Dr. N.G.P.ARTS AND SCIENCE COLLEGE

REGULATIONS 2022-23 for Under Graduate Programme

(Outcome Based Education model with Choice Based Credit System)

B.Sc. Biochemistry Degree

(For the students admitted during the academic year 2022-23 and onwards)

Eligibility

A pass in Higher Secondary Examination conducted by the Government of Tamil Nadu with Physics/ Biology/ Chemistry /Biochemistry/ Microbiology/Home science as one of the paper are only eligible for Examinations accepted as equivalent there by Academic Council, subject to such conditions as may be prescribed there to are permitted to appear and qualify for the **Bachelor of Science in Biochemistry Degree Examination** of this College after the programme of study of three academic years.

Programme Educational Objectives

The Curriculum is designed to attain the following learning goals which students shall accomplish by the time of their graduation:

1. Offer students a thorough understanding on basic principles of biochemistry at the molecular and cellular levels.
2. Empower students to comprehend the occurrence of varied bio- molecular types with unique chemical characteristics that make them indispensible for life.

3. Provide students a detailed understanding on basic energy requirement of living cells, and how cells meet this prerequisite adequately through varied metabolic processes.

4. Capacitate students to grasp intricate influence of DNA and RNA structures in preserving and transferring information of cell function for generations.

5. Enable students to understand how multiple biological reactions with differing kinetics are performed in a small cell volume at a given time.

6. Entitle students to appreciate the prominence of Biochemistry in basic and applied research in varied branches of industry, medicine, agriculture, pharmacy, food technology, biotechnology, etc.

PROGRAMME OUTCOMES:

On the successful completion of the program, the following are the expected outcomes.

PO Number	PO Statement
PO1	Graduates are cognizant of basic principles and concepts in diverse branches of biological and allied sciences that govern mechanisms of bio-molecular unity in varied life existences. Alumni are expressive of assimilated wisdom to peers and public at ease with language of their choice through discussion and debate.
PO2	Graduates are comprehensive of intricacies in biological organization, and they have acquired and developed primary and secondary experimental competencies and technical skills to address, investigate, design, develop and demonstrate solutions to life's important issues.
PO3	Graduates are advantaged to the pivotal and functional importance of major and allied subjects, and combine it with modern tools to investigate both basic and applied research questions in areas of industry, medicine, agriculture, pharmacy, food technology, biotechnology, etc. Alumni are valuable performers as an individual or in a team.
PO4	Graduates are competent to enroll in higher education programs, and successful in placements of vast career options in core and allied areas of the study (scholars, managers, counselors, writers, technical experts, field experts, teachers, entrepreneur and a responsible citizen). Alumni have acquired and developed skills to manage projects and finances. While discharging duties at varied capacities, graduates are inculcated to keep sustainable environment as a goal, and follow ethics of professional stature.
PO5	Graduates are infused with metamorphic qualities of education, and inspired to develop scientific temperament and lead a scientific way of life in facing socio-economical challenges that will benefit the society. Alumni are adept at connecting their learning's to worldwide events. Thereby, they continue the learning's lifelong.

TOTAL CREDIT DISTRIBUTION

Part	Subjects	No.of Papers	Credit	SemesterNo.
I	Tamil/Hindi/French/Malayalam	4	4x3=12	I,II,III&IV
II	English	4	4x3=12	I,II,III&IV
III	Core Credits (5)	3	5X 3=15	I-VI
	Core Credits (4)	9	4X 9=36	I-VI
	Core Credits (3)	1	3X1=03	I-VI
	Core Practical (2)	7	2X7=14	I-VI
	Core Project (2)	1	2X1=2	VI
	Inter Departmental Course(IDC)	2	3X2=6	I-II
	Inter Departmental Course(IDC)	2	4X2=8	III & IV
	Inter Departmental Course Practical (IDC)	1	2X1=2	I
	Discipline Specific Elective(DSE)	3	4X3=12	V & VI
	Skill Enhancement Course(SEC)	4	2X4=8	III -VI
	Industrial Training	1	2X1=2	V
IV	Environmental Studies(AECC)	1	2X1=2	I
	Basic Tamil/ Advanced Tamil/ Human Rights and Womens rights	1	2X1=2	II
	Generic Elective (GE)	1	2X1=2	V
	Innovation, IPR and Entrepreneurship	1	2X1=2	VI
V	NSS/NCC/YRC/RRC/Yoga/ Sports/Clubs	2	1X2=2	I & II
Total credits			142	

CURRICULUM

B.Sc BIOCHEMISTRY PROGRAMME

Course Code	Course Category	Course Name	L	T	P	Exam(h)	MaxMarks			Credits
							CIA	ESE	Total	
First Semester										
Part-I										
221TL1A1TA	Language-I	Tamil-I: Ikkala Ilakkiyam	4	1	-	3	50	50	100	3
221TL1A1HA		Hindi-I: Modern Literature								
221TL1A1MA		Malayalam-I: Modern Literature								
221TL1A1FA		French–I: Grammar, Translation and Civilization								
Part-II										
221EL1A1EA	Language-II	Professional English I	4	-	1	3	50	50	100	3
Part-III										
223BC1A1CA	Core-I	Biomolecules	4	-	-	3	50	50	100	4
223BC1A1CB	Core-II	Cell biology	3			3	50	50	100	3
223BC1A1CP	Core Practical-I	Biomolecules and Cell Biology	-	-	4	6	50	50	100	2
222CE1A1IA	IDC-I	Chemistry for Biologists	3	-	-	3	50	50	100	3
222CE1A1IP	IDC Practical-I	Chemistry Practical - Volumetric and Organic Analysis	-	-	4	3	50	50	100	2
Part-IV										
223MB1A1AA	AECC-I	Environmental studies	2	-	-	-	50		50	2
Part-V										
223BC1A1XA	Extension Activity	NSS/NCC/ YRC/RRC/ Yoga/Sports/Clubs					50	-	50	1
Total			**20**	**1**	**9**				**800**	**23**

Course Code	Course Category	Course Name	L	T	P	Exam(h)	MaxMarks			Credits
							CIA	ESE	Total	
Second Semester										
Part-I										
221TL1A2TA	Language-I	Tamil - II: Ara Ilakkiyam	4	1	-	3	50	50	100	3
221TL1A2HA		Hindi-II: Modern Literature								
221TL1A2MA		Malayalam-II: Modern Literature								
221TL1A2FA		French–II: Grammar, Translation and Civilization								
Part-II										
221EL1A2EA	Language-II	Professional English - II	4	-	1	3	50	50	100	3
Part-III										
223BC1A2CA	Core-III	Enzymes	5	-	-	3	50	50	100	4
223BC1A2CB	Core-IV	Microbiology	4	-	-	3	50	50	100	4
223BC1A2CP	Core Practical-II	Enzymes and Microbiology	-	-	4	6	50	50	100	2
222PY1A2IB	IDC-II	Physics	3	-	2	3	50	50	100	3
Part-IV										
221TL1A2AA/ 221TL1A2AB/ 225CR1A2AA	AECC-II	Basic Tamil/ Advanced Tamil /Human Rights and Women's Rights	2	-	-	-	50	-	50	2
Part V										
223BC1A2XA	Extension Activity	NSS/NCC/ YRC/RRC/ Yoga/Sports/ Clubs	-	-	-		50	-	50	1
Total			**22**	**1**	**7**				**700**	**22**

Course Code	Course Category	Course Name	L	T	P	Exam(h)	MaxMarks			Credits
							CIA	ESE	Total	
Third Semester										
Part-I										
221TL1A3TA	Language-I	Tamil-III	3	1	-	3	50	50	100	3
221TL1A3HA		Hindi-III								
221TL1A3MA		Malayalam-III								
221TL1A3FA		French–III								
Part-II										
221EL1A3EA	Language-II	English-III	3	1	-	3	50	50	100	3
Part–III										
223BC1A3CA	Core-V	Human Physiology	5	-	-	3	50	50	100	5
223BC1A3CB	Core-VI	Developmental Biology	5	-	-	3	50	50	100	4
223BC1A3CP	Core Practical-III	Human Physiology and Developmental Biology	-	-	4	6	50	50	100	2
222MT1A3IF	IDC-III	Principles of Biostatistics	4	-	-	3	50	50	100	4
223BC1A3SA	SEC-I	Analytical Biochemistry	2	-	2	3	50	50	100	2
		Total	**22**	**2**	**6**				**700**	**23**

14/6/23
BoS Chairman/HoD
Department of Biochemistry
Dr. N. G. P. Arts and Science College
Coimbatore – 641 048

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APPROVED
BoS- 14.06.23 AC - 14.07.23 GB - 20.07.23

Academic Council
Dr.N.G.P. Arts and Science College
CHAIRMAN

Course Code	Course Category	Course Name	L	T	P	Exam (h)	MaxMarks			Credits
							CIA	ESE	Total	
Fourth Semester										
Part-I										
221TL1A4TA	Language - I	Tamil-IV	3	1	-	3	50	50	100	3
221TL1A4HA		Hindi-IV								
221TL1A4MA		Malayalam-IV								
221TL1A4FA		French–IV								
Part-II										
221EL1A4EA	Language - II	Professional English-IV	4	-	-	3	50	50	100	3
Part-III										
223BC1A4CA	Core- VII	Intermediary Metabolism	5	-	-	3	50	50	100	5
223BC1A4CB	Core- VIII	Nutritional Biochemistry	4	-	-	3	50	50	100	4
223BC1A4CP	Core Practical-IV	Metabolism and Nutritional Biochemistry	-	-	4	6	50	50	100	2
224CS1A4EP	IDC-IV	Python for Biologists	3	-	2	3	50	50	100	4
223BC1A4EP	SEC-II	Bioinformatics	2	-	2	6	50	50	100	2
Total			**21**	**1**	**8**				**700**	**23**

16/11/23
BoS Chairman/HoD
Department of Biochemistry
Dr. N. G. P. Arts and Science College
Coimbatore – 641 048

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BOS - 16th 16.10.23
AC - 16th 13.12.23
SR - 21st 05.01.24

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Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Fifth Semester										
Part-III										
223BC1A5CA	Core- IX	Genetics and Molecular Biology	5	-	-	3	50	50	100	5
223BC1A5CB	Core- X	Plant Biochemistry	4	-	-	3	50	50	100	4
223BC1A5CC	Core- XI	Immunology	4	-	-	3	50	50	100	4
223BC1A5CP	Core Practical-V	Plant Biochemistry	-	-	4	6	50	50	100	2
223BC1A5CQ	Core Practical - VI	Immunology and Molecular Biology	-	-	4	6	50	50	100	2
223BC1A5SA	SEC-III	Recombinant DNA Technology	3	-	-	3	50	50	100	2
223BC1A5DA	DSE-I	Blood Biochemistry and Hematology	4	-	-	3	50	50	100	4
223BC1A5DB		Environmental Biochemistry								
223BC1A5DC		Dairy Biochemistry								
223BC1A5TA	IT	Industrial Training	-	-	-	-	50	50	100	2
Part IV										
	GE-I		2	-	-	-	50	-	50	2
Total			**22**	**-**	**8**				**850**	**27**

4/4/24
BoS Chairman/HoD
Department of Biochemistry
Dr. N. G. P. Arts and Science College
Coimbatore – 641 048

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Course Code	Course Category	Course Name	L	T	P	Exam(h)	Max Marks			Credits
							CIA	ESE	Total	
Sixth Semester										
Part-III										
223BC1A6CA	Core-XII	Clinical Biochemistry	4	-	-	3	50	50	100	4
223BC1A6CB	Core-XIII	Hormonal Biochemistry	4	-	-	3	50	50	100	4
223BC1A6CV	Core	Project and Viva Voce	-	-	4	3	50	50	100	2
223BC1A6CP	Core Practical-VII	Clinical and Hormonal Biochemistry	-	-	4	6	50	50	100	2
223BC1A6SA	SEC-IV	Molecular Diagnostics	4	-	-	3	50	50	100	2
223BC1A6DA	DSE-II	Neurobiochemistry	4	-	-	3	50	50	100	4
223BC1A6DB		Marine Biochemistry								
223BC1A6DC		Sports Biochemistry								
223BC1A6DD	DSE-III	Pharmaceutical Biochemistry	4	-	-	3	50	50	100	4
223BC1A6DE		Bioprocess Technology								
223BC1A6DF		Bioresources and Bioprospecting								
Part-IV										
223BC1A6AA	AECC-III	Innovation, IPR and Entrepreneurship	2	-	-	-	50	-	50	2
Total			22	-	08	-	-	-	750	24
Grand Total									4500	142

BoS Chairman/HoD
Department of Biochemistry
Dr. N. G. P. Arts and Science College
Coimbatore – 641 048

Dr.N.G.P. Arts and Science College
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BoS- 18th 07.11.24 | AC - 18th 26.11.24 | GB -

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DISCIPLINE SPECIFIC ELECTIVE

Students shall select the desired course of their choice in the list of elective courses during Semesters V&VI

SemesterV (Electivel) List of Elective Courses

S.No.	Course Code	Name of the Course
1.	223BC1A5DA	Blood Biochemistry and Hematology
2.	223BC1A5DB	Environmental Biochemistry
3.	223BC1A5DC	Dairy Biochemistry

SemesterVI (Elective II) List of Elective Courses

S.No.	Course Code	Name of the Course
1.	223BC1A6DA	Neurobiochemistry
2.	223BC1A6DB	Marine Biochemistry
3.	223BC1A6DC	Sports Biochemistry

SemesterVI (ElectiveIII) List of Elective Courses

S.No.	Course Code	Name of the Course
1.	223BC1A6DD	Pharmaceutical Biochemistry
2.	223BC1A6DE	Bioprocess Technology
3.	223BC1A6DF	Bioresources and Bioprospecting

GENERIC ELECTIVE COURSES (GE)

The following are the courses offered under Generic Elective Course Semester III (GE-I)

S.No.	Course Code	Course Name
1	223BC1A3GA	Organic farming: principles and practices

EXTRACREDIT COURSES

The following are the courses offered under self study to earn extra credits:

S.No.	CourseCode	Course Name
1	223BC1ASSA	Herbal technology
2	223BC1ASSB	Bioentrepreneurship

CERTIFICATE PROGRAMMES

The following are the programme offered to earn extra credits:

S.No.	Programme Code and Name	Course Code	Course Name
1	3BC5AA Certificate course on Cheminformatics	223BC5A1CA	Cheminformatics
2	3BC5AB Certificate course on Molecular Diagnostics	223BC5B1CA	Molecular Diagnostics

UG - REGULATION (R4)

(Students admitted in the AY 2022-23)

(OUTCOME BASED EDUCATION WITH CBCS)

1.NOMENCLATURE

1.1 Faculty: Refers to a group of programmes concerned with a major division of knowledge Eg. Faculty of Computer Science consists of disciplines like Departments of Computer Science, Information Technology, Computer Technology, Computer Applications, Data analytics, Cognitive Systems and Artificial Intelligence and Machine Learning.

1.2 Programme: Refers to the Bachelor of Science / Commerce /Arts stream that a student has chosen for study.

1.3 Batch: Refers to the starting and completion year of a programme of study. Eg. Batch of 2022–25 refers to students belonging to a 3 year Degree programme admitted in 2022 and completing in 2025.

1.4 Course: Refers to component of a programme. A course may be designed to involve lectures / tutorials / laboratory work / seminar / project work/ practical training / report writing / Viva- voce, etc., or a combination of these, to meet effectively the teaching learning needs.

a) **Core Course:**A course, which should compulsorily be studied by a candidate as a core requirement

b) **Inter Disciplinary Course (IDC):** A course chosen generally from a related discipline/subject with an intention to seek exposure in the discipline relating to the core domain of the student

c) **Discipline Specific Elective (DSE) Course**: Elective courses offered under main discipline/ subject of study.

d) **Skill Enhancement Courses (SEC):** Value-based and/or skill-based courses which are aimed at providing hands-on-training, competencies, skills, etc.

e) **Ability Enhancement Compulsory Courses (AECC):** Mandatory courses that lead to Knowledge enhancement. Environmental Science, Human Rights and Women's Rights, Basic Tamil/Advanced Tamil, Innovation and IPR/Innovation, IPR and Entrepreneurship.

f) **Ability Enhancement Elective Course (AEEC)/Generic Elective (GE)** An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is Generic Elective.

1.5 Project Work:

Course involving application of knowledge in problem solving / analyzing /exploring a real life situation / difficult problem. The Project work will be given in lieu of a Core paper.

Internship/Industrial Training

Students must undertake industrial / institutional training for a minimum of 15 days during the IV semester summer vacation. The students will submit the report for evaluation during V semester.

1.6 Extra Credits:

Extra credits shall be awarded for achievements in identified Curricular/co-curricular activities executed outside the regular class hours. Extra credits are not mandatory for completing the programme.

2. STRUCTURE OF PROGRAMME

2.1 PART- I: LANGUAGE- I

Tamil or any one of the languages namely Malayalam, Hindi and French will be offered under Part – I in the first four semesters.

2.2 PART- II: LANGUAGE- II

English will be offered during the first four semesters.

2.3 PART- III:

- Core Course
- Inter Departmental Course (IDC)
- Discipline Specific Elective (DSE)
- Skill Enhancement Course (SEC)
- Industrial Training (IT)

2.4 PART- IV:

2.4.1 Ability Enhancement Compulsory Course (AECC):

The Ability Enhancement Compulsory Courses such as i)Environmental Studies, ii) Human Rights and Womens' Rights, iii) Innovation and IPR/ Innovation, IPR and Entrepreneurship are offered during I,II and VI Semester.

