06.html> - Principles of management

Title of the Course/Paper	<b>Community Nutrition</b>		
Category of the Course CORE PAPER V	Year & Semester I year 1 <sup>st</sup> semester	Credits 4	Subject Code MFSMD5, MFN5
Pre-requisites	B.Sc. Nutrition FSM D, B.Sc. CND, B.Sc. Home Science or any Science graduate with PG Diploma in Nutrition and Dietetics/ PG Diploma in Catering Technology		
Objectives of the Course	To enable the students to Know the various National and International organisations working for nutrition Know the prevalence of malnutrition in India Know the measures to overcome malnutrition		
Course Outline	Unit 1. Nutrition and national development. Human life cycle – recommended dietary allowances for Indians. National organizations concerned with food and nutrition – ICMR, State Nutrition Councils and Beaureaus – Central and State. Health education Boards, social welfare boards, women's voluntary services, etc.		
	Unit 2. International organizations concerned with foods and nutrition, FAO, WHO, UNICEF, World Bank, etc. Assessing the food and nutrition problems in the community – Dietary survey, anthropometry, clinical examinations, laboratory examinations.		
	Unit 3. Prevalence of malnutrition in India. Environmental and socio-economic factors related to malnutrition and family size and composition. Etiology of malnutrition – dietary patterns, food and nutrient intake, food losses, food waste, customs, habits, prejudice, ignorance, nutrition and infections.		
	Unit 4. Measures to overcome malnutrition: a. Need for an integrated approach to solve the problems of nutrition. b. The package program of immunization, nutrition and education. C. feeding programs.		
	Unit 5. Teaching and extension of better nutrition – nutrition education for the community – principles of planning, executing and evaluating nutrition education programmes. Food production and distribution. National nutritional policy. Nutrition in high altitudes, space, Antarctic and Arctic expeditions and during emergency.		

#### 1. Recommended Texts:

- Jelliffe. D.B. (1996), The assessment of nutritional status on the community – WHO Monograph Series – No.53. Geneva.
- Reh, Emma. (1976), Manual on household food consumption Surveys. FAO. Nutritional studies, No.18. Rome.
- Shanti Ghosh (1977), The feeding and care of infants and young children. Voluntary Health association of India – New Delhi.

#### 2. Reference Books:

- Ebrahim G.J. (1983), Nutrition in Mother and child health: London, Macmillan.

- b. Ritchey, S.J. and J.Taper (1983), Maternal and Child Nutrition. Harper and row Publishers, New York.
- c. McLarea, D.S. (Ed.). (1983), Nutrition in the community. John Wiley and sons.
- d. Shukla, P.K. (1982), Nutritional Problems of India – Prentice Hall of India Pvt. Ltd., New Delhi.

**3. Website, e-learning resources:**

<http://www.hsc.wvu.edu/library/U-links/community-nutrition.htm>

[www.asns.org/nj04a.pdf](http://www.asns.org/nj04a.pdf)

[www.fns.usda.gov/fsec/FILES/SafetyNet.pdf](http://www.fns.usda.gov/fsec/FILES/SafetyNet.pdf)

[www.ext.vt.edu/actionforhealthykids/ assistanceguide/lesson5background.pdf](http://www.ext.vt.edu/actionforhealthykids/assistanceguide/lesson5background.pdf)

Title of the Course/Paper	Research Methodology		
Category of the Course CORE PAPER VI	Year & Semester I year 2 <sup>nd</sup> semester	Credits 4	Subject Code MFN6, MFSMD6, MFRM6,MHDFS6,MTSFD6
Pre-requisites	B.Sc. Nutrition FSM D, B.Sc. CND, B.Sc. Home Science or any Science graduate with PG Diploma in Nutrition and Dietetics/ PG Diploma in Catering Technology		
Objectives of the Course	To enable students to: 1. Understand the fundamental principles and techniques in Research Methodology 2. Get an overview of the methodologies used in educational research.		
Course Outline	Unit I The meaning of research – Theory, hypothesis, purpose, assessment and evaluation Research report – style, manual, format, evaluating a research report, foot notes, plagiarism, technical and popular reports.		
	Unit 2 Methods and tools of research – reliability and validity of research tools, quantitative and qualitative studies, observation, questionnaire, interviews, opinionnaires (Thurstone technique and likert method). Collection of data – Primary and secondary, published and unpublished and editing of primary and secondary data.		
	Unit 3 Sampling Sampling and sample designs, law of statistical regularity, law of inertia of large numbers, methods of sampling, advantages and limitations of probability sampling, non probability sampling. Classification and tabulation of data – Types of classification – geographical, chronological, quantitative and qualitative. Discrete and continuous frequency distribution, relative and two way frequency distribution, tabulation of data, types of tables.		
	Unit 4 Diagrammatic and graphic presentation Types of diagrams, Graphs, Techniques of constructing graphs, Limitations of diagrams and graphs Interpolation and extrapolation – definition, significance, assumption- methods of interpolation – graphic method and list of other methods. Experimental and Quasi experimental research – principles of experimental research, variables, controlling extraneous variables, experimental validity, experimental design – three, two and quasi experimental design, factorial design, theory and hypothesis, experimental control.		

	Unit 5 Research Ethics ICMR guidelines for research on human subjects and animals (2000) informed consent, standard of care, philosophy, law governing ethics, public health ethics, disaster research and ethics, community participation, vulnerable population, conflict of interest, publication ethics.
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## 2. Recommended Texts:

- S.P.Gupta (2001), "Statistical methods", Sultan chand nd Co, Educational Publishers, Daryaganj, New Delhi
- A.N.Sadhu and Amarjit Singh, "Research Methodology in social sciences", (1992), Himalaya Publishing house, Bombay
- ICMR Guidelines for Research on Human Subjects and Animals( 2000)

## 3. Reference Books:

- John W. Best and James V. Kahn, "Research in education" (2000), seventh edition, Prentice Hall of India Pvt Ltd, New Delhi.
- Lokesh Koul (1998), "Methodologyof educational research", 3<sup>rd</sup> edition, Vikas Publishing house pvt ltd, New Delhi.
- Rajammal P.Devadas (1983), "A handbook on Methodology of research", Latest edition, Sri Ramakrishna Mission.

- Website, e-learning resources:  
[www.wikipedia.com](http://www.wikipedia.com)

Title of the Course/Paper	<b>Food Facilities Layout Equipment</b>		
Category of the Course CORE PAPER VII	Year & Semester I year 2 <sup>nd</sup> semester	Credits 4	Subject Code MFSMD7
Pre-requisites	B.Sc. Nutrition FSM D, B.Sc. CND, B.Sc. Home Science or any Science graduate with PG Diploma in Nutrition and Dietetics/ PG Diploma in Catering Technology		
Objectives of the Course	To enable students to  Know about different equipments used in Organisations.  Plan, design equipments, operation etc for Food service organisations		
Course Outline	Unit 1. Planning of Food Services a. Consideration of location, type of food service, building materials (walls, floor surfaces and coverings), financial restrictions and space limitations. b. Layout design for efficient operation and safety: space relationships among work areas. c. Planning for installation of equipment for providing (i) Noise control (ii) Good and adequate lighting in different areas (iii) Thermal comfort (heating, cooling, air conditioning and ventilation) (iv) Adequate water supply and an efficient plumbing system		

	Unit 2. Functional Equipment a. Review: Base materials used in equipment construction; insulation materials; energy sources for operation of equipment. b. Design, selection, purchase, principles of operation and care of major equipment , small equipment and tools in the food service institution.
	Unit 3. (i) Equipment for food storage – refrigerators, deep freezers and walk-in coolers, cabinets and shelves for dry food store. (ii) Kitchen equipment: Cooking, ranges and ovens, boilers and steam equipment, kitchen tools, cooking utensils and cutlery, coffee makers and toasters. (iii) Pre-preparation equipment: Mixing and grinding machines, vegetable peelers cutters. (iv) Equipment for food service: Food dispensers, bain marie, serving tools, mobile carts, freezer cabinets and water coolers, tableware and dinnerware. (v) Dishwashing equipment (vi) Cleaning equipment: Hand operated cleaners, electric vacuum cleaner. c. Trends in equipment available in the market, manufacture and sales agencies for food service equipment. Costs – initial and operational.
	Unit 4. Financial investment on physical facilities a. Cost of installation, maintenance and repair of fundamental equipment. b. Investment on major functional equipment, depreciation and replacement costs. c. Daily utility cost for operational of power equipment.
	Unit 5. Individual / group project in any one of the above areas.

### 1. Recommended Texts:

- a. Verghese, B. (1994), Professional Food and Beverage Service Management, MacMillan India Limited, Bangalore.
- b. Bennion, M and Hughes, d (1975), Introductory foods, Macmillan Publishing Co. New York.

### 2. Reference Books:

- a. Kinton, R et.al (2002), “Theory of catering”, 9<sup>th</sup> edition, ELST, London
- b. Manay Shakunthala, N and Shadaksharaswamy, M (1987) – Foods, Facts and Principles, Wiley Eastern Ltd. New Delhi, Bangalore.
- c. DeCenzo, D.A and Robbins, S.P. (2002), Prentice Hall of India Pvt. Ltd., New Delhi
- d. Dharmaraj, E (2002), “Food and Hotel Legislations and Policies, New Age International Publishers, New Delhi
- e. Gladwell, D. C. (1974). “Practical Maintenance and Equipment for Hotellers, Licencees and Caterers. Barric and Senkines, London.
- f. Kotschever L, and Torrell M.E (1981), “food service planning, layout and equipment, John Wiley and Sons Inc, London.
- g. West B.B. et al. (1977), Food service in institutions. John Wiley and Sons Inc, New York.

### 3. Website, e-learning resources:

<http://infotree.library.ohiou.edu/bysubject/health-and-life-sciences/food/food-service-management/>  
<http://www.capitol.state.tx.us/statutes/docs/HS/content/htm/hs.006.00.000437.00.htm>  
<http://www.hotelschool.cornell.edu/links/categories.html?id=5&name=Foodservice+Industry>

Title of the Course/Paper	<b>Nutrition Through Life Cycle</b>		
Category of the Course CORE PAPER VIII	Year & Semester I year 2 <sup>nd</sup> semester	Credits 4	Subject Code MFN8, MFSMD8,MFRM8,MHDFS8
Pre-requisites	B.Sc. Nutrition FSM D, B.Sc. CND, B.Sc. Home Science or any Science graduate with PG Diploma in Nutrition and Dietetics/ PG Diploma in Catering Technology		
Objectives of the Course	To enable the students to a. Understand the role of nutrition in maintaining good health. b. Understand the dietary modifications at different stages of family life cycle.		
Course Outline	<p><b>Unit I</b> Introduction to Life cycle, Role of nutrition – the nutrients. A brief reminder on diet influences during the life cycle – Nutritional needs. Nutrition and assessment basis – anthropometry, biochemical, clinical and dietary – importance of nutritional assessment.</p> <p><b>Unit 2</b> Maternal malnutrition – the cause and outcome of pregnancy, physiology, stages of foetal growth, effects of malnutrition, effects of smoking, nausea, vomiting, constipation, heart burn, PIH, eclampsia and pre-eclampsia. Lactation Lactation and human milk – Physiology, the nature of human milk, colostrums – composition of human milk. Diet for nursing mother, advantages of breast feeding, basic values, importance of breast feeding over artificial feeding, public health measures for pregnant and lactating women</p> <p><b>Unit 3</b> Infancy – Nutritional assessment, nutrient needs, milk, lactose intolerance, infant formula – meaning, supplementary food- liquid, semi-solid and solid food choices, special nutritional concerns in infant feeding. Feeding the pre-mature infant, allergies and obesity. Nutritional disorders in infancy and childhood deficiency. PEM, Vitamin A Deficiency, Anaemia, Immunisation. Childhood Nutrient needs, factors influencing food choices, food acceptance, parental influences, pre-school children, normal food behaviour.</p> <p><b>Unit 4</b> School age children Food patterns, meal patterns, prevention of nutrition and health problems. Iron deficiency anaemia, over weight and obesity, dental caries. Adolescence – Nutrient requirements, eating behaviour, irregular meals, factors influencing eating behaviour, eating disorders like anorexia, bulimia, obesity, adolescent pregnancy – hazards to the mother, to the infants, weight gain, assessment of needs of nutrition.</p> <p><b>Unit 5</b> Ageing Physiological aspects, nutrition, digestion and absorption, nutrient requirements of older people, RDA, Food selection patterns of the older people, changes in life long food pattern, implications for nutrition education. Nutrition education – Principles, methods, individual counselling, group counselling, family counselling, computers in nutrition education.</p>		

#### 1. Recommended Texts:

- a. Caroline E. Townsend and Ruth A. Roth (2000), “Nutrition and diet therapy, 7<sup>th</sup> edition, Delmar, New York.
- b. Kathleen Mahan, L and Sylvia Escott – Stump (2002), Krause’s food, nutrition and diet therapy, 11<sup>th</sup> edition, Saunders, Philadelphia.
- c. Gordon, M.W and Paul M.Insel (1996), “Perspectives in nutrition, 3<sup>rd</sup> edition, Mosby, USA.
- d. Eleanor Noss Whitney, Sharon Rady Rolfes (2002), “Understanding nutrition”, 9<sup>th</sup> edition, Wadsworth Thomson Learning, Australia.
- e. Geoffrey P. Webb (2002), “Nutrition A. Health Promotion Approach, 2<sup>nd</sup> edition, Arnold, London.

## 2. Reference Books:

- a. Scroaff, M (2004), “Child health care programmes”, 1<sup>st</sup> edition, Adhyayam Publishers and distributors, Delhi.
- b. Mira Seth (2001), “Women and Development- The Indian experience”, Sage Publications, New Delhi.
- c. Francis Gienkiewicz Sizer, Eleanor Nass Whitney (2003), “Nutrition concepts and controversies”, 9<sup>th</sup> edition, Thomson Wadsworth, Australia.
- d. Michael, J.Gibney and Barri M. Margret (2004), Public Health Nutrition, Black Well Science UK.

## 3. Website, e-learning resources:

[www.bam.gov/](http://www.bam.gov/)  
[www.health.gov.healthypeople](http://www.health.gov.healthypeople)  
[www.ncemch.org](http://www.ncemch.org)  
[www.e-geriatric.net](http://www.e-geriatric.net)  
[www.cfsan.fda.gov](http://www.cfsan.fda.gov)

Title of the Paper	<b>Food Microbiology</b>		
Category of the Course Elective Inter – Disciplinary Core Paper IX	Year & Semester I Year 2 <sup>nd</sup> Semester	Credits 3	Subject Code MFN9, MFSMD9,MFRM9
Pre-requisites	B.Sc. Nutrition FSM D, B.Sc. CND, B.Sc. Home Science or any Science graduate with PG Diploma in Nutrition and Dietetics/ PG Diploma in Catering Technology		
Objectives of the Course	To enable the students to Gain knowledge of the role of micro-organisms in health and disease Understand the role of micro-organisms in health and disease Gain knowledge of micro-organisms in relation to food and food preservation.		
Course Outline	Unit I Introduction to microbiology and its relevance to everyday life.		



	<p>Unit 2</p> <p>General characteristics of micro organisms-bacteria, viruses, yeasts, moulds, algae, protozoa. Morphology, classification, motility, nutrition, respiration and reproduction.</p> <p>PROTOZOA</p> <p>Morphology, reproduction, motility and classification Entamoeba histolitica – Plasmodium Vivax – Balantidium Coli.</p> <p>Distribution and role of micro organisms in</p> <p>c) <u>Soil</u> iv) Micro organisms in the soil v) Nitrogen Cycle d) <u>Water</u> v) Micro organisms in water vi) Total bacterial count in water vii) Sanitary tests done on water viii) Listing of water borne infections.</p> <p>c) <u>Air</u> i) Micro-organisms present in air ii) Total bacterial count of air. vi) Listing of air borne infections.</p> <p>d) <u>Sewage</u> i) Composition of sewage ii) Effect of treatment of sewage by micro-organisms, septic tanks, and Activated sludge process.</p> <p>Destruction of Bacteria</p> <p>a) Sterilization i) Application of dry heat, burning, flaming and hot air oven. ii) application of moist heat, boiling, pasteurization, steam steriliser and autoclave. iii) Sterilization with the use of filters.</p> <p>b) Pasteurization Advantages involved in pasteurization/methods – holder, flash.</p> <p>c) Disinfection Methods of disinfection, natural, physical and chemical.</p> <p>Unit 3</p> <p>Purification of water - industrial and domestic methods</p> <p>i) Industrial method of purification of water, sedimentation, filtration – slow sand filters and rapid sand filters. Differences between slow and rapid sand filters – disinfection of water with the use of chemicals.</p> <p>ii) Domestic method of water purification – involving simple techniques like straining water through muslin cloth, filtration of water by ‘three pitchers system and use of domestic filters like Pasteurs, Chamberland filters and Berkfield filters. Use of certain common chemicals like alum, quick lime and permanganate in filtration.</p> <p>iii) Micro-organism in infection, resistance and immunity</p> <p>iv) Different methods of spread of infection.</p> <p>v) Reaction of the body to infection cellular and chemical defences – phagocytoses- antigen – antibody,. 2 examples of antigen antibody reactions.</p> <p>vi) Immunity – active and passive – artificial and natural</p> <p>Allergy and hypersensitivity</p> <p>i) Different types of allergies like idiosyncrasies, allergy of infection, contact dermatitis and drug allergy.</p> <p>ii) Hypersensitivity – definition – anaphylaxis and serum sickness.</p> <p>Unit 4</p> <p>Chemotherapy and antibiotics</p> <p>i) Chemotherapy – use of sulphonamides, sulphones and PAS. Antibiotics – use of antibiotics, spectrum of activity, mode of administration,</p>
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	<p>complication arising due to constant use of antibiotics, sensitivity tests done on antibiotics. Brief knowledge of any four common antibiotics.</p> <p>General principles underlying spoilage</p> <p>Chemical changes by Micro-Organism fitness or unfitness of food for consumption – causes of spoilage – classification of foods by the cause of spoilage – factors affecting – kinds and numbers of micro-organisms in food – growth and chemical changes – caused by micro-organisms.</p>
	<p>Unit 5</p> <p>Fermentation, Putrefaction and decay</p> <p>i) Fermentation – aerobic respiration, anaerobic respiration, products of fermentation.</p> <p>ii) Parts displayed by micro-organisms in putrefaction and decay.</p> <p>Microbiology of food poisoning, food infections and food borne diseases, principles of food preservation</p> <p>i) Microbial food poisoning by Staphylococci, Salmonella of food poisoning group and clostridium botulinum (Botulism). Measures to prevent microbial food poisoning.</p> <p>ii) Food infections – food borne diseases – dysenteries, diarrhoea, typhoid, Cholera.</p>

### 1. Recommended Texts:

- Joshua A.K. (1971), Microbiology – India printing works, Madras.
- Carpenter, Microbiology – W.B. Saunders Co., London.
- Salie, A.J., Fundamental principles of Bacteriology – McGraw Hill Book Co.,

### 2. Reference Books:

- Frazier. W.C, Food Microbiology – Mc Graw Hill Book and Co; New York.
- Smith and Water, (1975). Introductory food services – McGraw Hill Book and Co., New York
- Westwood and Harger (1966) :  
Food service in institutions,. John Wiley and Sons, Incorporation, New York, London.
- Adams M.R and Moss M.O (1995), Food Microbiology, the Royal society of chemistry, Cambridge.
- Banart. G.J, Basic food Microbiology. Chapman and Hall, New york.
- Hobbs BC and Roberts. D, Food poisoning and food hygiene. Edward Arnold (a division of Hodder and Stoughton), London.

### 3. Website, e-learning resources:

[www.cfsan.fda.gov](http://www.cfsan.fda.gov) – Center for food safety and applied nutrition

[www.foodsafetycouncil.org](http://www.foodsafetycouncil.org) - International food safety council

[www.who.int/water\\_sanitation\\_health/hygiene/en/](http://www.who.int/water_sanitation_health/hygiene/en/) - Sanitation and hygiene

<http://www.microbiol.org> – Microbiology network

<http://mic.sgmjournals.org> – microbiology journal

Title of the Course/Paper	Experimental Foods		
Category of the Course EXTRA DISCIPLINARY PAPER X	Year & Semester I year 2 <sup>nd</sup> semester	Credits 3	Subject Code MFSMD10, MFN10
Pre-requisites	B.Sc. Nutrition FSM D, B.Sc. CND, B.Sc. Home Science or any Science graduate with PG Diploma in Nutrition and Dietetics/ PG Diploma in Catering		

	Technology
Objectives of the Course	<p>To enable students to</p> <p>Evaluate foods using sensory organs</p> <p>Know the changes in food during different types of processing</p> <p>Know the different types of packaging and preservation of food</p>
Course Outline	<p>Unit 1:</p> <p>Evaluation of foods:</p> <p>a) Factors affecting acceptability of foods; planning and conducting acceptability studies. Use of sensory organs in the evaluation of foods- visual, tactile, olfactory and gustatory.</p> <p>b) Principles of objective evaluation; Selection of taste panel, types of tests needed.</p> <p>c) Principles of Subjective evaluation; Methods for objective evaluation- recent studies; improvised methods for laboratory studies.</p> <p>Unit 2:</p> <p>Changes in food during</p> <p>a) Preparation</p> <p>b) Cooking by different methods</p> <p>c) Browning reactions- enzymatic and non-enzymatic.</p> <p>Unit 3:</p> <p>Fats and oils- manufacture and properties of locally available fats and their uses in food preparation, rancidity. Factors affecting the absorption of fats and oils during frying.</p> <p>Enzymes in food industry. Classification, properties, enzyme applications and new developments.</p> <p>Unit 4:</p> <p>Food processing :</p> <p>Types and techniques, packaging material, shelf life of processed foods (cereals, nuts and oil seeds, pulses, flesh foods, instant foods, fruits and vegetables). Changes in food during processing. Determination of quality of processed foods.</p> <p>Unit 5 :</p> <p>Bio deterioration of foods :</p> <p>General aspects: microbial deterioration of carbohydrates, proteins and fats.</p> <p>Post harvest technology</p> <p>Visits : Regional Quality Control Laboratory, Central Food Technological Institute – food processing units.</p>

## 2. Recommended Texts:

- a. Paul P.C and Palmer H.H., 1972. Food theory and application, New York, John Wiley and Sons, Inc.,
- b. Mahan L.K. and Stump, S.E (2002), "Krause's Food Nutrition and Diet Therapy", 10<sup>th</sup> edition, W.B.Saunders company, Philadelphia.
- c. M. Swaminathan (2002), "Food and Nutrition", BAPPCO, 88, Mysore Road Bangalore – 560 018.

## 2. Reference Books

- a.. Griswold R.M., 1963. The experimental study of foods. Bostn, New York, Houghton Mifflin and Co.
- b. Bowers J., 1992. Food theory and applications, Maxwell Macmillan International edn.,

**3. Website, e-learning resources:**

[www.fao.org](http://www.fao.org) – Food and agricultural organisation  
[www.wfp.org](http://www.wfp.org) - world food programme  
[www.foodsafetycouncil.org](http://www.foodsafetycouncil.org) - International food safety council  
[www.cfsan.fda.gov](http://www.cfsan.fda.gov) – Center for food safety and applied nutrition

## 14. M.Sc. DEGREE COURSE IN GENERAL GENETICS

Title of the Course / Paper	<b>PAPER I CELL BIOLOGY</b>		
Category of the Course <b>C</b>	First year and First semester	Credits 4	Subject Code <b>MGC 01</b>
Pre - requisites	Knowledge of basic Biology.		
Objectives of the Course	This is a core course to any postgraduate in life science.		
Course Outline	Unit 1 Cell Theory, Structure of bacterial, animal and plant cells, cell cycle, continuous synchronous cultures, and cell fractionation.		
	Unit 2 Plasma membrane, fluid mosaic model, membrane proteins, lipid and carbohydrates, passive, facilitated and active transport, bulk transport.		
	Unit 3 Structure and function of Mitochondria, origin and evolution, chemiosmotic theory, Structure and function of Chloroplast, light and dark reactions, other plastids.		
	Unit 4 Structure and function of golgi apparatus, lysosome and microbodies, endoplasmic reticulum, nucleus.		
	Unit 5 Growth characteristics of transformed cells, Oncogene apoptosis and necrosis, cell signaling pathways- Tyrosine kinase and Map Kinases. G-proteins, Signal peptides.		

**Recommended Text:**

Title of the Course / Paper	<b>PAPER II MICROBIAL GENETICS</b>		
Category of the Course <b>C</b>	First year and First semester	Credits 4	Subject Code <b>MGC 02</b>
Pre - requisites	Knowledge of biology at Bachelor's level.		
Objectives of the Course	This course introduces to the student the fundamental concepts of Microbial Genetics.		
Course Outline	Unit 1 Bacterial Growth: Growth pattern; Growth media; pure cultures, Isogenic strains; Nutritional and antibiotic markers.		
	Unit 2 Mutagenesis in bacteria: Types of mutants, mutagenic agents, isolation and characterization of mutants, Reversion, Suppression, conditional mutants.		
	Unit 3 Plasmid Biology: Types of plasmids: F, R, Col, Ti as examples, Degradative plasmid, plasmid compatibility.		
	Unit 4 Bacterial transformation: Competence, DNA uptake, Mechanism of transformation, detection of transformants. Bacterial Conjugations: Hfr transfer, interrupted mating experiments, F' plasmids, chromosome transfer by F'. Transduction: Generalized transduction, Co-transduction and linkage, mapping by Co-transduction, Specialized transduction.		
	Unit 5 Genetic Recombinant: Rec mutants, Rec A protein and its functions, Rec BCD protein complex, Role of rec genes in Phage replication. Phage Lambda genetics: Gene organization, the lytic and lysogenic cycle.		

1. Geoffrey M. Cooper, The Cell: A Molecular Approach, III Edition, Sinauer associates, USA.
2. Gerald Karp, 2004 Cell and Molecular Biology, IV edition, John wiley and sons, USA.

**Website:**

<http://gslc.genetics.utah.edu/teachers/index.cfm>

**Recommended Texts:**

1. Staney R. Maloy, John E. Cronan, Jr. and David Freifelder, 1994, Microbial Genetics, Jones and Bartlett publishers, London.

2. L. Snyder and W. Champness, 1997, Molecular Genetics of Bacteria, ASM press, Washington, D.C.

**Reference Books:**

1. U.N. Strips, R.E. Yasbin, 2002, Modern microbial Genetics, II Edn, Wiley-Liss, New York.
2. A.N. Glazer, H. Nikaido, 1995, Microbial Biotechnology, W. H. Freeman & Co, New York.

**Website:**

[www.umd.umich.edu/casl/natsci/microbio/micro405-505/weblinks/htm](http://www.umd.umich.edu/casl/natsci/microbio/micro405-505/weblinks/htm)  
<http://ddas77.tripod.com/fantastic-weblinks/biomicro/genetics/1-100>  
<http://www.prenhall.com/klug>

Title of the Course / Paper	<b>PAPER III EUKARYOTIC GENETICS</b>		
Category of the Course <b>C</b>	First year and First semester	Credits <b>4</b>	Subject Code <b>MGC 03</b>
Pre - requisites	Knowledge of biology at Bachelor's level		
Objectives of the Course	This paper enlightens the students on basic principles governing nuclear and extranuclear inheritance, complexity of gene regulation and mapping strategies for gene localization		
Course Outline	Unit 1 Mitosis and Meiosis – regulation of meiosis and significance – Chromosomal basis of Inheritance - Mendelian principles – Deviations – Gene interaction – Epistasis.		
	Unit 2 Sex determination and dosage compensation mechanisms in Drosophila and human - Sex linkage – Sex limited and sex influenced traits.		
	Unit 3 Linkage and chromosome mapping – Diploid mapping two point – three point crosses – Haploid mapping analysis – Unordered and ordered tetrads.		
	Unit 4 Regulation of gene expression – Regulatory elements transcription factors – post transcriptional – Translational – post translational control – Immunoglobulin genes.		
	Unit 5 Extrachromosomal Inheritance – Mitochondrial genome and mutations – Chloroplast genome – Transposable elements in Maize, Yeast, Human.		

**Recommended Text:**

1. Griffiths, A.J.F., Wessler, Susan, R., Lewontin, R.C., Gelbart, W.M., Susuki, D.T., Miller, J.H. 2005, Introduction to Genetic Analysis, Seventh Edn. W.H. Freeman and Co., New York.

**Reference Books:**

1. Robert H. Tamarin, 2002, Principles of Genetics, Seventh Edition, Tata McGraw Hill Edi., New Delhi.
2. Snustad, Peter, Michael J. Simmons, 2003, Principles of Genetics, III Ed., John Wiley & Sons Inc., USA.

**Websites:**

[www.mhhe.com/tamarin7](http://www.mhhe.com/tamarin7)  
[www.wwfreesman.com/igase](http://www.wwfreesman.com/igase)

Title of the Course / Paper	<b>PAPER IV MOLECULAR GENETICS</b>		
Category of the Course <b>C</b>	First year and First semester	Credits <b>4</b>	Subject code <b>MGC 04</b>
Pre - requisites	Knowledge of Genetics at Bachelor's level		
Objectives of the Course	This is a foundation course of Molecular biology.		
Course Outline	Unit 1: DNA: Structure and Replication: DNA as genetic material, DNA structure, semi conservative replication, Overview of replication, Mechanism of replication, Brief account of replication of DNA and RNA viruses.		
	Unit 2:RNA: Transcription and Processing: Basic process of Bacterial and Eukaryotic transcription, Mechanism of transcription, Promoters, enhancers, and transcription factors, Post translational modifications		
	Unit 3: Genetic Code: History, methods for deciphering the genetic code, General features of the genetic code, Exceptions to the universal genetic code.		
	Unit 4: The process of Translation: Biosynthesis of proteins, Initiation, Elongation and Termination, Ribosomes, mRNA, tRNA and rRNAs, Post-tranlational modifications and Signal hypothesis. Protein synthesis inhibitors.		
	Unit 5: Regulation of Gene Expression: Prokaryotic Gene Regulation, Discovery of the <i>lac</i> system, The <i>lac</i> Operon of <i>E. coli</i> . Positive and Negative control: Arabinose operon, Stringent and relaxed control. Transcriptional regulation in eukaryotic cells. RNA silencing.		