Basic Tamil

a) Those who have not studied Tamil up to XII Std and taken a non-Tamil language under Part-I shall take one Basic Tamil course in the second semester.

(OR)

Advanced Tamil

b) Those who have studied Tamil up to XII Std and taken a non-Tamil language under Part-I shall take one Advanced Tamil course in the second semester.

Note: Students who come under the above a+b categories are exempted from Human Rights and Women's Rights in second semester.

Ability Enhancement Elective Course (AEEC)/Generic Elective (GE) An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is Generic Elective offered in V semester. (Theory/Practical/Non-Lab Practical)

2.5 PART- V: EXTENSION ACTIVITIES

The following extracurricular activities like NSS/YRC/NCC/RRC/Yoga/Sports/Clubs are offered under extension activities during semester I & II. Students will be evaluated based on their active participation in any one of the above activities. 75% Attendance is compulsory for extension activity.

3. CREDIT ALLOTTMENT

The following is the credit allotment:

- Lecture Hours (Theory) : 1 credit per lecture hour per week
- Laboratory Hours : 1 credit for 2 Practical hours per week
- Project Work : 1 credit for 2 hours of project work per week

4. DURATION OF THE PROGRAMME

The B.A. /B.Com./B. Sc. Programme must be completed within 3 years (6 semesters) and a maximum of 6 years (12 semesters) from the date of acceptance to the programme. If not, the candidate must enroll in the course determined to be an equivalent by BoS in the most recent curriculum recommended for the Programme.

5.REQUIREMENTS FOR COMPLETION OF A SEMESTER

Every student shall ordinarily be allowed to keep terms for the given semester in a program of his/ her enrolment, only if he/ she fulfills at least seventy five percent (75%) of the attendance taken as an average of the total number of lectures, practicals, tutorials, etc. wherein short and/or long excursions/field visits/study tours organized by the college and supervised by the faculty as envisaged in the syllabus shall be credited to his/her attendance. Every student shall have a minimum of 75% as an overall attendance.

6. EXAMINATIONS

The end semester examinations shall normally be conducted after completing 90 working days for each semester. The maximum marks for each theory and practical course shall be 100 with the following breakup:

a) Mark distribution for Theory Courses

Continuous Internal Assessment (CIA) : 50 Marks

End Semester Exams (ESE) : 50 Marks

Total :100 Marks

i) Distribution of Internal Marks

S.No.	Particulars	Distribution of Marks
1	CIA I (2.5 Units) (On completion of 45th working day)	15
2	Model (All 5 Units) (On completion of 85th working day)	15
3	Assignment	05
4	Attendance	05
5	Library Usage	05
6	Skill Enhancement *	05
	Total	**50**

Assignment Rubric
(Maximum -20 marks converted to 5 marks)

Criteria	4 marks	3 Marks	2 Marks	1 MArk
Language	Excellent spelling and Grammar	Good spelling and Grammar	Reasonable spelling and Grammar	Bad spelling and Grammar
Style	Outstanding style beyond usual college level	Attains College level style	Approaches College level style	Elementary form with little or no variety in sentence structure
Referencing	Good use of wide range of reference sources	Moderate use of suitable reference materials	Shows signs of plagiarism & using sources without referencing	No reference material used
Development	Main points well developed with high quality and quantity support	Main points developed with quality and quantity supporting details	Main points are present with limited details and development	Main points lack detailed development
Critical thinking/Problem solving	Advanced attempt to interpret the process, content/ analyse and solve the problem	Proficient attempt to interpret the process, content/ analyse and solve the problem	Adequate attempt to interpret the process, content/ analyse and solve the problem	Limited attempt to interpret the process, content/ analyse and solve the problem

Breakup for Attendance Marks:

S.No	Attendance Range	Marks Awarded
1	95% and Above	5
2	90% - 94%	4
3	85% - 89%	3
4	80% - 84%	2
5	75% - 79%	1

Note:
Special Cases such as NCC, NSS, Sports, Advanced Learner Course, Summer Fellowship and Medical Conditions etc. the attendance exemption may be given by principal and Mark may be awarded.

Break up for Library Marks:

S.No	Attendance Range	Marks Awarded
1	10h and above	5
2	9h– less than 10h	4
3	8h – less than 9h	3
4	7h - less than 8h	2
5	6h – less than 7h	1

Note:
In exception, the utilization of e-resources of library will be considered.

***Components for "Skill Enhancement" may include the following:**

Class Participation, Case Studies Presentation, Field Study, Field Survey, Group Discussion, Term Paper, Presentation of Papers in Conferences, Industry Visit, Book Review, Journal Review, e-content Creation, Model Preparation & Seminar.

Components for Skill Enhancement

Any one of the following should be selected by the course coordinator

S.No.	Skill Enhancement	Description
1	Class Participation	• Engagement in class • Listening Skills • Behaviour
2	Case Study Presentation/ Term Paper	• Identification of the problem • Case Analysis • Effective Solution using creativity/imagination
3	Field Study	• Selection of Topic • Demonstration of Topic • Analysis & Conclusion
4	Field Survey	• Chosen Problem • Design and quality of survey • Analysis of survey
5	Group Discussion	• Communication skills • Subject knowledge • Attitude and way of presentation • Confidence • Listening Skill

6	Presentation of Papers in Conferences	• Sponsored • International/National • Presentation • Report Submission
7	Industry Visit	• Chosen Domain • Quality of the work • Analysis of the Report • Presentation
8	Book Review	• Content • Interpretation and Inferences of the text • Supporting Details • Presentation
9	Journal Review	• Analytical Thinking • Interpretation and Inferences • Exploring the perception if chosen genre • Presentation
10	e-content Creation	• Logo/ Tagline • Purpose • Content (Writing, designing and posting in Social Media) • Presentation
11	Model Preparation	• Theme/ Topic • Depth of background Knowledge • Creativity • Presentation
12	Seminar	• Knowledge and Content • Organization • Understanding • Presentation

ii) Distribution of External Marks

Total	**:**	**50**
Written Exam	**:**	**50**

Marks Distribution for Practical course

Total	**:**	**100**
Internal	**:**	**50**
External	**:**	**50**

i) Distribution of Internals Marks

S.No.	Particulars	Distribution of Marks
1	Experiments/Exercises	15
2	Test 1	15
3	Test 2	15
4	Observation Notebook	05
	Total	**50**

ii) Distribution of Externals Marks

S.No.	Particulars	External Marks
1	Materials and methods/ Procedures/Aim	10
2	Experiment/ Performance/ Observations/ Algorithm	10
3	Results/ Calculations/ Spotters/ Output	10
4	Inference/Discussion/ Presentation	10
5	Record	6
6	Viva- voce	4
	Total	**50**

A) Mark Distribution for Project/Internship/Industrial Training

Total	**:**	**100**
Internal	**:**	**50**
External	**:**	**50**

i) Distribution of Internal Marks

S.No.	Particulars	Internal Marks
1	Review I	20
2	Review II	20
3	Attendance	10
	Total	**50**

ii) Distribution of External Marks

S.No	Particulars	External Marks
1	Project Work/Internship/ Industrial training presentation	40
2	Viva –voce	10
	Total	**50**

Evaluation of project Work/Internship/ Industrial training shall be done jointly by Internal and External Examiners

7. Credit Transfer

a. Upon successful completion of 1 NPTEL Course (4 Credit Course) recommended by the department, during Semester I to IV, a student shall be eligible to get exemption of one **4 credit course** during the V or VI semester. The proposed NPTEL course should cover content/syllabus of exempted core paper in V or VI semester.

S. No.	Course Code	Course Name	Proposed NPTEL Course	Credit
1			Option – 1 Paper title	4
			Option – 2 Paper title	
			Option – 3 Paper title	

b. Upon successful completion of **2 NPTEL Courses** (2 Credit each) recommended by the department, during Semester I to IV, a student shall be eligible to get exemption of **one 4 credit course** during the V or VI semester. Out of 2 NPTEL proposed courses, **atleast 1 course** should cover content/syllabus of exempted core paper in V or VI semester.

<u>Mandatory</u>

The exempted core paper in the V or VI semester should be submitted by the students for approval before the end of 4th semester.

Credit transfer will be decided by equivalence committee

S. No.	Course Code	Course Name	Proposed NPTEL Course	Credit
1			Option – 1 Paper title	2
			Option – 2 Paper title	
			Option – 3 Paper title	
2			Option – 1 Paper title	2
			Option – 2 Paper title	
			Option – 3 Paper title	

NPTEL Courses to be carried out during semester I – IV.

S.No.	Student Name	Class	Proposed NPTEL Course		Proposed Course for Exemption
			Course I	Option 1- Paper Title Option 2- Paper Title Option 3- Paper Title	Any one Core Paper in V or VI Semester
			Course II	Option 1- Paper Title Option 2- Paper Title Option 3- Paper Title	

Class Advisor **HoD** **Dean**

Upon Successful outcome of Design Thinking / Copy right/Product/ Patent by the end of the V Semester, student shall be eligible to get exemption in AECC: Innovation, IPR & Entrepreneurship / Innovation & IPR offered during VI Semester.

9. Internship/Industrial Training

Students must undertake industrial / institutional training for a minimum of 15 days during the IV semester summer vacation. The students shall submit the report for evaluation during V semester.

10. Extra Credits: 10

Earning extra credit is not essential for programme completion. Student is entitled to earn extra credit for achievement in Co-Curricular/ Extracurricular activities carried out other than the regular class hours.

A student is permitted to earn a maximum of Ten extra Credits during the programme period.

A maximum of 1 credit under each category is permissible.

Category	Credit
Proficiency in foreign language	1
Proficiency in Hindi	1
Self study Course	1
Typewriting/Short hand	1
CA/ICSI/CMA (Foundations)	1
CA/ICSI/CMA (Inter)	1
Sports and Games	1
Publications / Conference Presentations (Oral/Poster)/Awards	1
Lab on Project	1
Innovation / Incubation / Patent / Sponsored Projects / Consultancy/	1
Representation in State / National level celebrations	1
Awards/ Recognitions / fellowships	1

Credit shall be awarded for achievements of the student during the period of study only.

GUIDELINES

Proficiency in foreign language

A pass in any foreign language in the examination conducted by an authorized agency.

Proficiency in Hindi

A pass in the Hindi examination conducted by Dakshin Bharat Hindi Prachar Sabha.

Examination passed during the programme period only will be considered for extra credit.

Self study Course

A pass in the self study courses offered by the department.

The candidate should register the self study course offered by the department only in the III semester.

Typewriting/Short hand

A Pass in short hand /typewriting examination conducted by Tamil Nadu Department of Technical Education (TNDTE) and the credit will be awarded.

CA/ICSI/CMA(Foundations)

Qualifying foundation in CA/ICSI/CMA / etc.

Sports and Games

The Student can earn extra credit based on their Achievement in sports in University/ State / National/ International.

Publications / Conference Presentations (Oral/Poster)

Research Publications in Journals

Oral/Poster presentation in Conference

Lab on Project (LoP)

To promote the undergraduate research among all the students, the LoP is introduced beyond their regular class hours. LoP is introduced as group project consisting of not more than five members. It consist of four stages namely Literature collection, Identification of Research area, Execution of research and Reporting / Publication of research reports/ product developments. These four stages spread over from III to V semester.

(Evaluation will be done internally)

Innovation / Incubation / Patent / Sponsored Projects / Consultancy

Development of model/ Products /Prototype /Process/App/Registration of Patents/ Copyrights/Trademarks/Sponsored Projects /Consultancy

Representation in State/ National level celebrations

State / National level celebrations such as Independence day, Republic day Parade, National Integration camp etc.

Awards/ Recognitions/fellowships

Regional/ State / National level awards/ Recognitions/Fellowships

100 % CIA Courses :

- **AECC**
- **AEEC**

S.No	Type of Course
1	Environmental Studies (AECC)
2	Human Rights and Women's Rights, Basic Tamil / Advanced Tamil (AECC)
3	Innovation &IPR/ Innovation, IPR and Entrepreneurship(AECC)
4	Generic Elective (AEEC)

Modalities for Implementing Internal Assessment Marks:

- Student pertaining to 2022 Batch (2022-25) UG programme for the above mentioned courses shall secure a minimum of 40% out of the maximum marks in the continuous internal assessment (CIA) i.e., 20 marks out of 50 marks.
- Students who have not acquired the minimum marks shall be allowed to reappear to improve their marks in the exam components only within the time duration of the programme, in the forthcoming semesters.

Distribution of Internal Marks for AECC & AEEC

Theory			**Practical**	
S. No.	**Particulars**	**Distributionof Marks**	**Particulars**	**Distributionof Marks**
1	CIAI(2.5Units) (On completionof45thworkingday)	15	CIA I (Exercise 1-5)	5
2	Model(5Units)(On completionof85thworkingday)	15	CIA II (Exercise 6 - 10)	5
3	Assignment	05	Class Participation	10
4	Attendance	05	Practical Record	10
5	LibraryUsage	05	Test -III & Viva-Voce (10+10)	20
6	SkillEnhancement*	05	---	---
	Total	**50**		50

Question paper pattern AECC & AEEC

Test	MARKS	DESCRIPTION	TOTAL	Remarks
CIA Test I **1 Hour** **First 2.5 Units**	50 x 1 = 50 Marks	MCQ	50 Marks	Marks secured will be Converted to 15 marks
CIA test II/ Model test **1 Hour** **All five Units**	50 x 1 = 50 Marks	MCQ	50 Marks	Marks secured will be Converted to 15 marks

Question paper pattern	Total Marks -50
Basic Tamil	**Advanced Tamil**
Section -A	**Section -A**
Choose the correct answer 10x2=20	**Choose the correct answer 10** x1=10
Section -B	**Section -B**
True or false 10x2=20	**Fill in the blanks** 10x2=20
Section -C	**Section -C**
Answer in one page 1x10=10	**Write an essay in two pages** 2x10=20

Question paper pattern for all other courses falling under Part I to Part III

CIA Test : [1 ½ Hours-2.5 Units] - 25 Marks

SECTION	MARKS	DESCRIPTION	TOTAL	Remarks
Section – A	8 x 0.5 = 04 Mark	MCQ	25 Marks	Marks secured will be converted to 15 marks
Section - B	3 x 3 = 09 Mark	Answer ALL Questions Either or Type ALL Questions Carry Equal Marks		
Section - C	2 x 6 = 12 Mark			

Model Test: [3 Hours-5 Units] - 50 Marks

SECTION	MARKS	DESCRIPTION	TOTAL	Remarks
Section – A	5 x 1 = 05 Marks	MCQ	50 Marks	Marks secured will be converted to 15 marks
Section - B	5 x 3 = 15 Marks	Answer ALL Questions (Either or Type Questions) Each Questions Carry Equal Marks		
Section - C	5 x 6 = 30 Marks			

End Semester Examination: [3 Hours-5 Units] - 50 Marks

SECTION	MARKS	DESCRIPTION	TOTAL
Section – A	5 x 1 = 05 Marks	MCQ	50 Marks
Section - B	5 x 3 = 15 Marks	Answer ALL Questions (Either or Type Questions) Each Questions Carry Equal Marks	
Section - C	5 x 6 = 30 Marks		

B.Sc. Biochemistry (2022-23)

Syllabus

Course Code	Course Name	Category	L	T	P	Credit
221TL1A1TA	TAMIL- I: IKKALA ILAKKIYAM	LANGUAGE-I	4	1	-	03

PREAMBLE

This course has been designed for students to learn and understand

- மொழிப்பாடங்களின் வாயிலாக தமிழரின் பண்பாடுநாகரீகம் ,பகுத்தறிவு ஆகியவற்றை அறியச் செய்தல்
- கலை மற்றும் மரபுகளை அறியச் செய்தல்
- மாணவர்களின் படைப்பாக்கத்திறன்களை ஊக்குவித்தல்

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	வாழ்க்கைத்திறன்கள்(Life Skills)- மாணவர்களின் செயலாக்கத்திறனை ஊக்குவித்தல்	K3
CO2	மதிப்புக்கல்வி (Attitude and Value education)	K4
CO3	பாடஇணைச்செயல்பாடுகள் (Co-curricular activities)	K4
CO4	சூழலியல் ஆக்கம் (Ecology)	K4
CO5	மொழி அறிவு(Tamil knowledge)	K5

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓		✓	✓	✓
CO3	✓	✓	✓		✓
CO4	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights	✓	Gender Sensitization
✓	Social Awareness/ Environment	✓	Constitutional Rights/ Human Values/ Ethics

221TL1A1TA	TAMIL- I: IKKALA ILAKKIYAM	SEMESTER I

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I	மறுமலர்ச்சிக் கவிதைகள்	13 h

1. இலக்கிய வரலாறு -மறுமலர்ச்சிக் கவிஞர்களின் தமிழ்ப்பணிகள்
2. பாரததேசம் - பாரதியார்
3. படி - பாரதிதாசன்
4. தமிழரின் பெருமை - நாமக்கல்கவிஞர்
5. தமிழ்க் கொலை புரியாதீர் - புலவர் குழந்தை
6. திரைத்தமிழ்

அ) 'விஞ்ஞானத்த வளர்க்கப் போறண்டி' எனத்தொடங்கும் பாடல் - உடுமலை நாராயண கவி

ஆ) 'சும்மா கிடந்த நிலத்தை' எனத்தொடங்கும் பாடல் - பட்டுக்கோட்டை கல்யாண சுந்தரனார்

இ) 'சமரசம் உலாவும் இடமே' எனத்தொடங்கும் பாடல்- மருதகாசி

ஈ) 'உன்னை அறிந்தால்' எனத்தொடங்கும் பாடல் - கண்ணதாசன்

Unit II	புதுக்கவிதைகள்	13 h

1. இலக்கிய வரலாறு - புதுக்கவிதையின் தோற்றமும் வளர்ச்சியும்
2. கடமையைச் செய் - மீரா
3. மலையாளக் காற்று - சிற்பி
4. ஒப்பிலாத சமுதாயம் - அப்துல் ரகுமான்
5. கன்னிமாடம் - மு.மேத்தா
6. கரிக்கிறது தாய்ப்பால் - ஆரூர் தமிழ்நாடன்
7. ஐந்தாம் வகுப்பு 'அ' பிரிவு - நா. முத்துக்குமார்
8. ஹைகூ கவிதைகள் - 10 கவிதைகள்

Unit III	பெண்ணியம்	09 h

1. தொலைந்து போனேன் - தாமரை

2. நீரில் அலையும் முகம் - அ. வெண்ணிலா 3. தற்காத்தல் - பொன்மணி வைரமுத்து 4. ஏனிந்த வித்தியாசங்கள் ?- மல்லிகா 5. புதையுண்ட வாழ்க்கை - சுகந்தி சுப்ரமணியன்		
Unit IV	சிறுகதைகள்	15 h
1.இலக்கிய வரலாறு -சிறுகதையின் தோற்றமும் வளர்ச்சியும் 2. கனகாம்பரம் - கு.ப.ராஜகோபாலன் 3. ஆற்றங்கரைப் பிள்ளையார் - புதுமைப்பித்தன் 4. பொம்மை - ஜெயகாந்தன் 5. காய்ச்சமரம் - கி. ராஜநாராயணன் 6. காட்டில் ஒருமான் - அம்பை 7.வேட்கை - சூர்யகாந்தன்		
Unit V	பயிற்சிப் பகுதி	10 h
அ. இலக்கணம் 1.வல்லின ஒற்று மிகும், மிகா இடங்கள் - ஒற்றுப்பிழை நீக்கி எழுதுதல் 2.ர,ற - ல,ழ,ள - ண,ந,னவேறுபாடு - ஒலிப்பு நெறி,சொற்பொருள் வேறுபாடு அறிதல்) **ஆ. படைப்பாக்கம்** 1. கவிதை- எழுதுதல் (15 வரிகள் முதல் 30 வரிகள் வரை) 2.சிறுகதை - எழுதுதல் (குறைந்தது 3 பக்கங்கள்)		

Text Book

1 தமிழ் மொழிப்பாடம் - 2022-2023 ,தொகுப்பு: தமிழ்த்துறை , டாக்டர்என்.ஜி.பி. கலை அறிவியல் கல்லூரி ,கோயம்புத்தூர் – 641048,வெளியீடு: நியூ செஞ்சுரி புக் ஹவுஸ்,சென்னை – 600 098.

References

1 பேராசிரியர் புலவர் சோம. இளவரசு ,எட்டாம் பதிப்பு -2014 ,தமிழ் இலக்கிய வரலாறு – மணிவாசகர் பதிப்பகம்,சென்னை – 600 108.

2 பேராசிரியர் முனைவர் பாக்கியமேரி ,முதற் பதிப்பு- 2013 ,இலக்கணம் - இலக்கிய வரலாறு - மொழித்திறன்- பூவேந்தன் பதிப்பகம்,சென்னை-600 004.

3 இணையதள முகவரி: https://www.tamilvu.org

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BoS- 13	AC - 13	GB - 18
4/8/22	6/9/22	10/9/22

Course Code	Course Name	Category	L	T	P	Credit
221TL1A1HA	HINDI- I: MODERN LITERATURE	LANGUAGE-1	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the writing ability and develop reading skill
- the various concepts and techniques for criticizing literature
- The techniques for expansion of ideas and translation process

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the fundamentals of novels and stories	K1
CO2	Understand the principles of translation work	K2
CO3	Apply the knowledge writing critical views on fiction	K3
CO4	Build creative ability	K3
CO5	Expose the power of creative reading	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓		✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓		✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
	Intellectual Property Rights	✓	Gender Sensitization
✓	Social Awareness/ Environment	✓	Constitutional Rights/ Human Values/ Ethics

221TL1A1HA	HINDI- I: MODERN LITERATURE	SEMESTER I

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I 13 h

गद्य – नूतनगद्यसंग्रह(जयप्रकाश)पाठ 1- रजियापाठ 2- मक्रीलपाठ 3- बहतापानीनिर्मला
पाठ 4- राष्ट्रपितामहात्मागाँधी

Unit II 13 h

कहानीकुंज- डॉवी.पी. 'अमिताभ'(पाठ 1-4)

Unit III 12 h

व्याकरण : शब्दविचार (संज्ञा, सर्वनाम,विशेषण)

Unit IV 12 h

अनुच्छेद लेखन

Unit V 10 h

अनुवाद अभ्यास-III (केवल अंग्रेजी से हिन्दी में) (पाठ 1 to 10)

Text Books

1 प्रकाशक: सुमित्रप्रकाशन 204 लीलाअपार्ट्मेंट्स, 15 हेस्टिंग्सरोड'अशोकनगरइलाहाबाद-211001

2 प्रकाशक: गोविन्दप्रकाशनसदरबाजार, मथुराउत्तरप्रदेश-281001

3 पुस्तक: व्याकरण प्रदिप – रामदेवप्रकाशक: हिन्दी भवन 36 टेगोर नगर इलाहाबाद-211024

4 पुस्तक: व्याकरण प्रदिप – रामदेवप्रकाशक: हिन्दी भवन 36 इलाहाबाद-211024

5 प्रकाशक: दक्षिण भारत प्रचार सभा चेनैई -17

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BOS- 13 4/8/22 | AC - 13 6/9/22 | GB - 18 10/9/22

Course Code	Course Name	Category	L	T	P	Credit
221TL1A1MA	MALAYALAM- I: MODERN LITERATURE	LANGUAGE-I	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the writing ability and develop reading skill
- the various concepts and techniques for criticizing literature, to learn the techniques for expansion of ideas and translation process
- the competency in translating simple Malayalam sentences into English and vice versa

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the fundamentals of novels and stories.	K1
CO2	Understand the principles of translation work.	K2
CO3	Apply the knowledge writing critical views on fiction.	K3
CO4	Build creative ability.	K3
CO5	Expose the power of creative reading	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓		✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓		✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
	Intellectual Property Rights	✓	Gender Sensitization
✓	Social Awareness/ Environment	✓	Constitutional Rights/ Human Values/ Ethics

221TL1A1MA	MALAYALAM- I: MODERN LITERATURE	SEMESTER I

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I **Novel** 14 h

PathummayudeAdu

Unit II **Novel** 10 h

PathummayudeAdu

Unit III **Short Story** 14 h

Nalinakanthi

Unit IV **Short Story** 10 h

Nalinakanthi

Unit V **Practical Application** 12 h

Expansion of ideas, General Essay and Translation

Text Books

1 Vaikkam Muhammed Basheer, "PathummayudeAdu" (NOVEL), DC Books & Kottayam

2 T.Padmanabhan, "Nalinakanthi" (Short Story), DC Books & Kottayam.

References

1 MalayalaNovel Sahithyam.

2 MalayalaCherukathaInnale Innu.

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APPROVED

BoS- 13	AC - 13	GB - 18
4/8/22	6/9/22	10/9/22

Course Code	Course Name	Category	L	T	P	Credit
221TL1A1FA	FRENCH- I: GRAMMAR, TRANSLATION AND CIVILIZATION	LANGUAGE - I	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the Competence in General Communication Skills - Oral + Written - Comprehension & Expression
- the Culture, life style and the civilization aspects of the French people as well as of France
- the students to acquire Competency in translating simple French sentences into English and vice versa

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the Basic verbs, numbers and accents	K1
CO2	Apply the adjectives and the classroom environment in France	K2
CO3	Evaluate the Plural, Articles and the Hobbies	K3
CO4	Measure the Cultural Activity in France	K3
CO5	Select the sentiments, life style of the French people and the usage of the conditional tense	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓		✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓		✓	✓	✓
CO4	✓		✓	✓	
CO5	✓	✓	✓	✓	✓

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights		Gender Sensitization
✓	Social Awareness/ Environment	✓	Constitutional Rights/ Human Values/ Ethics

221TL1A1FA	FRENCH- I: GRAMMAR, TRANSLATION AND CIVILIZATION	SEMESTER I

Total Credits: 3
Total Instruction Hours: 60 h

Syllabus

Unit I Salut I Page 10 12 h

Objectifs de Communication	Tâche	Activités deréception et de production orale
• Saluer • Enter en contact • avecquelqu'un. • Se presenter. • S'excuser	Encours de cuisine, premiers contacts avec les members d'un groupe	• Comprendre des personnes qui se saluent. • Ēchanger pour entrer en contact, se présenter, saluer, s'excuser. • Communiquer avec *tu* ou *vous*. • Comprendre les consignes de classe • Ēpeler son nom et son prénom. Computer jusqu'à 10.

Unit II Enchanté I Page 20 12 h

Objectifs de Communication	Tâche	Activités deréception et de production orale
• Demander de se presenter. • Présenter quelqu'un.	Dans la classe de français, se presenter et remplir une fiche pour le professeur.	• Comprendre les informations essentielles dans un échange en milieu professionnel. • Ēchanger pour se presenter et présenter quelqu'un.

Unit III J'adoreI Page 30 12 h

Objectifs de Communication	Tâche	Activités deréception et de production orale
• Exprimerses gouts.	Dans un café, participer à une soirée de rencontres rapides et remplir de taches d'appréciation.	• Dans une soirée de recontresrapid comprendre des personnes qui échangent sur elles et sur leurs goût • Comprendre une personne qui parler des goûts de quelqu'un d'autre.

Unit IV J'adoreI Page 30 14 h

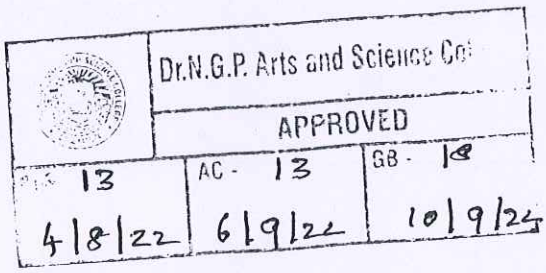
Objectifs de Communication	Tâche	Activités deréception et de production orale
• Présenterquelqu'un	Dans un café, participer à une soirée de rencontres rapides et remplir de taches d'appréciation	• Exprimersesgoûts. • Comprendre une demande laissée sur un répondeur téléphonique. • Parler de ses projets de week-end.
Autoévaluation du module I Page 40 – Préparation au DELF A1 page 42		
Demander à quelqu'un de faire quelque chose. Demander poliment. Parlerd'actions passes. Tuveuxbien?	Organiser un programme d'activités pour accueillirunepersonneimportante.	Comprendreunepersonne demande un service à quelqu'un. Demander à quelqu'un de faire quelque chose. Imaginer et raconter au passé à partir de situations dessinées.

Unit V Practical Application 10 h

Make in Own Sentences

Text Book

1 RegineMerieux, Yves Loiseau, "LATITUDES - 1" (Page No: 9-55)(Methode de Français), Goyal Publisher &DistributorsPvt.Ltd., 86 UB JawaharNagar (Kamala Nagar),Delhi-7 Les Editions Dider, Paris,2008- Imprime en Roumanie par Canale en Janvier 2012.



Course Code	Course Name	Category	L	T	P	Credit
221EL1A1EA	PROFESSIONAL ENGLISH- I	LANGUAGE- II	4	-	1	3

PREAMBLE

This course has been designed for students to learn and understand

- the effect of dialogue, the brilliance of imagery and the magnificence ofvaried genres
- any spontaneous spoken discourse and respond to them with proper sentence structure
- the transactional concept of English language

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Identify the various aspects in poetry	K2
CO2	Infer linguistic and non-linguistic features of the context for understanding and interpreting	K3
CO3	Construct sentences and convey messages effectively in real life situations	K3
CO4	Apply different reading strategies with varying speed	K3
CO5	Prepare modules with their own ideas and present them coherently in a grammatically correct form	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓			✓	✓
CO2	✓		✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights		Gender Sensitization
✓	Social Awareness/ Environment	✓	Constitutional Rights/ Human Values/ Ethics

221EL1A1EA	PROFESSIONAL ENGLISH- I	SEMESTER I

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I Genre Studies 12 h

Nissim Ezekiel: The Worm- Author's Biography- title indications- outline- paraphrasing the poem- context of poem- form- poetic devices- enjambment- techniques– Annotations

NiyiOsundare: Our Earth Will Not Die- Author's Biography- title indications- outline- paraphrasing the poem- context of poem- form- poetic devices- enjambment- techniques– Annotations

A. G. Gardiner: On Superstitions- Author's biography- Narrative structure- Exploration of the text- passage analysis- insight of ideas- cohesion and context- style- language techniques- Annotations

Nancy Bella: Clever Thief- Author's Biography- Plot Summary- Detailed summary and Analysis- Themes- Important Quotations-Characters- Description - analysis- Terms- Symbols- Critical analysis

H. G. Wells: The Truth about Pyecraft- Author's Biography-narrative structure- passage analysis- insight of ideas- cohesion and context- style- language techniques

Unit II Listening Skills 12 h

Listening vs. hearing- Types of listening, Tips to enhance Listening Skills, Non-verbal and Verbal signs of active listening - Comprehensive Listening - Listening to pre-recorded audios on speeches, interviews and conversations - Listening Activities- Listening and responding to complaints (formal situation), Listening to problems and offering solutions (informal)

Unit III Speaking Skills 14 h

Formal occasions- Introducing oneself, Introducing others, Enquiries and Seeking permission, Making short presentations - Informal occasions- Requests, Offering help, Congratulating, Farewell party, graduation speech -Giving instructions to do a task and to use a device, Giving and asking directions

Unit IV Reading Skills 10 h

Study Skills: Skimming and Scanning- Reading different kinds of texts- Types of reading-Developing a good reading speed, reading aloud, Referencing skill - Word Power (Denotation and Connotation) - Reading comprehension, Data interpretation –Charts, Graphs, Advertisements

Unit V Writing Skills 12 h

Sentence patterns, Note- making and note taking-Strategies - Paragraph writing: Structure and Principles - Academic Writing - Formal and Informal Letters, Report, Book /Movie Review

Text Books

1. Gardiner, A. G. 1926. Alpha of the Plough: Second series, J.M. Dent & Sons Ltd., London, United Kingdom. pg.no-151-156. (Unit I)
2. Ezekiel, Nissim. "The Worm," Crazy Romantic Love, www. mianmawaisarain.live/2020/05/poem-worm-nissim-ezekiel.html. Accessed 3 Aug. 2022. (Unit I)
3. <http://livros01.livrosgratis.com.br/ln000835.pdf/>(Unit I)
4. Mithra,S.M. 1919. Hindu Tales from the Sanskrit, Macmillan & Co Ltd., London, United Kingdom. pg.no-127-142. (Unit I)
5. Nation, I. S. P and Jonathan Newton. 2009. Teaching ESL/EFLListening and Speaking. Routledge, New York, United States. (Unit II)
6. Prabha, Dr. R. Vithya & S. Nithya Devi. 2019. Sparkle. (1st Edn.) McGraw - Hill Education, Chennai, India. (Unit III– V)

References

1. Our Earth Will Not Die By NiyiOsundare." Studocu.Com, studocu.com/in/document/bangalore-university/bachelor-of-computer-applications/1586771577-our-earth-will-not-die/27675462. Accessed 3 Aug. 2022.
2. OnSuperstitions."THEHISTORIAN,thehistorian1947.wordpress.com/2019/03/08/on-superstitions-by-a-g-gardiner. Accessed 3 Aug. 2022.
3. Swales, John M. & Feak, Christine B. 2012. Academic Writing for Graduate Students: Essential Tasks and Skills, University of Michigan Press, Michigan.
4. Rudzka, Brygida -Ostyn, 2003. Word Power: Phrasal Verbs and Compounds: A Cognitive Approach, Mouton de Gruyter, New York, United States.

Course Code	Course Name	Category	L	T	P	Credit
223BC1A1CA	BIOMOLECULES	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The importance of biological macromolecules.
- The influence and role of structure in reactivity of biomolecules.
- Their role with regard to maintenance and perpetuation of the living systems.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Outline the classification of biomolecules such as Carbohydrates, Lipids, Amino acids, Proteins and Nucleic acids.	K1
CO2	Describe the structure, conformational freedom and functions of biomolecules.	K2
CO3	Present the structural principles that govern reactivity/physical properties of biomolecules.	K3
CO4	Analyze the chemical and biochemical properties of biomolecules that help to sustain life.	K4
CO5	Develop knowledge on clinical consequences of Mineral and Vitamin deficiency. Experiment with pH and Buffer.	K4

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A1CA	BIOMOLECULES	SEMESTER I

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Carbohydrates 10 h

Introduction to biological macromolecules. Carbohydrate - Definition, classification. Structure, properties & chemical reactions of monosaccharide. Structure and Properties of disaccharides – Maltose, Lactose and Sucrose. Polysaccharides – structure & biological functions of Homo & Hetero polysaccharides. Occurrence, importance and the structure of sugar derivatives - amino sugars, bacterial cell wall polysaccharides - peptidoglycan.

Unit II Lipids 8 h

Definition, classification and physico-chemical properties of lipids. Storage lipids: Fatty acids - types, nomenclature & properties. Structural lipids - phospholipids, glycolipids & sphingolipids. Structure and functions of steroids - cholesterol. Eicosanoids - an overview.