**Recommended Text:**

1. Griffiths, Wessler, Lewontin, Gelbart, Suzuki and Miller (2005). Introduction to Genetic analysis. Eighth Edition, W.H. Freeman and Company, 41 Madison Avenue, New York, USA

**Reference Books:**

1. Benjamin Lewin (2004). Genes VIII. Eighth edition, Oxford University Press.
2. Bruce Albers, Johnson, Lewis, Raff, Roberts, Walter (2002). Molecular Biology of the Cell. Eighth edition, Garland Science.

**Website:**

<http://gslc.genetics.utah.edu/teachers/index.cfm>  
<http://www.kensbiorefs.com/MolecularGen.html>



Title of the Course / Paper	<b>PAPER V PRACTICAL I</b>		
Category of the Course <b>C</b>	First year and First semester	Credits <b>4</b>	Subject Code <b>MGC 05</b>
Pre - requisites	Registration to paper I to IV.		
Objectives of the Course	The course provides some practical knowledge to theory papers taught in semester I.		
Course Outline	Unit 1 Cell Biology: 1. Study of human peripheral blood cells. 2. Cell counting – hemocytometry. 3. Total and differential cell count.		
	Unit 2 Microbial Genetics: 4. Isolation of purification of bacteria. 5. Bacterial growth curve. 6. UV survival curve – LD <sub>50</sub> .		
	Unit 3 Eukaryotic genetics: 7. Mitotic chromosome preparation employing different stains for <i>Allium cepa</i> / Mouse bone marrow. 8. Chromosome preparations to demonstrate various stages of meiosis from flower buds / Grasshopper testis / Mouse testis. 9. Human Karyotype.		
	Unit 4 Molecular Genetics: 10. Model building (Ball and stick models)- nucleosides nucleotides, dinucleotides, A-T and G-C base pairs. 11. Absorption spectra of proteins and nucleic acids. 12. Quantitation of DNA/RNA by spectrophotometry method		
	Unit 5 13. Solving problems on Mendelian ratios modified Mendelian ratios. 14. Linkage of chromosome mapping.		

Title of the Course / Paper	<b>PAPER VI PRINCIPLES OF BIOCHEMISTRY</b>		
Category of the Course <b>ED</b>	Second year and Fourth semester	Credits <b>3</b>	Subject Code
Pre - requisites	Knowledge of Chemistry and biology.		
Objectives of the Course	This course has to be studied by students undergoing postgraduate course in Genetics and this can be offered by Department of Biochemistry / Chemistry.		
Course Outline	Unit 1 Molecular constituents of cells: Proteins: Structure and properties of amino acids, peptides and proteins. Nucleic acids: Structure and properties of bases, nucleosides, and nucleotides. DNA as genetic material.		
	Unit 2 Carbohydrates- Structure of mono, di and polysaccharides, storage and structural polysaccharides. Metabolism of carbohydrates: Glycolysis, TCA cycle, HMP shunt, gluconeogenesis, glyoxalate pathway, synthesis and degradation of starch and glycogen.		
	Unit 3 Lipids, Cellular distribution, structure and properties of fatty acids saponifiable and non-saponifiable lipids, metabolism of lipids-fatty acid oxidation and synthesis.		
	Unit 4 Concepts of Nitrogen metabolism, Metabolic regulation, brief account of enzymes-concepts of Bioenergetics-radioactivity, detection of measurement of radiation-traces in Biology.		
	Unit 5 Methods in cellular biochemistry. Methods of cell and tissue disruption. Centrifugation- analytical, differential and density gradient ultracentrifugation. Chromatography-paper TLC, Ion exchange, affinity, gas and molecular sieve.		

**Recommended Text:**

1. David L. Nelson and Michael M. Cox, Lehninger, 2004 Principles of Biochemistry, IV Edition, Macmillan worth Publishers, New York, NY.

**Reference Books:**

1. [Robert Horton](#), [Laurence A Moran](#), [Gray Scrimgeour](#), [Marc Perry](#), [David Rawn](#), Principles of Biochemistry , 2003, 4th Edition, Prentice Hall.
2. Benjamin Lewin , 2003, Genes VII, Oxford University Press, USA,

**Website:**

<http://gslc.genetics.utah.edu/teachers/index.cfm>

Title of the Course / Paper	<b>PAPER VIII POPULATION GENETICS</b>		
Category of the Course <b>C</b>	First year and second semester	Credits <b>4</b>	Subject Code <b>MGC 06</b>
Pre - requisites	Familiarity with high school level maths.		
Objectives of the Course	Learning computation of gene frequencies and understanding the evolutionary process and the inheritance of quantitative character.		
Course Outline	Unit 1 Hardy – Weinberg equilibrium – properties of equilibrium populations- Extension of Hardy –Weinberg equilibrium to multiple genes and sex-lined genes. Gene frequency estimation		
	Unit 2 Change of gene frequency – Migration, mutation, selection, stable equilibrium favoring heterozygotes- unstable equilibrium – selection against heterozygotes, balance between mutation and selection, Genetic drift in small population.		
	Unit 3 Non-random mating in human population – inbreeding coefficient- Genotypic frequencies in partially inbred population- consequences of inbreeding – genetic load.		
	Unit 4 Characters showing continuous variation. Phenotypic values and population mean – components of phenotypic value and variance. Degree of genetic determination, heritability and repeatability.		
	Unit 5 Threshold characters- liability and threshold- two classes one threshold. Heritability estimation for threshold characters.		

**Recommended Text:**

1. Philip. W. Hedrick, 2000, Genetics of Populations, Second edition, Jones and Bartlett Publishers, USA.

**Reference Books:**

1. D.S. Falconer, 1985, Introduction to Quantitative Genetics, Second edition, published by Longman Groups Limited, England
2. Ching Chin Li, 1968, Population Genetics, The University of Chicago press, Ltd., London.

**Website:**

<http://gslc.genetics.utah.edu/teachers/index.cfm>

Title of the Course / Paper	<b>PAPER IX HUMAN GENETICS I</b>		
Category of the Course <b>C</b>	First year and second semester	Credits <b>4</b>	Subject Code <b>MGC 07</b>
Pre - requisites	Completing paper III		
Objectives of the Course	Learn about DNA, chromosomes, chromosomal abnormalities and genetic syndromes with chromosomal abnormalities.		
Course Outline	Unit 1 Chromosome Structure and Function: DNA packing into chromosome, normal chromosome morphology as defined by G <sup>-</sup> , Q <sup>-</sup> and R- banding techniques. Description of normal karotype. Selective banding techniques – C <sup>-</sup> and AgNOR.		
	Unit 2 Chromosome behavior during cell division. Chromosome function - Centromere and telomere. Relationship of transcriptional architecture- Lyonization.		
	Unit 3 Chromosome Abnormalities: Numerical and Structure abnormalities; Nomenclature of chromosome abnormalities.		
	Unit 4 Chromosome Abnormalities and Genetic Disorder: Down syndrome, Edward Syndrome, Patau Syndrome, Turner Syndrome, Cri-du – Chat Syndrome, Wolf- Hiruchhorn Syndrome, Prader – willi Syndrome, Angelman Syndrome. Retinoblastoma, Burkitt Lymphoma, Chronic myeloid leukemia(CML).		
	Unit 5 Fragile sites: Definition and classification: dynamic mutation and genetic disorder: Fragile (X) Syndrome (Martin Bell Syndrome).		

**Recommended Texts:**

1. Felix Mitelman, 1995, An international system of human cytogenetic Nomenclature, Karger with cytogenetic and cell genetics by Karger Framington CT, USA.
2. S.Heim and F. Mitelman, 1995, Cancer Cytogenetics – Chromosome and Molecular genetic aberrations of tumor cells. Willey – Liss Inc.

**Reference Books:**

1. O.J Miller and E. Therman, 2000, Human Chromosome, Spring verlag.
2. R.L. Nussbaum, R.R. Mcinnes, M.F. Willard, 2001, Genetics in Medicine, W.B Saunder Co., Philadelphia, USA.

**Website:**

<http://gslc.genetics.utah.edu/teachers/index.cfm>

Title of the Course / Paper	<b>PAPER X ECO GENETICS</b>		
Category of the Course <b>C</b>	First year and Second semester	Credits <b>4</b>	Subject Code <b>MGC 08</b>
Pre - requisites	Paper III and IV		
Objectives of the Course	The paper enlightens the consequences of environmental threat to the fidelity of genetic material, the screening test systems for identification of potential mutagens / carcinogens, modulation of genetic damage and biomonitoring in risk prone occupational set ups.		
Course Outline	Unit 1 Mutagens – classification - Genetic damage – consequences - DNA repair - mechanisms – Fidelity of DNA.		
	Unit 2 Mutagenicity evaluation – assay systems – bacterial, plant, Drosophila, mammalian – end points - Biomonitoring in occupational and accidental set up.		
	Unit 3 Carcinogens – classification – mechanism of carcinogenesis – concordance with mutagenesis – Genetic epidemiology.		
	Unit 4 Antimutagenesis – classification and mechanisms - Antimutagens – source – natural products – Chemoprevention.		
	Unit 5 Genetic susceptibility to DNA damage – DNA repair deficient syndromes – Xeroderma pigmentosum - Fanconi's anaemia – Bloom's syndrome – Ataxia telangiectasia.		

**Recommended Text:**

1. B.J.Kilbey, 1984, Handbook of Mutagenicity test procedures, Second Edition, Elsevier, Amsterdam.

**Reference Books:**

1. Alexander Hollander, 1984, Chemical Mutagens – Principles and methods for their detection – Vol 1-10, Plenum Press, New York.
2. Kare Berg, Genetic damage in man caused by environmental agents, Academic Press. Inc, Lo

**Websites:**

<http://gslc.genetics.utah.edu/teachers/index.cfm>

Title of the Course / Paper	<b>PAPER XI PRACTICAL II</b>		
Category of the Course <b>C</b>	First year and second semester	Credits <b>4</b>	Subject Code <b>MGC 09</b>
Pre - requisites	Registration to paper VI to VIII.		
Objectives of the Course	The course provides practical knowledge on Population Genetic, Cytogenetic and Biostatistics.		
Course Outline	Unit 1 Population Genetics 1. Estimation of gene frequency for recessive, dominant disorders and multiple alleles 2. Testing for departure for Hardy Weinberg equilibrium expectations. 3. Estimation of inbreeding coefficient for specified pedigrees and populations 4. Estimation of heritability		
	Unit 2 Human Genetics – I 5. Culture of human leucocytes and chromosomal preparations 6. Differential staining techniques – GTG- banding 7. Selective staining techniques – CBG, - NOR banding		
	Unit 3 Eco Genetics 8. Chemical induced genetic damage assessment in root meristem of <i>Allium cepa</i> / Mouse bone marrow cells / cultured Human leucocytes 9. Sister chromatid exchange analysis – invitro Human lymphocytes. 10. Micronucleus test in Mouse		
	Unit 4 Biostatistics 11. Computation of Mean, mode, median, Variance, Standard deviation, standard error of Mean 12. Student's Test, Z-test 13. Chi-square test for contingency tables.		
	Unit 5 Biostatistics 14. Estimation of correlation co-efficient and testing significance 15. Estimation of regression co-efficient 16. One-way ANOVA		

Title of the Course / Paper	<b>PAPER XII PRINCIPLES OF IMMUNOLOGY</b>		
Category of the Course <b>E</b>	Second year and fourth semester	Credits <b>5</b>	Subject Code <b>MGE 10</b>
Pre - requisites	Knowledge of biology at Bachelor's level		
Objectives of the Course	Learning of basic concepts of Immunology.		
Course Outline	Unit 1 Structure and function of cells, organs involved in immune system, Blood groups, Blood transfusion and Rh incompatibilities.		
	Unit 2 Microbial infection: Virulence and host resistance, innate immunity and acquired immunity. Antigens- types and properties, hapton, adjuvants, vaccines, toxoids and antitoxins		
	Unit 3 Immunoglobulins: structure, types and properties, theories of antibody production Complement: structure, properties and functions		
	Unit 4 Antigen-Antibody reactions <i>In vitro</i> methods: agglutination, precipitation, complement fixation, immunofluorescence, ELISA and RIA. <i>In vivo</i> methods: skin test, immunocomplex test demonstration. Hypersensitive reactions: Type I anaphylaxis, type II antibody dependent cell cytotoxicity, Type III immune complex reactions, the respective diseases and immunological diagnosis		
	Unit 5 Cell mediated immune response Lymphokines, cytokines, Type IV hypersensitivity reactions. Human leucocyte antigens (HLAs) and roles in cell/organ transplantation, disease susceptibility/resistance.		

**Recommended text:**

2. William L. Anderson, 1999, Immunology, First edition, Fence Creek Publishing LLC, Madison.

**Reference Book:**

2. Ivan Roitt, Jonathan Brostoff and David male, 1989, Immunology, Churchill livingstone, Edinburgh, London.

**Website:** <http://gslc.genetics.utah.edu/teachers/index.cfm>

Title of the Course / Paper	<b>PAPER XIII BIOSTATISTICS</b>		
Category of the Course <b>ED</b>	First year and second semester	Credits <b>3</b>	Subject Code <b>MG10</b>
Pre - requisites	Familiarity with high school level maths.		
Objectives of the Course	Equips the students with data analysis skills to handle the biological data.		
Course Outline	Unit 1: Types of biological data: Ratio scale data, interval scale data, ordinal scale data, and Nominal scale data. Frequency distributions: Bar graph, histogram, frequency polygons, and cumulative frequency polygons. Populations: Samples – random sampling – parameters and statistics.		
	Unit 2: Measure of central tendency: Mean, Median, Mode, Geometric mean and Harmonic mean. Measure of Dispersion and Variability: Range, Mean Deviation, Variance, Standard Deviation, Co efficient of variation.		
	Unit 3: Permutation and Combinations: Probability of an event, addition and multiplication- theorems of Probability. Normal Distribution: Symmetry and Kurtosis proportions of a normal distribution, the distribution of the means- Statistical hypothesis testing and probability statistical errors in hypothesis testing. One – Sample Hypotheses, Two – Sample Hypotheses,		
	Unit 4: Testing for the goodness of fit: Chi-square test for the goodness of fit, statistical significance; statistical error in hypothesis testing; Chi-square test for contingency tables; heterogeneity square. Test of Hypothesis: Normal deviation test, tests for proportion, t-test.		
	Unit 5: Simple linear regression; testing the significance of a regression; comparison of two slopes; correlation coefficient – hypothesis testing about correlation coefficient; comparison of two correlation coefficients; interclass coefficient. Analysis of Variance: one-way classification; two-way classification.		

**Recommended Text:**

1. Jerrold. H. Zar, 2004, Biostatistical Analysis, Fourth edition, Published by Pearson Education Pte. Ltd., Patparganj, Delhi, India.

**Reference Books:**

1. Statistics for Biology and Health: Mathematical and Statistical methods for genetic Analysis by Kenneth Lange (2002) Springer.

**Website:**

<http://gslc.genetics.utah.edu/teachers/index.cfm>



## **15. M.Sc. DEGREE COURSE IN HOTEL AND CATERING MANAGEMENT**

### **SYLLABUS**

#### **SEMESTER – I**

**Objective:** The objective of this semester is to impart good knowledge in Business communication, to enable the student to acquire good communication skills which is essential to hospitality industry. Introducing the student to tourism management, Food & Beverage controls, Facility Management and Advanced knowledge is imparted in Food Production Management.

#### **CORE PAPER - 1**

#### **FOOD & BEVERAGE CONTROLS**

##### **UNIT – I**

##### **Gaining a perspective on selection and procurement:**

- The concept of selection and procurement
- Distribution systems
- Force affecting the distribution system
- An overview of purchasing functions
- The organization & the administration
- Buyers relationship with purchasing other company personnel

##### **UNIT – II**

##### **Principle of Selection & Procurement**

- The purchase specification
- The optimal amount
- The optimal prices
- The optimal suppliers
- The optimal payment policy
- Typical ordering procedures
- Typical receiving procedures
- Typical storage procedures
- Security in the purchasing system.

### **UNIT – III**

#### **Selecting and procurement of the items:**

- Fresh produce
- Convenience foods
- Processed produce and other grocery items
- Dairy product / egg / meat / poultry / fish etc.,
- Alcoholic and Non- alcoholic beverages
- Non food expense items
- Furniture, fixtures and equipments.

### **UNIT – IV**

#### **Food & Beverage Control & Profitability**

- Cost concepts
- Yield management
- Profit concepts
- Productivity in Food & Beverage operations
- The methodology of Food & Beverage control
- Food & Beverage cost calculation
- Maintaining Stock

### **UNIT –V**

#### **Pricing Concepts**

- Cost & Market orientation
- Range of Price Discretion
- Sales Volume
- Price & Profit

#### **REFERENCES:**

1. Hotel Management & Costing – D.Antony Ashok Kumar
2. Food & Beverage Management & Cost Control – D.Antony Ashok Kumar
3. Purchasing & Selection & Procurement for the Hospitality Industry – willies Smith

4. Profitable Food & Beverage Management – Richard Kotas & Chandana Jayawardena.

## **CORE PAPER 2**

### **TOURISM MANAGEMENT**

#### **UNIT - I**

##### **INTRODUCTION**

- Concept of management in tourism industry
- Role of managers in tourism industry
- Tourism as behaviour

#### **UNIT – II**

##### **IMPORTANCE OF TOURISM PLANNING**

- Nature
- Scope
- Process
- Steps
- Types and limitations of planning

#### **UNIT – III**

##### **SOCIAL AND CULTURAL DIMENSIONS**

- Societies culture & Tourism
- Social & cultural behaviour
- Interaction & Impacts

#### **UNIT – IV**

##### **ECONOMIC DIMENSION**

- Types & components of Tourism
- Socio-economic importance of Tourism
- Tools of tourism economics

#### **UNIT – V**

##### **MANAGEMENT CHALLENGES**

- Leadership & team management
- Decision making
- Manpower management
- Organization structure
- Motivating factors
- Financial management

**REFERENCES:**

1. Tourism & Hospitality Industry - Fridgen
2. Hotels for Tourism Development - Dr.Jagmohan Negi
3. Tourism Management by Akshay Kumar
4. Tourism Planning - Gunclare,A.,
5. Tourism Management - P.N.Seth

## **CORE PAPER - 3**

### ***BUSINESS COMMUNICATION***

#### **UNIT –I**

##### **Meaning of Communication**

- Objectives
- Process
- Media
- Barriers.

#### **UNIT –II**

##### **Effective Business Letter**

- Need and Function of the Business Letter
- Language and layout of business letter
- Enquiries and replies
- Orders and execution
- Credit and status enquiries
- Claims and adjustments
- Collection letters
- Sales letters
- Circulars.

#### **UNIT –III**

##### **Making correspondence**

- Insurance correspondence
- Agencies correspondence
- Application for appointment
- Correspondence of a company secretary
- Letter of allotment
- Letter of regret

#### **UNIT –IV**

### **Meaning of report**

- Principles governing the preparation of report
- Qualities of good report
- Functions of a report
- Business report
- Types of reports
- Reports by individuals
- Reports by committees or sub committees
- Directors reports
- Minutes vs report – Drafting of resolutions and minutes of company meetings
- Drafting of company meeting notices
- Letters to the editor of newspapers

### **UNIT – V**

#### **Management information system**

- Introduction
- Need, definition, objectives
- Component
- Differing information for different management levels, areas
- Stages of MIS – Design guidelines for effective design, current trends.

#### **REFERENCE:**

1. Business Communication – Homai. Pradhan, Dr.Bhende
2. Business Communication Today - Courtland . L.Bovee, John V. Thill
3. Business Communication – Raymind V.Lasilekar.

**CORE PAPER – 4**  
**FACILITY MANAGEMENT**

**UNIT – I**

**INTRODUCTION**

- General Procedure of location
- Factors affecting location
- Location analysis, cost analysis
- Space determination
- Work place design
- Layout techniques
- Types of layout
- Cost comparisons

**UNIT – II**

**FACILITIES PLANNING**

- The systematic layout
- Planning pattern planning consideration
- Flow process and flow diagram
- Procedure for determining space relationship
- Architectural consideration
- Difference between carpet area and plinth area
- Approximate cost of construction estimation
- Approximate operation areas in budget types / 5 star types hotel
- Approximate other operating areas per guest room
- Approximate water / electrical load requirement - estimation

**UNIT – III**

Facility Design:

- Lodging, planning and Design

- Site Design, Hotel Design
- Guest rooms suites – The Lobby – Food Beverage Outlets – Function Areas – Administrative offices – Food Production Areas – Other Back of the House Areas.

#### **UNIT – IV**

##### **Design of Function Areas**

- Receiving Area
- Storage Areas
- The Kitchen
- Dining Room
- Office Space

#### **UNIT – V**

##### **Renovation:**

- Reasons to renovate
- the life cycle of a Hotel
- Types of Renovation
- The Renovation Process
- Other Renewal Issues

#### **REFERENCE :**

- 1) Production Management – S.K. Hajra Choudhry
- 2) Hospitality Facility Management – David M Stipanuk & Harold Roffmann
- 3) Systematic layout planning – Richard Muther Cahners
- 4) Food Service Planning: Layout & Equipment – Lendal H Kotschevar, Margaut E Terrell
- 5) Management operations and Research – N.Sathyanaarayana



## **CORE PAPER – 5**

### **ADVANCED FOOD PRODUCTION MANAGEMENT**

#### **UNIT – 1**

##### **KITCHEN ORGANIZATION**

Hierarchy in Kitchen – Functions in Kitchen, Technical, Administrative and Social – Flow of work in kitchen, Kitchen Supervision: Motivating, Organizing, Planning, Co-ordinating, Understanding, Communication, Welfare and Control – Quality in Food Production – Case Study.

#### **UNIT – 2**

##### **LARDER**

Layout of a Larder, Larder Control, Equipments, Responsibilities of Larder Chef, Cold cuts: Galantines, Making of Galantines, Types of Galantines, Ballontines. Pates and Terrines – Types of pate, Pate de foie gras, preparation of pate & Terrines. Force Meat Types – preparation and uses. Moussess and Mousselines – Types of mousse, preparation difference between mousse and mousseline.

#### **UNIT – 3**

##### **STANDARDISATION PROCESS**

Standardisation: The method of Standardization – Standard Yield, Yield testing, Standard Purchase Specification and its objectives, Standard Recipe – Compilation of Standard Recipe.

#### **UNIT – 4**

##### **INTERNATIONAL CUISINES**

Historical Background, Staple food with regional influences, Specialties, Common types of Cooking, Recipes, Characteristics, preparation, Cooking techniques, Special cooking equipments in relation to:

- (a) French Cuisine                      (b) Italian              (c) German              (d) Mexican  
(e) Japanese

#### **UNIT – 5**

#### **BAKERY**

Breads, International Breads.

Cakes, International recipes

Types of Pastries, Icings and Toppings – Varieties, Uses.

Frozen Desserts – Types & Classification of Frozen Desserts.

Ice cream types - Components and their contribution, Methodology of preparation, Different Stages

#### **REFERENCES:**

1. Practical Cookery – Kinton & Cessarani
2. Theory of Catering - Kinton & Cessarani
3. Practical Professional Cookery – Kauffman & Cracknell.

### **PRACTICALS**

#### **A. ADVANCED FOOD PRODUCTION PRACTICALS**

##### **MENU 1**

##### **AMERICAN CUISINE**

Tomato Juice Cocktail

Okra Soup

Fried Chicken

Boston Baked Beans

Carrot Pudding

##### **MENU 2**

##### **GERMAN CUISINE**

Cauliflower Salad

Cream of Potato Soup

Fish Balls in Spinach

Stuten Kuechen

Orange Cake

##### **MENU 3**

**FRENCH CUISINE**

Oeuf Diable  
Consomme Ambassadrice  
Sole bonne femme  
Supreme de volaille ala kiev  
Pommes de terre anna  
Bavarois aux fruits

**MENU 4****ITALIAN CUISINE**

Zuppa papvese  
Spaghetti with meat balls  
Chicken Rissoto  
Potato Croquettes  
Amerit

**MENU 5****GREEK CUISINE**

Greek Salad  
Cacik  
Acgolmenono  
Meat balls in tomato Sauce  
Circassian Chicken  
Polpettes  
Hummus bitahina  
Fresh figs with wine and honey

**MENU 6****CHINESE CUISINE**

Chicken Wonton Soup  
Spring rolls with sweet chilli  
Fish with cashew ginger marinade  
Oriental Fried rice  
Deep fried banana

**MENU 7****SPANISH CUISINE**

Escudella Catalina  
Tortillas  
Pelota  
Spanish Rice Omelette  
Paella De Valencia

Churros

## **MENU 8**

### **COLDCUTS**

Galantine

Pate

Terrine

Ballontione

## **MENU 9**

Sandwiches and Canapes

## **MENU 10**

### **CENTER PIECES IN BANQUETS**

Vegetable and Fruit Carvings

Ice Carving

Margarine Sculpture

Fancy Bread Display

## **B. ADVANCED FOOD & BEVERAGE SERVICE PRACTICALS**

- Menu Engineering
- Art of Cocktail Mixing
- International Specialty food service
- Yield Management of food and beverages
- Case Study

## **SEMESTER – II**

**Objective:** The aim of this semester is to teach the student about Eco Tourism, to create an awareness of environment in him. Since the student is expected to work with people he is trained on Human Resource Management and Legal systems. In depth knowledge is imparted in Accommodation Management. Hospitality Management is dealt with in detail.

## **CORE PAPER – 6**

### **ECO TOURISM**

#### **1. Introduction to Eco Tourism**

- Principles of Eco Tourism
- Types of Eco Tourism
- Global growth and magnitude of Eco tourism

#### **2. Eco Tourism Venues**

- Public protected areas
- Privately owned protected areas
- Modified spaces
- Indigenous territories

#### **3. Impact OF Eco Tourism**

- Economic impacts
- Environmental impacts
- Exploring socio-cultural impacts on local communities
- Developing indicators for designations sustainability

- Rural development

#### **4. Planning, Management and Institutions**

- Management tools and techniques
- Policy and planning
- Eco tourism – related organizations
- Eco tourism in the inter-sectoral context
- The place of Eco tourism in public policy and planning

#### **5. The Business of Eco tourism**

- Accommodations
- Tour operations
- Tour guides and interpretations
- The business of Eco tourism
- Club organization and operations
- Background on clubs
- Types of clubs
- Club ownership
- Club organization
- Club operation.

#### **REFERENCE:**

1. The Encyclopedia of Eco Tourism by David B. Weaver
2. Hospitality today by Rocco M. Angelo & Andrew N. Vladimier

## **CORE PAPER – 7**

### **HUMAN RESOURCE MANAGEMENT & LEGAL SYSTEMS**

#### **UNIT - I**

##### **NATURE & SCOPE OF HUMAN RESOURCE MANAGEMENT**

- Meaning
- Objectives
- Functions
- Importance

#### **UNIT – II**

##### **SELECTION & RECRUITMENT**

- Factors influencing recruitment
- Factors affecting selection
- Techniques of selection
- Placement policy
- Job analysis
- Job description

- Job Evaluation

### **UNIT – III**

#### **TRAINING & DEVELOPMENT**

- Meaning
- Need & Importance
- Types
- Training programmes
- Evaluation

### **UNIT – IV**

#### **PERFORMANCE APPRAISAL**

- Objectives
- Factors influencing performance appraisal
- Techniques
- Modern techniques of performance appraisal
- Quality of work life
- Transfer & Promotion
- Discipline & Compensation

### **UNIT – V**

#### **LEGAL SYSTEMS IN BUSINESS LAW**

- Law relating to types of Business Organization, Sole proprietorship, Partnership. Private and public, joint stock companies salient features act, 1956 (like memorandum of Association. Articles of Association Membership, share capital, Directors remuneration, Winding of Prevention of MisManagement etc.,)
- Indian Contract Act, 1872
- Sale of goods. Conditions and warranties transaction of property.
- Introduction of Sales Tax and central Excise Laws.
- Introduction to laws regarding regulation of industries.
- Industrial Licensing, Industries (Development a Regulation) Act, R.T.P. Act. 1969.
- Negotiable Instrument Act.