Unit III Amino acids and Proteins 10 h

Classification and general properties of amino acids. Chemical reactions of amino acids due to carboxyl groups and amino groups. Peptide bond - structure and properties. Structure and biological importance of glutathione, synthetic peptides - polyglutamic acid. Protein - classification and Physico-chemical properties. Organization of protein Structure – Primary (Insulin), Secondary (Keratin, Collagen), Tertiary (Myoglobin) & Quaternary structure (Hemoglobin). Denaturation of proteins.

Unit IV Nucleic acids 8 h

Structures of Purines, Pyrimidines, Nucleosides and Nucleotides. Properties of nucleic acids. DNA double helical structure, A, B & Z forms. Denaturation & renaturation of DNA. Structure and functions of mRNA, tRNA, rRNA, snRNA, snoRNA, miRNA, siRNA. Chemical reactions of RNA and DNA with acid and alkali, colour reactions of DNA and RNA.

Unit V Minerals, Vitamins, Water, pH & Buffers 12 h

Micro and Macro Minerals - Clinical Significance. Vitamins – Definition, classification. Fat soluble (Vitamin A, D, E, K) and Water soluble vitamins (Vitamin B Complex & Vitamin C) - sources, functions and deficiencies, hypervitaminosis. Water: Structure, Physical properties of water, weak interaction in aqueous solutions. pH – Introduction, buffers, Henderson-Hasselbalch equation, biological buffer system.

Text Books

1 Jain, J.L., Jain, N. and Jain, S., 2016, "Fundamentals of Biochemistry", 7th Edition, S. Chand and Company Publication, Chennai.

2 Deb A.C., 2011, "Fundamentals of Biochemistry", 10th edition, New Central Book Agency, Kolkatta.

References

1 Nelson, D.L. and Cox, M.M., 2017, "Lehninger's Principles of Biochemistry", 7th edition, W.H. Freeman and Company, New York.

2 Berg, J.M., Tymoczko, J.L., Gatto Jr, G.J. and Stryer, L., 2015, "Biochemistry", 8th edition, W.H. Freeman and Company, New York.

3 Voet, D. and Voet, J.G., 2018, "Biochemistry", 5th edition, John Wiley and Sons Pvt. Ltd., New York.

4 Rodwell, V.W., Bender, D.A., Botham, K.M., Kennelly, P. and Weil, P.A., 2018, "Harper's Illustrated Biochemistry", 31st edition, The McGraw-Hill Inc., New York.

Course Code	Course Name	Category	L	T	P	Credit
223BC1A1CB	CELL BIOLOGY	CORE	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- biology of cells, cellular organelles, cell division and renewal
- ultrastructural organization of cellular components
- importance of cellular function

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Differentiate cellular types based on origin and evolution.	K1
CO2	Explain the structure and functions of various cellular organelles.	K2
CO3	Demonstrate microfilament polymerization, assembly and intracellular organization	K3
CO4	Explain the importance and functions cell-matrix and cell-cell interactions.	K4
CO5	Explicate structure and functions of nucleus and chromosomes and cell division	K1

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A1CB	CELL BIOLOGY	SEMESTER I

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Introduction to cell biology 7 h

An overview of cells: origin and evolution of cells and cell theory. Classification of cells: prokaryotic (Archaea and Eubacteria) and eukaryotic cells (animal and plant cells). Comparison of cells: microbial, plant, and animal cells. Cells as experimental models: prokaryotic and eukaryotic cells. Exceptions to cell theory: Mycoplasma, Viruses, Virioids, prions.

Unit II Structure and Functions of different cell organelles 8 h

Endoplasmic reticulum: RER- Brief overview of translational and posttranslational transport of proteins, SER: Lipid Synthesis, Brief overview of export of proteins from ER.

Structure and functions: Golgi apparatus, Ribosomes, Nuclear envelope, Nuclear-pore complex, Lysosomes - Lysosomal storage diseases, Glyoxysomes, Mitochondria, Chloroplast and Peroxisomes.

Unit III Cytoskeleton proteins 7 h

Structure and organization: Actin filaments. Microfilament polymerization: tread milling and role of ATP. Non-muscle myosin. Intermediate filament proteins: assembly and intracellular organization. Assembly, organization and movement: cilia and flagella.

Unit IV Cell wall, extracellular matrix, cell membrane and transport 7 h

Cell wall and cell matrix proteins: prokaryotic and eukaryotic cells. Structure and function: capsule. Interactions: Cell-matrix and cell-cell. Junctions: adherence, tight and gap, desmosomes, hemi-desmosomes, focal adhesions and plasmodesmata. Cell signaling and receptors (overview).Cell membrane: fluid mosaic model. Transport across membrane: Osmosis, diffusion, active and passive transport, and ion channels

Unit V Nucleus, chromosome, cell cycle 7 h

Structure and function: Nucleus and Chromosomes. Cell division: Mitosis and Meiosis (prokaryotes and eukaryotes). Cell cycle: phases of cell cycle (eukaryotic cell cycle, restriction point and checkpoints- overview). Cell death: apoptosis and necrosis (overview). Transformed cells: salient features.

Stem cells and maintenance of adult Tissues, Embryonic Stem cells and Therapeutic cloning.

Text Books

1 Verma, P S and Agarwal, V K, 2004, "Cell Biology, Genetics, Molecular Biology, Evolution and Ecology", 1st edition, S. Chand Publications, New Delhi.

2 Rodwell, V.W., Bender, D.A., Botham, K.M., Kennelly, P. and Weil, P.A., 2018, "Harper's Illustrated Biochemistry", 31st edition, The McGraw-Hill Inc, New York.

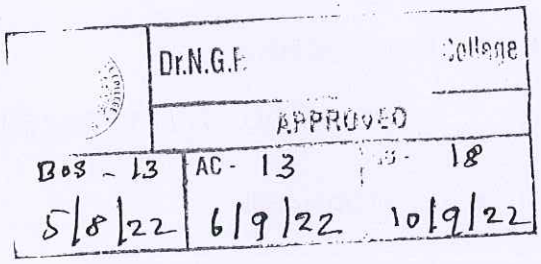
References

1 Cooper G M. and Hausman R E, 2015, "The cell: A Molecular approach", 6th edition, ASM Press, Washington D.C, USA.

2 Alberts B, Johnson A, Lewis J, Raff M, Roberts K and Walter P, 2015, "Molecular Biology of the cell" 6th edition, Taylor and Francis Company, United Kingdom.

3 Harvey Lodish, Arnold Berk, Paul Matsudaira, Chris A. Kaiser, Monty Krieger, Matthew P. Scott, Lawrence Zipursky and James Darnell, 2016. "Molecular Cell Biology", 8th edition, WH Freeman and Company, New York.

4 Kar G, Iwasa J and Marshall M, 2016. "Karp's Cell and Molecular Biology: Concepts and Experiments", 8th edition, John Wiley and Sons, USA.



223BC1A1CP	CORE PRACTICAL - I: BIOMOLECULES AND CELL BIOLOGY	SEMESTER I

Total Credits: 2
Total Instructions Hours: 48 h

S.No	List of Experiments
	BIOMOLECULES
1	Preparation of Normal and Molar solutions, Preparation of Buffer Solutions-Phosphate, Citrate, Tris, Acetate
2	Determination and adjustment of pH using pH paper and pH meter
3	Qualitative Analysis of carbohydrates: Monosaccharides: Glucose, Fructose, Galactose. Disaccharides: Sucrose, Lactose, Maltose Polysaccharides: Starch
4	Qualitative analysis of amino acids: Histidine, Tyrosine, Tryptophan, Cysteine and Arginine
5	Determination of Saponification number, acid number and Iodine number of edible oil
6	Qualitative test for nucleic acids
	CELL BIOLOGY (DBT Star Scheme Practicals)
7	Mitosis in Onion root tip squash
8	Meiosis in grasshopper testis squash
9	Fractionation of cellular components
10	Staining and visualization of mitochondria by Janus green stain
11	Cell Types - Microbial, Animal and Plant Morphometric measurements
12	Identification and study of cancerous cells using permanent slides and photomicrographs

Note: 10 experiments are mandatory out of 12

References

1 Kleinsmith, L J, Hardin, J and Bertoni, G P, 2011, "Becker's The World of the Cell", 8th Edition, Pearson/Benjamin-Cummings, Boston, USA.

2 Jayaraman, J, 2011, "Laboratory Manual in Biochemistry", 2nd Edition, New Age International Pvt. Ltd., India.

Course Code	Course Name	Category	L	T	P	Credit
222CE1A1IA	CHEMISTRY FOR BIOLOGISTS	IDC	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The concept of expressing concentration of solutions.
- The concepts of Chemical kinetics and catalysis.
- About the bonding and basic organic chemistry.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concept of concentration of the solutions	K2
CO2	Infer the acid and basic properties of solutions	K2
CO3	Interpret the concept of the bonding in molecules	K2
CO4	Summarize the basic concepts of the stereo chemistry	K2
CO5	Explain the Chemical kinetics and catalysis	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		✓
CO2	✓		✓	✓	
CO3		✓		✓	✓
CO4			✓		
CO5	✓	✓		✓	✓

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

222CE1A1IA	CHEMISTRY FOR BIOLOGISTS	SEMESTER I

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Solutions 8 h

Normality, molarity, molality, mole fraction, mole concept. Primary and secondary standards – preparation of standard solutions. Principle of Volumetric analysis (with simple problems). Indicators – Theory of indicators- Oswald and quinonoid theory.

Unit II Acids and Bases 7 h

Acid base theories – Strength of acids and bases – Equilibrium constant and Ionic constant of water- pH, pKa, pKb, Buffer solution, pH and pOH simple calculations.

Unit III Chemical bonding 7 h

Types of bonding - Ionic Bond: Nature of ionic bond, factors influencing the formation of ionic bond, Covalent and coordinate bond- Molecular Orbital Theory- MO- configuration of H2, N2, O2 - bond order– diamagnetism and paramagnetism.

Unit IV Stereo Chemistry 7 h

Isomerism, Structural isomerism- Symmetry of elements (Plane, Centre and Axis of symmetry), Optical isomerism of lactic acid and tartaric acid, Enantiomers, Diastereomers – Separation of racemic mixture, Geometrical isomerism (maleic and fumaric acid). R/S and E/Z configuration assignments for simple molecules.

Unit V Chemical kinetics and catalysis 7 h

Rate of reaction, rate law, order, molecularity, first order rate law, half life period of first order equation, pseudo first order reaction, zero and second order reactions. Catalysis – homogenous, heterogeneous and enzyme catalysis, Industrial applications of enzyme catalysis.

Text Books

1 Puri. B.R, Sharma. L.R and Pathania. M.S, 2017, "Principles of Physical Chemistry", 47th Edition, John Wiley and Sons & USA

2 Madhan. R.D, 2016, "Modern Inorganic Chemistry", 10th Edition, Mc Graw Hill Company & USA.

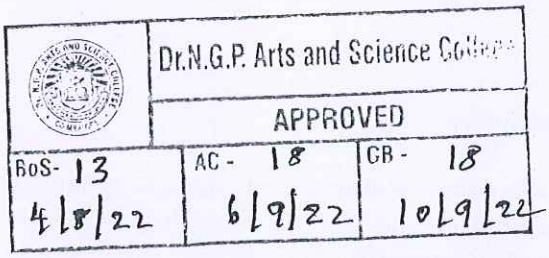
References

1 Lee. J.D, 2002, "A New Concise Inorganic Chemistry", 5th Edition, ELBS & UK.

2 Jain. M.K and Sharma. S.C, 2012, "Modern Organic Chemistry", Vishal publishing Co & New Delhi

3 Puri. B.R, Sharma. L.R and Kalia. K.C, 2016, "Principles of Inorganic Chemistry", Vishal Publishing & Co & New Delhi.

4 Glasstone. S and Lewis. D, 2014, "Elements of Physical Chemistry", 2nd Edition, Macmillan Ltd, London



222CE1A1IP	VOLUMETRIC AND ORGANIC ANALYSIS	SEMESTER I

Total Credits: 2
Total Instructions Hours: 48 h

S.No	List of Experiments
	Volumetric analysis
1	Estimation of Sodium Hydroxide using standard Sodium Carbonate.
2	Estimation of Hydrochloric acid using standard Oxalic acid.
3	Estimation of Oxalic acid using standard Sulphuric acid.
4	Estimation of Ferrous sulphate using standard Mohr salt solution.
5	Estimation of Oxalic acid using standard Ferrous sulphate solution.
6	Estimation of Ferrous ions using Mohr salt solution.
	Systematic analysis of organic compounds.
7	Systematic analysis of organic compounds containing diamides.
8	Systematic analysis of organic compounds containing carbohydrates.
9	Systematic analysis of organic compounds containing monocarboxylic acids.
10	Systematic analysis of organic compounds containing Dicarboxylic acids.
11	Systematic analysis of organic compounds containing amines.
12	Systematic analysis of organic compounds containing amides

Note: 10 experiments are mandatory out of 12

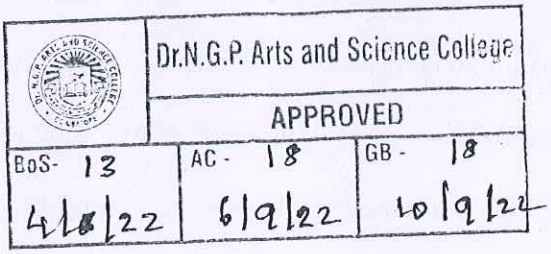
References

1 V. Venkateswaran, R. Veeraswmay and A.R. Kulandaivelu, 1997, "Basic Principles of Practical Chemistry" 2nd Edition. Sultan Chand and Sons, New Delhi.

2 J. Mendham, R.C. Denney, J.D. Bames and M. Thomas, 1989, "Vogel's Text book of Quantitative Analysis" 6th Edition, Pearson Education.

3 R. Gopalan, P.S. Subramanian and K. Rengarajan, 2004, "Elements of Analytical Chemistry", 1st Edition, S. Chand and Sons, New Delhi.

4 S. Giri, D.N. Bajpai and O.P. Panday, 2013, "Practical Chemistry Vol. I & II", 30th Edition, S. Chand & Company, New Delhi.



Course Code	Course Name	Category	L	T	P	Credit
223MB1A1AA	ENVIRONMENTAL STUDIES	AECC	2	-	-	2

PREAMBLE

This course has been designed for students to learn and understand

- Multi disciplinary aspects of Environmental studies
- Importance to conserve the Biodiversity
- Causes of Pollution and its control

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	To understand the importance of natural resources in order to conserve for the future	K1
CO2	To impart knowledge on Natural resources and its conservation	K2
CO3	To impart knowledge on Biodiversity and its conservation	K3
CO4	To create awareness on effects, causes and control of air, water, soil and noise pollution etc.,	K4
CO5	To build awareness about sustainable development and Environmental protection	K1

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓		✓	✓	✓
CO2	✓		✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223MB1A1AA	ENVIRONMENTAL STUDIES	SEMESTER I

Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I **Introduction to Environmental studies & Ecosystems** 5 h

Introduction to Environmental studies& Ecosystems: Multidisciplinary nature of environmental studies; components of environment – atmosphere, hydrosphere, lithosphere and biosphere. Scope and importance; Concept of sustainability and sustainable development. Ecosystem- Structure and function of ecosystem; Energy flow in an ecosystem: food chain, food web and ecological succession.

Unit II **Natural Resources: Renewable and Non-renewable Resources** 5 h

Natural Resources: Renewable and Non-renewable Resources: Land Resources and land use change; Land degradation, soil erosion and desertification. Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Water: Use and overexploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state). Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs.

Unit III **Biodiversity and Conservation** 5 h

Biodiversity and Conservation: Levels of biological diversity: genetic, species and ecosystem diversity; Biogeography zones of India; Biodiversity patterns and global biodiversity hot spots. India as a mega-biodiversity nation; Endangered and endemic species of India. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit IV **Environmental Pollution, Environmental Policies & Practices** 5 h

Environmental Pollution, Environmental Policies & Practices: Environmental pollution: types, causes, effects and controls; Air, water, soil, chemical and noise pollution. Nuclear hazards and human health risks. Solid waste management: Control measures of urban and industrial waste. Pollution case studies. Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture. Environment Laws: Environment Protection Act; Prevention & Control of Pollution Act – Air & Water. Wildlife Protection Act; Forest Conservation Act;

Unit V **Human Communities and the Environment& Field Work** 4 h

Human Communities and the Environment & Field Work: Human population and growth: Impacts on environment, human health and welfares. Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness. Visit to an area to document environmental assets; river/forest/flora/fauna, etc. Population explosion – Family Welfare Programmes. Role of Information Technology in Environment and human health. Role of the Colleges, Teachers and Students in village adoption towards clean, green and make in villages in various aspects.

Text Books

1 *Carson, R.* 2002," **Silent Spring**", *Houghton Mifflin Harcourt*

2 *Gadgil, M., & Guha, R.*1993," **This Fissured Land: An Ecological History of India**", *Univ. of California Press.*

References

1 *Gleeson, B. and Low, N. (eds.)* 1999," **Global Ethics and Environment**", London, Routledge.

2 *Gleick, P.H.* 1993," **Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security**",*Stockholm Env. Institute, Oxford Univ. Press.*

3 *Groom, Martha J. Gary K. Meffe, and Carl Ronald carroll.* 2006, "**Principles of Conservation Biology**". *Sunderland: Sinauer Associates.*

4 *Grumbine, R. Edward, and Pandit, M.K.* 2013," **Threats from India's Himalaya dams**", **Science,** *339: 36-37.*

5 *McCully, P.*1996," **Rivers no more: the environmental effects of dams** "*(pp. 29-64). Zed Books.*

6 *McNeil, John R.* 2000," **Something New Under the Sun: An Environmental History of the Twentieth Century**".