**REFERENCE:**

1. Personnel Management – E.E.Flippo
2. Personnel: The Management of Human Resources – Stephen P. Robbins
3. Personnel Management – Memoria.C.B
4. Legal System in Business by P.Saravanel
5. Business Law by S.S.Gulshan & G.K .Kapoor
6. Business Law by S.P.Iyengar & B.K.Goyal

**CORE PAPER – 8****ADVANCED ACCOMMODATION MANAGEMENT****UNIT – I****PLANNING AND ORGANISING**

- Staffing
- Work Study
- Measurement of work
- Job analysis
- Motivating staff
- Recruitment & orientation

**UNIT – II****INTERIOR DECORATION**

- Guest Room Designing
- Factors affecting designing
- Principles and elements of designing
- Layout planning
- Role of colours, lighting systems, wall & floor finishes in interior decoration

**UNIT – III**

## **RENOVATION PROCESS**

- Redecoration
- Renovation process
- Refurnishing
- Types & selection of furniture

## **UNIT – IV**

### **LAUNDRY MANAGEMENT**

- Types
- Layout of OPL
- Flow process
- Wash cycle & dry cleaning
- Guest laundry – procedure
- Stain removal

## **UNIT – V**

- Definition of budget
- Types
- Purchase & selection criteria
- Controlling systems
- Inventory & stock taking
- Registers & records maintained
- Concept of safeguarding assets

## **REFERENCES:**

1. House Craft – Valerie Paul
2. Commercial Housekeeping & Maintenance – Stanley Thornes
3. Hotel, Hostel and Hospital Housekeeping – John C. Bronson and Margaret Lennox
4. Hotel and Catering studies – Ursula Jones
5. Housekeeping and Front Office – Jones
6. Managing housekeeping Custodial Operation – Edwin B. Feldman
7. Professional Management of Housekeeping Operations (II Edn.)- Robert J. Martin & Thomas J.A. Jones
8. Housekeeping Management – Margaret M. Leappa & Aleta Nitschke

**CORE PAPER – 9**  
**HOSPITALITY MANAGEMENT**

**UNIT – I**

**HOSPITALITY INDUSTRY**

- Definition of hotel
- Evolution of hotel industry
- Hotel chains
- Classification of hotels
- Managers role in hotel industry
- Knowledge of various departments

**UNIT - II**

**RESTAURANT BUSINESS**

- Organisation
- Chain – Independent / Franchise

**UNIT – III**

## **FOOD SERVICE DEMAND**

- The changing Age Composition of our population
- Other Demographic Factors
- Supply Labour
- Work force Diversity
- Competitions with other Industries

## **UNIT – IV**

### **THE HOTEL BUSINESS**

- The Economics of the Hotel Business
- Dimensions of the Hotel investment Decision
- Brand Competition
- Changes in Franchise Relationship

## **UNIT V**

### **THE PRINCIPLES OF HOSPITALITY MANAGEMENT**

- Planning in Organizations
- Departmentalization
- Selection and Employment
- Characteristic of Control System
- Element of leading and Directing
- The Environment

### **REFERENCES:**

1. Managing Hospitality – Robert H. Woods
2. Introduction to Management in the Hospitality industry – Tom Power

## **PAPER 10**

### **EXTRA DISCIPLINARY**

#### **PRACTICALS**

##### **C. ACCOMMODATION OPERATIONS**

1. Laundry operation
2. Stains & Stain Removal methods
3. Cost estimation
4. Housekeeping plans into action
5. Training & evaluating supervisors and managers
6. Guest room designing ( Model Presentation)

## 16. M.Sc. DEGREE COURSE IN INFORMATION TECHNOLOGY

### SYLLABUS

Title of the Course/ Paper	C++ and Data Structures		
Core -1	First Year & First Semester	Credit: 4	
Objective of the course	This course introduces the basic concepts of programming in C++ and Data Structures.		
Course outline	Unit 1: Introduction to OOP – Overview of C++ - Classes – Friend Functions – Friend Classes – Inline functions – Constructors – Destructors – Static Members – Passing objects to functions – Function returning objects. Arrays – Pointers – this pointer – References – Dynamic memory Allocation – functions Overloading – Default arguments – Overloading Constructors – Pointers to Functions – Ambiguity in function overloading-Operator Overloading		
	Unit-2: Members Operator Function – Friend Operator Function – Overloading some special operators like [ ] , ( ) , a and comma operator-Inheritance – Types of Inheritance – Protected members – Virtual base Class – Polymorphism – Virtual functions – Pure virtual functions- Class templates and generic classes – Function templates and generic functions – Overloading a function templates – power of templates.		
	Unit 3: Exception Handling – Derived class Exception – generic functions – Exception handling Functions – terminate() unexpected() – Uncaught – exception(); Streams – Formations I/O with ios class functions and manipulators – creating own manipulator – overloading << and >> - File I/O – Name spaces conversion functions.		
	Unit-4: Abstract data types - asymptotic notations – Arrays-representation of arrays – operations on arrays – ordered lists – polynomials. Linked lists: Singly linked list- circular linked lists - doubly linked lists – general lists – stacks -queues - circular queues – Evaluation of expressions		
	Unit-5 : Trees – Binary Trees – Binary Tree Traversals – Binary Tree Representations – Binary Search Trees – Threaded Binary Trees – Application of Trees (Sets) – Representation of Graphs – Graph Implementation – Graph Traversals- Application of Graph Traversals- Minimum Cost Spanning Trees – Shortest Path Problems .		

#### 1. Recommended Texts

- (i) E.Horowitz, S.Sahni and Mehta, 1999, Fundamentals of Data Structures in C++, Galgotia.
- (ii) Herbert Schildt, 1999, C++ - The complete Reference, Third

Edition, Tata McGraw –Hill.

## 2. Reference Books

- (i) Gregory L.Heileman, 1996, Data Structures , Algorithms and Object Oriented Programming – Mc-Graw Hill International Editions.
- (ii) A.V.Aho, J.D. Ullman, J.E. Hopcraft: Data Structures and Algorithms- Adisson Wesley Pub.

Title of the Course/ Paper	Computer Architecture		
Core -2	First Year & First Semester	Credit: 4	
Objective of the course	This course introduces the concepts of Computer Architecture.		
Course outline	Unit 1: : Data representation - Data types - complements, fixed point and floating point representation other binary codes - micro operations: Register transfer language, Register transfer, Bus and Memory transfer, Arithmetic, logic, and shift micro operations, Arithmetic logic shift unit - micro programmed control - control memory - Address sequencing - micro program example - design of control unit.		
	Unit-2: : Central processing unit: General register and stack organizations, instruction formats - Addressing modes, Data transfer and manipulation - program control, RISC - Pipelining - Arithmetic and instruction, RISC pipeline - Vector processing and Array processors.		
	Unit 3: Computer Arithmetic - Addition and subtraction, Multiplication and division, floating point and decimal Arithmetic operations.		
	Unit-4: Input-output organization - peripheral devices, I/O interface, Asynchronous data transfer, modes of transfer, priority interrupt, direct memory access, I/O processor, serial communications.		
	Unit-5 : Memory organization - Memory hierarchy - main memory - Auxiliary memory - associative, cache and virtual memory, memory management hardware - multi processors: Interconnection structures, Inter processor arbitration.		

## 1. Recommended Texts

- (i) M.M. Mano, 1993, Computer System architecture. PHI (Third Edition).

## 2. Reference Books

- (i) V. C. Hamacher, G.Vranesic, S. G.Zaky-Computer Organiation, McGraw Hill.
- (ii) J. P.Hayes, 1988, Computer architecture, McGraw Hill, ISE.
- (iii) H. K, Briggs. F.A, 1988, Computer Architecture and Parallel Processing, McGraw-Hill ISE.
- (iv) William Stallings, 2003, Computer Organization & Architecture, 6<sup>th</sup> dition,PHI, New Delhi.

Title of the Course/ Paper	Database Management Systems		
Core -3	First Year & First Semester	Credit: 4	
Objective of the course	This course introduces the concepts of database systems design		
Course outline	Unit 1: Introduction to Database Systems – Relational Model – Structure – Relational Algebra – Null Values – SQL – Set Operation – Views – Advanced SQL – Embedded SQL – Recursive Queries – The Tuple Relational Calculus – Domain Relational Calculus.		
	Unit 2: E-R Model – Constraints – E-R- Diagrams Weak Entity Sets – Reduction to Relational Schemes – Relational Database Design – Features of Relational Design – Automatic Domains and First Normal Form – Decomposition using Functional Dependencies – Multivalued Dependencies – More Normal Forms – Web Interface – Object – Based Databases – Structured Types and inheritance in SQL – Table inheritance – Persistent.		
	Unit 3: Storage and File Structure – RAID – File Organisation – Indexing and Hashing – B Tree – B Tree Index files - Static and Dynamic Hashing – Query Processing – Sorting & Join Operators – Query Optimization – Choice of Evaluation Plans.		
	Unit 4: Transaction Management – Implementation of Atomicity and Durability – Serializability – Recoverability – Concurrency Control – Dead Lock Handling – Recovery System – Buffer Management.		
	Unit 5 : Database – System Architecture – Client Server – Architectures – Parallel System – Network Types – Distributed Database – Homogeneous and Hetrogeneous Database – Directory System – Case Study – Oracle – MSSQL Server.		

#### 1. Recommended Texts

- (i) A. Silberschatz, H.F. Korth and S. Sudharshan, 2006, Database System Concepts, 5<sup>th</sup> Edition, Tata McGraw Hill, New Delhi.

#### 2. Reference Books

- (i) J. D. Ullman, 1988, Principles of Database Systems, Galgotia Publishers, New Delhi
- (ii) C.J. Date, 1985, An Introduction to Database Systems, Third Edition, Narosa, New Delhi.
- (iii) Elmasri and Navathe, 1999, Fundamentals of Database Systems, Third Edition, Pearson Education, Delhi.
- (iv) C. Ritchie, 2004, Relational Database Principals, 2<sup>nd</sup> Edition, Thomson, Singapore.

#### 3. Website, E-learning resources

- (i) <http://www.cse.iitb.ac.in/dbms/Data/Papers-Local/DBConceptsBook/slide-dir/>



Title of the Course/ Paper	Practical – I : Data Structure Lab. Using C++		
Core -4	First Year & First Semester	Credit: 2	
Objective of the course	This course gives training to program data structure implementation.		
Course outline	<p>For the implementation of the following problems, the students are advised to use all possible object oriented features. The implementation based on structured concepts will not accepted.</p> <ol style="list-style-type: none"> <li>1. Implementation of Arrays (Single and Multi-Dimensional)</li> <li>2. Polynomial Object and necessary overloaded operators.</li> <li>3. Singly Linked Lists.</li> <li>4. Circular Linked Lists.</li> <li>5. Doubly Linked Lists.</li> <li>6. General Lists.</li> <li>7. Implementation of Stack (using Arrays and Pointers)</li> <li>8. Implementation of Queue (Using Arrays and Pointers)</li> <li>9. Implementation of Circular Queue (using Arrays and Pointers)</li> <li>10. Evaluation of Expressions.</li> <li>11. Binary Tree implementations and Traversals.</li> <li>12. Binary Search Trees.</li> </ol>		

Title of the Course/ Paper	Practical – II: RDBMS Lab.		
Core –5	First Year & First Semester	Credit: 2	
Objective of the course	This course gives training in design and implementation of data bases for the selected problems.		
Course outline	<p>Students are advised to use the concepts like Data Normalization, Link between table by means of foreign keys and other relevant data base concepts for developing databases for the following problems. The implementation of each problem should have necessary input screen Menu-driven query processing and pleasing reports. The choice or RDBMS is left to the students. Necessary validations must be done after developing database.</p> <ol style="list-style-type: none"> <li>1. Building Simple Applications.</li> <li>2. Working with Intrinsic Controls and ActiveX Controls.</li> <li>3. Application with multiple forms.</li> <li>4. Application with Dialogs.</li> <li>5. Application with Menus.</li> <li>6. Application using Data Controls.</li> <li>7. Application using Common Dialogs.</li> <li>8. Drag and Drop Events.</li> <li>9. Database Management.</li> <li>10. Creating ActiveX Controls</li> <li>11. Library Management System</li> <li>12. Students Marksheet Processing</li> <li>13. Bank Transactions.</li> <li>14. Personal information system</li> <li>15. Question Database and conducting Quiz.</li> </ol>		

Title of the Course/ Paper	Operating Systems		
Core -6	First Year & Second Semester	Credit: 4	
Objective of the course	This course introduces the fundamental concepts of operating Systems with case studied on Unix and Windows.		
Course outline	Unit 1: Introduction – Multiprogramming - Time sharing - Distributed system - Real-Time systems - I/O structure - Dual-mode operation - Hardware protection _ General system architecture - Operating system services - System calls - System programs - System design and implementation. Process Management: Process concept - Concurrent process - Scheduling concepts - CPU scheduling - Scheduling algorithms, Multiple processor Scheduling		
	Unit 2: Process Management: Process Synchronization - Critical section - Synchronization hardware - Semaphores, classical problem of synchronization, Interprocess communication. Deadlocks: Characterization, Prevention, Avoidance, and Detection.		
	Unit 3: Storage management - Swapping, single and multiple partition allocation - paging - segmentation - paged segmentation, virtual memory - demand paging - page replacement and algorithms, thrashing. Secondary storage management - disk structure - free space management - allocation methods – disk scheduling - performance and reliability improvements - storage hierarchy.		
	Unit 4: Files and protection - file system organization - file operations - access methods - consistency semantics - directory structure organization - file protection - implementation issues - security - encryption		
	Unit 5: Case Studies: UNIX and Windows operating systems.		

#### 1. Recommended Texts

- (i) A. Silberschatz P.B. Galvin, Gange, 2002, Operating System Concepts, 6<sup>th</sup> Edn., Addison-Wesley Publishing Co., Boston.

#### 2. Reference Books

- (i) H.M. Deitel, 1990, An Introduction to Operating Systems, Addison Wesley Publishing Co., Boston
- (ii) D.M. Dhamdhare , 2002, Operating System, Tata McGraw-Hill, New Delhi.
- (iii) A.S. Tanenbaum , Operating Systems: Design and Implementation, Prentice-Hall of India, New Delhi.
- (iv) Nutt, 2005, Operating Systems, 3<sup>rd</sup> Edition, Pearson Education, Delhi.

Title of the Course/ Paper	Programming in Java		
Core -7	First Year & Second Semester	Credit: 4	
Objective of the course	This course is to develop programming skills in Java.		
Course outline	Unit 1: Introduction to Java - Features of Java - Object Oriented Concepts - Lexical Issues - Data Types - Variables - Arrays - Operators - Control Statements. Classes - Objects - Constructors - Overloading method - Access Control - Static and fixed methods - Inner Classes - String Class - Inheritance - Overriding methods - Using super-Abstract class.		
	Unit 2: Packages - Access Protection - Importing Packages - Interfaces - Exception Handling - Throw and Throws - Thread - Synchronization - Messaging - Runnable Interface - Inter thread Communication - Deadlock - Suspending, Resuming and stopping threads - Multithreading.		
	Unit 3: I/O Streams - File Streams - Applets –Events handling - String Objects - String Buffer - Char Array - Java Utilities - Code Documentation.		
	Unit 4: Networks basics - Socket Programming - Proxy Servers - TCP/IP Sockets - Net Address - URL - Datagrams - Working with windows using AWT Classes - AWT Controls - Layout Managers and Menus, jdbc connectivity.		
	Unit 5 : Servlets – Environment and Role – Architectural Role for servlets – HTML support – Generation – Server side – Installing Servlets- Servlet APT – servlet life cycle – HTML to servlet communication.		

#### 1. Recommended Texts

- (i) C. S. Horstmann, Gary Cornell, 1999, Core Java 2 Vol. I Fundamentals, Pearson Education, Delhi.
- (ii) D.R. Callaway, 1999, Inside Servlets, Pearson Education, Delhi.

#### 2. Reference Books

- (i) P. Naughton and H. Schildt, 1999, Java2 (The Complete Reference), Third Edition, Tata McGraw-Hill, New Delhi.
- (ii) K. Moss, 1999, Java Servlets, Tata McGraw-Hill, New Delhi.
- (iii) H.M.Deital and P.J. Deital, 2005, Java: How to program, 5<sup>th</sup> Edition, Pearson Education, Delhi.

Title of the Course/ Paper	Practical –III: Java Programming Lab.		
Core -8	First Year & Second Semester	Credit: 2	
Objective of the course	This course gives practical training in programming in Java.		
Course outline	<p><b>APPLICATION</b></p> <ol style="list-style-type: none"> <li>1. Determining the order of numbers generated randomly using Random Class.</li> <li>2. Implementation of Point Class for Image manipulation.</li> <li>3. Usage of Calendar Class and manipulation.</li> <li>4. String Manipulation using Char Array.</li> <li>5. Database Creation for storing e-mail addresses and manipulation.</li> <li>6. Usage of Vector Classes.</li> <li>7. Implementing Thread based applications &amp; Exception Handling (Synchronization &amp; asynchronization).</li> </ol> <p><b>APPLETS</b></p> <ol style="list-style-type: none"> <li>8. Working with Frames and various controls.</li> <li>9. Working with Dialogs and Menus.</li> <li>10. Working with Panel and Layout.</li> <li>11. Incorporating Graphics (Scaling Only).</li> </ol> <p><b>APPLICATIONS FOR EVENTS HANDLING</b></p> <ol style="list-style-type: none"> <li>13. Application Using jdbc Connectivity</li> <li>14. HTML to Servlet Applications</li> <li>15. Servlet to Applet communication</li> </ol>		

### ***Elective – I***

Title of the Course/ Paper	Visual Programming		
Elective	First Year & First Semester	Credit: 4	
Objective of the course	This course introduces the basic concepts of Visual Programming.		
Course outline	Unit 1: Customizing a Form - Writing Simple Programs - Toolbox - Creating Controls - Name Property - Command Button - Access Keys - Image Controls - Text Boxes - Labels - Message Boxes - Grid - Editing Tools - Variables - Data Types - String - Numbers.		
	Unit-2: Displaying Information - Determinate Loops - Indeterminate Loops - Conditionals - Built-in Functions - Functions and Procedures.		
	Unit 3: Lists - Arrays - Sorting and Searching - Records - Control Arrays - Combo Boxes - Grid Control - Projects with Multiple forms - DoEvents and Sub Main - Error Trapping.		
	Unit-4: VB Objects - Dialog Boxes - Common Controls - Menus - MDI Forms - Testing, Debugging and Optimization - Working with Graphics.		
	Unit-5 : Monitoring Mouse activity - File Handling - File System Controls - File System Objects - COM/OLE - automation - DLL Servers - OLE Drag and Drop – Accessing windows API – Visual basic and Databases – Visual basic and the Internet.		

#### **1. Recommended Texts**

- (i) Gary Cornell, 1999, Visual Basic 6 from the Ground up, Tata McGraw-Hill, New Delhi .
- (ii) Noel Jerke, 1999, Visual Basic 6 (The Complete Reference), Tata McGraw-Hill, New Delhi.

#### **2. Reference Books**

- (i) B. Siler and J. Spotts, 2001, Special Editor using Visual Basic 6, PHI, New Delhi.

Title of the Course/ Paper	E-Commerce		
Elective	First Year & First Semester	Credit: 4	
Objective of the course	This course introduces the features of E-Commerce		
Course outline	<p>Unit 1: Overview of electronic commerce: introduction-definition of electronic commerce-potential benefits of electronic commerce-internet and www as enablers of electronic commerce-impact of electronic commerce on business models-electronic commerce security-organization of topics-implications for the accounting. Electronic commerce and the role of independent third parties: introduction-consulting practices and accountants-independence-cpa vision problem-new assurance services identified by the aicpa-impact of Electronic commerce on the traditional assurance function-third party Assurance of web based electronic commerce-implications for the accounting. Regulatory environment: introduction-cryptography issues-privacy issues-web linking-domain name disputes-internet sales tax-electronic agreement and digital signature – Internet service providers and international libel laws-implications for the accounting.</p> <p>Unit 2: Edi electronic commerce and the internet: introduction-traditional Edi system-data transfer and standards-financial Edi-Edi systems and the internet-impact of Edi internet applications on the accounting profession. Risks of insecure system: introduction-overview of risks associated with internet transactions-internet associated risk-intranet associated risk-social engineering-risks associated with business transactions- risks associated with confidentially maintained archival-Master file and reference data- risks associated with virus and malicious-implications of the accounting. Risks management: introduction- control weakness vs control risks – Risk management paradigm – disaster recovery plans- Implications of the accounting.</p> <p>Unit 3: Internet security standards:-introductions- standard setting issues and Committees - security committees and organization - security protocols and languages-messaging protocols –secure electronic payments and protocols-the role of accountants in internet related standard setting process. Cryptography and authentication: introduction-message security issues- Encryption techniques-key management-additional authentication methods-additional non repudiation techniques.</p> <p>Unit-4: Firewalls: introduction – firewall defined – TCP/IP-open system interconnect (OSI)-components of firewall-typical functionality of firewalls- network topology-securing the firewall-factors to consider in firewall design – in-house solutions Vs commercial fire wall software-limitations of security prevention provided by firewall. Introduction-the set protocol – magnetic strip cards-smart cards-electronic check-electronic cash.</p>		

	Unit-5 : Intelligent agent: introduction-definition of intelligent agent-capabilities of intelligent agent-level of agent sophistication-agent societies- intelligent agents and electronic commerce-online information Chain - limitations of agents- implications of the accounting. Web based marketing: introduction-the scope of marketing-business marketing and information technology-strategy congruence-the four P's applied to internet marketing – the fifth “P”personalization- internet marketing techniques-online advertisement mechanisms –web site design issues- Intelligent agent and their impacts on marketing techniques.
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#### 1. Recommended Reference Books

- (i) M. Greenstein, T. M. Feinman, 2000, Electronic Commerce, Tata McGraw Hill, New Delhi.
- (ii) Kalakota & Whinston, 2000, Frontiers of Electronic Commerce, 5<sup>th</sup> Indian Reprint, Pearson Edn., Delhi.

Title of the Course/ Paper	Programming in C		
Elective	First Year & First Semester	Credit: 4	
Objective of the course	This course introduces the concepts of Programming in C		
Course outline	Unit 1: C fundamentals – character set – identifier and key words – data types – constants – variables – declarations – expressions – statements – arithmetic, unary, relational and logical, assignment and conditional operators – library functions.		
	Unit 2: Data input/output functions – simple c programs – flow of control – control structures – switch, break and continue, go to statements – comma operator.		
	<b>Unit 3:</b> Functions – defining, accessing functions – functions prototypes – passing arguments – recursions – storage classes – multi file programs.		
	<b>Unit 4:</b> Arrays – defining and processing – passing arrays to functions – multidimensional arrays – arrays and string – structures – passing structures to functions – self referential structures – unions.		
	<b>Unit 5 :</b> Pointers – declarations – passing pointers to functions – operation in pointers – pointer and arrays – arrays of pointers – structures and pointers – files: creating, processing, opening and closing – bit wise operations.		

#### 1. Recommended Texts

- (i) Gottfried B S – Programming with C – II Edition TMH Pub Co Ltd.
- (i) B. W. Kernighan and D. M. Ritchie, 1990, The C Programming Language, Second Edition, PHI, New Delhi.



## 2. Reference Books

- (i) A. N. Kanthane, 2005, Programming with ANSI and Turbo C, Pearson Education, Delhi.
- (ii) J. R. Hanly and E. B. Koffman, 2005, Problem solving and program design in C, Fourth Edition, Pearson Education India.

## ***Elective – II***

Title of the Course/ Paper	Software Engineering		
Elective	First Year & Second Semester	Credit: 3	
Objective of the course	This course introduces the concepts of Software Planning, analysis, design and testing.		
Course outline	Unit 1: The Product-The Process-Project Management Concepts-Software Projects And Project Metrics		
	Unit 2: Software Project Planning-Risk Analysis And Management-Project Scheduling And Tracking-Software Quality Assurance		
	Unit 3: Software Configuration Management-System Engineering-Analysis Concepts And Principles-Analysis Modeling.		
	Unit 4: Design Concepts and Principles-Architectural Design-User Interface Design.		
	Unit 5 : Component level Design-Software Testing Techniques-Software Testing Strategies-Technical Metrics For Software – Ethics in Information Technology.		

## 1. Recommended Texts

- (ii) R. S. Pressman, 2005, Software Engineering A Practitioner's approach, 6<sup>th</sup> Edition, Tata McGraw-Hill, New Delhi.

## 2. Reference Books

- (i) I. Sommerville, 2001, Software Engineering, 6<sup>th</sup> Edition, Addison Wesley, Boston.
- (ii) Rajib Mal, 2005, -Fundamental of Software engineering , 2<sup>nd</sup> Edition , PHI, New Delhi.
- (iii) N. E. Fenton, S. L. Pfleenger, 2004, Software Metrics, Thomson Asia, Singapore.

## 3. Website, E-learning resources

- (i) <http://www.mhhe.com/pressman>

Title of the Course/ Paper	Data Warehousing and Data Mining		
Elective	First Year & Second Semester	Credit: 3	

Objective of the course	This course introduces the basic concepts of data warehousing and data mining
Course outline	Unit 1: Introduction: Data Mining tasks – Data Mining versus Knowledge Discovery in Data bases – Relational databases – Data warehouses – Transactional databases – Object oriented databases – Spatial databases – Temporal databases – Text and Multimedia databases – Heterogeneous databases - Mining Issues – Metrics – Social implications of Data mining.
	Unit 2: Data Preprocessing: Why Preprocess the data – Data cleaning – Data Integration – Data Transformation – Data Reduction – Data Discretization.
	Unit 3: Data Mining Techniques: Association Rule Mining – The Apriori Algorithm – Multilevel Association Rules – Multidimensional Association Rules – Constraint Based Association Mining.
	Unit 4: Classification and Prediction: Issues regarding Classification and Prediction – Decision Tree induction – Bayesian Classification – Back Propagation – Classification Methods – Prediction – Classifiers accuracy.
	Unit 5 : Clustering Techniques: cluster Analysis – Clustering Methods – Hierarchical Methods – Density Based Methods – Outlier Analysis – Introduction to Advanced Topics: Web Mining , Spatial Mining and Temporal Mining.

### 1. Recommended Texts

- (i) J. Han and M. Kamber , 2001, Data Mining: Concepts and Techniques, Morgan Kaufmann, .New Delhi.

### 2. Reference Books

- (i) M. H.Dunham, 2003, Data Mining : Introductory and Advanced Topics , Pearson Education, Delhi.
- (ii) Paulraj Ponnaiah, 2001, Data Warehousing Fundamentals, Wiley Publishers.
- (iii) S.N. Sivananda and S. Sumathi, 2006, Data Mining, Thomsan Learning, Chennai.

### 3. Website, E-learning resources

- i. <http://www.academicpress.com>
- ii. <http://www.mkp.com>

Title of the Course/ Paper	Software Testing		
Elective	First Year & Second Semester	Credit: 3	
Objective of the course	This course introduces the basic concepts of software testing		

Course outline	Unit 1: Introduction: Purpose – Productivity and Quality in Software – Testing Vs Debugging – Model for Testing – Bugs – Types of Bugs – Testing and Design Style.
	Unit-2: Flow/Graphs and Path Testing – Achievable paths – Path instrumentation – Application – Transaction Flow Testing Techniques – Data Flow Testing Strategies
	Unit 3: Domain Testing: Domains and Paths – Domains and Interface Testing – Linguistic –Metrics – Structural Metric – Path Products and Path Expressions.
	Unit-4: Syntax Testing – Formats – Test Cases – Logic Based Testing – Decision Tables – Transition Testing – States, State Graph, State Testing.
	Unit-5 : Verification and Validation – Fundamental Tools - Levels of Testing – Testing Approaches – Types of Testing – Test Plan – Software Testing Tools: WinRunner – Silk Test

#### 1. Recommended Texts

- (i) B. Beizer , 2003, Software Testing Techniques, II Edn., DreamTech India, New Delhi.
- (ii) K.V.KK. Prasad , 2005, Software Testing Tools, DreamTech. India, New Delhi.

#### 2. Reference Books

- (i) I. Burnstein, 2003, Practical Software Testing, Springer International Edn.
- (ii) E. Kit, 1995, Software Testing in the Real World: Improving the Process, Pearson Education, Delhi.
- (iii) R.Rajani, and P.P.Oak, 2004, Software Testing, Tata Mcgraw Hill, New Delhi.

#### 3. Website, E-learning resources

- (i) [http://www.amazon.com/gp/reader/0201877562/ref=sib\\_dp\\_pt/102-1957971-9723354#reader-link](http://www.amazon.com/gp/reader/0201877562/ref=sib_dp_pt/102-1957971-9723354#reader-link)

### ***Elective – III***

Title of the Course/ Paper	Internet Technology		
Elective	First Year & Second Semester	Credit: 3	
Objective of the course	This course introduces the design of websites and internet technologies.		
Course outline	Unit 1: Introduction to Javascript – Advantage of Javascript – Javascript Syntax – Datatype – Variable – Array – Operator and Expression – Looping Constructor – Function – Dialog box.		
	Unit 2: Javascript document object model – Introduction – Object in HTML – Event Handling – Window Object – Document object – Browser Object – Form Object – Navigator object – Screen object – Build in Object – User defined object – Cookies		

	Unit 3: Features of C# - C# and .NET framework – Getting started – C# language fundamentals – classes and objects – Inheritance and Polymorphism – Interfaces – Arrays – Indexers and Collections – Strings and Regular Expressions – Handling Exceptions – Delegates and Events.
	Unit 4: ASP. NET Language Structure – Page Structure – Page event, Properties & Compiler Directives. HTML server controls – Anchor, Tables, Forms, Files. Basic Web server Controls – Label, Textbox, Button, Image, Links, Check & Radio button, Hyperlink. Data List Web Server Controls – Check box list, Radio button list, Drop down list, List box, Data grid, Repeater.
	Unit 5: Request and Response Objects, Cookies, Working with Data – OleDb connection class, command class, transaction class, data adaptor class, data set class. Advanced Issues – Email, Application Issues, Working with IIS and page Directives, Error handling. Security – Authentication, IP Address, Secure by SSL & Client Certificates.

#### 1. Recommended Texts

- (i) I. Bayross, 200, Web Enable Commercial Application Development Using HTML, DHTML, Javascript, Perl CGI, BPB Publications.
- (ii) G. Buczek, 2002, ASP.NET Developers Guide, TMH.
- (iii) Jesse Liberty, 2002, Programming C#”, Second Edition, O’Reilly Press.