7 *Odum, E.P., Odum, h.T. & Andrews, J.*1971," **Fundamentals of Ecology**", *Philadelphia: Saunders.*

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Course Code	Course Name	Category	L	T	P	Credit
221TL1A2TA	TAMIL - II: ARA ILAKKIYAM	LANGUAGE- I	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- மொழிப்பாடங்களின் வாயிலாக தமிழரின் பண்பாடுநாகரீகம் ,பகுத்தறிவு ஆகியவற்றை அறியச் செய்தல்
- கலை மற்றும் மரபுகளை அறியச் செய்தல்
- மாணவர்களின் படைப்பாக்கத்திறன்களை ஊக்குவித்தல்

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	வாழ்க்கைத்திறன்கள் (Life Skills) - மாணவர்களின் செயலாக்கத்திறனை ஊக்குவித்தல்	K1
CO2	மதிப்புக்கல்வி (Attitude and Value education)	K2
CO3	பாடஇணைச்செயல்பாடுகள் (Co-curricular activities)	K2
CO4	சூழலியல் ஆக்கம் (Ecology)	K3
CO5	மொழி அறிவு (Tamil knowledge)	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

COURSE FOCUSES ON

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights	✓	Gender Sensitization
✓	Social Awareness/ Environment	✓	Constitutional Rights/ Human Values/ Ethics

221TL1A2TA	TAMIL - II: ARA ILAKKIYAM	SEMESTER II

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I **அற இலக்கியம்** 13 h

1. இலக்கிய வரலாறு- பதிணென்கீழ்க்கணக்குநூல்கள்

2.திருக்குறள்

அ. அறன்வலியுறுத்தல்- அ. எண் 04

ஆ. நட்பாராய்தல் - அ. எண் 80

இ. நாடு- அ. எண் 74

ஈ. குறிப்பறிதல்- அ. எண் 110

Unit II **அற இலக்கியம்** 13 h

1. நாலடியார் - அறிவுடைமை

2. மூதுரை - ஔவையார் - 10 பாடல்கள்-6,7,9,10,14,16,17,23,26,30

3. இனியவைநாற்பது- பூதஞ்சேந்தனார் - முதல் 10 பாடல்கள்

Unit III **அறநெறிக் கட்டுரைகள்** 09 h

1. இலக்கியவரலாறு - தமிழ் உரைநடையின் தோற்றமும் வளர்ச்சியும்

2. கலைகள்-உ.வே.சா

3. சங்க நெறிகள்- வ.சுப.மாணிக்கம்

Unit IV **அறநெறிக் கட்டுரைகள்** 15 h

1. வீர வணக்கம் - க.கைலாசபதி

2. தமிழர் பண்பாடு - டாக்டர் சோ.நா.கந்தசாமி

3. இணையத் தமிழ் வளர்ச்சி - முனைவர் ப.அர.நக்கீரன்

Unit V **பயிற்சிப் பகுதி** 10 h

1.இலக்கணம்-வழு, வழுவமைதி,வழாநிலை

2.அலுவலகம் சார்ந்த கடிதம் -விண்ணப்பங்கள், வேண்டுகோள்,முறையீடு

3.படைப்பாக்கம்-பொதுத்தலைப்பில் கட்டுரைகள் எழுதுதல்

Text Book

1 தமிழ் மொழிப்பாடம்-2022-2023,தொகுப்பு: தமிழ்த்துறை , டாக்டர் என்.ஜி.பி. கலை அறிவியல் கல்லூரி,கோயம்புத்தூர். வெளியீடு: நியூ செஞ்சுரி புக் ஹவுஸ் ,சென்னை. (Unit I to V)

References

1 பேராசிரியர் புலவர் சோம. இளவரசு ,எட்டாம் பதிப்பு-2014,தமிழ் இலக்கிய வரலாறு-மணிவாசகர் பதிப்பகம்,சென்னை.

2 பேராசிரியர் முனைவர் பாக்கியமேரி ,முதற் பதிப்பு- 2013,இலக்கணம்- இலக்கிய வரலாறு- மொழித்திறன்- பூவேந்தன் பதிப்பகம்,சென்னை. .

3 தமிழ் இணையக் கல்விக்கழகம் - TAMIL VIRTUAL ACADEMY
வலைதள முகவரி : https://www.tamilvu.org

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BoS- 14 2/12/22	AC - 14th 19.01.2023	GB - 19th 30.01.2023

Course Code	Course Name	Category	L	T	P	Credit
221TL1A2HA	HINDI - II: MODERN LITERATURE	LANGUAGE- I	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the writing ability and develop reading skill
- the various concepts and techniques for criticizing literature
- the techniques for expansion of ideas and translation process

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the fundamentals of novels and stories	K1
CO2	Understand the principles of translation work	K2
CO3	Expose the knowledge writing critical views on fiction	K2
CO4	Build creative ability	K3
CO5	Apply the power of creative reading	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

COURSE FOCUSES ON

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights	✓	Gender Sensitization
✓	Social Awareness/ Environment	✓	Constitutional Rights/ Human Values/ Ethics

221TL1A2HA	HINDI – II: MODERN LITERATURE	SEMESTER II

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I 13 h

आधुनिकपद्य – शबरी(श्रीनरेशमेहता)

Unit II 13 h

उपन्यास: सेवासदन-प्रेमचन्द

Unit III 12 h

कहानी-किरीट- डा उषा पाठक / डा अचला पाण्डेय

पाठ 1.कफ़न, 3. चीफ़ की दावत

Unit IV 12 h

पत्र लेखन: (औपचारिक या अनौपचारिक)

Unit V 10 h

अनुवाद अभ्यास-III (केवल हिन्दी से अंग्रेजी में) (पाठ 1 to 10)

Text Books

1. प्रकाशक: लोकभारती प्रकाशन पहली मंजिल , दरबारी बिल्डिंग,महात्मा गाँधी मार्ग , इलाहाबाद. (Unit I)
2. प्रकाशक: सुमित्र प्रकाशन 204 लीला अपार्ट्मेंट्स , 15 हेस्टिंग्स रोड 'अशोक नगर इलाहाबाद . (Unit II)
3. प्रकाशक: राधाकृष्ण प्रकाशन दिल्ली. (Unit III)
4. पुस्तक: व्याकरण प्रदिप – रामदेवप्रकाशक: हिन्दी भवन 36 इलाहाबाद. (Unit IV)
5. प्रकाशक: दक्षिण भारत प्रचार सभा चेनैई. (Unit V)

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Course Code	Course Name	Category	L	T	P	Credit
221TL1A2MA	MALAYALAM - II: MODERN LITERATURE	LANGUAGE -I	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the writing ability and develop reading skill
- the various concepts and techniques for criticizing literature, to learn the techniques for expansion of ideas and translation process
- the competency in translating simple Malayalam sentences into English and vice versa

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the fundamentals of novels and stories	K1
CO2	Understand the principles of translation work	K2
CO3	Apply the knowledge writing critical views on fiction	K3
CO4	Build creative ability	K3
CO5	Expose the power of creative reading	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

COURSE FOCUSES ON

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights	✓	Gender Sensitization
✓	Social Awareness/ Environment	✓	Constitutional Rights/ Human Values/ Ethics

221TL1A2MA	MALAYALAM- II: MODERN LITERATURE	SEMESTER II

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I **Novel** 12 h

Enmakaje: Chapter1- Chapter5

Unit II **Novel** 10 h

Enmakaje: Chapter 6- Chapter 10

Unit III **Novel** 12 h

Enmakaje: Chapter 11- Chapter 15

Unit IV **Autobiography** 14 h

NeermathalamPoothaKalam :Chapter 1- Chapter 10

Unit V **Autobiography** 12 h

NeermathalamPootha Kalam: Chapter 11- Chapter 20

Text Books

1. Ambika SuthanMangad, Enmakaje (Novel), DC Books Kottayam, Kerala, India. (Unit I to III)
2. Madhavikkutty, NeermathalamPootha Kalam (Autobiography), DC Books Kottayam, Kerala, India. (Unit IV & V)

References

1. MalayalaNovel Sahithyam, DC Books Kottayam, Kerala, India.
2. MalayalaSahithyaCharithram, National Books Kottayam, Kerala, India.

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BoS- 14	AC - 16th	GB - 19th
2/12/22	19.01.2023	30.01.2023

Course Code	Course Name	Category	L	T	P	Credit
221TL1A2FA	FRENCH- II: GRAMMAR, TRANSLATION AND CIVILIZATION	LANGUAGE- I	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the Competence in General Communication Skills – Oral + Written- Comprehension & Expression
- the Culture, life style and the civilization aspects of the French people as well as of France
- the students to acquire Competency in translating simple French sentences into English and vice versa

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the Basic verbs, numbers and accents	K1
CO2	Apply the adjectives and the classroom environment in France	K2
CO3	Evaluate the Plural, Articles and the Hobbies	K3
CO4	Measure the Cultural Activity in France	K3
CO5	Select the sentiments, life style of the French people and the usage of the conditional tense	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓		✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓		✓	✓	✓
CO5	✓	✓		✓	✓

COURSE FOCUSES ON

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights	✓	Gender Sensitization
✓	Social Awareness/ Environment	✓	Constitutional Rights/ Human Values/ Ethics

221TL1A2FA	FRENCH- II: GRAMMAR, TRANSLATION AND CIVILIZATION	SEMESTER II

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I 12 h

Proposer, accepter, refuserune invitation. Indiquer la date.	Organiserune soirée au cinéma avec des amis, par téléphone et par courriel.	Comprendreunemessage d'invitationsurunréponde urtéléphonique. Inviter quelqu'un accepter ourefuserl'invitation.

Unit II 12 h

Prendreet fixer un rendez-vous. Demander etindiquerl'heure.	Organiser une soirée au cinéma avec des amis, par téléphone et par courriel.	Comprendre des personnes qui fixentunrendez-vous par téléphonique. Prendreun rendez-vous par telephone

Unit III 12 h

Exprimer son point de vuepositif et négatif. S'informersur le prix. S'informersur la quantitité. Exprimer la quantitité.	Engroupes, choisir un cadeau pour un ami.	Exprimer son point de vuesur des idées de cadeau. Faire des achatsdans un magasin

Unit IV 14h

Demander etindiquerune direction. Localiser (près de, en face de ….). Exprimerl'obligationl'Interdit.Conseiller.	Suivre un itinéraire à l'aided'indications par telephone et d'un plan. Par courrierélectronique, donner des informations et des conseils à un ami qui veut voyager.	Comprendre des indications de direction. Comprendre des indications de lieu. Comprendreune chanson. Comprendre de courts messages qui experiment l'obligationoul'interdiction. Donner des conseils à des personnesdans des situations données.

Unit V 10 h

Make in Own Sentences

Text Book

1 Regine Merieux, Yves Loiseau, "LATITUDES - 1" (Page No: 56-101) (Methode de Français), Goyal Publisher & Distributors Pvt.Ltd., 86 UB Jawahar Nagar (Kamala Nagar), New Delhi-7 Les Editions Dider, Paris, 2008-ImprimeenRoumanie par Canaleen Janvier 2012.(Unit I toIV)

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BoS- 14	AC - 14th	GB - 14th
2/12/22	19.01.2023	30.01.2023

Course Code	Course Name	Category	L	T	P	Credit
221EL1A2EA	PROFESSIONAL ENGLISH - II	LANGUAGE- II	4	-	1	3

PREAMBLE

This course has been designed for students to learn and understand

- the language for specific purposes through various literary manuscripts
- the process of communicative competences in academics through authentic contexts
- the different formats of business correspondence with lucidity and accuracy via various media

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Relate and appreciate the eminent writers works of various genres	K1
CO2	Infer and comprehend complex situational talks	K2
CO3	Identify formal and informal communicative context to speak fluently	K3
CO4	Construct the denotative and connotative meanings while reading specialized texts	K3
CO5	Develop the skill of writing through descriptions, narrations and essays	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

COURSE FOCUSES ON

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights	✓	Gender Sensitization
✓	Social Awareness/ Environment	✓	Constitutional Rights/ Human Values/ Ethics

221EL1A2EA	PROFESSIONAL ENGLISH - II	SEMESTER II

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I Genre Studies 12 h

John Keats: La Belle Dame Sans Merci - Author's Note - title indications- outline- paraphrasing the poem- context of poem- form- poetic devices- enjambment- techniques- Annotations

A.G. Gardiner: On Keyhole Morals- Author's Note- Title indications- Outline - Passage Analysis - context of the Prose - Narrative techniques- Style

Charles Lamb: A Dissertation upon Roast Pig- Author's Note - title indications- outline- paraphrasing the Essay- context of Essay- form-devices- Narrative techniques

John Galsworthy: The Silver Box- Author's Note- Plot Summary- Critical Analysis- Themes- Characters- Description - analysis- Terms- Symbols

Unit II Listening Skills 10 h

Listening to Talks/Lectures by Specialists on selected subject specific topics- Listening to Public Announcements- Listening to Instructions & Directions- Listening to Speeches- Listening to process/event descriptions to identify cause & effects

Unit III Speaking Skills 14 h

Small Talk- Mini Presentations and Making Recommendations- Group Discussions, Debates, and Expressing opinions through Role play– Picture Description- Giving Instruction to Use a Product- Presenting a Product- Summarizing a Lecture- Narrating Personal Experiences/ Events- Interviewing a Celebrity- Scientific Lectures- Educational Videos- Debates- Different Viewpoints on an Issue

Unit IV Reading Skills 12 h

Reading Biographies, Newspaper Reports, Technical Blogs- Reading Advertisements- Gadget Reviews - Newspaper Articles- Journal Reports- Reading Editorials & Blogs- Case Studies- Excerpts from Literary Texts

Unit V Writing Skills 12 h

Inferring & Interpreting- Predicting Reorganizing Material- Summary Writing Based on the Reading Passages- Writing – Emails & Essay Writing (Descriptive or narrative)- Grammar - Tenses- Question Types: Wh/ Yes or No/ and Tags

Text Books

1. <https://www.poetryfoundation.org/poems/44475/la-belle-dame-sans-merci-a-ballad/> (Unit I)
2. <https://sittingbee.com/on-keyhole-morals-a-g-gardiner/> (Unit I)
3. <https://www.gradesaver.com/charles-lamb-essays/study-guide/summary- a-dissertation-upon-roast-pig/> (Unit I)
4. <https://public-library.uk/ebooks/41/61.pdf- The Silver Box- John Galsworthy/> (Unit I)
5. Hart, Steve,AravindR.Nair, VeenaBhambhani. 2016. Embark: English for Undergraduates. Cambridge University Press, New Delhi, India. (Unit II)
6. Lakshminarayanan. 2012. A Course Book On Technical English. Scitech Publications Pvt. Ltd, New Delhi, India. (Unit III))
7. Raman, Meenakshi & Sangeeta Sharma. 2016. Technical Communication-Principles And Practice, Oxford University Press, New Delhi, India. (Unit IV)
8. Viswamohan, Aysha. 2017. English For Technical Communication (With CD), McGraw Hill (India) Private Limited, New Delhi, India.(Unit V)

References

1. Bajwa and Kaushik. 2010. Springboard to Success- Workbook for Developing English and Employability Skills. Orient Black Swan, Chennai, India.
2. Chellammal, V. 2003. Learning to Communicate. Allied Publishing House, New Delhi, India.
3. Krishnaswamy. N, Lalitha Krishnaswamy & B.S. Valke. 2015. Eco English, Learning English through Environment Issues. An Integrated, Interactive Anthology. Bloomsbury Publications, New Delhi, India.
4. Syamala. V. 2002. Effective English Communication for You. Emerald Publishers, Chennai, Tamil Nadu, India.

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BoS- 14 2/12/22	AC - 14th 19.01.2023	GB - 19th 30.01.2023

Course Code	Course Name	Category	L	T	P	Credit
223BC1A2CA	ENZYMES	CORE	5	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- the classification, functions and reactions mediated by enzymes in a cell
- features of enzyme catalysis and kinetics, mechanism of action of selected enzymes and co-enzymes
- the isolation of enzymes, inhibitors and applications of enzymes

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Classify enzymes, explain active site and specificity of enzymes and enzymes as protein structure	K2
CO2	Describe co-enzymes with examples, regulatory enzymes, ribozymes and abzymes	K2
CO3	Illustrate factors that affect enzyme activity and construct MM plot,LB plot, Eadie-Hofstee and Hanes plot	K3
CO4	Compare different types of enzyme inhibition, build models of bi-substrate reactions and illustrate theories of enzyme catalysis	K3
CO5	Explain industrial and diagnostic applications of enzymes	K4

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

COURSE FOCUSES ON

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights		Gender Sensitization
✓	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A2CA	ENZYMES	SEMESTER II

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Introduction to Enzymes 13 h

Introduction -Definition, IUB Classification of enzymes, numbering and nomenclature (Class and subclass with one example). Units of enzyme activity – katal, International Unit (IU). Concept of active sites, enzyme specificity- Group specificity, optical specificity. Theories of enzyme catalysis- Lock and Key model and Induced fit model. Enzyme as proteins Structure: Primary, Secondary, Tertiary and Quaternary structure with reference to examples.

Unit II Coenzymes and Regulatory enzymes 12 h

Coenzymes, Cofactors: Definition, Structure and functions of TPP, NAD, NADP, FAD, FMN and Coenzyme A, metal cofactor. Regulatory enzymes: Isoenzymes - Lactate dehydrogenase and creatine phosphokinase. Allosteric enzymes - properties, types, models, Aspartate transcarbamoylase. Ribozymes, Abzymes. Multienzyme Complex: Pyruvate dehydrogenase.