#### 2. Reference Books

- (i) J. Jaworski, 1999, Mastering Javascript, BPB Publications.
- (ii) T. A. Powell, 2002, Complete Reference HTML (Third Edition), Tata McGraw-Hill, New Delhi.
- (iii) Richard Anderson, Professional ASP.NET, Wrox Press Ltd.
- (iv) Jeffrey Richter, 2002, Applied Microsoft .NET framework Programming, Microsoft Press.
- (v) Kumar Sanjeev and Shibi Panikkar, Magic of ASP.NET with C#, Firewall Media.

Title of the Course/ Paper	Multimedia Systems		
Elective	First Year & Second Semester	Credit: 3	
Objective of the course	This course introduces the basic concepts of Multimedia Systems.		
Course outline	Unit 1: Introductory Concepts: Multimedia – Definitions, CD-ROM and the Multimedia Highway, Uses of Multimedia, Introduction to making multimedia – The Stages of project, the requirements to make good multimedia, Multimedia skills and training, Training opportunities in Multimedia. Motivation for multimedia usage, Frequency domain analysis, Application Domain.		

	Unit 2: Multimedia-Hardware and Software: Multimedia Hardware – Macintosh and Windows production Platforms, Hardware peripherals – Connections, Memory and storage devices, Media software – Basic tools, making instant multimedia, Multimedia software and Authoring tools, Production Standards.
	Unit 3: Multimedia – making it work – multimedia building blocks – Text, Sound, Images, Animation and Video, Digitization of Audio and Video objects, Data Compression: Different algorithms concern to text, audio, video and images etc., Working Exposure on Tools like Dream Weaver, Flash, Photoshop Etc.,
	Unit 4: Multimedia and the Internet: History, Internet working, Connections, Internet Services, The World Wide Web, Tools for the WWW – Web Servers, Web Browsers, Web page makers and editors, Plug-Ins and Delivery Vehicles, HTML, VRML, Designing for the WWW – Working on the Web, Multimedia Applications – Media Communication, Media Consumption, Media Entertainment, Media games.
	Unit 5 : Multimedia-looking towards Future: Digital Communication and New Media, Interactive Television, Digital Broadcasting, Digital Radio, Multimedia Conferencing, Assembling and delivering a project-planning and costing, Designing and Producing, content and talent, Delivering, CD-ROM technology.

#### 1. Recommended Texts

- (iv) S. Heath, 1999, Multimedia & Communication Systems, Focal Press, UK.
- (v) T. Vaughan, 1999, Multimedia: Making it work, 4<sup>th</sup> Edition, Tata McGraw Hill, New Delhi.
- (vi) K. Andleigh and K. Thakkar, 2000, Multimedia System Design, PHI, New Delhi.

#### 2. Reference Books

- (iv) Keyes, “Multimedia Handbook”, TMH, 2000.
- (v) R. Steinmetz and K. Naharstedt, 2001, Multimedia: Computing, Communications & Applications, Pearson, Delhi.
- (vi) S. Rimmer, 2000, Advanced Multimedia Programming , PHI, New Delhi..

Title of the Course/ Paper	Windows Programming		
Elective	First Year & Second Semester	Credit: 3	
Objective of the course	This course introduces the concepts of Windows Programming.		
Course outline	Unit 1: Windows Fundamentals – Programming Concepts and Vocabulary for Windows – Windows Development Tools – Resource Information		

	Unit 2: Application Framework- Project Utility – Writing Windows Programming (Procedure Oriented) – Pie-chart Application
	Unit 3: MFC Library – MFC Design Considerations – Key features of MFC Library – C Object – Simple Application and Template- Drawing in Client Area- Fourier Series application with Resources- Bar Chart with Resources.
	Unit 4: Graph Applications – Word Processor Applications – OLE Features and Specifications - Container Application.
	Unit 5 : Active X Controls – Create simple Active X Controls with MFC – Customizing Controls – COM – DHTML- ATL vs. ActiveX.

1. Recommended Texts

- (ii) L. Klander, 2000, Core Visual C++ 6, First Indian reprint, Addison Wesley, Boston.

2. Reference Books

- (iii) C.H.Pappas and W.H.Murray, 1999, Visual C++ 6 (The Complete Reference), Tata McGraw Hill, New Delhi.
- (iv) H. Schildt, 1999, Windows 98 Programming from the GroundUp, Tata McGraw Hill, New Delhi.

**Elective – IV: Practical Based on Elective -III**

Title of the Course/ Paper	Practical – IV: Web Applications Lab.		
Elective	First Year & Second Semester	Credit: 2	
Objective of the course	This course gives training in Web technologies.		

Course outline	<ol style="list-style-type: none"> <li>2. Write a script to create an array of 10 elements and arrange them in the ascending or descending order.</li> <li>3. Write a function in Javascript that takes a string and looks at it character by character and perform all the String manipulation..</li> <li>4. Create a simple calculator which should perform all the mathematical operations.</li> <li>5. Create a document and add a link to it. Create a new window on that document. When the user moves the mouse over the link , it should load the linked document on it.</li> <li>6. Create a document that accepts the user's name in a text field form and displays the same the next time when the user visits the site informing him that he has accessed the site for the second time, and so on.</li> <li>7. Create a Web form for an online library. This form must be able to accept the Membership Id of the person borrowing a book, the name and ID of the book, and the name of the book's author. On submitting the form, the user (the person borrowing the book) must be thanked and informed of the date when the book is to be returned. You can enhance the look of the page by using various ASP.NET controls.</li> <li>8. Use a calendar control in the page to determine the current date (when the book is borrowed) and calculate the due date, which must be three weeks from the current date. Display the due date to the user.</li> <li>9. Create an array containing the titles of five new movies. Use this array as a data source for a drop down list control. The page must be capable of displaying the selected movie title to the user when the user clicks on the submit button.</li> <li>10. Create a virtual directory in IIS. Create a global.asax file and include the "Session_Start" and "Session_End" and, "Application_BeginRequest" and "Application_EndRequest" events. Write a simple ASP.NET page and execute it in the browser. What is the output that you get?</li> <li>11. Create the Employee information and perform all the validator controls. Create an ASP.NET application. The application must consist of a form that accepts the user's credentials and validate the same. The user is then allowed to purchase items from the site by filling in a form. The user is finally informed when the purchased goods will be delivered to him/her. <ol style="list-style-type: none"> <li>a. Create a single default error page for any errors occurring in the application.</li> <li>b. Use ASP.NET debugger to debug the application during its development</li> <li>c. Enable tracing for the application. Display the user entered data in the purchase form as trace information at the bottom of the purchase page.</li> <li>d. Switch off tracing for the application.</li> </ol> </li> <li>12. Create the simple web services and test the service.</li> <li>13. Create a ASP.NET application. Send a simple E-Mail to your friends.</li> <li>14. Create a DataBase application and perform all the operations such as addition, deletion, insertion and updation etc.</li> </ol>
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# Elective

Title of the Course/ Paper	Practical VIII: Multimedia Systems Lab.		
Elective	First Year & Second Semester	Credit: 2	
Objective of the course	This course gives practical training in various multimedia software		
Course outline	<p>List of Practicals in Flash :</p> <ol style="list-style-type: none"> <li>8. To Move an object, to move an object in the path</li> <li>9. Text flip, Text color change,</li> <li>10. Creating a link using texts and objects, change the color of the object.</li> <li>11. Shape Tweening and Using shape hints, Motion tweening, hybrid tweening.</li> <li>12. Character Animation, Object Animation, Drawing Images</li> <li>13. An application to show the masking effect.</li> <li>14. Slide show presentation.</li> </ol> <p>List of Practicals in Photoshop:</p> <ol style="list-style-type: none"> <li>1. To create a greeting card, Create background picture</li> <li>6. Text effects, photo effects</li> <li>7. Color , Buttons</li> <li>8. Editing Images</li> <li>9. Designing web page</li> </ol> <p>List of practicals in Dream weaver</p> <ol style="list-style-type: none"> <li>6. Text Management</li> <li>7. Tables – Layers</li> <li>8. Creating menubar</li> <li>9. Creating Pages and sites</li> <li>10. Animation in images</li> </ol>		



Title of the Course/ Paper	Practical VIII: Windows Programming Lab.		
Elective	First Year & Second Semester	Credit: 2	
Objective of the course	This course gives practical training in windows programming		
Course outline	16. SDK program for window creation and display. 17. Window Creation using CFrame wind 18. Usage of Mouse Routines. 19. Creating Menus for windows. 20. Implementing keyboard Accelerator. 21. Checking/ Unchecking and Enabling/Disabling Menus. 22. Inserting and Removing Menus at Runtime. 23. Floating Pop-up Menus. 24. MDI with cascaded and tiled window. 25. Creating modal and modeless Dialog box. 26. Creating Status Bar. 27. Using List Box with CList Box Class. 28. Using Edit Box with CEdit Class. 29. Working of Spin Button Controls. 30. Creating Graphics Editor.		

## 17. M.SC. DEGREE COURSE IN MATHEMATICS SYLLABUS

Title of the Course		ALGEBRA-I					
Paper Number		I					
Category	Core	Year	I	Credits	4	Course Code	
		Semester	I				
Pre-requisite		An introductory course in abstract algebra					
Course Outline		UNIT-I : Counting principle - class equation for finite groups and its applications - Sylow's theorems (For theorem 2.12.1, First proof only). Chapter 2: Sections 2.11 and 2.12 (Omit Lemma 2.12.5)					
		UNIT-II : Solvable groups - Direct products - Finite abelian groups- Modules Chapter 5 : Section 5.7 (Lemma 5.7.1, Lemma 5.7.2, Theorem 5.7.1) Chapter 2: Sections 2.13 and 2.14 (Theorem 2.14.1 only) Chapter 4: Section 4.5					
		UNIT-III : Linear Transformations: Canonical forms –Triangular form - Nilpotent transformations. Chapter 6: Sections 6.4 , 6.5					
		UNIT-IV : Jordan form - rational canonical form. Chapter 6 : Sections 6.6 and 6.7					
		UNIT-V: Trace and transpose - Hermitian, unitary, normal transformations, real quadratic form. Chapter 6 : Sections 6.8, 6.10 and 6.11 (Omit 6.9)					
Recommended Text		I.N. Herstein. <i>Topics in Algebra</i> (II Edition) Wiley, 2002.					
Reference Books		1. M.Artin, <i>Algebra</i> , Prentice Hall of India, 1991.					
		2. P.B.Bhattacharya, S.K.Jain, and S.R.Nagpaul, <i>Basic Abstract Algebra</i> (II Edition) Cambridge University Press, 1997. (Indian Edition)					
		3. I.S.Luther and I.B.S.Passi, <i>Algebra</i> , Vol. I –Groups(1996); Vol. II Rings(1999), Narosa Publishing House , New Delhi					
		4. D.S.Dummit and R.M.Foote, <i>Abstract Algebra</i> , 2 <sup>nd</sup> edition, Wiley, 2002.					
		5. N.Jacobson, <i>Basic Algebra</i> , Vol. I & II W.H.Freeman (1980); also published by Hindustan Publishing Company, New Delhi.					

Title of the Course		REAL ANALYSIS –I					
Paper Number		II					
Category	Core	Year	I	Credits	4	Course Code	
		Semester	I				
Pre-requisite		An introductory real analysis course					
Course Outline		<b>UNIT-I : Functions of bounded variation</b> - Introduction - Properties of monotonic functions - Functions of bounded variation - Total variation Additive property of total variation - Total variation on $[a, x]$ as a function of $x$ - Functions of bounded variation expressed as the difference of two increasing functions - Continuous functions of bounded variation.  Chapter – 6 : Sections 6.1 to 6.8  <b>Infinite Series</b> : Absolute and conditional convergence - Dirichlet's test and Abel's test - Rearrangement of series - Riemann's theorem on conditionally convergent series.  <i>Chapter 8 : Sections 8.8, 8.15, 8.17, 8.18</i>					
		<b>UNIT-II : The Riemann - Stieltjes Integral</b> - Introduction - Notation - The definition of the Riemann - Stieltjes integral - Linear Properties - Integration by parts- Change of variable in a Riemann - Stieltjes integral - Reduction to a Riemann Integral – Euler's summation formula - Monotonically increasing integrators, Upper and lower integrals - Additive and linearity properties of upper and lower integrals - Riemann's condition - Comparison theorems.  <i>Chapter - 7 : Sections 7.1 to 7.14</i>					
		<b>UNIT-III : The Riemann-Stieltjes Integral</b> - Integrators of bounded variation-Sufficient conditions for the existence of Riemann-Stieltjes integrals-Necessary conditions for the existence of Riemann-Stieltjes integrals- Mean value theorems for Riemann - Stieltjes integrals - The integrals as a function of the interval - Second fundamental theorem of integral calculus-Change of variable in a Riemann integral-Second Mean Value Theorem for Riemann integral-Riemann-Stieltjes integrals depending on a parameter-Differentiation under the integral sign-Lebesgue criteriaon for the existence of Riemann integrals.  <i>Chapter - 7 : 7.15 to 7.26</i>					

	<p><b>UNIT-IV : Infinite Series and infinite Products</b> - Double sequences - Double series - Rearrangement theorem for double series - A sufficient condition for equality of iterated series - Multiplication of series - Cesaro summability - Infinite products.</p> <p><b>Chapter - 8 Sec, 8.20, 8.21 to 8.26</b></p> <p><b>Power series</b> - Multiplication of power series - The Taylor's series generated by a function - Bernstein's theorem - Abel's limit theorem - Tauber's theorem</p> <p><b>Chapter 9 : Sections 9.14 9.15, 9.19, 9.20, 9.22, 9.23</b></p> <p><b>UNIT-V: Sequences of Functions</b> - Pointwise convergence of sequences of functions - Examples of sequences of real - valued functions - Definition of uniform convergence - Uniform convergence and continuity - The Cauchy condition for uniform convergence - Uniform convergence of infinite series of functions - Uniform convergence and Riemann - Stieltjes integration – Non-uniform Convergence and Term-by-term Integration - Uniform convergence and differentiation - Sufficient condition for uniform convergence of a series - Mean convergence.</p> <p><b>Chapter -9 Sec 9.1 to 9.6, 9.8,9.9, 9.10,9.11, 9.13</b></p>
<b>Recommended Text</b>	Tom M.Apostol : <i>Mathematical Analysis</i> , 2 <sup>nd</sup> Edition, Narosa,1989.
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Bartle, R.G. <i>Real Analysis</i>, John Wiley and Sons Inc., 1976.</li> <li>2. Rudin, W. <i>Principles of Mathematical Analysis</i>, 3<sup>rd</sup> Edition. McGraw Hill Company, New York, 1976.</li> <li>3. Malik, S.C. and Savita Arora. <i>Mathematical Analysis</i>, Wiley Eastern Limited. New Delhi, 1991.</li> <li>4. Sanjay Arora and Bansi Lal, <i>Introduction to Real Analysis</i>, Satya Prakashan, New Delhi, 1991.</li> <li>5. Gelbaum, B.R. and J. Olmsted, <i>Counter Examples in Analysis</i>, Holden day, San Francisco, 1964.</li> <li>6. A.L.Gupta and N.R.Gupta, <i>Principles of Real Analysis</i>, Pearson Education, (Indian print) 2003.</li> </ol>

Title of the Course		ORDINARY DIFFERENTIAL EQUATIONS					
Paper Number		III					
Category	Core	Year	I	Credits	4	Course Code	
		Semester	I				
Pre-requisite		UG level Calculus and Differential Equations					
Course Outline		<b>UNIT-I : Linear equations with constant coefficients</b> Second order homogeneous equations-Initial value problems-Linear dependence and independence-Wronskian and a formula for Wronskian-Non-homogeneous equation of order two.					
		<b>Chapter 2: Sections 1 to 6</b>					
		<b>UNIT-II : Linear equations with constant coefficients</b> Homogeneous and non-homogeneous equation of order n –Initial value problems- Annihilator method to solve non-homogeneous equation- Algebra of constant coefficient operators.					
		<b>Chapter 2 : Sections 7 to 12.</b>					
		<b>UNIT-III : Linear equation with variable coefficients</b> Initial value problems -Existence and uniqueness theorems – Solutions to solve a non-homogeneous equation – Wronskian and linear dependence – reduction of the order of a homogeneous equation – homogeneous equation with analytic coefficients-The Legendre equation.					
		<b>Chapter : 3 Sections 1 to 8 ( Omit section 9)</b>					
		<b>UNIT-IV : Linear equation with regular singular points</b> Euler equation – Second order equations with regular singular points – Exceptional cases – Bessel Function.					
		<b>Chapter 4 : Sections 1 to 4 and 6 to 8 (Omit sections 5 and 9)</b>					
		UNIT-V : Existence and uniqueness of solutions to first order equations: <b>Equation with variable separated – Exact equation – method of successive approximations – the Lipschitz condition – convergence of the successive approximations and the existence theorem.</b>					
		<b>Chapter 5 : Sections 1 to 6 ( Omit Sections 7 to 9)</b>					
Recommended Text		E.A.Coddington, <i>A introduction to ordinary differential equations</i> (3 <sup>rd</sup> Printing) Prentice-Hall of India Ltd.,New Delhi, 1987.					
Reference Books		1.Williams E. Boyce and Richard C. Di Prima, <i>Elementary differential equations and boundary value problems</i> ,John Wiley and sons, New York, 1967.  2. George F Simmons, <i>Differential equations with applications and historical notes</i> , Tata McGraw Hill, New Delhi, 1974.  3. N.N. Lebedev, <i>Special functions and their applications</i> , Prentice Hall of India, New Delhi, 1965. 4. W.T.Reid. <i>Ordinary Differential Equations</i> , John Wiley and Sons, New York, 1971 5. M.D.Raisinghania, <i>Advanced Differential Equations</i> , S.Chand & Company Ltd. New Delhi 2001 6. B.Rai, D.P.Choudhury and H.I. Freedman, <i>A Course in Ordinary Differential Equations</i> , Narosa Publishing House, New Delhi, 2002.					

Title of the Course		GRAPH THEORY					
Paper Number		IV					
Category	Core	Year	I	Credits	4	Course Code	
		Semester	I				
Pre-requisite		An elementary course in algebra					
Course Outline		<b>UNIT-I : Graphs, subgraphs and Trees :</b> Graphs and simple graphs – Graph Isomorphism – The Incidence and Adjacency Matrices – Subgraphs – Vertex Degrees – Paths and Connection – Cycles – Trees – Cut Edges and Bonds – Cut Vertices. <b>Chapter 1 (Section 1.1 – 1.7)</b> <b>Chapter 2 (Section 2.1 – 2.3)</b>					
		<b>UNIT-II : Connectivity, Euler tours and Hamilton Cycles :</b> Connectivity – Blocks – Euler tours – Hamilton Cycles. <b>Chapter 3 (Section 3.1 – 3.2)</b> <b>Chapter 4 (Section 4.1 – 4.2)</b>					
		<b>UNIT-III : Matchings, Edge Colourings :</b> Matchings – Matchings and Coverings in Bipartite Graphs – Edge Chromatic Number – Vizing's Theorem. <b>Chapter 5 (Section 5.1 – 5.2)</b> <b>Chapter 6 (Section 6.1 – 6.2)</b>					
		UNIT-IV : Independent sets and Cliques, Vertex Colourings : <b>Independent sets – Ramsey's Theorem – Chromatic Number – Brooks' Theorem – Chromatic Polynomials.</b> <b>Chapter 7 (Section 7.1 – 7.2)</b> <b>Chapter 8 (Section 8.1 – 8.2, 8.4)</b>					
		<b>UNIT-V: Planar graphs :</b> Plane and planar Graphs – Dual graphs – Euler's Formula – The Five- Colour Theorem and the Four-Colour Conjecture. <b>Chapter 9 (Section 9.1 – 9.3, 9.6)</b>					
Recommended Text		J.A.Bondy and U.S.R. Murthy , <i>Graph Theory and Applications</i> , Macmillan, London, 1976.					
Reference Books		1. J.Clark and D.A.Holton , <i>A First look at Graph Theory</i> , Allied Publishers, New Delhi , 1995. 2. R. Gould. <i>Graph Theory</i> , Benjamin/Cummings, Menlo Park, 1989. 3. A.Gibbons, <i>Algorithmic Graph Theory</i> , Cambridge University Press, Cambridge, 1989. 4. R.J.Wilson and J.J.Watkins, <i>Graphs : An Introductory Approach</i> , John Wiley and Sons, New York, 1989. 5. R.J. Wilson, <i>Introduction to Graph Theory</i> , Pearson Education, 4 <sup>th</sup> Edition, 2004, Indian Print. 6. S.A.Choudum, <i>A First Course in Graph Theory</i> , MacMillan India Ltd. 1987.					

Title of the Course		ALGEBRA – II					
Paper Number		VII					
Category	Core	Year	I	Credits	4	Course Code	
		Semester	II				
Pre-requisite		Algebra-I					

<b>Course Outline</b>	<b>UNIT-I :</b> Extension fields – Transcendence of e.  <b>Chapter 5: Section 5.1 and 5.2</b>
	<b>UNIT-II :</b> <b>Roots or Polynomials.- More about roots</b>  <b>Chapter 5: Sections 5.3 and 5.5</b>
	<b>UNIT-III :</b> Elements of Galois theory.  <b>Chapter 5 : Section 5.6</b>
	<b>UNIT-IV :</b> Finite fields - Wedderburn's theorem on finite division rings.  <b>Chapter 7: Sections 7.1 and 7.2 (Theorem 7.2.1 only)</b>
	<b>UNIT-V :</b> Solvability by radicals - A theorem of Frobenius - Integral Quaternions and the Four - Square theorem.  <b>Chapter 5: Section 5.7 (omit Lemma 5.7.1, Lemma 5.7.2 and Theorem 5.7.1)</b> <b>Chapter 7 : Sections 7.3 and 7.4</b>
	<b>Recommended Text</b> I.N. Herstein. <i>Topics in Algebra</i> (II Edition) Wiley 2002
	<b>Reference Books</b> <ol style="list-style-type: none"> <li>1. M.Artin, <i>Algebra</i>, Prentice Hall of India, 1991.</li> <li>2. P.B.Bhattacharya, S.K.Jain, and S.R.Nagpaul, <i>Basic Abstract Algebra</i> (II Edition) Cambridge University Press, 1997. (Indian Edition)</li> <li>3. I.S.Luther and I.B.S.Passi, <i>Algebra</i>, Vol. I –Groups(1996); Vol. II <i>Rings</i>, (1999) Narosa Publishing House , New Delhi.</li> <li>4. D.S.Dummit and R.M.Foote, <i>Abstract Algebra</i>, 2<sup>nd</sup> edition, Wiley, 2002.</li> <li>5. N.Jacobson, <i>Basic Algebra</i>, Vol. I &amp; II Hindustan Publishing Company, New Delhi.</li> </ol>

Title of the Course		REAL ANALYSIS – II					
Paper Number		VIII					
Category	Core	Year	I	Credits	4	Course Code	
		Semester	II				
Pre-requisite		Real Analysis-I					
Course Outline		UNIT-I : Measure on the Real line - Lebesgue Outer Measure - Measurable sets - Regularity - Measurable Functions - Borel and Lebesgue Measurability Chapter - 2 Sec 2.1 to 2.5 of de Barra					
		UNIT-II : Integration of Functions of a Real variable - Integration of Non- negative functions - The General Integral - Riemann and Lebesgue Integrals Chapter - 3 Sec 3.1,3.2 and 3.4 of de Barra					

	<b>UNIT-III : Fourier Series and Fourier Integrals</b> - Introduction - Orthogonal system of functions - The theorem on best approximation - The Fourier series of a function relative to an orthonormal system - Properties of Fourier Coefficients - The Riesz-Fischer Theorem - The convergence and representation problems in for trigonometric series - The Riemann - Lebesgue Lemma - The Dirichlet Integrals - An integral representation for the partial sums of Fourier series - Riemann's localization theorem - Sufficient conditions for convergence of a Fourier series at a particular point - Cesaro summability of Fourier series- Consequences of Fejes's theorem - The Weierstrass approximation theorem <b>Chapter 11 : Sections 11.1 to 11.15 of Apostol</b>	
	<b>UNIT-IV : Multivariable Differential Calculus</b> - Introduction - The Directional derivative - Directional derivative and continuity - The total derivative - The total derivative expressed in terms of partial derivatives - The matrix of linear function - The Jacobian matrix - The chain rule - Matrix form of chain rule - The mean - value theorem for differentiable functions - A sufficient condition for differentiability - A sufficient condition for equality of mixed partial derivatives - Taylor's theorem for functions of $\mathbb{R}^n$ to $\mathbb{R}^1$ <b>Chapter 12 : Section 12.1 to 12.14 of Apostol</b>	
	<b>UNIT-V : Implicit Functions and Extremum Problems</b> : Functions with non-zero Jacobian determinants – The inverse function theorem-The Implicit function theorem-Extrema of real valued functions of severable variables-Extremum problems with side conditions. <b>Chapter 13 : Sections 13.1 to 13.7 of Apostol</b>	
	<b>Recommended Text</b> 1. G. de Barra, <i>Measure Theory and Integration</i> , New Age International, 2003 (for Units I and II) 2. Tom M.Apostol : <i>Mathematical Analysis</i> , 2 <sup>nd</sup> Edition, Narosa 1989 (for Units III, IV and V)	
	<b>Reference Books</b> 1. Burkill,J.C. <i>The Lebesgue Integral</i> , Cambridge University Press, 1951. 2. Munroe,M.E. <i>Measure and Integration</i> . Addison-Wesley, Mass.1971. 3. Royden,H.L. <i>Real Analysis</i> , Macmillan Pub. Company, New York, 1988. 4. Rudin, W. <i>Principles of Mathematical Analysis</i> , McGraw Hill Company, New York,1979. 5. Malik,S.C. and Savita Arora. <i>Mathematical Analysis</i> , Wiley Eastern Limited. New Delhi, 1991.	

Title of the Course		PARTIAL DIFFERENTIAL EQUATIONS					
Paper Number		IX					
Category	Core	Year	I	Credits	4	Course Code	
		Semester	II				
Pre-requisite		UG level differential equations					
Course Outline		<b>UNIT-I : Partial Differential Equations of First Order:</b> Formation and solution of PDE- Integral surfaces – Cauchy Problem order eqn- Orthogonal surfaces – First order non-linear – Characteristics – Csmpatible system – Charpit method. <b>Fundamentals:</b> Classification and canonical forms of PDE. <b>Chapter 0: 0.4 to 0.11 (omit .1,0.2.0.3 and 0.11.1) and Chapter 1: 1.1 to 1.5</b>					



	<b>UNIT-II : Elliptic Differential Equations:</b> Derivation of Laplace and Poisson equation – BVP – Separation of Variables – Dirichlet's Problem and Neumann Problem for a rectangle – Interior and Exterior Dirichlet's problems for a circle – Interior Neumann problem for a circle – Solution of Laplace equation in Cylindrical and spherical coordinates – Examples. <b>Chapter 2: 2.1, 2.2, 2.5 to 2.13 (omit 2.3 and 2.4)</b>
	<b>UNIT-III : Parabolic Differential Equations:</b> Formation and solution of Diffusion equation – Dirac-Delta function – Separation of variables method – Solution of Diffusion Equation in Cylindrical and spherical coordinates Examples. <b>Chapter 3: 3.1 to 3.7 and 3.9 (omit 3.8)</b>
	<b>UNIT-IV : Hyperbolic Differential equations:</b> <b>Formation and solution of one-dimensional wave equation – canonical reduction – IVP- d'Alembert's solution – Vibrating string – Forced Vibration – IVP and BVP for two-dimensional wave equation – Periodic solution of one-dimensional wave equation in cylindrical and spherical coordinate systems – vibration of circular membrane – Uniqueness of the solution for the wave equation – Duhamel's Principle – Examples</b> <b>Chapter 4: 4.1 to 4.12 (omit 4.13)</b>
	<b>UNIT-V: Green's Function:</b> Green's function for Laplace Equation – methods of Images – Eigen function Method – Green's function for the wave and Diffusion equations. <b>Laplace Transform method:</b> Solution of Diffusion and Wave equation by Laplace Transform. <b>Fourier Transform Method:</b> Finite Fourier sine and cosine transforms – solutions of Diffusion, Wave and Laplace equations by Fourier Transform Method. <b>Chapter 5: 5.1 to 5.6 Chapter 6: 6.13.1 and 6.13.2 only (omit (6.14) Chapter 7: 7.10 to 7.13 (omit 7.14)</b>
<b>Recommended Text</b>	S, Sankar Rao, <i>Introduction to Partial Differential Equations</i> , 2 <sup>nd</sup> Edition, Prentice Hall of India, New Delhi, 2005
<b>Reference Books</b>	
1. R.C. McOwen, <i>Partial Differential Equations</i> , 2 <sup>nd</sup> Edn. Pearson Education, New Delhi, 2005. 2. I.N. Sneddon, <i>Elements of Partial Differential Equations</i> , McGraw Hill, New Delhi, 1983. 3. R. Dennemeyer, <i>Introduction to Partial Differential Equations and Boundary Value Problems</i> , McGraw Hill, New York, 1968. M.D. Raisinghania, <i>Advanced Differential Equations</i> , S.Chand & Company Ltd., New Delhi, 2001.	