Unit III Enzyme Kinetics 11 h

Enzyme Kinetics: Effect of pH, temperature, substrate concentration, product concentration and enzyme concentration on enzyme activity, Turn over number of enzymes. Michaelis-Menten equation. Lineweaver-Burk plot (only for single substrate catalyzed reaction), Eadie-Hofstee and Hanes plot. Determination of Km and Vmax.

Unit IV Enzyme Inhibition, Bi-substrate reactions and enzymatic catalysis 12 h

Enzyme Inhibition: Reversible-competitive, non-competitive and un-competitive inhibition. Irreversible inhibition and feedback inhibition. Bisubstrate reactions: sequential- ordered and random, ping-pong reactions. Enzymatic catalysis: Significance of activation energy, General acid base catalysis, covalent catalysis (chymotrypsin and lysozyme).

Unit V Enzyme Applications 12 h

Isolation of enzymes, criteria of purity. Immobilized Enzymes- methods & applications. Industrial uses of enzymes: production of glucose from starch, cellulose and dextrans, use of lactase in dairy industry. Diagnostic (AST, ALT, creatine kinase, alkaline and acid phosphatases) applications of enzymes. Enzymes as Biosensors – Calorimetric biosensors, Potentiometeric biosensors. Enzyme Engineering: Artificial Enzymes.

Text Books

1. Palmer, T, 2004, "Understanding enzymes", 1st edition, East West Press Pvt. Ltd., New Delhi..
2. Bhatt S.M, 2014, "Enzymology and Enzyme technology", 15th edition, S. Chand publishing Ltd, New Delhi.

References

1. Palmer, T and Bonner, P L, 2004, "Enzymes: Biochemistry, Biotechnology, Clinical chemistry", 1st edition, East West Press Pvt. Ltd., New Delhi.
2. Wolfgang Aehle, P, 2006, "Enzymes in Industry" 3rd Edition, Wiley-VCH, German.
3. Choudhary N.L and Singh, A, 2012, "Fundamentals of Enzymology", 1st Edition, Oxford Book Company,UK.
4. Nelson D L and Cox M M, 2017, "Lehninger's Principles of Biochemistry", 7th Edition, Macmillan Learning, New Delhi.

Course Code	Course Name	Category	L	T	P	Credit
223BC1A2CB	MICROBIOLOGY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The key Microbiological techniques.
- The principles and methods of sterilization and disinfection.
- The pathogenic microbial diseases and the mode of action of antibiotics.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Identify and Illustrate different types of microscopes and staining techniques	K3
CO2	Plan and choose a suitable nutritional medium required for microbial growth.	K3
CO3	Outline and apply the physical and chemical sterilization Methods.	K3
CO4	Identify the mode of action of antibiotics.	K3
CO5	Compare and contrast the various pathogenic microbial diseases.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

COURSE FOCUSES ON

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights		Gender Sensitization
✓	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A2CB	MICROBIOLOGY	SEMESTER II

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction 10 h

Definition, History and scope of Microbiology, Classification of microorganisms. Microscopy: Principles, types and applications of Microscopy - Simple and compound microscope - Dark field, Phase contrast, Fluorescence and Electron microscopy, Confocal Microscope. Microbiological staining techniques: Simple staining, Negative staining, Gram staining, Acid fast staining, capsule staining, flagella staining, endospore staining.

Unit II Microbial nutrition and growth 10 h

Role of Carbon, nitrogen, hydrogen, oxygen, sulfur and phosphorous, nutritional classification of microorganisms. Nutritional uptake by cell - facilitated diffusion, active transport, group translocation, Media Preparation, types of media, Physical conditions required for microorganisms – temperature, atmosphere, pH, pressure. Microbial growth and measurement. Pure culture techniques – tube dilution, pour plate, spread and streak plate methods. Anaerobic culture methods – Wright's tube, Roll tube, McIntosh - Fildes anaerobic jar, Gaspak, Anaerobic chamber (glove box), incubator. Principle, classes, and applications of Biosafety cabinets.

Unit III Sterilization and disinfection 8 h

Principles and methods of sterilization: dry heat, moist heat, filtration, radiation, tyndallization, Pasteurization, ultrasonication, Physical and Chemical methods of sterilization: disinfection sanitization, antisepsis sterilant and fumigation, Phenol coefficient test – Sterility testing.

Unit IV Antibiotics and mode of action 10 h

Antimicrobial spectrum of antibiotics and mode of action of the following antibiotics: a) Antibacterial - Penicillin, streptomycin and tetracyclines b) Antifungal – Nystatin, griseofulvin and cycloheximide c) Antiviral - Acycloguanosine (acyclic nucleoside) and remdesivir. Drug resistance – chromosomal mutation and plasmid-borne multiple drug resistance

Unit V Microbes & Pathogenic diseases 10 h

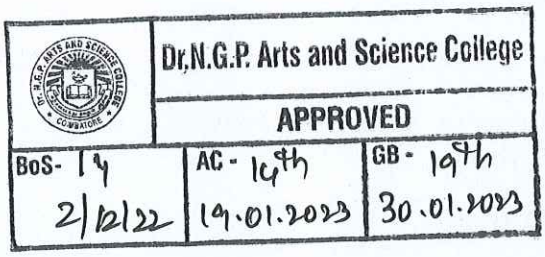
Normal human micro flora, host - parasitic interaction, epidemics, exo and endotoxins. Air borne diseases: Aetiology, symptoms and prevention of Tuberculosis, Diphtheria, Poliomyelitis, Influenza, SARS, and Covid-19. Food and Waterborne diseases: Aetiology, symptoms and pathogenesis of Typhoid, Cholera, Bacillary dysentery and Hepatitis. Direct contact disease: Aetiology and symptoms of Rabies. Fungal disease: Aetiology, symptoms and prevention of mucormycosis. Molecular methods to study complex microbial communities, Functional Metagenomics.

Text Books

1. Pelczer, Chan and Krieg, 2014,"Microbiology" 5th Edition, McGraw Hill, Education (India) Pvt Ltd, New Delhi, India.
2. Anantha Narayanan and Panicker, 2020, "Text Book of Microbiology" , 11thEdition, Universities Press, Hyderabad, India

References

1. Willey, Sandman and Wood, 2020, "Prescott's Microbiology", 11th Edition, McGraw-Hill, New York, USA
2. Tortora, Funke, Case, Weber and Bair, 2021, "Microbiology – An Introduction", 13th Global Edition, Pearson Education Inc, London, UK
3. Arora and Arora, 2020, "Textbook of Microbiology", 6th Edition, CBS Publishers, New Delhi, India
4. Pommerville CJ, 2021, "Fundamentals of Microbiology", 12th Edition, Jones and Bartlett Publishers Inc, Massachusetts, USA



223BC1A2CP	CORE PRACTICAL II : ENZYMES AND MICROBIOLOGY	SEMESTER II

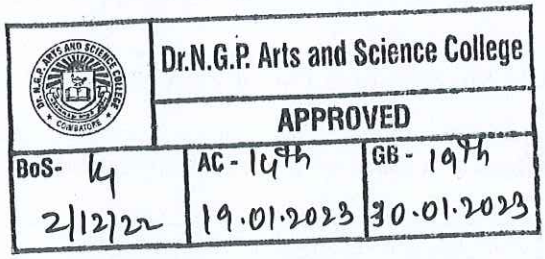
Total Credits: 2
Total Instructions Hours: 48 h

S.No	List of Experiments
	Enzymes
1	Effect of pH on the activity of any one of the following enzymes: a). Acid phosphatase b). Amylase c). Urease
2	Effect of temperature on the activity of any one of the following enzymes: a). Acid phosphatase b). Amylase c). Urease
3	Effect of substrate concentration on the activity of any one of the following enzymes: a). Acid phosphatase b). Amylase c). Urease
4	Separation of isoenzymes by Native PAGE and SDS PAGE (Demonstration)
5	Enzyme immobilization by sodium alginate method (DBT Star Practical)
6	Determination of Molecular weight of enzymes using gel filtration (DBT Star Practical)
	Microbiology
7	Preparation and Inoculation of Culture Media-Solid and Liquid
8	Culture transfer techniques: Slid to solid (Streaking), Liquid to solid (spreading), Liquid to liquid, solid to liquid and determination of CFU/ml. (DBT Star Practical)
9	Staining techniques- Simple staining, Gram Staining, Negative, spore and Acid-Fast Staining
10	Antibiotic sensitivity of bacterial pure culture
11	Tests for identification of Bacteria- IMViC, Bacterial Sugar Fermentation, Oxidase, catalase, urease and H2S Production
12	Study and plot the growth curve of E. coli by turbidimetric and standard plate count methods (DBT Star Practical)

Note: End Semester Practical Examination requires completion of 10 experiments out of 12.

References

1. Abhilasha Singh, 2007, "Enzyme Assays", 1st Edition, Regency Publications, New Delhi.
2. Sadasivam S and Manickam A, 2008, "Biochemical Methods", 3rd Edition, New Age International Publishers, New Delhi.
3. James C Cappuccino, 2017, "Microbiology A laboratory manual", 11th edition, Pearson education publishing house, New Delhi
4. Rajan S and Selvi Christy, 2018, "Experimental Procedures in Life Sciences", CBS Publishers & Distributors Pvt Ltd, India.



Course Code	Course Name	Category	L	T	P	Credit
222PY1A2IB	PHYSICS	IDC	3	-	2	3

PREAMBLE

This course has been designed for students to learn and understand

- The properties of materials and its determination.
- The number systems and truth tables.
- The concepts of smart materials and its applications

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Explain concepts of Elasticity, and their applications in real time examples	K2
CO2	Demonstrate the Newton's law of Gravitation and applications of acoustics.	K3
CO3	Identify different number system and verification of logic gates with truth tables.	K2
CO4	Examine the coefficient of viscosity of the liquids	K3
CO5	Apply the concept of diffraction and interference and application of various smart materials	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

COURSE FOCUSES ON

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

222PY1A2IB	PHYSICS	SEMESTER II

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I Properties of Matter 12 h

Elastic Modulus – Poisson's ratio (definition)– Bending of beams – Expression for bending moment -Depression of Cantilever- Experimental determination of Young's modulus by cantilever depression - Determination of Y by uniform and non- uniform bending methods - Determination of rigidity modulus and moment of inertia of a disc by torsional pendulum.

Unit II Gravitation and Acoustics 12 h

Newton's law of Gravitation - Kepler's laws of planetary motion - Deduction of Newton's law of gravitation from Kepler's laws- Determination of 'G' by Boy's method- Variation of g with altitude and depth - Acceleration due to gravity- Determination of 'g' by compound pendulum. Doppler effect– Applications of Doppler effect – Determination of frequency of alternating current by Sonometer.

Unit III Digital Electronics 12 h

Number system: Decimal – Binary –Conversion of binary to decimal number - Conversion of decimal to binary- Binary addition, subtraction – Logic gates – OR, AND, NOT, XOR, NAND and NOR gates –Verification of truth tables – Laws and theorems of Boolean's algebra – De Morgan's theorems.

Unit IV Viscosity 12 h

Viscosity – Viscous force – Co-efficient of viscosity –Poiseuille's formula for coefficient of viscosity of a liquid – Stoke's method for coefficient of viscosity of a viscous liquid - Determination of coefficient of viscosity using burette - comparison of Viscosities

Unit V Optics and Smart materials 12 h

Interference – Conditions for interference maxima and minima – Air wedge – Determination of thickness of a thin wire by Air wedge method – Newtons rings - Determination of wavelength using newton's ring - Diffraction – Difference between diffraction and interference - Theory of transmission grating. Metallic glasses – Shape Memory Alloys – Biomaterials - Applications

Text Books

1. Murugeshan R and Kiruthiga Sivaprasath ER, 2014, "Modern Physics", 17th Edition, S Chand and Co, New Delhi.
2. Murugeshan R and Kiruthiga Sivaprasath, ER, 2008, "Properties of Matter", 10th Edition, S Chand and Co, New Delhi.

References

1. Millman J, Halkias C and Chetan Parikh, 2009, "Integrated Electronics", 10th Edition, Tata McGraw Hill Publishing Company Ltd, New York
2. Robert Resnick, David Halliday and Kenneth S Krane, I.N., 2001, "Physics", 10th Edition, Wiley India, New Delhi.
3. Mehta R, 2010, "Principles of Electronics", 11th Edition, S Chand and Co, New Delhi.
4. Brij Lal and Subrahmanyam N, 2006, "A Textbook of Optics", 10th Edition, S Chand and Co, New Delhi.

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221TL1A2AA	BASIC TAMIL	SEMESTER II

Total Credits: 2

Total Instruction Hours: 24 h

இளங்கலை 2022 – 23ஆம் கல்வியாண்டு முதல் சேர்வோர்க்குரியது

(10 மற்றும் 12 – ஆம் வகுப்பு வரை தமிழ் மொழிப்பாடம் பயிலாதவர்களுக்கு)

(பருவத் தேர்வு இல்லை)

Syllabus

Unit I **தமிழ் மொழியின் அடிப்படைக் கூறுகள்** 05 h

எழுத்துகள் அறிமுகம்

1. உயிர் எழுத்துக்கள் - குறில் , நெடில் எழுத்துகள்
2. மெய் எழுத்துக்கள் - வல்லினம், மெல்லினம், இடையினம்
3. உயிர்மெய் எழுத்துக்கள்
4. பயிற்சி

Unit II **சொற்களின் அறிமுகம்** 05 h

1.பெயர்ச்சொல்

2.வினைச்சொல் – விளக்கம் (எ.கா.)

3.பயிற்சி

Unit III **குறிப்பு எழுதுதல்** 05 h

1. பெயர், முகவரி, பாடப்பிரிவு , கல்லூரியின் முகவரி

2. தமிழ் மாதங்கள்(12), வாரநாட்கள் (7)

3. எண்கள் (ஒன்று முதல் பத்து வரை), வடிவங்கள், வண்ணங்கள்

Unit IV **குறிப்பு எழுதுதல்** 05 h

1. ஊர்வன, பறப்பன, விலங்குகள்

2.மனிதர்களின் உறவுப்பெயர்கள்

3. ஊர்களின் பெயர்கள் (எண்ணிக்கை 10)

Unit V **பயிற்சிப் பகுதி** 04 h

பயிற்சிப் பகுதி (உரையாடும் இடங்கள்)

வகுப்பறை, பேருந்து நிலையம், சந்தை – பேசுதல், எழுதுதல்.

Notes:

அக மதிப்பீட்டுத் தேர்வு - வினாத்தாள் அமைப்பு முறை **மொத்த மதிப்பெண்கள் -50**

பகுதி – அ

சரியான விடையைத் தேர்வு செய்தல் 10x2=20

பகுதி – ஆ

சரியா? தவறா? 10x2=20

பகுதி – இ

ஒரு பக்க அளவில் விடையளிக்க 1x10=10

குறிப்பு:

- அனைத்து அலகுகளில் இருந்தும் வினாக்கள் அமைதல் வேண்டும்
- பகுதி இ –க்கான வினாக்கள் இது அல்லது அது என்ற அடிப்படையில் அமைதல் வேண்டும்

Text Book

1 அடிப்படைத் தமிழ் - 2022-2023 , தொகுப்பு: தமிழ்த்துறை , டாக்டர் என்.ஜி.பி. கலை அறிவியல் கல்லூரி , கோயம்புத்தூர் – 641048, வெளியீடு: நியூ செஞ்சுரி புக் ஹவுஸ் , சென்னை. (Unit I to IV)

References

1 ஒன்றாம் வகுப்பு பாடநூல் - தமிழ்நாடு அரசு பாடநூல் கழகம், சென்னை.

2 தமிழ் இணையக் கல்விக்கழகம் - TAMIL VIRTUAL ACADEMY. வலைதள முகவரி : https://www.tamilvu.org.

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221TL1A2AB	ADVANCED TAMIL	SEMESTER II

Total Credits: 2

Total Instruction Hours: 24 h

இளங்கலை 2022– 2023 ஆம் கல்வியாண்டு முதல் சேர்வோர்க்குரியது

(10 மற்றும் 12– ஆம் வகுப்புகளில் தமிழ் மொழிப்பாடம் பயின்றவர்களுக்கு உரியது)

(பருவத் தேர்வு இல்லை)

Syllabus

Unit I கவிதைகள் 06 h

1தமிழ்நாடு - பாரதியார்

2.மனதில் உறுதி வேண்டும் - பாரதியார்

3. இன்பத்தமிழ் - பாரதிதாசன்

4.வேலைகளல்லவேள்விகள் - தாராபாரதி

5.தமிழா! நீ பேசுவது தமிழா! - காசியானந்தன்

6. நட்புக் காலம் (10 கவிதைகள்) - அறிவுமதி கவிதைகள்

Unit II கட்டுரை 05 h

கட்டுரைத் தொகுப்பு -நல்வாழ்வு - டாக்டர் மு.வரதராசன்

1. நம்பிக்கை

2. புலனடக்கம்

3. பண்பாடு

Unit III இலக்கணம் 04 h

1.வல்லினம் மிகும் மற்றும் மிகா இடங்கள்

2. ர ,ற,ல,ழ,ள,ந,ண,ன – வேறுபாடு அறிதல்

Unit IV கடிதங்கள் 05 h

1.பாராட்டுக் கடிதம்

2.நன்றிக் கடிதம்

3.அழைப்புக் கடிதம்

4. அலுவலக விண்ணப்பங்கள்

Unit V பயிற்சிப் பகுதி 04 h

படைப்பாக்கப் பகுதி

பொதுத் தலைப்புகளில் கவிதை ,கட்டுரை எழுதச்செய்தல்

Notes

அக மதிப்பீட்டுத் தேர்வு - வினாத்தாள் அமைப்பு முறை மொத்த மதிப்பெண்கள் - 50

பகுதி –அ

சரியான விடையைத் தேர்வு செய்தல் 10 x1=10

பகுதி –ஆ

கோடிட்ட இடங்களை நிரப்புக. 10x2=20

பகுதி –இ

இரண்டு பக்க அளவில் விடையளிக்க 2x10=20

குறிப்பு:

- அனைத்து அலகுகளில் இருந்தும் வினாக்கள் அமைதல் வேண்டும்
- பகுதி இ–க்கான வினாக்கள் இதுஅல்லது அதுஎன்ற அடிப்படையில் அமைதல் வேண்டும்

Text Book

1 சிறப்புத் தமிழ் - 2022-2023 , தொகுப்பு: தமிழ்த்துறை , டாக்டர் என்.ஜி.பி. கலை அறிவியல் கல்லூரி, கோயம்புத்தூர். வெளியீடு: நியூ செஞ்சுரி புக் ஹவுஸ், சென்னை. (Unit- I to IV)

References

1 பேராசிரியர் புலவர் சோம. இளவரசு ,எட்டாம் பதிப்பு. 2014 . தமிழ் இலக்கிய வரலாறு – மணிவாசகர் பதிப்பகம்,சென்னை.