Title of the Course		PROBABILITY THEORY					
Paper Number		X					
Category	Core	Year	I	Credits	4	Course Code	
		Semester	II				
Pre-requisite		UG level calculus and real analysis					
Course Outline		<b>UNIT-I : Random Events and Random Variables:</b> Random events – Probability axioms – Combinatorial formulae – conditional probability – Bayes Theorem – Independent events – Random Variables – Distribution Function – Joint Distribution – Marginal Distribution – Conditional Distribution – Independent random variables – Functions of random variables. <b>Chapter 1: Sections 1.1 to 1.7</b> <b>Chapter 2 : Sections 2.1 to 2.9</b>					

	<b>UNIT-II : Parameters of the Distribution</b> : Expectation- Moments – The Chebyshev Inequality – Absolute moments – Order parameters – Moments of random vectors – Regression of the first and second types. <b>Chapter 3 : Sections 3.1 to 3.8</b>
	<b>UNIT-III: Characteristic functions</b> : Properties of characteristic functions – Characteristic functions and moments – semiinvariants – characteristic function of the sum of the independent random variables – Determination of distribution function by the Characteristic function – Characteristic function of multidimensional random vectors – Probability generating functions. <b>Chapter 4 : Sections 4.1 to 4.7</b>
	<b>UNIT-IV : Some Probability distributions:</b> One point , two point , Binomial – Polya – Hypergeometric – Poisson (discrete) distributions – Uniform – normal gamma – Beta – Cauchy and Laplace (continuous) distributions. <b>Chapter 5 : Section 5.1 to 5.10 (Omit Section 5.11)</b>
	<b>UNIT-V: Limit Theorems</b> : Stochastic convergence – Bernaulli law of large numbers – Convergence of sequence of distribution functions – Levy-Cramer Theorems – de Moivre-Laplace Theorem – Poisson, Chebyshev, Khintchine Weak law of large numbers – Lindberg Theorem – Lapunov Theroem – Borel-Cantelli Lemma - Kolmogorov Inequality and Kolmogorov Strong Law of large numbers. <b>Chapter 6 : Sections 6.1 to 6.4, 6.6 to 6.9 , 6.11 and 6.12. (Omit Sections 6.5, 6.10,6.13 to 6.15)</b>
	<b>Recommended Text</b> M. Fisz, <i>Probability Theory and Mathematical Statistics</i> , John Wiley and Sons, New York, 1963.
<b>Reference Books</b>	1. R.B. Ash, <i>Real Analysis and Probability</i> , Academic Press, New York, 1972 2. K.L.Chung, <i>A course in Probability</i> , Academic Press, New York, 1974. 4. R.Durrett, <i>Probability : Theory and Examples</i> , (2 <sup>nd</sup> Edition) Duxbury Press, New York, 1996. 5. V.K.Rohatgi <i>An Introduction to Probability Theory and Mathematical Statistics</i> , Wiley Eastern Ltd., New Delhi, 1988(3 <sup>rd</sup> Print). 6. S.I.Resnick, <i>A Probability Path</i> , Birhauser, Berlin,1999. 7. B.R.Bhat , <i>Modern Probability Theory</i> (3 <sup>rd</sup> Edition), New Age International (P)Ltd, New Delhi, 1999

#### GROUP A: ELECTIVE-I

Title of the Course		A1 . FORMAL LANGUAGES AND AUTOMATA THEORY					
Paper Number		V					
Category	Elective-I	Year	I	Credits	4	Course Code	
		Semester	I				
Pre-requisite		Elementary algebra					

<b>Course Outline</b>	<b>UNIT-I :</b>  Finite automata, regular expressions and regular grammars Finite state systems – Basic definitions – Nondeterministic finite automata – Finite automata with $\epsilon$ moves – Regular expressions – Regular grammars. <b>Chapter 2. Sections 2.1 to 2.5</b> <b>Chapter 9 Section 9.1</b>
	<b>UNIT-II :</b> <b>Properties of regular sets.</b> The Pumping lemma for regular sets – Closure properties of regular sets – Decision algorithms for regular sets – The Myhill-Nerode Theorem and minimization of finite automata.  <i>Chapter 3 : Sections 3.1 to 3.4</i>
	<b>UNIT-III : Context-free grammars</b> Motivation and introduction – Context-free grammars – Derivation trees- Simplification of context-free grammars – Chomsky normal form – Greibach normal form.  <i>Chapter 4 : Section 4.1 to 4.6</i>
	<b>UNIT-IV : Pushdown automata</b> Informal description- Definitions-Pushdown automata and context-free languages – Normal forms for deterministic pushdown automata. <b>Chapter 5 : Sections 5.1 to 5.3</b>
	<b>UNIT-V : Properties of context-free languages</b> The pumping lemma for CFL's – Closure properties for CFL's – Decision algorithms for CFL's.  <i>Chapter 6 : Sections 6.1 to 6.3</i>
<b>Recommended Text</b>	John E.Hopcraft and Jeffrey D.Ullman, <i>Introduction to Automata Theory, Languages and Computation</i> , Narosa Publishing House, New Delhi, 1987.
<b>Reference Books</b>	1. A. Salomaa, <i>Formal Languages</i> , Academic Press, New York, 1973. 2. John C. Martin, <i>Introduction to Languages and theory of Computations</i> (2 <sup>nd</sup> Edition) Tata-McGraw Hill Company Ltd., New Delhi, 1997.

Title of the Course		A2. FUZZY SETS AND THEIR APPLICATIONS					
Paper Number		V					
Category	Elective-II	Year	I	Credits	4	Course Code	
		Semester	I				
Pre-requisite		Knowledge of graphs, relations, composition					
Course Outline		UNIT-I : Fundamental Notions: Chapter I: Sec. 1 to 8					
		UNIT-II : Fuzzy Graphs: Chapter II: Sec. 10 to 18					
		UNIT-III : Fuzzy Relations: Chapter II: Sec. 19 to 29					
		UNIT-IV : Fuzzy Logic: Chapter III: Sec.31 to 40 (omit Sec. 37, 38, 41)					

	<b>UNIT-V : The Laws of Fuzzy Composition: Chapter IV: Sec.43 to 49</b>
<b>Recommended Text</b>	A.Kaufman, <i>Introduction to the theory of Fuzzy subsets</i> , Vol.I, Academic Press, New York, 1975.
<b>Reference Books</b>	1. H.J.Zimmermann, <i>Fuzzy Set Theory and its Applications</i> , Allied Publishers, Chennai, 1996 2. George J.Klir and Bo Yuan, <i>Fuzzy sets and Fuzzy Logic-Theory and Applications</i> , Prentice Hall India, New Delhi, 2001.

Title of the Course		A3. MATHEMATICAL ECONOMICS						
Paper Number		V						
Category	Elective-I	Year	I	Credits	3	Course Code		
		Semester	I					
Instructional Hours per week		Lecture		Tutorial		Lab Practice		Total
		5		1		--		6
Pre-requisite		UG level Modern Algebra and Calculus						
Objectives of the Course		To initiate the study on consumer behaviour, Thory of firms, Market equilibrium. Welfare Economics.						
Course Outline		<b>UNIT-I: The Theory of Consumer Behaviour:</b> Utility function – Indifference Curves – Rate of Commodity Substitution – Existence of Utility Function – Maximizatin of Utility – Choice of a utility Index – Demand function – Income and Leisure – Substitution and Income Effects – Generalization to $n$ variables – Theory of Revealed Preference – Problem of Choice in Risk. <b>Chapter 2: 2.1 to 2.10</b>						
		<b>UNIT-II : The Theory of Firm:</b> Production Function – Productivity Curves – Isoquents – Optimization behaviour – Input Demand Functions – Cost Functions (short-run and long-run) – Homogeneous Production functions and their properties – CES Production Function and their Properties – Joint Products – Generalisation to $m$ variables.						
		<b>UNIT-III : Market Equilibrium:</b> Assumptions of Perfect Competition – Demand Functions – Supply Functions – Commodity Equilibrium – Applications of the Analysis – Factor Market Equilibrium – Existence of Uniqueness of Equilibrium – Stability of Equilibrium – Dynamic Equilibrium with lagged adjustment.						
		<b>UNIT-IV : Imperfect Competition:</b> Monopoly and its Applications – Duopoly and Oligopoly – Monopolistic Composition – Monopsony, Duopsony and Oligopsony – Bilateral Monopoly <b>Chapter 6 : Sections 6.1 to 6.7</b>						
		<b>UNIT-V: Welfare Economics:</b> Parato Optimality and the efficiency of Perfect competition – The efficiency of Imperfect competition – External Effects in consumption and Production – Taxes, Subsidies and Compensation – Social Welfare functions – The theory of Second Best. <b>Chapter 7 : Sections 7.1 to 7.7</b>						
Recommended Text		J.M.Henderson and R.E.Quandt, <i>Micro Economic Theory- A Mathematical Approach</i> , (2 <sup>nd</sup> Edn) McGraw Hill, New York, 1971.						

Reference Books	
1. William J. Baumol. <i>Economic Theory and Operations Analysis</i> , Prentice Hall of India, New Delhi, 1978	
2. A.C.Chiang, <i>Fundamental Methods of Mathematical Economics</i> , McGraw Hill, New York, 1984	
3. Michael D. Intriligator, <i>Mathematical Optimization and Economic Theory</i> , Prentice Hall, New York, 1971.	
4. A. Kautsoyiannis, <i>Modern Microeconomics</i> (2 <sup>nd</sup> edn) MacMillan, New York, 1979	

Title of the Course		A4. PROGRAMMING IN C++ AND NUMERICAL METHODS (Theory 75 marks(UE) + Computer Laboratory 25 marks(CIA))					
Paper Number		V					
Category	Elective-I	Year	I	Credits	4	Course Code	
		Semester	I				
Pre-requisite		Basics of computer programming					
Course Outline		UNIT-I : Tokens, Expressions and Control Structures – Functions in C++ Chapters: 3 and 4 (Balagurusamy)					
		UNIT-II : Classes and Objects – Constructors and Destructors – Operator Overloading and Type conversions Chapters : 5, 6 and 7(Balagurusamy)					
		UNIT-III : Inheritance – Pointers – Virtual Functions and Polymorphism Chapters 8 and 9(Balagurusamy)					
		UNIT-IV : The solution of Nonlinear Equations $f(x)=0$ Chapter2: Sec. 2.1 to 2.7(John H.Mathews) Interpolation and Polynomial Approximation Chapter 4: 4.1 to 4.4 (omit Sec. 4.5 & 4.6)(John H.Mathews)					
		UNIT-V : Curve Fitting Chapter 5: Sec. 5.1 to 5.3 (omit Sec. 5.4)( John H.Mathews) Solution of Differential Equations Chapter 9: Sec. 9.1 to 9.6 (omit 9.7 to 9.9) (John H.Mathews)					
		Recommended Text		E. Balagurusamy, <i>Object Oriented Programming with C++</i> , Tata McGraw Hill, New Delhi, 1999. John H.Mathews, <i>Numerical Methods for Mathematics, Science and Engineering</i> (2 <sup>nd</sup> Edn.), Prentice Hall, New Delhi, 2000			
Reference Books		1.D. Ravichandran, <i>Programming with C++</i> , Tata McGraw Hill, New Delhi, 1996 2. Conte and de Boor, <i>Numerical Analysis</i> , McGraw Hill, New York, 1990					

**Computer Laboratory Practice Exercises :**

**Section I : Computer Language Exercises for Programming in C++ :**

1. Write a class to represent a vector (a series of float values). Include member functions to perform the following tasks: To create the vector, To modify the value of a given element, To multiply by a scalar value, To display the vector in the form (10, 20, 30,...). Write a program to test your class.
2. Create a class **FLOAT** that contains one float data member. Overload all the four arithmetic operators so that they operate on the objects of **FLOAT**.
3. Write a class called employee that contains a name and an employee number. Include a member function to get data from the user for insertion into object, and another function to display the data. Write a main() program to create an array of employee information and accept information from the user and finally print the information.
4. Write a program which shows the days from the start of year to date specified. Hold the number of days for each month in an array. Allow the user to enter the month and the day of the year. Then the program should display the total days till the day.
5. Write a program to use a common friend function to exchange the private values of two classes.
6. Write a program to include all possible binary operator overloading using friend function.
7. Write a program to read an array of integer numbers and sort it in descending order. Use readdata, putdata, and arraymax as member functions in a class.
8. Write a program to read two character strings and use the overloaded '+' operator to append the second string to the first.
9. Write a function that takes two Distance values as arguments and returns the larger one. Include a main() program that accept two Distance values from the user, compare them and displays the larger.
10. Write a program to implement the concept of object as function argument and returning objects.
11. Develop a program Railway Reservation System using Hybrid Inheritance and Virtual Function.
12. Using overloaded constructor in a class write a program to add two complex numbers.
13. Create a class MAT of size(m,n). Define all possible matrix operations for MAT type objects.
14. Write a program that determines whether a given number is a prime number or not and then prints the result using polymorphism.

## Sections II : Numerical Methods Exercises for Programming in C++:

1. Non-Linear Equations
  - 1.1 Bisection Method
  - 1.2 Regula-falsi Method
  - 1.3 Newton-Raphson Method
  - 1.4 Secant Method
  - 1.5 Fixed Point Iteration
2. Interpolation

- 2.1 Lagrange's Interpolation Formula
- 2.2 Newton Interpolation Formula
- 3. Curve Fitting
  - 3.1 Least-Square line
  - 3.2 Least-Square polynomial
  - 3.3 Non linear curve fitting
- 4. Numerical Solution to Differential Equations
  - 4.1 Euler's Method
  - 4.2 Taylor's Method of order 4
  - 4.3 Runge-Kutta Method of order 4
  - 4.4 Milne-Simpson Method

#### GROUP B: ELECTIVE-II

Title of the Course		B1. DISCRETE MATHEMATICS					
Paper Number		XI					
Category	Elective-II	Year	I	Credits	4	Course Code	
		Semester	II				
Pre-requisite		Elementary algebra					
Course Outline		UNIT-I : Lattices: Properties of Lattices: Lattice definitions – Modular and distributive lattice; Boolean algebras: Basic properties – Boolean polynomials, Ideals; Minimal forms of Boolean polynomials. Chapter 1: § 1 A and B § 2A and B. § 3.					
		UNIT-II : Applications of Lattices: Switching Circuits: Basic Definitions - Applications Chapter 2: § 1 A and B					
		UNIT-III : Finite Fields Chapter 3: § 2					
		UNIT-IV : Polynomials : Irreducible Polynomials over Finite fields – Factorization of Polynomials Chapter 3: § 3 and §4.					
		UNIT-V: Coding Theory : Linear Codes and Cyclic Codes Chapter 4 § 1 and 2					
Recommended Text		Rudolf Lidl and Gunter Pilz, <i>Applied Abstract Algebra</i> , Spinger-Verlag, New York, 1984.					
Reference Books		1. A.Gill, <i>Applied Algebra for Computer Science</i> , Prentice Hall Inc., New Jersey. 2. J.L.Gersting, <i>Mathematical Structures for Computer Science</i> (3 <sup>rd</sup> Edn.), Computer Science Press, New York. 3. S.Wiitala, <i>Discrete Mathematics- A Unified Approach</i> , McGraw Hill Book Co.					

Title of the Course		B2. MATHEMATICAL PROGRAMMING					
Paper Number		XI					
Category	Elective-II	Year	I	Credits	4	Course	

		Semester	II			Code	
<b>Pre-requisite</b>		<b>Basic mathematical programming techniques.</b>					
<b>Course Outline</b>		<p><b>UNIT-I : Integer Linear Programming:</b> Types of Integer Linear Programming Problems – Concept of Cutting Plane – Gomory’s All Integer Cutting Plane Method – Gomory’s mixed Integer Cutting Plane method – Branch and Bound Method. – Zero-One Integer Programming.</p> <p><b>Dynamic Programming:</b> Characteristics of Dynamic Programming Problem – Developing Optimal Decision Policy – Dynamic Programming Under Certainty – DP approach to solve LPP.</p> <p><b>Chapters: 7 and 21.</b></p> <p><b>UNIT-II : Classical Optimization Methods:</b> Unconstrained Optimization – Constrained Multi-variable Optimization with Equality Constraints - Constrained Multi-variable Optimization with inequality Constraints</p> <p><b>Non-linear Programming Methods:</b> Examples of NLPP – General NLPP – Graphical solution – Quadratic Programming – Wolfe’s modified Simplex Methods – Beale’s Method.</p> <p><b>Chapters: 22 and 23</b></p> <p><b>UNIT-III : Theory of Simplex method :</b> Canonical and Standard form of LP – Slack and Surplus Variables – Reduction of any Feasible solution to a Basic Feasible solution – Alternative Optimal solution – Unbounded solution – Optimality conditions – Some complications and their resolutions – Degeneracy and its resolution.</p> <p><b>Chapter 24</b></p> <p><b>UNIT-IV : Revised Simplex Method:</b> Standard forms for Revised simplex Method – Computational procedure for Standard form I – comparison of simplex method and Revised simplex Method.</p> <p><b>Bounded Variables LP problem:</b> The simplex algorithm</p> <p><b>Chapters 25 and 27</b></p> <p><b>UNIT-V: Parametric Linear Programming :</b> Variation in the coefficients <math>c_j</math>, Variations in the Right hand side, <math>b_i</math>.</p> <p><b>Goal Programming :</b> Difference between LP and GP approach – Concept of Goal Programming – Goal Programming Model formulation – Graphical Solution Method of Goal Programming – Modified Simplex method of Goal Programming.</p> <p><b>Chapters 28 and 29.</b></p>					
<b>Recommended Text</b>		J.K.Sharma, <i>Operations Research</i> , Macmillan (India) New Delhi 2001					
<b>Reference Books</b>		<ol style="list-style-type: none"> <li>1. Hamdy A. Taha, <i>Operations Research</i>, (seventh edition) Prentice - Hall of India Private Limited, New Delhi, 1997.</li> <li>2. F.S. Hiller &amp; J.Lieberman <i>Introduction to Operation Research</i> (7<sup>th</sup> Edition) Tata- McGraw Hill Company, New Delhi, 2001.</li> <li>3. Beightler. C, D.Phillips, B. Wilde, <i>Foundations of Optimization</i> (2<sup>nd</sup> Edition) Prentice Hall Pvt Ltd., New York, 1979</li> <li>4. S.S. Rao - <i>Optimization Theory and Applications</i>, Wiley Eastern Ltd. New Delhi. 1990</li> </ol>					

Title of the Course		B3. WAVELETS					
Paper Number		XI					
Category	Elective-II	Year	I	Credits	4	Course Code	
		Semester	II				
Pre-requisite		Basic Analysis and Linear Algebra					



<b>Course Outline</b>	<b>UNIT-I :</b> The Discrete Fourier Transforms <b>Chapter 2: 2.1 to 2.3</b>
	<b>UNIT-II :</b> Wavelets on $\mathbb{Z}_n$ <b>Chapter 3: 3.1 to 3.3</b>
	<b>UNIT-III :</b> Wavelets on $\mathbb{Z}$ <b>Chapter 4: 4.1 to 4.7</b>
	<b>UNIT-IV :</b> Wavelets on $\mathbb{R}$ <b>Chapter 5: 5.1 to 5.5</b>
	<b>UNIT-V</b> Wavelets and Differential Equations <b>Chapter 6: 6.1 to 6.3</b>
<b>Recommended Text</b>	Michael W.Frazier, <i>An Introduction to Wavelets through Linear Algebra</i> , Springer Verlag, Berlin, 1999
<b>Reference Books</b>	1. C.K.Chui, <i>An Introduction to Wavelets</i> , Academic Press, 1992 2. E.Hernandez and G.Weiss, <i>A First Course in Wavelets</i> , CRC Press, New York, 1996 3. D.F.Walnut, <i>Introduction to Wavelet Analysis</i> , Birhauser, 2004.

Title of the Course		B4. JAVA PROGRAMMING (Theory 75 marks(UE) + Computer Laboratory 25 marks (CIA))					
Paper Number		XI					
Category	Elective-II	Year	I	Credits	4	Course Code	
		Semester	II				
Pre-requisite		Knowledge in Programming in C / C++					
Course Outline		UNIT-I : Java Tokens – Java statements – Constants – Variables – Data types Chapters 3 and 4					
		UNIT-II : Operators – Expressions – Decision making and Branching. Chapters 5,6 and 7					
		UNIT-III : Classes – Objects – Methods – Arrays – Strings – Vectors – Multiple Inheritance Chapters 8, 9 and 10					
		UNIT-IV : Multithreaded Programming – Managing errors and Exceptions Chapters 12 and 13					
		UNIT-V : Applet Programming Chapter 14					



## **18. M.Sc. DEGREE COURSE IN MEDICAL LABORATORY TECHNOLOGY**

### **SYLLABUS SEMESTER I**

Title of the paper	<b>Basis in Human Anatomy and Physiology -Core-1</b>		
Category: C	Year & Semester First year & First Semester	Credits 4	Subject code
Pre-requisites	Bachelor degree in any life science discipline		
Objective	To understand the anatomical feature of various systems and its functions		

#### **Course outline: (Basis in Human Anatomy and Physiology)**

##### **UNIT I**

Scope of Anatomy and Physiology, Definition of various terms used in anatomy. Structure of cell, function of its components. Types, structure, histology and functions of tissues - epithelial, connective and nervous. Morphological, functional and biochemical maturation of tissues. Muscle - types and mechanism of contraction. Identification of a histological section. Histology of important organs.

##### **UNIT II**

Composition and functions of blood and lymph. Circulatory system. Development and functions of red and white blood cells and platelets. Blood coagulation. Structure and functions of heart. Cardiac cycle. ECG. Blood pressure, cardiac output. Spleen and lymphoid cells. Structure and functions of lungs and mechanism of respiration.

### **UNIT III**

Structure and functions of digestive system - stomach, liver, pancreas, gall bladder and intestine. Digestion, absorption and excretion. Structure and functions of excretory system-kidney. Formation and composition of urine. Micturition. GFR. Renal regulation of fluid, electrolytes and acid - base balance.

### **UNIT IV**

Structure and functions of central nervous system - brain, spinal cord, nerves and neurons. Transmission of nerve impulses and neurotransmitter. CSF - formation, composition and functions. Structure and function reproductive system. Physiology of pregnancy, parturition and lactation.

### **UNIT V**

Human Rights and human relation education - historical development, national and international. State, national and international instruments. Article 21 of Indian Constitution. Human relations - political, ethnic and communal relations, socio - cultural relations, organization relations and related human rights. Economics of human rights and relations/Adam Smith's thoughts of moral sentiments. Economic philosophy - Thirukkural.

#### **Reference Books:**

Human Physiology – Stuart Era Fox.

Textbook of Medical Physiology – Guyton and Hall, 2001, 10<sup>th</sup> edition.

#### **Recommended Books:**

General Physiology – A. Mariakuttian & N. Arumugam.

#### **Indian Books:**

Textbook of Physiology and Nutrition – M. Swaminathan

Web Sites:

Title of the paper	<b>Biochemistry - Core -2</b>		
Category: C	Year & Semester First year & First Semester	Credits 4	Subject code
Pre-requisites	Bachelor degree in any life science discipline		
Objective	To understand the chemistry of living organisms		

**Course outline: (Biochemistry)**

**UNIT I**

Classification, chemical structure, properties and functions of carbohydrates, aminoacids, proteins, lipids and nucleic acids.

**UNIT II**

Enzymology - enzyme classification coenzymes, determination of active site, specificity, types of catalysis, basic aspects of chemical kinetics - Michaelis - Menten equation, enzyme kinetics - factors which affect enzyme activity and inhibitors, allosteric enzymes, general mechanism of enzyme catalysis.

**UNIT III**

Structure of cell and assembly of biological membranes - membrane lipids, integral and peripheral membrane proteins and their isolation. Structure and functions of glycoprotein. RBC membrane as a useful experimental system, membrane models, liposomes, membrane fluidity.

**UNIT IV**

Metabolism and regulation of Carbohydrates - Glycolysis. TCA cycle, HMP shunt and Gluconeogenesis and their regulation. Electron transport, oxidative phosphorylation, Chemiosmotic theory, inhibitors of phosphorylation. Components of the electron transport system. Redox potential, mechanism of oxidative phosphorylation, inhibitors of phosphorylation - chemiosmotic theory. Metabolism and regulation of Nucleic acids and Nucleotides.

## **UNIT V**

Metabolism of lipoproteins, fatty acids and phospholipids. Metabolism of purine and pyrimidine nucleotides.

### **Reference Books:**

Biochemistry by Geoffrey L Zubay, Fourth Edition, 1998

Fundamentals of Biochemistry by Donald Voet, Judith Voet and Pratt, second edition, 1995

Harper's Biochemistry by Murray et al. Appleton and Lange Publishers, 25<sup>th</sup> edition, 2000.

### **Recommended Books:**

Principles of Biochemistry with human focus by Garrett and Grisham, Harcourt College Publishers, Orlando, Florida, USA. 2002

Principles of Biochemistry by Lehninger, Nelson and Cox, fourth edition, W H Freeman and Company, New York, USA, 2005.

### **Indian Books:**

Biochemistry – Sathyanarayana U, 2002, Arunabha Sen Books & Allied (P) Ltd, Kolkata.

### **Web Sites:**

<http://golgi.harvard.edu/biopages.html>

[www.whfreeman.com/biochem5](http://www.whfreeman.com/biochem5)

<http://www.harcourtcollege.com>

Title of the paper	<b>Practical I (Biochemistry)- Core -3</b>		
Category: C	Year & Semester First year & First Semester	Credits 4	Subject code
Pre-requisites	Bachelor degree in any life science discipline		
Objective	To get hands on training in advanced biochemical techniques		

### **Course outline: (Practical I - Biochemistry)**

1. Estimation of carbohydrates, protein, lipid, nitrogen, inorganic phosphorus, calcium and iron.
2. Assay of alkaline phosphatase and Lactate dehydrogenase.
3. Separation of proteins, lipoproteins, lipids, Carbohydrates.
4. Fractional analysis of intracellular organelles of liver tissue by centrifugation.

### **Reference Books:**

Varley's Practical Clinical Biochemistry by Alan H Gowenlock, published by CBS Publishers and distributors, India Sixth Edition (1988).

Tietz Fundamentals of Clinical chemistry – Burtis and Ashwood, Fifth Edition, WB Saunders Company, Oxford Science Publications USA, (2001)

Practical Biochemistry – Keith Wilson & John Walker, fifth edition, Cambridge University Press, UK (2000).

Analytical Biochemistry & Separation Techniques – Palanivelu third edition (2004).

Biochemical calculations – Irwin H. Segel, second edition, John Wiley & Sons, USA (1976).

Introduction to Practical Biochemistry by Sawhney and Randhir Singh, Narosa Publishing House, London (2000).

Experiments in Biochemistry – A Hands on Approach by Shawn O Farrell and Ryan T Ranallo, Thomson Learning Inc., USA (2000)

**Recommended Books:**

Principles of Instrumental analysis – Skoog, Holler, Nieman, fifth edition  
Published by Harcourt College Publishers, Singapore (2001).

Essentials of Practical Biochemistry by Lalit M Srivatsava, Nibhriti Das, Subrata Sinha, Published by CBS Publishers and Distributors, India, (2002)

**Indian Books:**

Analytical Biochemistry & Separation Techniques – Palanivelu third edition (2004).

Title of the paper	<b>General Chemistry-Elective-1</b>		
Category: E	Year & Semester First year & Fourth Semester	Credits 3	Subject code
Pre-requisites	Bachelor degree in any life science discipline		
Objective	To understand the physical and chemical properties of molecules		

**Course outline: (General Chemistry)**

**UNIT I**

Atomic and molecular structure - molecular orbitals, ionic bond, covalent bond, multiple bond, polarity of hydrogen bond, van der Waals interaction molecular orbital theory, hybridization, stereo -chemistry.

**UNIT II**



Ionic equilibria - Ostwald's diluter law - determination of dissociation constants, ionic product of water, pH value, acids and bases, solubility product, ionization constant, normality, molarity, molality, mass and weight, SI system of Units, electronegativity, dielectric constant.

### UNIT III

Chemical and physical properties of solids, liquids, gases and colloids - boiling point, freezing point, adhesion, specific gravity, density, surface tension, viscosity, osmosis, molecular volume, refractivity, molecular structure and bonding.

### UNIT IV

Coordination chemistry - nomenclature, Werner's theory, conductivity and precipitation studies, structure of EDTA, geometrical and optical isomerism, linear and tetrahedral compounds, applications of coordination compounds.

### UNIT V

Chemical Kinetics - Complex reaction, transition state theory and collision theory, reactions in solutions, effect of solvent polarity and ionic strength.

### Reference Books:

1. Text book of quantitative inorganic analysis - AI Vogel.
2. Fundamentals of general, organic and biological chemistry - John R. Holum.
3. Organic chemistry of biological compounds - Robert Barker
4. Chemistry - Molly M Bloomfield.

Title of the paper	Nutritional Biochemistry-Elective-2		
Category: Elective	Year & Semester First year & First Semester	Credits 3	Subject code

Pre-requisites	Bachelor degree in any life science discipline
Objective	To understand the human nutrition

### **Course outline: (Nutritional Biochemistry)**

#### **UNIT I**

Definition for nutrition, nutrients, body weight, body composition. Measurement of energy expenditure, basal metabolic rate, calorific value, respiratory quotient, nutritional requirements of carbohydrates, proteins and lipids. Deficiency states of carbohydrate, proteins and lipid, RDA.

#### **UNIT II**

Nutritional requirements of vitamins (fat and water soluble) - structure, functions, deficiency states, dietary source, RDA.

#### **UNIT III**

Nutritional requirements of minerals- functions, deficiency states, dietary source, RDA.

#### **UNIT IV**

Nutrition and Body's defense- Dietary guidelines for disease prevention. The process of cancer development, the body's defense system and nutritional therapy.

#### **UNIT V**

Dietary management with special reference to diabetes mellitus, cardiovascular diseases, nephritis, cirrhosis, jaundice, ulcer and malnutrition (kwashiorkor and marasmus).

### **RECOMMENDED BOOKS**

1. Human nutrition and Dietetics – Davidson and Passmore
2. Food science – M.S. Swaminathan.
3. Nutritional Biochemistry – Tom Brody, 1994, Academic press, USA.
4. Antioxidant status, diet, nutrition and health - Andreas M Pappas, 1996.  
Published by CRC Press. Washington, DC.
5. Text book of Physiology and Nutrition- M. Swaminathan.

## SEMESTER II

Title of the paper	<b>Clinical Biochemistry-Core-4</b>		
Category: C	Year & Semester First year & First Semester	Credits 4	Subject code
Pre-requisites	Bachelor degree in any life science discipline		
Objective	To understand the biochemical basics of disease based on clinical investigations		

### Course outline: (Clinical Biochemistry)

#### UNIT I

Diseases related to carbohydrate, protein, lipid and nucleic acid - deficiency states, in born errors in their metabolism, genetic disorders. Detection of these anomalies.

#### UNIT II

Clinical enzymology - enzymes in plasma and their origin, general principles of assay. Clinical significance of enzymes and isoenzymes (LDH, CK, phosphatase, 5' nucleotidase, amylase, lipase, acetyl choline esterase, transaminase and gamma glutamyl transferase. Measurement of serum enzymes in diagnosis, with special reference to myocardial infarction, liver, muscle and bone diseases and malignancy.

### **UNIT III**

Hypertension, atherosclerosis, coronary artery disease, myocardial infarction. Diagnosis - measurement of ECG, BP, cardiac output. Respiratory diseases - bronchitis, chronic obstructive pulmonary disease and asthma.

### **UNIT IV**

Malabsorption syndrome, acidity, ulcers - gastric, duodenal and peptic, colon cancer, pancreatitis, diabetes mellitus, gastric and pancreatic function tests.

Diseases relating to liver - jaundice, cirrhosis, hepatitis, cholestasis, cholelithiasis, hepatic coma, carcinoma, inherited diseases of bilirubin metabolism - liver function tests.

Diseases related to kidney - nephritis, nephrosis, uremia, renal failure, renal calculi, renal hypertension, renal tubular acidosis, diabetes insipidus. Kidney function tests. Dialysis - hemodialysis and peritoneal dialysis.

### **UNIT V**

Composition of CSF. Diseases related to CNS - meningitis, encephalitis, epilepsy, Parkinsons, Alzheimers, cerebral palsy.

Diseases of immune system - AIDS, autoimmune disease, Detection of these anomalies. Biochemical changes in cancer - detection of tumor markers.

### **Reference Books:**

Varley's Practical Clinical Biochemistry - Alan H Gowenlock, published by CBS Publishers and distributors, 1988, 6th edition, India.

Textbook of Biochemistry with clinical correlations-T.M.Devlin, 2002, 5th edition.

Biochemistry: A case oriented approach- Montgomery, Comway, Spector, Chappell, 1996, 6th edition, Mosby Publishers, USA.

### **Recommended Books:**

Tietz Fundamentals of Clinical chemistry – Burtis and Ashwood, 2001, 5th edition, WB Saunders Company, Oxford Science Publications USA.

### **Indian Books:**

Text book of Biochemistry : A clinically oriented approach - Dinesh Puri, B.I, 2002, Churchill Livingstone Inc., India.

Text Book of Medical Biochemistry – Chatterjea & Schinde, 2000 4<sup>th</sup> edition.

Title of the paper	<b>Immunology-Core-5</b>		
Category: C	Year & Semester First year & Second Semester	Credits 4	Subject code
Pre-requisites	Bachelor degree in any life science discipline		
Objective	To understand the concept of defense mechanisms		

### **Course outline: (Immunology)**

#### **UNIT I**

Introduction and definition, Innate and acquired immunity, factors affecting immunity. Cells of immune system - stem cells, lymphocytes, B and T cells, macrophages, null cells, natural killer cells, eosinophils, basophils, neutrophils, mast cells and platelets.

#### **UNIT II**

Antibody - structure, properties and functions, Antigens - properties and function, antigen - antibody reactions, antigenicity, essential factors for antigenicity, antibody diversity

### **UNIT III**

Complement - salient features of complement, complement activation, classical pathway, alternate pathway, complement fixation, biological functions of complements. Hypersensitivity - factors governing hypersensitivity, types of hypersensitivity, immediate and delayed hypersensitivity.

### **UNIT IV**

Auto immune disease - classification, pathogenesis, diagnosis and treatment of auto immune diseases, AIDS, Addison's disease, rheumatoid arthritis.

Tumor immunology - surface changes on tumor cells, immune response to tumors, approaches to cancer therapy, immunodiagnosis of solid tumors.

### **UNIT V**

Transplantation - Graft versus host reaction, immunosuppressants, molecules involved in rejection, mechanism of rejection and prevention of graft rejection, histocompatibility.

Immunological techniques - Radio immuno assay, ELISA, immuno electrophoresis, Western blot, immunodiffusion, production of monoclonal and polyclonal antibodies and their applications, flow cytometry.

### **Reference Books:**

Immunological techniques - D.M.Weir, 1992, 3 Volumes. Black well scientific Publication.

Immunology – L. Roitt, 1996, Black well Scientific Publications.

Medical Immunology- T.G. Parslow, D.P. Stites, A.L. Terr, 2001. 10th edition, McGraw-Hill publishing.

Kuby Immunology - R.A.Goldsby, T.J.Kindt & B.A.Osborne 2000, Freeman and Company

Monoclonal antibodies- H.Zola. 2000, Bios Scientific Publishers Ltd.

**Recommended Books:**

Essential Immunology- Ivan M. Roitt and Peter J. Delvis, 10<sup>th</sup> edition, Blackwell

Science Pub.,USA.

Immunology for Life Scientists - Lesley Janes Eales, 2<sup>nd</sup> edition, Wiley Pub.

Immunology-Janes Kuby, Fifth edition, W.H.Freeman and company, New York. Antibodies- Their structure and Function - Steward, M.W., 1984, Chapman

And Hall, New York.

II.Ransohoff Richard et al., 1996, Cytokines and the CNS, CRC Press Boca Raton. 12Joshi, K.R & Osama, N.O., 1998, Immunology, Agro Botanica Bikaner.

**Indian Books:**

Immunology: introductory textbook - I.Nandini Shetty, 1996, New Age International, New Delhi.

**Websites:**

<http://www.piercenet.com/resources/browse.cfm>

[www.portlandpress.com](http://www.portlandpress.com)

[www.library.csusm.edu/course\\_guides/biology](http://www.library.csusm.edu/course_guides/biology)

[www.immunologylink.com](http://www.immunologylink.com)

<http://www.wiley.com/college/bio/karp12791/weblinks.html>

Title of the paper	<b>Practical II (Clinical Biochemistry)-Core-6</b>		
Category: C	Year & Semester First year & Second semester	Credits 4	Subject code
Pre-requisites	Bachelor degree in any life science discipline		
Objective	To get hands on training in Biochemical techniques based on clinical investigation		

### **Course outline: (Practical II -Clinical Biochemistry)**

1. Collection and preservation of blood and urine.
2. Estimation of blood glucose, Glucose Tolerance test, Urea, Serum creatinine, total protein, A/G ratio, cholesterol, triglycerides, phospholipids.
3. Clinical Enzymology - Determination of the activity of Glutamyl transferase, alkaline phosphatase, Creatine kinase, Lactate dehydrogenase, aspartate transaminase, alanine transaminase, amylase.
4. Quantitative analysis of urine - Urine glucose, urea, uric acid, creatinine calcium, chloride.
5. Analysis of calcium, oxalate, urate and xanthate in renal calculi.
6. Analysis of liver, gastric, pancreatic and kidney function tests.
7. Measurements of BP, ECG - interpretation.

### **Reference Books:**

Varley's Practical Clinical Biochemistry by Alan H Gowenlock, published by CBS Publishers and distributors, India Sixth Edition (1988).

Tietz Fundamentals of Clinical chemistry – Burtis and Ashwood, Fifth Edition, WB Saunders Company, Oxford Science Publications USA, (2001)



Practical Biochemistry – Keith Wilson & John Walker, fifth edition, Cambridge University Press, UK (2000).

Analytical Biochemistry & Separation Techniques – Palanivelu third edition (2004).

Biochemical calculations – Irwin H. Segel, second edition, John Wiley & Sons, USA (1976).

Introduction to Practical Biochemistry by Sawhney and Randhir Singh, Narosa Publishing House, London (2000).

Experiments in Biochemistry – A Hands on Approach by Shawn O Farrell and Ryan T Ranallo, Thomson Learning Inc., USA (2000)

#### **Recommended Books:**

Principles of Instrumental analysis – Skoog, Holler, Nieman, fifth edition Published by Harcourt College Publishers, Singapore (2001).

Essentials of Practical Biochemistry by Lalit M Srivatsava, Nibhriti Das, Subrata Sinha, Published by CBS Publishers and Distributors, India, (2002)

#### **Indian Books:**

Analytical Biochemistry & Separation Techniques – Palanivelu third edition (2004).

Title of the paper	<b>Endocrinology - Elective-3</b>		
Category: E	Year & Semester First year & Second Semester	Credits 3	Subject code
Pre-requisites	Bachelor degree in any life science discipline		
Objective	To introduce to the students the biochemical aspects of nutrition and information about the Endocrine system and its signal transduction.		

### **Course outline: (Endocrinology and Nutritional Biochemistry)**

#### **UNIT I**

General concepts of endocrinology - the endocrine system, hormones - chemical nature, types, hormone action, regulatory feedback, hormone - receptor interaction. Concepts of hormone assay.

#### **UNIT II**

Hypothalamus and pituitary - anatomy, chemistry, functions, regulation and diseases related to the hormones of these glands. Detection of anomalies. Thyroid and parathyroid anatomy, chemistry, functions, regulation and diseases related to the hormones of these glands. Detection of anomalies.

#### **UNIT III**

Adrenal cortex and medulla anatomy, chemistry, functions, regulation and diseases related to the hormones of these glands. Detection of anomalies. Gonadal hormones - anatomy, chemistry, functions, regulation and diseases related to the hormones of these glands. Detection of anomalies. Endocrinology of pregnancy and lactation.

#### **UNIT IV**

Pancreatic and gastric anatomy, chemistry, functions, regulation and diseases related to the hormones of these glands. Detection of anomalies.

#### **UNIT V**

Prostaglandins, leukotrienes, thromboxanes, structure, functions, regulation and significance. Methods of detection. Hormones involved in calcium and phosphate metabolism. Diseases related to its metabolism.

#### **Reference Books:**

Williams Text book of Endocrinology - Wilson and Foster 8th edn.

Mechanisms of hormone action - Autin and Shor.

## SEMESTER- II

Title of the paper	<b>Extra Disciplinary- Elective -4</b>		
Category: ED	Year & Semester First year & Second Semester	Credits 3	Subject code
Pre-requisites	Bachelor degree in any life science discipline		
Objective	-		

### **Course outline: (Basics in Physiology)**

#### **Unit – 1**

Types, structure and functions of tissues – epithelial, connective and nervous tissues. Morphological functional and biochemical maturation of tissues. Muscle – types and mechanism of contraction.

#### **Unit – II**

Composition and functions of blood. Blood coagulation. Structure and functions of Heart, cardiac cycle, ECG, blood pressure, cardiac output. Structure and functions of lungs and mechanism of respiration.

#### **Unit – III**

Structure and functions of digestive system – stomach, liver, pancreas, gall bladder and intestine. Digestion and absorption of food.

#### **Unit – IV**

Structure and functions of excretory system – kidney, nephron, formation, micturition and composition of urine, GFR. Structure and functions of reproductive system – Physiology of pregnancy, parturition and lactation.

**Unit –V**

Structure and functions of central Nervous system – brain, spinal cord, nerves and neurons. Transmission of nerve impulse and neurotransmitters.

**Reference Books:**

Human Physiology – Stuart Era Fox.

Textbook of Medical Physiology - Guyton and Hall, 2001, 10<sup>th</sup> edition.

**Recommended Books:**

General Physiology - A. Nariakuttian & N. Arumugam.

**Indian Books:**

Textbook of Physiology and Nutrition – M. Swaminathan.

**Websites :**

[www. Sciencedirect.com](http://www.Sciencedirect.com)

## **19. M.Sc. DEGREE COURSE IN PHYSICS**

### **SYLLABUS**

**(Effective from the academic year 2008 – 2009 and thereafter)**

#### **Paper 1: MATHEMATICAL PHYSICS**

**(CORE COURSE, FIRST YEAR, FIRST SEMESTER, 4 CREDITS)**

##### **UNIT 1: Linear Vector Spaces and Tensors**

Linear operators – Vectors in n-dimensions – Matrix representation of vectors and operators in a basis - Linear independence, dimension - Inner product - Schwarz inequality - Orthonormal basis - Gram-Schmidt Process – Eigenvalues and Eigenfunctions of operators/matrices – Hermitian and unitary operators/matrices – Cayley-Hamilton theorem - Diagonalizing matrix.

Tensors : Coordinate transformations – Contravariant and Covariant Vectors – Tensors of higher rank – Einstein's summation convention – Kronecker delta – Product rule – Quotient rule- Levi-Civita tensor in three dimensions .

##### **UNIT 2: Linear Differential Equations and Green's Function**

Second order linear differential equations – Wronskian - Sturm - Liouville theory - Orthogonality of eigenfunctions - Illustration with Legendre, Laguerre, and Hermite differential equations – Expansion of polynomials - Dirac delta function.

One-dimensional Green's function - Eigenfunction expansion of the Green's function - Reciprocity theorem - Sturm - Liouville type equations in one dimension and their Green's functions.

##### **UNIT 3: Complex Variables**

Functions of a complex variable - Single and multivalued functions - Analytic functions - Cauchy - Riemann conditions - Singular points - Cauchy's theorem and integral formulae - Taylor and Laurent expansions - Zeros and poles - Residue theorem and its applications

##### **UNIT 4: Laplace and Fourier Transforms**

Laplace transforms - Solution of linear differential equations with constant coefficients - Fourier integral - Fourier transforms (Infinite), Fourier sine and cosine transforms - Convolution theorems.

## UNIT 5: Group Theory

Basic definitions - Lagrange's Theorem - Invariant subgroup - Homomorphism and Isomorphism between groups - Representation of a group - Unitary representations - Schur's lemmas - Orthogonality theorem - Character table - Simple applications to symmetry groups and molecular vibrations.

### BOOKS FOR STUDY:

1. **P. K. Chattopadhyay**, 1990, *Mathematical Physics*, Wiley Eastern, Madras.
2. **G. Arfken and H. J. Weber**, 2001, *Mathematical Methods for Physicists*, 5<sup>th</sup> Edition, Harcourt (India), New Delhi.
3. **A. W. Joshi**, 1997, *Elements of Group Theory for Physicists*, 4<sup>th</sup> Edition, New Age International, New Delhi.
4. **A. W. Joshi**, 1995, *Matrices and Tensors in Physics*, 3<sup>rd</sup> Edition, Wiley Eastern, Madras.
5. **E. Kreyszig**, 1999, *Advanced Engineering Mathematics*, 8<sup>th</sup> Edition, Wiley, New York.
6. **M. D. Greenberg**, 1998, *Advanced Engineering Mathematics*, 2<sup>nd</sup> Edition, International Ed., Prentice - Hall International, New Jersey.
7. **F. A. Cotton**, *Chemical Application of Group Theory*. 3<sup>rd</sup> Edition, John Wiley and Sons, New York.

### BOOK FOR REFERENCE:

1. **Tulsi Dass and S. K. Sharma**, 1998, *Mathematical Methods in Classical and Quantum Physics*, Universities Press(INDIA), Hyderabad.
2. **S. Lipschutz**, 1987, *Linear Algebra*, Schaum's Series, McGraw - Hill, New York
3. **E. Butkov**, 1968, *Mathematical Physics* Addison - Wesley, Reading, Massachusetts.
4. **P. R. Halmos**, 1965, *Finite Dimensional Vector Spaces*, 2<sup>nd</sup> Edition, Affiliated East-West, New Delhi.
5. **M. Hamermesh**, 1962, *Group Theory and Its application to Physical Problems*, Addison Wesley, Reading.
6. **C. R. Wylie and L.C. Barrett**, 1995, *Advanced Engineering Mathematics*, 6<sup>th</sup> Edition, International Edition, McGraw-Hill, New York.
7. **W. W. Bell**, 1968, *Special Functions for Scientists and Engineers*, Van Nostrand, London.
8. **M. A. Abramowitz and I. Stegun (Editors)**, 1972, *Handbook of Mathematical Functions* Dover, New York.

### WEB SITES:

1. <http://www.mpi-pks-dresden.mpg.de/~jochen/methods/outline/html>
2. <http://phy.syr.edu/~trodden/courses/mathmethods/>
3. [http://dmoz.org/Science/Physics/Mathematical\\_Physics/](http://dmoz.org/Science/Physics/Mathematical_Physics/)
4. <http://www.thphys.nuim.ie/Notes/engineering/frame-notes.html>
5. <http://www.thphys.nuim.ie/Notes/frame-notes.html>

## **Paper 2: CLASSICAL MECHANICS AND RELATIVITY** (CORE COURSE, FIRST YEAR, FIRST SEMESTER, 4 CREDITS)

### **UNIT 1: Lagrangian and Hamiltonian Formulations**

Hamilton's variational principle - Lagrange's equations of motion – Canonical momenta – Cyclic coordinates and conservation of corresponding momenta – Legendre transformation and Hamiltonian - Hamilton's equations of motion - Two-body central force problem – Kepler Problem and Kepler's laws - Scattering by central potential - Two-particle scattering - Cross-section in lab. frame.

### **UNIT 2: Mechanics of Rigid Bodies**

Rigid body motion – Kinematics – Euler angles – Infinitesimal rotations – Rate of change of a vector – Coriolis force - Dynamics - Angular momentum and kinetic energy - Moment of inertia tensor - Euler's equations of motion - Torque-free motion - Symmetrical top.

### **UNIT 3: Canonical Transformation**

Canonical transformations and their generators – Simple examples - Poisson brackets – Equations of motion in Poisson bracket formalism - Symmetries and conservation laws - Hamilton-Jacobi theory - Application to harmonic oscillator problem.

### **UNIT 4: Small Oscillations**

Formulation of the problem - Transformation to normal coordinates - Frequencies of normal modes - Linear triatomic molecule.

### **UNIT 5: Relativity**

Lorentz transformations - Four vectors - Lorentz invariance of the four product of two four vectors - Invariance of Maxwell's equations - Relativistic Lagrangian and Hamiltonian for a free particle.

### **BOOKS FOR STUDY:**

1. **H. Goldstein**, 2002, *Classical Mechanics*. 3<sup>rd</sup> Edition, C. Poole and J. Safko, Pearson Education, Asia, New Delhi.
2. **S. N. Biswas**, 1998, *Classical Mechanics*, Books and Allied Ltd., Kolkata.
3. **Upadhyaya**, 1999, *Classical Mechanics*, Himalaya Publishing Co., New Delhi.

### **BOOKS FOR REFERENCE:**

1. **L. D. Landau and E. M. Lifshitz**, 1969, *Mechanics*, Pergamon Press, Oxford.



2. **K. R. Symon**, 1971, *Mechanics*, Addison Wesley, London.
3. **J. L. Synge** and **B. A. Griffith**, 1949, *Principles of Classical Mechanics*, Mc Graw-Hill, New York.
4. **C. R. Mondal**, *Classical Mechanics*, Prentice-Hall of India, New Delhi.
5. **R. Resnick**, 1968, *Introduction to Special Theory of Relativity*, Wiley Eastern, New Delhi.
6. **R. P. Feynman**, 1962, *Quantum Electrodynamics*, Benjamin, Reading, MA.

#### **WEB SITES**

1. <http://astro.physics.sc.edu/selfpacedunits/unit56.html>
2. <http://www.phy.auckland.nz/staff/smt/453310SC.html>
3. <http://www.damtp.cam.ac.uk/user/tong/dynamics.htm>
4. <http://farside.ph.utexas.edu/teaching/301/lectures/lectures.html>
5. <http://www.lancs.ac.uk/depts/physics/teaching/py332/phys332.htm>

### **Paper 3: QUANTUM MECHANICS - I**

**(CORE COURSE, FIRST YEAR, FIRST SEMESTER, 4 CREDITS)**

#### **UNIT 1: Basic formalism**

Interpretation and conditions on the wave function - Postulates of quantum mechanics and the Schrodinger equation - Ehrenfest's theorem- Stationary states - Hermitian operators for dynamical variables - Eigenvalues and eigenfunctions - Uncertainty principle.

#### **UNIT 2: One Dimensional Problems and Three Dimensional Problems**

Particle in a box - Square-well potential - Barrier penetration - Simple harmonic oscillator - Ladder operators method.

Orbital angular momentum and spherical harmonics - Central forces and reduction of two-body problem - Particle in a spherical well - Hydrogen atom.

#### **UNIT 3: General Formalism**

Hilbert space - Dirac notation - Representation theory - Co-ordinate and momentum representations - Time evolution - Schrodinger, Heisenberg and Interaction pictures- Symmetries and conservation laws - Unitary transformations associated with translations and rotations - Parity and time reversal.

#### **UNIT 4: Approximation methods**

Time-independent perturbation theory for non-degenerate and degenerate levels - Variation method, simple applications - WKB approximation - Connection formulae (no

derivation) - WKB quantization rule - Application to simple harmonic oscillator - Hydrogen molecule, covalent bond and hybridization.

## UNIT 5: Angular Momentum and Identical particles

Eigenvalue spectrum from angular momentum algebra - Matrix representation - Spin angular momentum - Non-relativistic Hamiltonian including spin - Addition of angular momenta - Clebsch - Gordan Coefficients.

Symmetry and anti-symmetry of wave functions - Spin and Pauli matrices.

### BOOKS FOR STUDY:

1. **P. M. Mathews and K. Venkatesan**, 1976, *A Text book of Quantum Mechanics*, Tata McGraw-Hill, New Delhi.
2. **L. I. Schiff**, 1968, *Quantum Mechanics*, 3<sup>rd</sup> Edition, International Student Edition, MacGraw-Hill Kogakusha, Tokyo.
3. **V. Devanathan**, 2005, *Quantum Mechanics*, Narosa Publishing House, New Delhi.

### BOOKS FOR REFERENCE:

1. **E. Merzbacher**, 1970, *Quantum Mechanics* 2<sup>nd</sup> edition, John Wiley and Sons, New York.
2. **V. K. Thankappan**, 1985, *Quantum Mechanics*, 2<sup>nd</sup> Edition, Wiley Eastern Ltd, New Delhi.
3. **P. A. M. Dirac**, 1973, *The Principles of Quantum Mechanics*, Oxford University Press, London.
4. **L. D. Landau and E. M. Lifshitz**, 1976, *Quantum Mechanics* Pergomon Press, Oxford.
5. **S. N. Biswas**, 1999, *Quantum Mechanics*, Books And Allied Ltd., Kolkata.
6. **G. Aruldas**, 2002, *Quantum Mechanics*, Prentice Hall of India, New Delhi.
7. **A. Ghatak and S. Lokanathan**, *Quantum Mechanics: Theory and Applications*, 4<sup>th</sup> Edition, Macmillan India.
8. **J. S. Bell, Gottfried and M. Veltman**, 2001, *The Foundations of Quantum Mechanics* World Scientific, Singapore.
9. **R. P. Feynman, R. B. Leighton, and M. Sands**, 1998, *The Feynman Lectures on Physics*, Vols. 3, Narosa, New Delhi.
10. **V. Devanathan**, 1999, *Angular Momentum Techniques in Quantum Mechanics*, Kluwer Academic Publishers, Dordrecht.

### WEB SITES

1. <http://www.netsa.org.lk/OcwWeb/Physics/index.htm>
2. <http://www.theory.caltech.edu/people/preskill/ph229/>

3. <http://www.nsl.msui.edu/~pratt/phy851/lectures/lectures.html>
4. <http://walet.phy.umist.ac.uk/QM/LectureNotes/>
5. <http://www.ks.uiuc.edu/Services/Class/PHYS480/>
6. <http://www.mat.univie.ac.at/~gerald/ftp/book-schroe/index.html>
7. <http://people.deas.harvard.edu/~jones/ap216/lectures/lectures.html>
8. <http://www.netsa.org.lk/OcwWeb/Chemistry/5-73Introductory-Quantum-Mechanics-IFall2002/LectureNotes/index.htm>
9. <http://www.glue.umd.edu/~fivel/>
10. <http://www.phys.ualberta.ca/~gingrich/phys512/latex2html/phys512.html>
11. <http://www.eas.asu.edu/~vasilesk/EEE434.html>
12. <http://minty.caltech.edu/Ph125a/>
13. <http://walet.phy.umist.ac.uk/QM/LectureNotes/>

## **Paper 4: INTEGRATED ELECTRONICS AND MICROPROCESSOR**

**(CORE COURSE, FIRST YEAR, FIRST SEMESTER, 4 CREDITS)**

### **UNIT 1 : Semiconductor Devices**

**FET, MOSFET, UJT, SCR, TRIAC – Structure and constructional features – Working principle and I-V Characteristics – FET as Common Source and Common Drain amplifier -Biasing of FET and MOSFET- UJT relaxation oscillator – SCR, TRIAC for power control.**

**IC Technology – Monolithic, Thin film and Hybrid technologies – Limitations in IC Technology – VLSI**

## **UNIT 2: Digital Electronics**

**Logic families and circuits – DTL, TTL, ECL, I<sup>2</sup>L and CMOS – CMOS Devices – Inverters, NAND and NOR gates – Comparative study. PLA, PLC and PLD.**

**Design of Asynchronous feedback technique counters – Design of synchronous counters – Design of random sequence counters – Serial parallel registers – Shift registers – Applications.**

**Binary weighted resistor D/A convertor – R-2R ladder DAC – FLASH, Counter type, successive approximation and dual slope ADC.**

## **UNIT 3: Applications of Op-Amps**

**DC Analysis of IC Op-Amp – Instrumentation amplifier – Transducer Bridge Instrumentation Amplifier – Applications – Temperature Indicator, Fluxmeter & Weighing machine - Analog Integrator, differentiator – Design of analog circuits for solution of differential equation and simultaneous equations using Op-Amps – Sample and Hold system – Analog multiplexer.**

**Active filter circuits – Low Pass , High Pass, Band Pass- 1<sup>st</sup> Order, 2<sup>nd</sup> Order Butterworth Filter circuits – Wide Band and Narrow Band reject Filters.**

**Timer 555 – Internal architecture and working – Monostable and Astable operation. Voltage control oscillator (VCO) IC 566- PLL concept – Phase Locked loop IC 565 – Application – Frequency multiplier, FSK modulator and Demodulator**

## **UNIT 4: 8085, Programming and Interfacing**

**Addressing modes – Instruction set – Programming techniques – Assembly language programs. Interfacing Memory and I/O – Memory system – Linear selection addressing - Coincidence selection addressing – Two dimensional addressing – 2K x 8, 4k x 8 ROM Interface – 2k x 8, 4k x 8 RAM Interface – Timing diagram for Memory READ and Memory WRITE cycles.**

**IN and OUT Instructions – Timing diagram – Device selection – Design of Input port and output port using I/O - Mapped I/O and memory mapped I/O techniques – Difference between I/O mapped I/O memory mapped I/O – Simple Polled I/O and Hand shaking operations.**

#### **UNIT 5: INTERFACING PERIPHERAL I/O SYSTEMS**

**Programmable peripheral device 8255 – Interfacing keyboard – Matrix Scanning – Interfacing multiplexed 7 segment display – DAC and ADC Interface – Waveform generation using DAC interface – Stepper motor interface – clockwise, anticlockwise and wiper action**

#### **BOOKS FOR STUDY:**

1. **S. M. Sze**, 1985, *Semiconductor Devices - Physics and Technology*, Wiley, New York.
2. **Millman and Halkias**, *Integrated Electronics*.
3. **R. A. Gaekwad**, 1994, *OpAmps and integrated circuits* EEE.
4. **Taub and Shilling**, 1983, *Digital Integrated Electronics*, Mc Graw-Hill, New Delhi.
5. Malvino and Leech, *Digital Electronics*,
6. **J. Millman**, 1979, *Digital and Analog Circuits and Systems*, Mc Graw-Hill, London.
7. R. S. Gaonkar, **1997**, *Microprocessor Architecture, Programming and Application with the 8085*, 3<sup>rd</sup> Edition, Penram International Publishing, Mumbai.