2 டாக்டர் மு.வரதராசன். 2010. நல்வாழ்வு, பாரி நிலையம், சென்னை.

3 பேராசிரியர் முனைவர் பாக்கியமேரி ,முதற் பதிப்பு.2013. இலக்கணம் - இலக்கிய வரலாறு - மொழித்திறன்- பூவேந்தன் பதிப்பகம்,சென்

4 தமிழ் இணையக் கல்விக்கழகம் - TAMIL VIRTUAL ACADEMY. வலைதள முகவரி : https://www.tamilvu.org

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Course Code	Course Name	Category	L	T	P	Credit
225CR1A2AA	HUMAN RIGHTS AND WOMEN'S RIGHTS	AECC	2	-	-	2

PREAMBLE

This course has been designed for students to learn and understand

- Concepts of Human Rights.
- human Right Violations and Redressal Mechanism.
- rights to Women and Child.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the Basic concepts ofHuman Rights	K1
CO2	Describe the Fundamental Rights	K2
CO3	RelateHuman Right Violations and Redressal Mechanism.	K3
CO4	State the Rights to Women and Child	K2
CO5	Apply Civil and Political Rights of Women	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1		✓		✓	✓
CO2		✓	✓	✓	✓
CO3				✓	✓
CO4		✓		✓	✓
CO5	✓	✓	✓	✓	✓

COURSE FOCUSES ON:

☐	Skill Development	☐	Entrepreneurial Development
☐	Employability	☐	Innovations
☐	Intellectual Property Rights	☑	Gender Sensitization
☑	Social Awareness/ Environment	☑	Constitutional Rights/ Human Values/ Ethics

225CR1A2AA	HUMAN RIGHTS AND WOMEN'S RIGHTS	SEMESTER II

Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I Introduction to Human Rights 04 h

Meaning - Definition - Nature - Content - Legitimacy of Human Rights - Origin and Development of Human Rights - Theories – Principles of Magna Carta – Modern Movements of Human Rights – The Future of Human Rights.

Unit II Human Rights in India 05 h

The Constitution of India – Fundamental Rights – Right to Life and Liberty – Directive Principles of State Policy – Fundamental Duties – Individual and Group Rights – Other facets of Human Rights – Measures for Protection of Human Rights in India.

Unit III Human Right Violations and Redressal Mechanism 05 h

Human Rights – Infringement of Human Right by State Machinery and by Individual – Remedies for State action and inaction – Constitutional Remedies – Public Interest Litigation (PIL) - Protection of Human Rights Act, 1993 – National Human Rights Commission – State Human Rights Commissions – Constitution of Human Right Courts.

Unit IV Rights to Women and Child 05 h

Matrimonial protection - Protection against dowry-Protection to pregnancy-Sexual offences - Law relating to work Place - Directive principles of Constitution (Article 39 a, d, e & Article 42, 43 & 46) - Trafficking of women - Constitutional Rights – Personal Laws - Protection of children against Sexual Offences Act 2012 (POCSO).

Unit V Civil and Political Rights of Women 05 h

Right of Inheritance - Right to live with decency and dignity - The Married women's Property Act 1874 - Women's right to property - Women Reservation Bill - National Commission for Women - Political participation - Pre independent political participation of women - Participation of Women in post independent period.

Text Books

1. LalitParmar, 1998, "Human Rights", Anmol Publications Pvt. Limited, New Delhi.
2. Krishna Pal Malik, 2009, "Women & Law", Allahabad Law University, New Delhi.

References

1. Mandagadde Rama Jois, 2015, "Human Rights", Bharatiya Values, BharatiyaVidyaBhavan Publications, Mumbai.
2. Paras Diwan and PiyushDiwan, 1994, "Women and Legal Protection", South Asia Books, Andhra Pradesh.
3. Venkataramand Sandhiya. N, 2001, "Research in Value Education", APH Publishing Corporation, New Delhi.
4. Anand A S, 2008, "Justice for Women: Concerns and Expressions", Universal Law Publishing Co., New Delhi.

2/12/22

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BoS- 4 2/12/22 | AC - 16th 19.01.2023 | GB - 19th 30.01.2023

Academic Council
Dr.V. Rajendran
CHAIRMAN
Dr.N.G.P. Arts and Science College

Course Code	Course Name	Category	L	T	P	Credit
221TL1A3TA	TAMIL - III	LANGUAGE - I	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- மொழிப்பாடங்களின் வாயிலாக தமிழரின் பண்பாடுநாகரீகம், பகுத்தறிவு ஆகியவற்றை அறியச் செய்தல்
- கலை மற்றும் மரபுகளை அறியச் செய்தல்
- மாணவர்களின் படைப்பாக்கத்திறன்களை ஊக்குவித்தல்

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	வாழ்க்கைத்திறன்கள் (Life Skills) - மாணவர்களின் செயலாக்கத்திறனை ஊக்குவித்தல்	K1
CO2	மதிப்புக்கல்வி (Attitude and Value education)	K2
CO3	பாடஇணைச்செயல்பாடுகள் (Co-curricular activities)	K2
CO4	சூழலியல் ஆக்கம் (Ecology)	K3
CO5	மொழி அறிவு(Tamil knowledge)	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		
CO2				✓	
CO3		✓			
CO4	✓		✓		
CO5	✓			✓	

COURSE FOCUSES ON

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights	✓	Gender Sensitization
✓	Social Awareness/ Environment	✓	Constitutional Rights/ Human Values/ Ethics

221TL1A3TA	TAMIL - III	SEMESTER III

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I **காப்பியங்கள்** 10 h

1. சிலப்பதிகாரம் – வழக்குரை காதை

2. மணிமேகலை – ஆதிரை பிச்சையிட்ட காதை

Unit II **காப்பியங்கள்** 10 h

1. கம்பராமாயணம் - கும்பகர்ணன் வதைப்படலம்: பா. எண் : 60 முதல் – 100 வரை

2. பெரிய புராணம் - அதிபத்த நாயனார் புராணம்

Unit III **சிற்றிலக்கியங்கள்** 10 h

1.திருக்குற்றாலக்குறவஞ்சி - வசந்தவல்லி பந்தாடிய சிறப்பு (6: 4 கண்ணிகள்)

2.கலிங்கத்துப்பரணி- களம் பாடியது: போர்க்களக் காட்சி- பா.எண்: 472 முதல்- 502 வரை

Unit IV **இலக்கிய வரலாறு** 10 h

1.காப்பியங்களின் தோற்றமும் வளர்ச்சியும்

2.சிற்றிலக்கியங்களின் தோற்றமும் வளர்ச்சியும்

3.நாடகத்தின் தோற்றமும் வளர்ச்சியும்

Unit V **இலக்கணம்** & **பயிற்சிப் பகுதி** 08 h

அ. இலக்கணம்

1.'பா' வகைகள் : வெண்பா, ஆசிரியப்பா, கலிப்பா, வஞ்சிப்பா - பொது இலக்கணம் மட்டும்.

2. அணி: உவமையணி, உருவக அணி, இல்பொருள் உவமையணி விளக்கம், உதாரணம்.

ஆ. பயிற்சிப் பகுதி

1. வாசகர் கடிதம் : நாளிதழ்,வானொலி,செய்தி ஊடகங்களுக்கு விமர்சனம் எழுதுதல்

2.திரைக்கதை : மத்திய மற்றும் மாநில அரசு விருது பெற்ற தமிழ்த் திரைப்படங்கள் மட்டும்

Text Book

1 தமிழ் மொழிப்பாடம் - 2022-2023, தொகுப்பு: தமிழ்த்துறை, டாக்டர் என். ஜி. பி. கலை அறிவியல் கல்லூரி, கோயம்புத்தூர். வெளியீடு: நியூ செஞ்சுரி புக் ஹவுஸ், சென்னை. (Unit I to V)

References

1 பேராசிரியர் புலவர் சோம. இளவரசு, எட்டாம் பதிப்பு - 2014, தமிழ் இலக்கிய வரலாறு- மணிவாசகர் பதிப்பகம், சென்னை.

2 பேராசிரியர் முனைவர் பாக்கியமேரி, முதற் பதிப்பு- 2013, இலக்கணம் - இலக்கிய வரலாறு - மொழித்திறன் - பூவேந்தன் பதிப்பகம், சென்னை. .

3 தமிழ் இணையக் கல்விக்கழகம் - TAMIL VIRTUAL ACADEMY. வலைதள முகவரி: https://www.tamilvu.org

Course Code	Course Name	Category	L	T	P	Credit
221TL1A3HA	HINDI - III	LANGUAGE- I	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the writing ability and develop reading skill
- the various concepts and techniques for criticizing literature
- the techniques for expansion of ideas and translation process

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the fundamentals of novels and stories	K1
CO2	Understand the principles of translation work	K2
CO3	Expose the knowledge writing critical views on fiction	K2
CO4	Build creative ability	K3
CO5	Apply the power of creative reading	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓			✓	✓
CO2		✓			✓
CO3	✓		✓	✓	
CO4					✓
CO5	✓	✓	✓		✓

COURSE FOCUSES ON

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights	✓	Gender Sensitization
✓	Social Awareness/ Environment	✓	Constitutional Rights/ Human Values/ Ethics

221TL1A3HA	HINDI - III	SEMESTER III

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I 10 h

पद्य – काव्य पराशर (भोलानाथ)

(प्राचीन- कबीर, तुलसी, सुर, मीरा, आधुनिक- मैथिलीशरण गुप्त, अरूण कमल)

Unit II 10 h

हिन्दी साहित्य का इतिहास: (साधारण ज्ञान)

Unit III 10 h

अलंकार : अनुप्रास,यमक, श्लेष, वक्रोक्ति, उपमा,रूपक

Unit IV 10 h

संवाद लेखन

Unit V 08 h

अनुवाद अभ्यास-III (केवल हिन्दी से अंग्रेजी में)

(पाठ 10 to 20)

Text Books

1. प्रकाशक: जवाहर पुस्तकालय सदर बाजार, मथुरा उत्तर प्रदेश-281001 (Unit I)
2. आचार्य रामचन्द्र शुक्ल लोकभारती प्रकाशन इलाहाबाद. (Unit II)
3. प्रकाशक: विनोद पुस्तक मंदिर आगरा-282002 (Unit III)
4. पुस्तक: व्याकरण प्रदिप - रामदेव प्रकाशक: हिन्दी भवन 36 इलाहाबाद-211024 (Unit IV)
5. प्रकाशक: दक्षिण भारत प्रचार सभा चेनैई -17 (Unit V)

Course Code	Course Name	Category	L	T	P	Credit
221TL1A3MA	MALAYALAM - III	LANGUAGE- I	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the writing ability and develop reading skill
- the various concepts and techniques for criticizing literature, to learn the techniques for expansion of ideas and translation process
- the competency in translating simple Malayalam sentences into English and vice versa

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the fundamentals of novels and stories	K1
CO2	Understand the principles of translation work	K2
CO3	Expose the knowledge writing critical views on fiction	K2
CO4	Build creative ability	K3
CO5	Apply the power of creative reading	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓			✓	
CO2	✓				✓
CO3		✓	✓		
CO4	✓			✓	✓
CO5	✓	✓	✓		✓

COURSE FOCUS ON

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights	✓	Gender Sensitization
✓	Social Awareness/ Environment	✓	Constitutional Rights/ Human Values/ Ethics

221TL1A3MA	MALAYALAM - III	SEMESTER III

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I **Poetry** 10 h

Kumaranasan

Unit II **Poetry** 10 h

Kumaranasan

Unit III **Poetry** 10 h

Kumaranasan

Unit IV **Poetry** 10 h

Vayalar Ramavarma

Unit V **Poetry** 08 h

Vayalar Ramavarma

Text Books

1 Kumaranasan. 1998. Chinthavishtayaya Sitha. DC Books Kottayam, Kerala, India. (Unit I to III)

2 Ayisha (Poem), National Book Stall Kottayam, Kerala, India. (Unit IV & V)

Reference

1 Dr.M.Leelavathy. Kavitha Sahithya Charithram. Sahithya Academy Thrissur, Kerala, India.

Course Code	Course Name	Category	L	T	P	Credit
221TL1A3FA	FRENCH - III	LANGUAGE- I	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the Competence in General Communication Skills – Oral + Written- Comprehension & Expression
- the Culture, life style and the civilization aspects of the French people as well as of France
- the students to acquire Competency in translating simple French sentences into English and vice versa

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the Basic verbs, numbers and accents	K1
CO2	Apply the adjectives and the classroom environment in France	K2
CO3	Select the Plural, Articles and the Hobbies	K2
CO4	Measure the Cultural Activity in France	K3
CO5	Evaluate the sentiments, life style of the French people and the usage of the conditional tense	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓				✓
CO2	✓	✓			
CO3			✓	✓	
CO4	✓	✓			✓
CO5	✓		✓	✓	✓

COURSE FOCUSES ON

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights	✓	Gender Sensitization
✓	Social Awareness/ Environment	✓	Constitutional Rights/ Human Values/ Ethics

221TL1A3FA	FRENCH - III	SEMESTER III

Total Credits: 3
Total Instruction Hours: 48 h

Syllabus

Unit I — 10 h

° Décrireun lieu. ° Situer	A partird'unerecherche de documents, composer une presentation touristique pour un magazine ou un site internet.	Comprehendre la description d'un lieu. Décrireunevilleouunerégionq u'onaime. Interrogersur la situation of d'un lieu. Comprendre des indications sur la fréquenced'actions.	Comprendreune presentation de catalogue touristique. Comprendre des pictogrammes. Comprendre la description d'un lieu et d'une situation precise dans un message électronique.

Unit II — 10 h

Se situerdans le temps.	A partird'unerecherc he de documents, composer une presentation touristique pour un magazine ou un site internet.	Comprehendre la description d'un lieu. Décrireunevilleouunerégio nqu'onaime. Interrogersur la situation of d'un lieu. Comprendre des indications sur la fréquenced'actions.	Comprendreune presentation de catalogue touristique. Comprendre des pictogrammes. Comprendre la description d'un lieu et d'une situation precise dans un message électronique.

Unit III — 10 h

Raconter. ° Décrire les étapesd'une action.	Raconterune scene insolite à l'oreal et à l'écrit.	Comprehendre le récit d ún voyage. Raconterses actions quotidiennes.	Ecrire une biographie a partir d'eléments écrits.

Unit IV — 10 h

Exprimer l'intensité et la quantité. ° Interroger.	Raconterune scene insoliteà l'oreal et à l'écrit.	Comprehendre le récit d ún voyage. Raconterses actions quotidiennes.	Ecrire une biographie a partir d'eléments écrits.