#### **BOOKS FOR REFERENCE:**

1. **R. F. Coughlin** and **F. F. Driscoll**, 1996 *OpAmp and linear integrated circuits* Printice Hall of India, New Delhi.
2. **M. S. Tyagi**, *Introduction to Semiconductor Devices*, Wiley, New York.
3. **P. Bhattacharya**, 2002, *Semiconductor Optoelectronic Devices*, 2<sup>nd</sup> Edition. Printice-Hall of India, New Delhi.
4. **B. Somnath Nair**, 2002, *Digital Electronics And Logic Design*, Printice-Hall of India, New Delhi.
5. **R. L. Boylestad** and **L. Nashelsky**, *Electronic Devices and Circuit Theory*, 8<sup>th</sup> Edition, Pearson Education.
6. B. Ram, *Fundamentals of Microprocessors and Micro Computers*, Dhanpat Rai Publications, New Delhi.
7. V. Vijayendran, **2002**, *Fundamentals of Microprocessor 8085 – Architecture, Programming and Interfacing*, Viswanathan, Chennai

**Paper 5: PRACTICAL - I**  
**(CORE COURSE, FIRST YEAR, FIRST SEMESTER, 4 CREDITS)**

**Part – A – Electronics & Microprocessor 8085**

External Examination: 4 hrs., Marks:30 (5 marks for record & 25 marks for experiment)

Any **TEN** Experiments:

**Electronics:**

1. FET CS amplifier – frequency response, input impedance, output impedance
2. Study of attenuation characteristics of Wien bridge network & Wien bridge oscillator using op.amp.
3. Study of attenuation characteristics of phase shift network & phase shift oscillator using op.amp.
4. Op.amp. – Schmitt trigger
5. Op. amp. – astable & monostable multivibrators
6. Study of R-S, clocked R-S & D flip-flops using NAND / NOR gates
7. Study of J-K, D & T flip-flops using IC 7476 / 7473
8. Clock generators using IC 7400 and 7413

**Microprocessor 8085:**

9. Microprocessor 8085 – addition & subtraction of 8- & 16-bit numbers
10. Microprocessor 8085 – multiplication (8-bit & 16-bit) & division (8-bit)
11. Sum of a set of N data (8-bit numbers)
12. Picking up the smallest & largest number in an array & sorting in ascending & descending order
13. LED interface – single LED on / off, binary, BCD, ring & Johnson Counters
14. Interfacing of seven segment display
15. Microprocessor 8085 – counter under switch control
16. D/A conversion & waveform generation using op.amp.

**Part – B – General**

External Examination: 4 hrs., Marks:30 (5 marks for record & 25 marks for experiment)

Any **FIVE** Experiments:

1. Cornu's method – Young's modulus by Elliptic fringes.
2. Stefan's constant.
3. Band gap energy - Thermistor / Semiconductor
4. Hydrogen spectrum - Rydberg's constant.
5. Thickness of the enamel coating on a wire – by diffraction.
6. Coefficient of linear expansion – Air wedge method.
7. Permittivity of a liquid using an RFO.
8. L-G Plate.

9. Lasers: Study of Laser Beam Parameters
10. Arc Spectrum - Copper.
11. Impedance measurement using LCR bridge

#### **BOOK FOR REFERENCE:**

1. **D. Chattopadhyay, P. C. Rakshit, and B. Saha**, 2002, *An Advanced Course in Practical Physics*, 6<sup>th</sup> Edition, Books and Allied, Kolkata.

### **Paper 6: QUANTUM MECHANICS II**

**(CORE COURSE, FIRST YEAR, SECOND SEMESTER, 4 CREDITS)**

#### **UNIT 1: Scattering Theory**

Scattering amplitude - Cross sections - Born approximation - Partial wave analysis - Effective range theory for S-wave - Transformation from centre of mass to laboratory frame.

#### **UNIT 2: Perturbation Theory**

Time dependent perturbation theory - Constant and harmonic perturbations - Transition probabilities - Adiabatic approximation - Sudden approximation - The density matrix - Spin density matrix and magnetic resonance - Semi-classical treatment of an atom with electromagnetic radiation - Selection rules for dipole radiation.

#### **UNIT 3: Relativistic Quantum Mechanics**

Klein-Gordon equation - Dirac equation - Plane-wave solutions - Interpretation of negative energy states - Antiparticles - Spin of electron - Magnetic moment of an electron due to spin - Energy values in a Coulomb potential.

#### **UNIT 4: Dirac Equation**

Covariant form of Dirac equation - Properties of the gamma Matrices - Traces - Relativistic invariance of Dirac equation – Probability density-current four vector – Bilinear covariants - Feynman's theory of positron (Elementary ideas only without propagation formalism).

#### **UNIT 5: Second Quantization**

Second quantization of Klein-Gordon field - Creation and annihilation operators - Commutation relations - Quantization of electromagnetic field - Creation and annihilation operators - Commutation relations.

### BOOKS FOR STUDY:

1. **P. M. Mathews** and **K. Venkatesan**, 1976, *A Text book of Quantum Mechanics*, Tata McGraw-Hill, New Delhi.
2. **L. I. Schiff**, 1968, *Quantum Mechanics*, 3<sup>rd</sup> Edition, International Student Edition, MacGraw-Hill Kogakusha, Tokyo.
3. **E. Merzbacher**, 1970, *Quantum Mechanics*, 2<sup>nd</sup> edition, John Wiley and Sons, New York.
4. **V. K. Thankappan**, 1985, *Quantum Mechanics*, 2<sup>nd</sup> Edition, Wiley Eastern Ltd, New Delhi.
5. **J.D. Bjorken** and **S.D. Drell**, 1964, *Relativistic Quantum Mechanics*, MacGraw-Hill New York.
6. **V. Devanathan**, 2005, *Quantum Mechanics*, Narosa Publishing House, New Delhi.

### BOOKS FOR REFERENCE:

1. **P. A. M. Dirac**, 1973, *The Principles of Quantum Mechanics*, Oxford University Press, London.
2. **L. D. Landau** and **E. M. Lifshitz**, 1958 *Quantum Mechanics*, Pergomon Press, London.
3. **S. N. Biswas**, 1999, *Quantum Mechanics*, Books and Allied, Kolkata.
4. **G. Aruldas**, 2002, *Quantum Mechanics*, Prentice-Hall of India, New Delhi.
5. **J. S. Bell**, **Gottfried** and **M. Veltman**, 2001, *The Foundations of Quantum Mechanics*, World Scientific.
6. **V. Devanathan**, 1999, *Angular Momentum Techniques in Quantum Mechanics*, Kluwer Academic Publishers, Dordrecht.

## Paper 7: ELECTROMAGNETIC THEORY AND PLASMA PHYSICS

(CORE COURSE, FIRST YEAR, SECOND SEMESTER, 4 CREDITS)

### UNIT 1: Electrostatics

Boundary value problems and Laplace equation – Boundary conditions and uniqueness theorem – Laplace equation in three dimension – Solution in Cartesian and spherical polar co ordinates – Examples of solutions for boundary value problems.

Polarization and displacement vectors - Boundary conditions - Dielectric sphere in a uniform field – Molecular polarisability and electrical susceptibility – Electrostatic energy in the presence of dielectric – Multipole expansion.

### UNIT 2: Magnetostatics

Biot-Savart Law - Ampere's law - Magnetic vector potential and magnetic field of a localised current distribution - Magnetic moment, force and torque on a current



distribution in an external field - Magnetostatic energy - Magnetic induction and magnetic field in macroscopic media - Boundary conditions - Uniformly magnetised sphere.

### UNIT 3: Maxwell Equations

Faraday's laws of Induction - Maxwell's displacement current - Maxwell's equations - Vector and scalar potentials - Gauge invariance - Wave equation and plane wave solution- Coulomb and Lorentz gauges - Energy and momentum of the field - Poynting's theorem - Lorentz force - Conservation laws for a system of charges and electromagnetic fields.

### UNIT 4: Wave Propagation

Plane waves in non-conducting media - Linear and circular polarization, reflection and refraction at a plane interface - Waves in a conducting medium - Propagation of waves in a rectangular wave guide.

Inhomogeneous wave equation and retarded potentials - Radiation from a localized source - Oscillating electric dipole.

### UNIT 5: Elementary Plasma Physics

The Boltzmann Equation - Simplified magneto-hydrodynamic equations - Electron plasma oscillations - The Debye shielding problem - Plasma confinement in a magnetic field - Magneto-hydrodynamic waves - Alfvén waves and magnetosonic waves.

### BOOKS FOR STUDY:

1. **D. J. Griffiths**, 2002, *Introduction to Electrodynamics*, 3<sup>rd</sup> Edition, Prentice-Hall of India, New Delhi.
2. **J. R. Reitz, F. J. Milford and R. W. Christy**, 1986, *Foundations of Electromagnetic Theory*, 3<sup>rd</sup> edition, Narosa Publication, New Delhi.
3. **J. D. Jackson**, 1975, *Classical Electrodynamics*, Wiley Eastern Ltd. New Delhi.
4. **J. A. Bittencourt**, 1988, *Fundamentals of Plasma Physics*, Pergamon Press, Oxford.

### BOOKS FOR REFERENCE:

1. **W. Panofsky and M. Phillips**, 1962, *Classical Electricity and Magnetism*, Addison Wesley, London.
2. **J. D. Kraus and D. A. Fleisch**, 1999, *Electromagnetics with Applications*, 5<sup>th</sup> Edition, WCB McGraw-Hill, New York.
3. **B. Chakraborty**, 2002, *Principles of Electrodynamics*, Books and Allied, Kolkata.
4. **R. P. Feynman, R. B. Leighton and M. Sands**, 1998, *The Feynman Lectures on Physics*, Vols. 2, Narosa, New Delhi.

### **WEB SITES:**

1. <http://www.plasma.uu.se/CED/Book/index.html>
2. <http://www.thphys.nuim.ie/Notes/electromag/frame-notes.html>
3. <http://www.thphys.nuim.ie/Notes/em-topics/em-topics.html>
4. [http://dmoz.org/Science/Physics/Electromagnetism/Courses\\_and\\_Tutorials/](http://dmoz.org/Science/Physics/Electromagnetism/Courses_and_Tutorials/)

### **Paper 8: PRACTICAL - II** **(CORE COURSE, FIRST YEAR, SECOND SEMESTER, 4 CREDITS)**

#### **Part – A – Electronics & Microprocessor 8085**

External Examination: 3 hrs., Marks:30 (5 marks for record & 25 marks for experiment)

Any **TEN** Experiments:

#### **Electronics:**

1. Op.amp. – solving simultaneous equations
2. Op.amp. – 4-bit D/A & A/D converters using R-2R ladder network
3. Op.amp. – active filters
4. IC 555 timer – astable & monostable multivibrator
5. IC 555 timer – Schmitt trigger
6. IC 7476 – shift register, ring counter & Johnson counter
7. Arithmetic operations using IC 7483
8. IC 7490 as scalar and seven segment display using IC 7447

#### **Microprocessor 8085:**

1. Square & square root of 8- & 16-bit numbers
2. Code conversion (8- & 16- bit numbers) :  
a) binary to BCD  
b) BCD to binary
3. Clock program – 12 / 24 hrs.
4. DAC 0800 interface & waveform generation
5. ADC using DAC & Op.amp. comparator
6. ADC 0809 interface
7. Hex keyboard interface
8. Stepper motor interface

#### **Part – B – General**

External Examination: 4 hrs., Marks: 30 (5 marks for record & 25 marks for experiment)

Any **FIVE** Experiments:

1. Young's modulus – Hyperbolic fringes.
2. Determination of strain hardening coefficients.
3. Viscosity of liquid – Meyer's disc.
4. F. P. Etalon using spectrometer.
5. Solar constant.
6. Solar spectrum – Hartmann's formula.
7. Arc spectrum – Iron.
8. Edser and Butler fringes – Thickness of air film.
9. B – H loop using Anchor ring.
10. Specific charge of an electron – Thomson's method.
11. FFT & DFT of certain signals

**BOOK FOR REFERENCE:**

1. **D. Chattopadhyay, P. C. Rakshit, and B. Saha**, 2002, *An Advanced Course in Practical Physics*, 6<sup>th</sup> Edition, Books and Allied, Kolkata.

**Paper 9: ELECTIVE I**

**(ELECTIVE COURSE, FIRST YEAR, SECOND SEMESTER, 4 CREDITS)**

One of the courses listed below

**Paper 10: ELECTIVE II**

**(ELECTIVE COURSE, FIRST YEAR, SECOND SEMESTER, 4 CREDITS)**

One of the courses listed below

## **ELECTIVES I and II**

Two out of the following 4 courses

1. Spectroscopy
2. Digital Communication
3. Extra-disciplinary Elective ( to be offered by other departments)
4. Extra-disciplinary Elective ( to be offered by other departments)

### **Paper 9/10: SPECTROSCOPY**

**(ELECTIVE COURSE, FIRST YEAR, SECOND SEMESTER, 4 CREDITS)**

#### **UNIT 1: Microwave Spectroscopy**

Rotational spectra of diatomic molecules - Polyatomic molecules - Linear and symmetric top molecules - Hyperfine structure and quadrupole moment of linear molecules - Experimental techniques - Stark effect.

#### **UNIT 2: Normal Coordinate Analysis**

Selection rules for Raman and IR vibrational normal modes – Normal for Raman and IR activity  $C_{2v}$  and  $C_{3v}$  point groups – Representation of Molecular Vibrations in Symmetry co-ordinates – Normal coordinate analysis for  $H_2O$  molecule

#### **UNIT 3: Infrared Spectroscopy**

Vibrations of diatomic and simple polyatomic molecules - Anharmonicity – Fermi Resonance – Hydrogen Bonding – Normal Modes of Vibration in a crystal – Solid State Effects – Interpretation of Vibrational Spectra – Instrumentation techniques – FTIR spectroscopy

#### **UNIT 4: Raman Scattering**

Vibrational and Rotational Raman spectra – Mutual Exclusion principle – Raman spectrometer – Polarization of Raman Scattering light. Structure Determination through IR and Raman spectroscopy – Phase transitions – Resonance Raman Scattering

#### **UNIT 5: NMR and ESR Spectroscopy**

Quantum theory of NMR – Bloch equations – Design of CW NMR Spectrometer – Principle and block diagram of PT NMR – Chemical Shift – Application to molecular structure.

Quantum Theory of ESR – Design of ESR Spectrometer – Hyperfine Structure – Anisotropic systems – Triplet state study of ESR – Applications – Crystal defects – Biological studies

#### **BOOKS FOR STUDY:**

1. **C. N. Banwell** and **E. M. McCash**, 1994, *Fundamentals of Molecular Spectroscopy*, 4<sup>th</sup> Edition TMH, New Delhi.
2. **G. Aruldas**, 2001, *Molecular Structure and Spectroscopy*, Prentice Hall of India Pvt. Ltd. New Delhi.
3. **D. N. Satyanarayana**, 2004, *Vibrational Spectroscopy and Applications*, New Age International Publication

#### **BOOKS FOR REFERENCE:**

1. **D. D. Jyaji** and **M. D Yadav** 1991, *Spectroscopy*, Amol Publications
2. **Atta ur Rahman**, 1986, *Nuclear Magnetic Resonance*, Springer Verlag.
3. **D. A. Lang**, *Raman Spectroscopy*, Mc Graw-Hill International
4. **Raymond Chang**, 1980, *Basic Principles of Spectroscopy* Mc Graw-Hill Kogakusha, Tokyo.

### ***Paper 9/10: DIGITAL COMMUNICATION***

**(ELECTIVE COURSE, FIRST YEAR, SECOND SEMESTER, 4 CREDITS)**

#### **UNIT 1: Signal Analysis**

Fourier transforms of gate functions, delta functions at the origin – Two delta function and periodic delta function – Properties of Fourier transform – Frequency shifting – Time shifting – Convolution – Graphical representation – Convolution theorem – Time Convolution theorem – Frequency Convolution theorem – Sampling theorem.

#### **UNIT 2: Information Theory**

Communication system – Measurement of information – Coding – Bandot Code-CCITT Code – Hartley Law – Noise in a information Carrying Channel- Effects of noise- Capacity of noise in a channel – Shannon Hartley theorem – Redundancy.

#### **UNIT 3: Pulse Modulation**

Pulse amplitude modulation - natural sampling – Instantaneous sampling - Transmission of PAM Signals -Pulse width modulation – Time division multiplexing – Band width requirements for PAM Signals. Pulse Code Modulation –Principles of PCM –Quantizing noise – Generation and demodulation of PCM -Effects of noise –

Companding – Advantages and applications of PCM – Other digital pulse modulating systems Differential PCM –Delta modulation.

#### **UNIT 4: Error Control Coding**

Introduction to Linear Block Codes, Hamming Codes, BCH Coding, RS Coding, Convolutional Coding, Coding Gain Viterbi Coding.

#### **UNIT 5: Spread Spectrum Systems**

Pseudo Noise sequences, generation and Correlation properties, direct sequence spread spectrum systems, frequency HOP Systems, processing gain, antijam and multipath performance.

#### **BOOKS FOR STUDY**

1. **B.P. Lathi**, *Communication system*, Wiley Eastern.
2. **George Kennedy**, *Electronic Communication Systems*, 3<sup>rd</sup> Edition, McGraw Hill.
3. **Simon Haykin**, *Communication System*, 3<sup>rd</sup> Edition, John Wiley & Sons.

#### **BOOKS FOR REFERENCE:**

1. **Simon Haykin**, 1988, *Digital Communication*, John Wiley,.
2. **John Proakis**, 1995, *Digital Communication*, 3<sup>rd</sup> Edition, McGraw Hill, Malaysia.
3. **M. K. Simen**, 1999, *Digital Communication Techniques, Signal Design and Detection*, Prentice Hall of India.

#### **Papers 9 / 10 : EXTRA DISCIPLINARY ELECTIVES**

**(ELECTIVE COURSES, FIRST YEAR, SECOND SEMESTER, 4 CREDITS)**

These electives will be offered by Chemistry or Mathematics or Other departments

## **20. M.Sc. DEGREE COURSE IN VISUAL COMMUNICATIONS**

### **SYLLABUS**

#### **SEMESTER I**

##### **Introduction to Human Communication**

- Unit 1: Nature and Scope of human communication
- Unit 2: Theories of Interpersonal Communication
- Unit 3: Theories of Persuasion (Elaboration Likelihood Model, Cognitive Dissonance)
- Unit 4: Public Communication (Rhetoric Model), Models of Mass Communication
- Unit 5: Visual Persuasion-Semiotic Approach (Sign, Meaning, Iconography)

##### **Principles of Animation**

- Unit 1: Key Poses, Breakdowns, In-betweens Counts, charts, slow-in-out
- Unit 2: Extreme Position, Arcs, Path of Action, Holds-Timing
- Unit 3: Emphasis, Anticipation, Flexibility, Weighted/Flow Joint Movement
- Unit 4: Action Generic Walks/Cycle, Runs/Cycles, Overlapping Action
- Unit 5: Personality, Expression, Eyes, Silhouetting, Dialogue, Laughter, Takes

##### **Visualization & Storyboard**

- Unit 1:** Drawing Terminology-Tools and Basic Techniques-Ideation & Creativity
- Unit 2: Storyboard, Characterization, Shots, Layouts, Composition and Staging
- Unit 3: Point of View, Horizons, Perspectives, Vanishing Point, Foreshortening, Plane
- Unit 4: Figure Composition, Frame, Light and Shade Logics
- Unit 5: Storyboard Tips and Techniques—Anima tics

##### **Computer Graphics & Animation I (3D Max, Maya)**

- Unit 1: Basics of computer graphics, key concepts/terminologies
- Unit 2: Introduction to 3dsmax, Interface and Viewpoints-Maya Interface
- Unit 2: Objects, Materials, Reflections/Refractions Bump, maps, UVW mapping, unwrapping
- Unit 3: Traditional lighting techniques in depth, Different types of lights and their purpose
- Unit 4: Photometric Lights and Shadow, Interior and exterior rendering, Hyper-shade
- Unit 5: Modeling, Patch& NURBS, Polygon, Units and bitmap reference, Box/Spline Modeling

##### **Elective**

##### **Media Aesthetics**

- Unit 1: Principles of design and applied media aesthetics, contextualization and perception
- Unit 2: Structuring Light and Lighting
- Unit 3: Structuring color, functions, compositions and feel
- Unit 4: Structuring space-area and frames, depth and volume
- Unit 5: Study of two and three dimensional space and its visual possibilities

##### **Indian Cinema**

- Unit 1: Early Cinema-Indian Cinema Beginning to Independence
- Unit 2: Post Independence Era—1970s-Regional, Parallel Cinema
- Unit 3: European, Asian and Latin American Cinema-Directors

- Unit 4: Indian Films-Decades 1980s, 1990s
- Unit 5: Contemporary Indian Cinema-Directors

## **SEMESTER II**

### **Film Language**

- Unit 1: Film Language as a visual communication system
- Unit 2: Basic elements and tools (Scene, shots, movement, distance,), Camera Movements
- Unit 3: Editing-Triangle Principles (Timing, Montage) visual punctuation, transition,
- Unit 4: Signs, Syntax, Montage Codes, Framed Images, Diachronic Shots, Scene motion
- Unit 5: Guidelines and Rules of Filming (staging), dialogue, matching, glances

### **Story Development & Scriptwriting**

- Unit 1: Story Problems-Terminology of Story Design, Ideation-Originality- Creativity
- Unit 2: Elements of Story (Structure, Genre, Character, Meaning, Hero's Journey)
- Unit 3: Principles of Story Design (Acts, Scene Design, Composition)
- Unit 4: Scriptwriting Tools and Techniques, Formats- Dialogue Writing, Action-Description
- Unit 5: Script Analysis-Exercises, Drills, Case Studies

### **Computer Graphics & Animation II (Maya, 3D Max)**

- Unit 1: Principles of Movement Dynamics and particles, Types of particles and Space warps
- Unit 2: Rigid-body and soft-body dynamics Particle creations and settings
- Unit 3: 2D and 3D Paint effects, Atmospheric effects, Fluid effects pre- build effects
- Unit 4: Emitters, Fields and Collisions, Environmental Modeling
- Unit 5: Hair, Cloth- Maya, Maya Fur and Hair, Maya nCloth, Scripting (MEL)

### **Character Animation & Camera Techniques (Using Maya, 3D Max)**

- Unit 1: Character Design, Personality, Character Modeling (Shape, Proposition, Head Heights)
- Unit 2: Rigging and IK systems, Skeletons Constraints, Key-frame, Curves, Editors,
- Unit 3: Skinning & Character Sets, Deformations & Animation Effects (Morphing)
- Unit 4: Types of camera, Camera matching animation, Setup, Settings, Angles/Motion
- Unit 5: Material Baking and Renderings, Videography Techniques for CG (Blue Matte etc.)

### **Elective**

#### **Visual Culture in India**

- Unit 1: Visual Culture in India-Cultural Studies Approach-Images, Ideology, Representation
- Unit 2: Film Culture (Celebrity/Hero-worship/Gender/Politics)
- Unit 3: Popular Culture in India, Folk Media and Narratives
- Unit 4: Cartoon and Comic Traditions in India,
- Unit 5: Contemporary Visual Culture/Urban Culture

#### **World Cinema**

- Unit 1: Early Cinema-World-Indian Beginning to World War
- Unit 2: Post-War Films- Hollywood Cinema
- Unit 3: European Films and Film Makers
- Unit 4: Asian and Latin American Cinema-Directors
- Unit 5: Contemporary Cinema (Korean,



## **21. M.SC. DEGREE COURSE IN ZOOLOGY**

### **SYLLABUS**

#### **SEMESTER I**

#### **ANIMAL BIOCHEMISTRY**

5 credits

#### **UNIT I:**

Broad classification of Animal Kingdom

Principles of Taxonomy: Nomenclature: Binomial, Trinomial nomenclature.

Suffix as for super family name (oidea), family name (idea). Use of suffixes 'T' 'Orum' 'ae' 'arum' 'iensis'.

Tautonyms, Synonyms, and Homonyms.

New trends in taxonomy: Ecological approach, Ethological approach, Cytological approach, Biochemical approach, Numerical Taxonomy and Phylocode.

Taxonomic keys: Indented, simple non - Bracket Grouped type, combination, Pictorial, Branching type, Circular and Box - type.

## **UNIT II:**

Protozoa:

Polymorphism in Protozoa, Reproduction and feeding in Protozoa.

Origin and evolution of Metazoa - theories.

Porifera:

1. Interrelationship between different classes.

2. Phylum - Mesozoa.

Coelenterata:

Polymorphism in Coelenterates.

Ctenophora:

Structural peculiarities and affinities.

## **UNIT III:**

ORIGIN OF BILATERIA:

Origin and evolution trends in coelom formation.

Theories on origin of metamerism.

Platyhelminthus: Functional morphology and adaptive biology for parasitic mode of life.

Annelida: Interrelationship between classes of annelida.

Phylogeny of Arthropoda Mollusca and Echinodermata.

## **UNIT IV:**

MINOR PHYLA:

Structural peculiarities and affinities of:

Gastrotricha, Rotifera, Entoprocta, Phoronida, Ectoprocta and Branchiopoda.

#### **UNIT V:**

Prochordate phylogeny

Ostracoderms: Evolutionary position of the Ostracoderms.

Placoderms: Origin of jaws - Placoderms as ancient 'experiments' in the evolution of the jawed vertebrates.

Chondrichthyes: Tendencies in Elasmobranch evolution.

Actinopterygii: Origin and evolution, Adaptive radiation of bony fishes.

#### **UNIT VI:**

Amphibia: Evolution of Amphibia. Adaptive radiation in Amphibia.

Reptilia: Evolution of Reptilia. – Adaptive radiation of Reptiles.

Aves: Birds as glorified reptiles, Adaptive radiation in birds.

Mammals: Evolution of Mammals, Adaptive radiation in Mammal.

#### **UNIT VII:**

Comparative anatomy:

Origin and evolution of paired fins and limbs. Urinogenital system, heart and aortic arches and brain of vertebrates. Jaw suspension in vertebrates. Origin and evolution of middle ear and inner ear Ear ossicles.

#### **REFERENCE / BOOKS**

1. Barnes R. D. (1982) Invertebrates Zoology 6th endn. Toppan International Co.,
2. Hyman L.H. (1940 - 1959). The Invertebrata, Vol. I to VI.
3. Carter, G. S. A. (1946) General Zoology of Invertebrates 2nd endn. (Wick and Jackson Ltd., London).
4. Borradile, L.A. (1955) The Invertebrata. 2nd endn. Cambridge University Press.
5. Barrington, E. J. W. (1969) Invertebrate Structure and functions. English Language. Book Society.

6. Kotpal, R.L. (1982) Protozoa, Porifera, Coelenterata, Helminthes, Annelida, Arthropoda, Mollusca, Echinodermata and Minor Phyla. Rastogi Publications.
7. Moore, R. C. Lalicker, C. G. and Fisher, A. G. (1952) Invertebrate Fossils, Mc. Graw Hill Book Co., New York.
8. Gardinar, M. S. (1972) Biology of the invertebrates, Mc Graw Hill Book Co., New York.
9. Waterman, A.J. (1971) Chordate Structure and Function. Macmillan Co. London.
10. Jolie, M. (1968) Chordate Morphology. East West Press.
11. Romer, A.S. (1976) Vertebrate Body.
12. Young, J.Z. (1950) Life of Vertebrates. Clarendon Press Oxford.
13. Colbert, E.H. (1955) Evolution of the Vertebrates. John Wiley and Sons Inc. New York.
14. Kotpal, R. L. The Birds. Rastogi Publications.
15. Hobart M. Smith. Evolution of Chordate structure, Holt, Rinehart and Winston. Inc. New York.
16. Halstead, L.B. (1969). The Pattern of Vertebrate Evolution. Freeman and Co. San Francisco. U. S. A.
17. Kapoor, V.C. (1991) Theory and Practice of Animal Taxonomy. Oxford and IBH Publishing Co., Pvt. Ltd. New Delhi.

## **CELL AND MOLECULAR BIOLOGY**

4 credits

### **UNIT I: CELL STRUCTURE**

Structure of eukaryotic cell - Animal cell.

### **UNIT II: STRUCTURE AND FUNCTIONS OF CELL ORGANELLES**

Plasma membrane: Composition and structure - Membrane associated receptors - Membrane transport - Membrane Potentials - Extracellular space - Cell adhesion - Intracellular recognition - Intercellular junctions.

Lysosomes - Peroxisomes.

Mitochondria - energetics - Control of cellular respiration - Biogenesis and mitochondrial replication.

### **UNIT III: NUCLEI**

Nuclear - cytoplasmic Interactions.

Structure and function of Chromatin - Organization of Nucleosomes Euchromatin and heterochromatin - Unusual chromosomes (Polytene and lampbrush) - Mechanism of Chromosome formation.

Nuclear transplantation - Cell fusion: homokaryons and heterokaryons Cytoplasts and Karyoplasts.

### **UNIT IV: CELL DIVISION AND CELL CYCLE**

Cell cycles- its components G<sub>0</sub> - G<sub>1</sub> transition - Spindle organization

Chromosome movements - Regulation of cell division in normal and malignant cell synchronization of cell division.

Cancer cell: Differences between normal and cancer cell - Membrane and biochemical changes in cancer cell - Nuclear and chromosome changes - Tumor Viruses - Oncogenes - Environmental factors inducing cancer - Hormones in relation to cancer - Characteristics of cancer cells. Theories of carcinogenesis

### **UNIT V: INFORMATION TRANSFER**

Information transfer in Prokaryotes; Information transfer in Eukaryotes Transcription - Promoters - Initiators and terminators - Transduction RNA processing - Trimming of introns and splicing of exons.

### **REFERENCE/BOOKS**

1. De Robertis, E. D.F. and De Robertis. E. M. F., (1981). Cells and Molecular Biology. Saunder International Edition.
2. Brachet, J. and Mirsky. A. E., (1967). The cell (all volumes). II Edition, Academic Press, New York.
3. Howland, J. L. (1973) Cell Physiology. Mac Millan Publishing Co.
4. De. Witt, (1977). Biology of the cell: An evolutionary approach. Saunders Company.

5. Wilson G. B. and Morrison. J. H., (1967). Cytology. II Edition. Reinhold Publishing Corporation, New York.
6. Avers, C. J., (1976). Cell Biology. D. Can Nostrand Company. New York.
7. Korenberg, A., (1974). DNA replication. W. H. Freeman and Company. San Francisco.
8. Ambrose, E. J; and Dorothy. M. E., (1979) Cell Biology. II edition. The English language. Book Society.
9. Albert. B and Watson. J. D., (1990) Molecular Biology of the Cell. Garland Publishing. London. Darrtell. J., Lodish, H. and Baltimore, D., 1992. Molecular Cell Biology. Scientific American Books.
10. Shanmugam, G., (1988) A Laboratory Manipulation in Fish. Madurai Kamaraj University.

## **GENETICS**

4 Credits

### **UNIT I:**

1. Molecular structure of DNA and RNA - Replication, Theories, Gene Concept Fine Structure of the gene – one gene one polypeptide concept.
2. Identification of DNA and RNA as the genetic material.
3. Microbial Genetics - Conjugation, transformation and transduction and sexduction.
4. Chromosome mapping in prokaryotes (Virus, Bacteria) and eukaryotes (Neutospora, Drosophila and Man).

### **UNIT-II:**

5. Enzyme regulation of gene action. Gene regulation of gene action-Operon concept - Gal and LAC Operon system. Evidence of regulation of gene action.
6. Genes and metabolism. Inborn errors of metabolism in Man

### **UNIT III:**

7. Sex Determination. Evolution of sex chromosomes Dosage compensation - X inactivation. Geneomic imprinting.

8. Human Genetics - Normal human karyotype - Variations in Karotypes (Autosomal and sex chromosomal structural and numerical) with special Reference/Books to classical syndromes in Man. Principles and methods of pedigree analysis Statistical evaluation. Genetic Counseling - Objectives, ethics and principles. Methods of counseling for point mutation disorders, structural and numerical chromosomal disorders.

#### **UNIT IV:**

9. Genes in Development and differentiation.

Radiation Genetics. Mechanism of chromosomal breakage - physical, chemical and biological factors or agents, Mutagens and mutagenesis and carcinogenesis genetic changes in Neoplasia in man.

10. Population genetics - population and gene pool. Hardy Weinberg Law genetic equilibrium. Calculation of gene frequencies for Autosolam (Complete dominance, incomplete dominance and multiple alleles) and sex linked genes. Factors affecting hardy Weinberg equilibrium.

#### **UNIT V:**

11. Genetic engineering - Restrictive enzymes - Recombinant DNA techniques. Applications of Recombinant DNA technology. Present status of genetic engineering.
12. Applied Genetics - Application of genetics in plant and animal breeding. Application of genetics in Crime and Law - DNA fingerprinting. Genetic basis of intelligence. Studies on Twins.
13. Genetics and society: Eugenics, Euphonis, Euthenics and eypsychics.

#### **REFERENCE / BOOKS:**

1. Watson. J.D. (1980) Molecular Biology of the Gene, W. A. Benjamin and, Company, New York.
2. Sinnot. E. W., Dunn. L. C., Dobzansky, T. H. (1958) Principles of Genetics, McGraw Hill Co., New York.
3. Burns, G. W. (1969). The Science of Genetics, the McMillan Company, New York.
4. Levine, R. P. (1968). The Science, Holt Reinhart & Winston, New York.

5. Ayala, F. J. & Kieger, J. A. Jr. (1980) Modern Genetics, The Benjamin Publishing Co., Inc.
6. Levine, L. (1970) Paper on Genetics, C. V. Mosby Co. St. Louis.
7. Curs Sten (1973) Principle of human genetics, W. H. Freeman and Co.,
8. Markert, C. L. Fd., (1974) Isozymes, Vol. I-IV, Academic Press, New York.
9. Markert, C.L. & Ursprung, (1973) Developmentgenetics, Prentice Hall.
10. Gardner, (1984) Principles of Genetics, 7th edn. Wiley private Limited, New Delhi.



**LAB COURSE I (INVERTEBRATES, CHORDATES, AND LAB COURSE II  
GENETICS & MOLECULAR BIOLOGY OF CELL)**

4 Credits

**INVERTEBRATES:**

**UNIT I:**

1. Identification and study of selected Protozoans and Helminthes of medical importance.
2. Identification and study of sections of certain animals from Coelenterata, Aschelminthes and Annelida to understand the evolution of different types of coelom.
3. Identification and study of larval forms from all major phyla of Invertebrates.
4. Identification and study of types of minor phyla.
5. Identification and study of invertebrate fossils (slides and specimens).

**UNIT II:**

1. Dissection of digestive system of *Gryllotalpa*, *Pila*, *Sepia/Loligo*.
2. Dissection of nervous system of Prawn, Crab, *Gryllotalpa*, *Pila*, and *Sepia/Loligo*.
3. Dissection of reproductive system of *Gryllotalpa* and *Pila*.

**UNIT III:**

1. Mounting of:
  - a) Appendages of Prawn
  - b) Gnathochilarium of Millipede
  - c) Sting of Honey bee.
  - d) Pedicellaria of Sea urchin.
  - e) Aristotle's lantern of Sea urchin.
2. Study of prepared slides of mouth parts of Honey bee, Housefly, Thrips, Mosquito, Bed bug and Butterfly to relate structure and type.

Practical record to be submitted during the University practical examination.

**CHORDATES**

**UNIT I:**

1. Study of the following specimens to bring out their affinities;

- a) Amphioxus.
  - b) Balanoglossus
  - c) Ascidian
  - d) Peteromyzon
2. Study of the following specimens with Reference to their adaptive features for their respective modes of life:
- a) Echeneis
  - b) Ichthyophis/Uraeotyphus
  - c) Hyla
  - d) Draco
  - e) Pigeon
  - f) Bat
3. Study of the following skull types with Reference/Books to jaw suspensions:
- a) Fish
  - b) Frog
  - c) Calottes
  - d) Rat/Rabbit

## **UNIT II:**

1. Dissection and mounting of internal ear of Frog.
2. Dissection and mounting of Weberian ossicles in Cat fish.
3. Dissection of aortic arches in Shark, Teleost, Frog and Calottes.
4. Demonstration of Aortic arches in Rat.
5. Dissection and display of portal system of Shark, Frog and Calottes.
6. Demonstration of portal system of Rat.
7. Dissection and display V<sup>th</sup>, VII<sup>th</sup>, IX<sup>th</sup> and X<sup>th</sup> cranial nerves of Shark and Frog.
8. Dissection and display of sympathetic nervous system of Frog.
9. Dissection and display of urinogenital system of Shark, Frog and Calottes.

10. Demonstration of urinogenital system of Rat. .

**GENETICS & MOLECULAR BIOLOGY OF CELL:**

1. Preparation of culture medium. Culture of *Drosophila* - Methods of maintenance. Sex identification of at least four mutants.
2. Identification of blood groups - A, b, AB, 0 and Rh and reasons for a particular blood group in child.
3. Mounting of salivary glands of *Drosophila* larva or Chironomous larva. Analysis of banding pattern.
4. Localization of Barr body in the Buccal smear - squamous epithelial cells. (Smear to be made and the presence or absence of Barr body to be reported giving reasons).
5. Karyotyping using human metaphase chromosome plates (Giemsa stained) - eye Karyotyping. Identification of syndromes (Down, Klinefelter and Turner) from karyotype photographs showing clinical features of each syndrome case.
6. Problems relating to the application of binominal theorem in population genetics with Reference to P. T. C. Earlobe attachment etc.
7. Observation of simple Medelian traits in Man - Identification of color blindness using color charts. Population analysis of color blindness - Visit to primary school.

**SEMESTER II**  
**BIOCHEMISTRY AND BIOPHYSICS**

4 Credits

**UNIT I: WATER**

Water - Biological importance, pH and Acid - Base balance. Henderson Hasselbach equation. Buffers - biological importance, Acidosis, Alkalosis.

**UNIT II: ENZYMES**

Enzymes - general properties, function, classification, nomenclature. Enzyme kinetics - Factors affecting enzyme action.

**UNIT III: BIOENERGETICS CARBOHYDRATE AND LIPIDS AND METABOLISM OF CARBOHYDRATES AND LIPIDS**

Carbohydrate - structure, classification and biological significance.

**METABOLISM**

1. Glycogenesis, 2. Glycogenolysis, 3. Gluconeogenesis, 4. Glycolysis, 5. Kreb's cycle 6. Embden – Meyerhof pathway, 7. Hexose mono phosphate shunt.

Bioenergetics - Role of ATP, Biological Oxidation, Respiratory chain and Oxidative phosphorylation.

Lipids - structure and classification. Oxidation of Fatty acids. Energetics. Protein - structure, classification of Proteins - Deamination, transamination, transmethylation.

**UNIT IV: HORMONES & VITAMINS**

General function, Classification - Steroid Hormones, Protein Hormones, Tissue hormones.

Vitamins - Water and Lipid soluble vitamins - structure, classification, sources and deficiency diseases in man.

**UNIT V: MICROSCOPY**

Principle and biological application of Light microscope, Electron Microscope, Polarising microscope, Fluorescent microscope, Phase contrast microscope, and X-ray microscope.

## **UNIT VI: CHROMATOGRAPHY**

Principle and biological application of Chromatography - Paper, TLC, Column Gel filtration, ion-exchange and affinity chromatography.

## **UNIT VII: PHOTOBIOPHYSICS**

Electromagnetic spectrum - visible and invisible region. Principles involved in Photoelectric colorimetry. Principle of Spectroscopy - UV & IR Spectroscopy in biological investigation. Effects of UV on biological systems.

Effects of radiation on macromolecules. Radioactive isotopes-measurement GM tubes, Liquid scintillation counters. Autoradiography.

## **REFERENCE/BOOKS**

1. Murray, R. K., Granner, D. K., Maynes, P.A. and Rodwell, V.W. (1998) Harper's Biochemistry. 25th edition. McGraw Hill, New York.
2. Hames, B.D., Hoopa, N. M and Houghton, J. D. (1998) Instant notes in Biochemistry. Viva Books Pvt. Ltd. New Delhi.
3. Jain, J.L. (2001) Fundamentals of Biochemistry. 8, Chandra & CO. Pvt. Ltd. New Delhi.
4. Vasudevan, D.M and Sreekumar. 8. (2000) Text of Biochemistry for medical students. Jaypee Brothers, Medical Publishers (P) Ltd. New Delhi.
5. Rama Rao, A.V. 8.8. (1986)Text of biochemistry. L.K. & 8 Publishers. A. P.
6. Ambika, S. (1990) Fundamentals of Biochemistry for Medical Students. Published by the author.
7. Bose, S. (1982) Elementary Biophysics. Jyoth Books.
8. Bums, D.M. & MacDONald, S. G. G. (1979) Physics for Biology and Premedical students. Elbs and Addisson - Wesley Publishers Ltd., London.
9. Casey, E. J. (1962) Biophysics concepts and Mechanism. Affiliated East –West Press Pvt. Ltd., New Delhi.
10. Das, D. (1982) Biophysics and Biophysical Chemistry. Academic Publishers. New Delhi.
11. Epstein, H. T. (1963) Elementary Biophysics selected topics. Addisson – Wesley Publishing Company Inc London. .

12. Palanichamy, Sand Shanmugavelu, M. (1991) Principles of Biophysics. Palani Paramount Publication, T. N.

13. Pattabhi, V and N. Gautham (2001) Biophysics. Narosa publication, T.N.

## **ANIMAL PHYSIOLOGY**

5 credits

### **UNIT I:**

Introduction, scope, significance of study and definitions & divisions.

### **UNIT II:**

Nutrition – nutrients - digestion and adsorption of proteins, carbohydrates and lipids and role of gastrointestinal hormones in digestion.

### **UNIT III:**

Respiration in Invertebrates and Vertebrates - physiology of respiration in Man - respiratory pigments - BMR

### **UNIT IV:**

Circulation - types of heart - physiology of cardiac muscle - heart beat and its regulation - composition of blood and coagulation.

### **UNIT V:**

Excretion- excretion of metabolic waste products in relation to the environment - physiology of excretion in Man, and hormonal control.

### **UNIT VI**

Osmo - osmoregulation in Invertebrate (Protozoans, crustaceans, insects) - osmoregulation in fishes, birds and terrestrial animals - hormonal control.

### **UNIT VII**

Neuro muscular co-ordination - muscle physiology and structure and type of neurons - nervous system neurosecretions in insects, mollusks and crustaceans endocrine glands in vertebrates - endocrine control of reproduction in vertebrates with Reference to Man - endocrine related diseases and disorder in Man.

### **UNIT VIII:**

Chemical co-ordination - neurosecretions in insects, mollusks and crustacean - endocrine glands in vertebrates - endocrine control of reproduction in vertebrates with Reference to Man - endocrine related disease and disorder in Man.

#### **UNIT IX:**

Receptors - classification and function - mechanisms of hearing and physiology of vision, in Man.

#### **UNIT X:**

Behavioural physiology - chronobiology (circadian rhythm Lunar periodicity, circannual rhythm) Behaviour (types - trophism, taxis, kinesis, reflex, learning) - Migration in birds and fishes - temperature regulation in poikilotherms, homeotherms and heterotherms - hibernation, aestivation - diapause.

#### **REFERENCE/BOOKS**

1. Hoar, W.S (1968): General and Comparative Physiology, Prentice Hall
2. Prosser, C.L. (1973): Comparative Animal Physiology, 3rd edn. W.B. Saunders & Co., Philadelphia.
3. Wood, D.W. (1968): Principles and Animal Physiology
4. Bentley, (1971): Endocrine and osmoregulation Springer verlag, N.Y.,
5. Palmen, J.D. Brown, J.R. and Hastirigs, J. W. (1970): Biological clocks, Academic Press, London.

## **ENVIRONMENTAL BIOLOGY & EVOLUTION**

4 Credits

### **UNIT I: ECOSYSTEM**

Review of concept of ecosystem - Natural and Man-made ecosystem, with examples. Energy flow - Trophic structure and levels - Pyramids, food chain and food web - ecological efficiencies and productivity and its measurement.

### **UNIT II: BIOLOGICAL CYCLES**

Complete and incomplete biogeochemical cycles - sedimentary cycle Recycle pathway of elements - Cycling of non-essential elements and organic nutrients.

### **UNIT III: RESOURCES ECOLOGY**

Renewable and non-renewable resources – Animal resources. Conventional and non-conventional energy sources.

### **UNIT IV: ENVIRONMENTAL CONSERVATION AND MANAGEMENT**

Principles of conservation - Rain water harvesting - Soil health and fauna - Inputs in agricultural Biosphere reserves - Wildlife conservation and management - biodiversity - Germplasm conservation and cryopreservation.

Environmental pollution and its biological effects. Air, water, soil and noise pollution. Biological indicators and their role in environmental monitoring.

Problems of urbanization - Sewage, soil waste and industrial waste disposal and management.

Social forestry - tribal welfare.

### **UNIT V: EVIDENCES**

Evidences: The need for evidences for the fact of evolution Evidences from comparative anatomy, embryology, physiology and biochemistry - visual pigments, haemoglobin, protein sequences in phylogeny and evidences from paleontology.

### **UNIT VI: MECHANISM OF EVOLUTION**

Mutationism - Views of De Vries and of R.B.Golschmid; hopeful monsters -



Inadequacies of mutationism.

Lamarckism - Life of Lamarck - Lamarckian postulates - Inadequacies of Lamarckism.

Natural selection - Innature and laboratory - Creative aspects of natural selection - Modern understanding of selection, stabilizing and diversity and directional selection.

Adaptation - Nature and types of adaptation - Adaptive trends quantifying adaptation - Batesian and Mullerian mimicry Polymorphism and Evolutions.

The role of polyploidy, isolating mechanism - pre mating, Post mating - problems of the origin of isolating mechanism.

## **UNIT VII: SPECIATION**

Structure of species - clones, peripheral population and peripheral isolates.

Genetics and Ecology of speciations: Mayer's founder principle and genetic evolution in the peripheral isolates - Ecological opportunities for specification.

HUMAN EVOLUTION - Sociobiology: Definition and scope - selfish gene, altruism and kin selection - bioethics.

## **REFERENCE/BOOKS**

1. Odum, E. P. (1983). Basic Ecology, Saunder's College Publishing, New York.
2. Odum, E. P. (1959) System Ecology - An introduction in Joh Wiley and Son's, New York.
3. Berwer. A. (1988). The Science of Ecology. SaWlder's College Publishing.
4. Bandopaghyay, J. (1985) India's. Environment Crisis and response – Natraj Publishers, Dehrappn.
5. Smith, R. L. (1986). Element of Ecology, Harper and Row Publishers, New York.
6. APHA, Soli, J. Archeivala - 1988 - Wastewater treatment for pollution control - Second Ed. Tata McGraw hill Publication Company Ltd., New Delhi - ISBN-O-07-463002-4.
7. D. S. Bendall (ed) 1983). Evolution from Molecules to Men. Cambridge University Press.

8. M. Grene (ed) (1983). Dimension of Darwinism. Cambridge University Press.
9. E.C. Minkoff (1984). Evolutionary Biology. Addison-Wesley. London.
10. Montagu (ed) (1980). Sociobiology examined. Oxford University Press.

## **LAB COURSE II: BIO CHEMISTRY, BIOPHYSICS, ENVIRONMENTAL BIOLOGY AND EVOLUTION.**

4 credits

### **BIOCHEMISTRY AND BIOPHYSICS:**

1. Buffer preparation and determination of pH - Demonstration.
2. Enzyme kinetics – any one enzyme (Salivary amylase) Maltose standards, influence of enzyme concentration, time course, pH, Temperature, Substrate concentration – (Lineweaver Burk Plot) on enzyme activity.
3. Qualitative analysis of urine - protein, glucose, ketone and acetone bodies.
4. Chromatography: Determination of amino acid in body fluids and tissue of Frog.
5. Quantitative estimation of glucose, protein, cholesterol, urea and creatinine in the
6. Serum of chick/goat.
7. Principles and application of Spectrophotometry or Colorimetry, Electrophoresis, Centrifuge, Chromatography.

### **ENVIRONMENTAL BIOLOGY**

1. Estimation of Aquatic - Primary productivity – Dark and Light bottle.
2. Estimation of Dissolved oxygen, Salinity, Nitrites, Phosphates, Calcium, Silicates and Alkalinity in water samples.
3. Analysis of industrial effluent - TDS, TSS, BOD, (COD - Demonstration).
4. Estimation of Earthworm population - Demonstration.
5. Collection, Isolation and identification of Plankton.
6. Study of sandy, muddy and rocky shore fauna with special Reference to their

adaptation to the environment.

7. Animal Association - parasitism, mutualism and commensalisms.

8. Visit to treatment Plants

a) Drinking water treatment plant - Kilpauk water works.

b) Effluent Treatment - CETP - Pallavaram.

c) Sewage treatment - Koyembedu.

## **BIOSTATISTICS**

3 Credits

### **UNIT I: COLLECTION OF DATA**

Definition of statistical population and sample in biological studies.

Variables - qualitative and quantitative; discrete and continuous.

Derived variables - rates, ratios, percentages and indices.

Accuracy and precision of recorded data - implied limits numbers of significant digits - rounding of data.

Units of measurement - abbreviations of common units of measurements - expression of very large or small number as an index of ten.

### **UNIT II: CLASSIFICATION AND PRESENTATION OF DATA**

Types of classification: Qualitative and quantitative.

Qualitative classification - chronological, geographical etc. and continuous frequency distributions.

Diagrammatic and graphical representations of data - Bar diagrams (simple, multiple and subdivided) - Pie diagram - Cartogram.

Frequency diagram: histograms, frequency polygon and frequency curve line graphs.

### **UNIT III: DESCRIPTIVE STATISTICS**

Measure of central tendency; Arithmetic mean - definition - computation for different types of data (ungrouped and discrete and continuous frequency distributions) - other measures such as median, mode, geometric mean, harmonic mean and weighted average may be defined - computation for different types of data (ungrouped and discrete and continuous frequency distributions) - Properties interpretation. Definition of other

measures such as range, quartile deviation, decile range and mean deviation may be defined (Computation not required).

#### **UNIT IV: INFERENCE STATISTICS:**

Probability; basic principles - a priori and a posteriori probabilities - addition and multiplication rules of probability - conditional probability.

Patterns of probability distributions: definition – properties-uses - standard errors (standard error of the mean to be stressed) computation- properties - used estimation of population parameters from sample statistics - confidence intervals determination of sample size. Hypothesis testing - null hypothesis - level of significance - degrees of freedom - types I and II errors.

Test of significance: Chi-square test for goodness of fit, homogeneity and association between attributes (problem relating to Genetics, patterns of distribution etc. to be worked out).

Test of significance for large sample - comparison of sample mean with population mean - comparison of two-sample mean.

## **UNIT V: CORRELATION AND REGRESSION**

Correlation: Definition and types - simple, multiple, partial, linear, nonlinear, mutual, cause and effect, etc.

Uses of scatter diagram and correlation graph in the study of correlation between two variables.

Computation of Karl Pearson's Co-efficient of correlation - testing its significance - Interpretation.

Regression analysis: derivation of regression equations between two variables - regression coefficient - construction of regression lines - properties - applications.

## **UNIT VI: POPULATION STATISTICS**

Vital statistics - natality and mortality rates.

Population estimation - population growth

## **REFERENCE/BOOKS**

1. Gurumani, N. (2005) Biostatistics, 2nd edn. MJP publications, India.
2. Milton, J.S. (1992) Statistical method in Biological and Health Sciences. McGraw Hill Inc., New York.
3. Scheffler, W. C. (1968) Statistics for biological sciences, Addison- Wesley Publication Co., London.
4. Snedecor, G. W and Cochran, W.G. (1967) Statistical Methods. Oxford & IBH Publication co., New Delhi.
5. Spiegel, M.R (1981) Theory and problems of statistics, Schaum's Outline series McGraw-Hill International Book Co., Singapore.
6. Pillai, R.S.N and Bagawathi, V. (1989), Statistics. Theory and practice (For B.Com. and B.A., (Eco) classes) S. Chand & Co, Ltd., New Delhi.
7. Stansfield, W.D (1986) Theory and problems of genetics (including 600 problems). Schaum's outline series. McGraw-Hill Book Co., New York.
8. Sobel, R.R. and Rohlf, F. J (1969) Biometry. The principles and Practice of Statistics in Biological Research. W. H. Freeman and Co., San Francisco.
9. Pillai, R.S.N and Bagawathi, V. (1987) Practical Statistics (For B.Com. and B.A., Students) S.Chand & Co. (Pvt.) Ltd., New York.

10. Mahajan, B.K. (1984). Methods in Biostatistics for Medical students and Research works. Smt. Indu Mahajan, New Delhi.

### **List of Courses on Soft-Skills for PG Course**

<b>S. No.</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Credits</b>
1	UOM S 002	LANGUAGE AND COMMUNICATION	2
2	UOM S 004	SPOKEN AND PRESENTATION SKILLS	2
3	UOM S 006	MANAGERIAL SKILLS	2
4	UOM S 008	COMPUTING SKILLS	2

## UOM S 002 LANGUAGE AND COMMUNICATION

### Objectives

- *enable* students to convert the conceptual understanding of communication in to everyday practice.
- *train* students to ground concepts/ideas in their own experience.
- *create* a learner-language interface enabling students to exercise control over language use.
- *sensitise* students to the nuances of the four basic communication skills – Listening, Speaking, Reading and Writing.

**UNIT I:** Twinning Functions of Listening and Speaking.

**UNIT II:** Twinning Functions of Reading and Writing.

**UNIT III:** Individual Communication.

**UNIT IV:** Intermediary Communication.

**UNIT V:** Social Communication.

### Recommended Texts

- Windshuttle, Keith and Elizabeth Elliot. 1999. *Writing, Researching and Communicating: Communication Skills for the Information Age*. 3<sup>rd</sup> Reprint. Tata McGraw-Hill. Australia.
- Dignen, Flinders and Sweeney. *English 365*. Cambridge University Press.
- Goleman, Daniel. 1998. *Working with Emotional intelligence*. Bantam Books. New York.
- Jones, Leo and Richard Alexander. 2003. *New International Business English*. Cambridge University Press.

### Websites

- [www.tatamcgrawhill.com/sites/0070600988](http://www.tatamcgrawhill.com/sites/0070600988)



## UOM S 004 SPOKEN AND PRESENTATION SKILLS

### Objectives

- *coach* students to identify, classify and apply relevant skill sets.
- *illustrate* role of skills in real-life situations with case studies, role play, etc.
- *translate* performance of skills into efficient habits.
- *enable* students to perceive cultural codes involved in presentation and design language performance accordingly.

**UNIT I:** General Language Knowledge and Presentation.

**UNIT II:** Special Language Knowledge and Presentation.

**UNIT III:** General Communication Skills for Presentation.

**UNIT IV:** Professional Communication Skills for Presentation.

**UNIT V:** Social Communication Skills for Presentation.

### Recommended Texts

- Cathcart, Robert. S. and Larry A. Samovar. 1970. *Small Group Communication: A Reader*. 5<sup>th</sup> Edition. Wm. C. Brown Publishers. Iowa.
- Tamblyn, Doni and Sharyn Weiss. 2000. *The Big Book of Humours Training Games*. 2004 Edition. Tata McGraw-Hill. New Delhi.
- Andrews, Sudhor. 1988. *How to succeed at Interviews*. 21<sup>st</sup> Reprint. Tata McGraw-Hill. New Delhi.
- Monippally, Matthukutty. M. 2001. *Business Communication Strategies*. 11<sup>th</sup> Reprint. Tata McGraw-Hill. New Delhi.

## **UOM S 006 MANAGERIAL SKILLS**

### **Objectives**

- To help students to understand the mechanism of stress particularly negative emotions such as anxiety, anger and depression for effective management.
- To introduce the basic concepts of body language for conflict management.
- To give inputs on some of the important interpersonal skills such as group decision-making, negotiation and leadership skills.
- To make students learn and practice the steps involved in time management.
- To impart training for empowerment thereby encouraging the students to become successful entrepreneurs.

### **Unit I- Stress management**

- Definitions and Manifestations of stress.
- Stress coping ability and stress inoculation training.
- Management of various forms of fear (examination fear, stage fear or public speaking anxiety), depression and anger.

### **Unit II- Conflict Management skills**

- Types of conflict (intrapersonal, Intra group and inter group conflicts).
- Basic concepts, cues, signals, symbols and secrets of body language.
- Significance of body language in communication and assertiveness training.
- Conflict stimulation and conflict resolution techniques for effective management.

### **Unit III- Interpersonal Skills**

- Group decision making (strengths and weaknesses).
- Developing characteristics of charismatic and transformational leadership.
- Emotional intelligence and leadership effectiveness- self awareness, self management, self motivation, empathy and social skills.
- Negotiation skills- preparation and planning, definition of ground rules, clarification and justification, bargaining and problem solving, closure and implementation.

### **Unit IV- Time Management**

- Time wasters- Procrastination.
- Time management personality profile.
- Time management tips and strategies.
- Advantages of time management.

### **Unit V- Towards Empowerment**

- Stimulating innovation and change- coping with “temporariness”.
- Network culture.
- Power tactics and power in groups (coalitions).
- Managerial empowerment and entrepreneurship.
- Prevention of moral dwarfism especially terrorism.
- Altruism (prosocial behaviour/helping behaviour).

- Spirituality (clarifications with regard to spirituality)- strong sense of purpose- trust and respect- humanistic practices- toleration of fellow human beings expressions.

### **PRACTICAL TRAINING**

Relaxation exercises- Western (Autogenic Relaxation) and Indian techniques (Shavasana).

Role-play.

Transactional Analysis.

### **REFERENCES**

1. Swaminathan. V.D & Kaliappan. K.V. (2001). Psychology for Effective Living. Chennai. The Madras Psychology Society.
2. Robbins, S.B. (2005). Organizational Behaviour. New Delhi: Prentice Hall of India.
3. Smith, B. (2004). Body Language. Delhi: Rohan Book Company.
4. Hurlock, E.B. (2006). Personality Development, 28<sup>th</sup> Reprint. New Delhi: Tata McGraw Hill.

## UOM S 008 COMPUTING SKILLS

**Objective:** The major objective in introducing the Computer Skills course is to impart training for students in Microsoft Office which has different components like MS Word, MS Excel, MS Access, Power point etc., at two levels based on their knowledge and exposure. It provides essential skills for the user to get adapted to any work environment, as most of the systems in any6 work place have MS Office installed for their day to day activities. The course is highly practice oriented rather than regular class room teaching.

**Pre-requisite:** Pass in Level B are an equivalent course.

**Unit I:** *Word Processing* – Formatting – Paragraph and character styles, templates and wizards, table and contents and indexes, cross referencing; Tables and Columns – creating manipulating and formatting; Mail Merge, Labels and Envelopes.

**Unit II:** *Spreadsheets* – Workbook, Building, Modifying, navigating; worksheet- Autofiull, copying and moving cells, inserting and deleting rows, printing; Formulas and functions- Troubleshooting formulas, Functions and its forms like database, financial, logical, reference , mathematical and statistical – Databases – Creating, sorting, filtering and linking.

**Unit III:** *Presentations* – Power point – exploring, creating and editing slides, inserting tables and charts- special effects- Clip Art, creating and drawing shapes, inserting multimedia content – presentations – planning, animation, handouts, slideshow..

**Unit IV:** *Databases* – Access – Components, creating a database and project, import and exporting, customizing; Tables- creating and setting fields; Queries –Types, creating, wizard- Reports- creating and layout.

**Unit V:** *Information Management* – Outlook – Starting, closing, contacts, tool bars, file management; email-reading, composing, responding, attachments, signature, junk mail; tasks- screen, sorting, creating, deleting, assigning, updating; scheduling- calendar.

Note: All units needs an approach through practical exposure.

References:

1. Working in Microsoft Office; Ron Mansfield, Tata McGraw Hill
2. Microsoft Excel 2007; Guy Hart Davis, Tata McGraw Hill.

**Examination:**

1. Internal assessment could be based on Theory and/or practicals.
2. End semester is based on practicals.