Unit V — 08 h

Make in Own Sentences based on the above Lessons

Text Book

1 LATITUDES 1 (Méthode de français) Pages from 102-127, Author : Regine Mérieux, Yves Loiseau (Unit I to IV)

Course Code	Course Name	Category	L	T	P	Credit
221EL1A3EA	PROFESSIONAL ENGLISH - III	LANGUAGE- II	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the basics of English grammar and specific usage
- the importance of the vocabulary and use in different contexts
- the necessity of communication and composition writing skills

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Infer the specific usage of while-listening process	K2
CO2	Organize the various abilities and sub-skills involved in reading	K3
CO3	Utilize the importance of speaking skills and developing it through various practices	K3
CO4	Assume the sentence construction and paragraph development	K4
CO5	Acquire all-round mature outlook to function effectively in different context	K4

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1			✓		✓
CO2	✓	✓		✓	
CO3	✓		✓		✓
CO4	✓		✓		
CO5		✓		✓	

COURSE FOCUSES ON

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights	✓	Gender Sensitization
✓	Social Awareness/ Environment	✓	Constitutional Rights/ Human Values/ Ethics

221EL1A3EA	PROFESSIONAL ENGLISH - III	SEMESTER III

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I Listening 08 h

Listening is casual conversation and small group and conference setting - Listening for factual - Developing Listening skills - Listening to Situation - Why do we avoid Listening - poor listening disadvantages of - Poor listening vs Effective Listening - Advantages of effective listening

Unit II Reading 09 h

Effective reading - Benefits of effective reading - Differences between efficient and inefficient readers- Four Basic steps of Effective Reading - Stumbling blocks in becoming an effective Reader- Tips to improve reading comprehension skills

Unit III Speaking 10 h

Purpose of General situation- Advantages of Conversations - Features of a good conversation- Tips for improving conversation - Public speakers - importance of public speaking- (Speeches for special occasions) – preparatory steps for speaking - Structuring the contents - Audience Awareness - Mode of Delivery

Unit IV Advanced English and Writing Skills 11 h

Common Errors in English-Vocabulary Building-Words often confused-Importance of professional content - Using Word's Effectively - Writing effective sentences – Building Effective paragraph - Proof reading-Writing a Resume-Cover Letter-Business Letters

Unit V Soft Skills 10 h

Introduction-What are soft skills?- Importance of soft skills- Attributes regarded as soft skills- soft skills- Social- Soft skills-Thinking- soft skills-Negotiating-Exhibiting your soft skills-Identifying your soft skills-Improving your soft skills-Will formal training enhance your soft skills- Soft Skills training-Train Yourself-Practicing soft skills-Measuring attitude

Text Books

1. Camp and Satterwhite. 1998. College English and Communication. 7th Edition Glencoe Mchrawttill Publishers, New York, Unites states of America. (Unit I,II, III)
2. Mohan, Krishna and Banerji, Meera. 2009. Developing Communication skills. 2nd Edition, Macmillcan, India. (Unit I,II, III, IV)
3. Kumar, Sanjay and Lata Pushp. 2018. Language and Communication Skills for Engineers. First Edition, Oxford University Press, India. (Unit I,II, III)
4. Alex. Soft Skills. 2009. S. Chand Publishing, New Delhi, India. (Unit V)

References

1. Gauri Mishra, Ranjana Kaul. 2016. Language Through Literature. Primus Books, India.
2. Ghosh, B.N. Editor. 2017. Managing Soft Skills for Personality Development. McGraw - Hill Education, Chennai, India.
3. Miles Craven. 2008. Cambridge English Skills Real Listening and Speaking. First Edition, Cambridge University Press, United Kingdom.
4. Radhakrishna Pillai G. 2000. English for Success. Emerald Publishers,, Chennai, India.

Course Code	Course Name	Category	L	T	P	Credit
223BC1A3CA	HUMAN PHYSIOLOGY	CORE	5	-	-	5

PREAMBLE

This course has been designed for students to learn and understand

- The functions of important physiological systems including the cardio- respiratory, Gastrointestinal and Renal.
- Integration and interrelationships of the organ systems of the human body
- The pathologic conditions altering normal physiology

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Explain the significance of body fluids and gas exchanges in lungs	K2
CO2	Explain the physiological aspects of muscular and nervous system	K2
CO3	Summarize the physiological processes of the cardiovascular system	K2
CO4	Illustrate the physiological aspects of digestive system	K3
CO5	Demonstrate the importance of excretory, endocrine and reproductive systems	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A3CA	HUMAN PHYSIOLOGY	SEMESTER IV

Total Credits: 5

Total Instruction Hours: 60 h

Syllabus

Unit I Body fluids and Respiratory system 12 h

Blood and Body fluids: Intracellular, extracellular and interstitial fluid. Plasma as an extracellular fluid. Structure and functions of RBCs, WBCs and Platelets. Hemoglobin- Structure and function. Mechanism of blood coagulation, Anticoagulants, Blood types and blood transfusion. Formation and functions of lymph, CSF.

Respiratory system: Diffusion of gases in lungs, transport of oxygen from lungs to tissues through blood, factors influencing the transport of oxygen. Lung volumes, Transport of CO2 from tissues to lungs through blood, factors influencing the transport of CO2, Chloride shift.

Unit II Muscle and Nervous system 12 h

Muscle system: Skeletal muscles - Properties of skeletal muscles, Muscular contraction and relaxation, Smooth muscle - mechanism of contraction

Nervous system: Central Nervous system. Peripheral Nervous system. Blood brain barrier and CSF, Structure of neuron, Membrane potentials. Synaptic transmission, Structure of Neuromuscular junction and mechanism of neuromuscular transmission, neurotransmitters, Sensory receptors and neural pathways. Somatic sensation, EEG, sleep, coma, learning and memory

Unit III Cardiovascular system 12 h

Anatomy of heart, Properties of cardiac muscles, Conducting system of the heart, Cardiac cycle – Diastole and Systole, ECG. Chemical energy required for cardiac contraction, Pressure changes during cardiac cycles, Regulation of heart pumping- Effect of temperature, potassium and calcium ions on heart function. Overview of circulation- Capillary circulation, Blood volume, Blood flow, Arterial and venous blood pressure

Unit IV Gastrointestinal physiology 12 h

Anatomy and histology of alimentary canal. Digestive glands – histological structures of salivary glands, pancreas, liver. Movements of alimentary canal.

Composition and functions of saliva, gastric, pancreatic, intestinal juices and bile.

Synthesis of Bile acids. Digestion and absorption of carbohydrates, proteins and fats

Unit V Excretory, Endocrine and Reproductive system 12 h

Excretory System: Mechanism of urine formation, Composition of urine, Micturition, Renal regulation of acid balance.

Endocrine system: Definition and role of hormones, mechanism of action of hormones – intracellular receptor mechanism and second messenger mechanism (cAMP, cGMP, Ca2+). Structure, function and manifestations of deficiency and excess of hormones of pituitary, thyroid, parathyroid, pancreatic and adrenal glands.

Male and Female reproduction system- an overview, Assisted reproductive technology- Basics of ART

Text Books

1 Hall J.E, 2015, "Guyton and Hall Textbook of medical physiology", 13th edition , W.B. Saunders company publisher, USA

2 Pal G. K, 2022, "Textbook of Medical Physiology",4rd Edition, Elsevier/Ahuja, India

References

1 Chatterjee C. C, 2017, "Human Physiology - Vol I and II", 11th Edition, CBS Publishers, India

2 Barret K E., Barman S.M, Boitano S and Brooks H L, 2016, "Ganong's Review of Medical Physiology",25th Edition, McGraw Hill, USA

3 Widmaier E P, Raff H and Strang K, 2016, "Vander's Human Physiology: The Mechanisms of Body Function", 14th Edition, McGraw Hill USA.

4 Sembulingam K & Sembulingam P, 2013, "Essentials of Medical Physiology", 6thEdition, Jaypee Brothers Medical Publishers, New Delhi

Course Code	Course Name	Category	L	T	P	Credit
223BC1A3CB	DEVELOPMENTAL BIOLOGY	CORE	5	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Conceptual overview of developmental patterns in different species
- Methods used to study the process of embryonic development in animals
- concept of aging , apoptosis and its relevance several medical applications

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Explain the basic concepts and principles of development	K2
CO2	Describe early embryonic development process among model organisms	K2
CO3	Describe late embryonic developmental processes in model organisms	K2
CO4	Illustrate the plant developmental processes	K3
CO5	Demonstrate mechanism of apoptosis and aging process	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A3CB	DEVELOPMENTAL BIOLOGY	SEMESTER III

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Basic concepts of development 12 h

Potency- Totipotent pluripotent, multipotent, unipotent cells. Commitment: Autonomous specification, conditional specification, Syncytial specification, morphogenetic gradients, cell specification.

Primary germ layers: Ectoderm, Mesoderm, Endoderm, triploblastic and diploblastic animals. Fate maps and cell lineages, Genomic equivalence: Creation of sheep dolly as evidence for genomic equivalence. Imprinting: DNA methylation

Mutants, chimeras and transgenes for analysis of development (Fate mapping studies) Chick- quail experiment -GFP

Unit II Early Embryonic Development 12 h

The Stages of Animal Development, Developmental Patterns in Unicellular Protists and Metazoa, The Developmental Mechanics of Cell Specification, Determining the Function of Genes during Development.

Structure of Gametes, Recognition of Egg and Sperm, Acrosomal Reaction.

The Early Development of Snails. The genetics of axis specification in Drosophila.

Early Mammalian Development: Mammalian Anterior-Posterior Axis Formation, Dorsal- Ventral and left-Right Axes in Mammals.

Unit III Later Embryonic Development 12 h

Cell aggregation and differentiation in Dictyosteliu discoideum; axes and pattern formation in Drosophila, amphibia and chick; organogenesis – vulva formation in Caenorhabditis elegans; eye lens induction, limb development and regeneration in vertebrates; differentiation of neurons, post embryonic development-larval formation, metamorphosis; environmental regulation of normal development;

Sex determination - environment dependance in reptiles, location dependent

Unit IV An overview of plant development 12 h

Plant Life Cycles , Gamete Production in Angiosperms , Pollination ,Fertilization , Embryonic Development, Dormancy, Germination, Vegetative Growth, The Vegetative-to-Reproductive Transition ,Senescence.

Unit V Apoptosis and Aging 12 h

Apoptosis: mechanism and significance, Genes and aging, Antagonistic pleiotropy, Insulin/IGF-1 signaling in aging , Environmental and epigenetic causes of aging, Teratogenesis: Introduction, Principles and Teratogenic agents.

Text Books

1 Gilbert S F 2013, "Developmental Biology", 10th edition, Sinauer Associates, In, United States

2 Slack J M W 2012,"Essential Developmental Biology", 3rd edition, Wiley-Blackwell Publishers, United States

References

1 Balinsky B.I., 2012, "An Introduction to Embryology ", 5th edition, Cengage Learning, India

2 Wolpert L., Tickle C., Arias A.M., 2015, "Principles of Development", 5th edition, Oxford University Press Oxford, United Kingdom

3 Rajni A., Anita G., 2019, " Developmental Biology ", 1st edition, R Chand & Co , India

4 Taiz L., Zeiger E, Møller I M., Murphy A., 2018, "Plant Physiology and Development ", 6th edition, Oxford University Press Oxford, United Kingdom.

223BC1A3CP	CORE PRACTICAL : HUMAN PHYSIOLOGY AND DEVELOPMENTAL BIOLOGY	SEMESTER III

Total Credits: 2
Total Instructions Hours: 48 h

S.No	Experiments
1	Estimation of Hemoglobin by Sahli's Method and Cyanmethemoglobin method (DBT Star Status Practical)
2	Determination of Hematocrit
3	Determination of Total RBC and WBC Count
4	Staining of Peripheral Blood Smear & Differential Leukocyte Count (DLC)
5	Determination of bleeding time (Duke's method) and clotting time (Capillary Tube Method)
6	Determination of blood grouping (ABO , Rh typing)
7	Pulmonary function tests and spirometry (Demonstration)
8	Histology of connective tissue, liver, brain permanent slides (Demonstration)
9	Measurement of pulse rate, heart rate and blood pressure
10	Case studies - Renal (clearance,GFR, eGFR) Respiratory & cardiac systems
11	Study of whole mounts and sections of developmental stages of frog : Cleavage stages, blastula, gastrula, neurula, tail-bud stage, tadpole (external and internal gill stages)
12	Study of whole mounts of developmental stages of chick through: Primitive streak (13 and 18 hours), 21, 24, 28, 33, 36, 48, 72, and 96 hours of incubation (Hamilton and Hamburger stages).
13	Study of the developmental stages and life cycle of Drosophila and Zebra Fish from stock culture.
14	Study of different sections of placenta (photomicropgraph/ slides).

References

1 VarshneyV P, BediM, 2018, "Ghai's Text book of practical physiology", 9th edition, Jaypee Brothers Medical Publishers, New Delhi.

2 AmritKaur, 2019,"Laboratory Manual of Physiology and Biochemistry", 1st edition, CBS publishers, India.

3 Trigunayat M.M, & Trigunayat K, 2019, A Manual of practical Zoology: Biodiversity, Cell Biology, Genetics and Developmental Biology, 1st Edition, Scientific Publishers, India.

4 Jangir O P, 2002, Developmental Biology A manual, 1st Edition,Agrobio India.

Course Code	Course Name	Category	L	T	P	Credit
222MT1A3IF	PRINCIPLES OF BIOSTATISTICS	IDC	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- concepts of estimation
- various concepts of Probability distribution
- basic concept of Chi square distribution

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	explain the concept of probability distribution	K1
CO2	discuss the basics of sampling distribution	K2
CO3	explain the concept of estimation	K1
CO4	apply the concept of hypothesis testing	K3
CO5	analyze the effect of Chi-square test	K4

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	
CO2	✓	✓	✓	✓	
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

COURSE FOCUSES ON

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

222MT1A3IF	PRINCIPLES OF BIOSTATISTICS	SEMESTER III

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Probability Distributions 10 h

Probability distributions of discrete variables - Binomial distribution - Poisson distribution - continuous probability distributions - Normal distribution - applications.

Unit II Sampling distributions 9 h

Sampling distributions - distribution of the sample mean and the difference between two sample means - distribution of the sample proportion and thedifference between two sample proportions.

Unit III Estimation 9 h

Confidence interval for a population mean and difference between two population means - t distribution - confidence interval for a population proportion andthe difference between two population proportions - determination of sample size for estimating means and proportions.

Unit IV Hypothesis testing 10 h

Hypothesis testing: A single population mean and the difference between two population means - paired comparisons -single population proportion and the difference between two population proportions.

Unit V The Chi- square distribution and the analysis of frequencies 10 h

Mathematical properties - tests of goodness-of-fit - tests of independence- tests of homogeneity - Fisher exact test - relative risk - odds ratio and the Mantel -Haenszel statistic - survival analysis.

Note: Theory 20% and problem 80%

Text Books

1 Wayne W. Daniel, 2006,"Biostatistics - A Foundation for Analysis in the Health Sciences", Seventh edition, Wiley India Pvt. Ltd, New Delhi

References

1 Bernard Rosner, 2015, " Fundamentals of Biostatistics", United States of America Print, Harvard University, New York

2 Parabhakara G.N., 2006, "BioStatistics", First Edition, Medical Publishers Pvt Ltd, New Delhi.

3 Annadurai B., 2015, "A Text Book of Bio Statistics", First Edition, New Age International Pvt. Ltd, New Delhi

4 Veer BalaRastogi, 2011, "Fundamentals of Bio-Statistics", 2nd Edition, Ane Books Pvt.Ltd, New Delhi

Course Code	Course Name	Category	L	T	P	Credit
223BC1A3SA	ANALYTICAL BIOCHEMISTRY	SEC	2	-	2	2

PREAMBLE

This course has been designed for students to learn and understand

- the analysis of various biochemical constituents through various techniques
- about various techniques and its application in the field of research
- The basic laboratory skills in the conduct of any laboratory experiment

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Outline the principles, techniques and applications of the chromatography.	K2
CO2	Compare and contrast the various centrifugation techniques for analysis of different biological sample types	K2
CO3	Apply the various electrophoretic techniques in biological research applications	K3
CO4	Analyze the basics spectroscopic techniques	K4
CO5	Examine the biological samples by using of radio isotopic techniques	K4

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A3SA	ANALYTICAL BIOCHEMISTRY	SEMESTER III

Total Credits: 2

Total Instruction Hours: 48 h

Syllabus

Unit I Chromatography techniques 10 h

Basic principles, types, techniques and applications of various chromatography methods - Paper and Column chromatography, Thin layer chromatography, HPTLC, Ion-exchange chromatography, Affinity chromatography, Molecular sieve chromatography, Gas liquid chromatography, High Performance Liquid Chromatography, Fast Protein Liquid Chromatography.

Demonstration – on Paper chromatography and Packing of column using burette, cotton, sand and silica gel

Unit II Electrophoresis techniques 10 h

Basic principles, techniques, applications and various types of electrophoresis, Paper electrophoresis, gel electrophoresis – capillary electrophoresis, PAGE, Agarose gel electrophoresis ,Immunoelectrophoresis, Isoelectric focusing of proteins, 2D Electrophoresis.

Demonstration on electrophoresis

Unit III Centrifugation techniques 8 h

Basic Principles of centrifugation and sedimentation, sedimentation coefficient, different types of rotors, differential centrifugation, density gradient centrifugation, Ultracentrifugation.

Demonstration on centrifugation

Unit IV Spectroscopic techniques 10 h

Concept of electromagnetic spectrum. Basic principles and applications of UV Visible spectrometry and Colorimetry, Fluorimetry, Flame photometry, Atomic absorption spectroscopy, Nephelometry and turbidimetry.

Demonstration on UV Visible spectrometry and Fluorimetry

Unit V Radio isotopic techniques 10 h

Introduction to radioisotopes. Radioactive decay, Units of Radioactivity, Detection and measurement of Radioactivity – Geiger-Muller counter, Scintillation counter, Auto-radiography. Applications of Radio-isotopes in biological and medical

sciences.Imaging Techniques, Safety and disposal of radioisotopes

Note:

Make a visit to Nuclear medicine department.

Text Books

1 Sawhney and Singh, 2015, "Introductory Practical Biochemistry", 11th edition, Narosa Publishing house, New Delhi.

2 Dr. (Mrs.) Sonali M, Dr. Jaiprakash S, Dr. Paresh M, Dr. Santosh C, 2022, " A Textbook of Advanced Instrumentation Techniques ", 1st edition, Everest Publishing house, Shaniwar Peth Pune

References

1 Wilson and Walker, 2018, "Principles and techniques of Biochemistry and Molecular Biology", 8th edition, Cambridge University Press, UK.

2 Avinash upadhyay, Kakoli upadhyay, Nirmalendunath, 2014, " Biophysical Chemistry Principles & Techniques. ", Himalaya Publishing House

3 Sadasivam S and Manickam A, 2018, "Biochemical methods", 3rd edition, New Age International Publishers, New Delhi

4 Dr.Sameer Rastogi, 2021, "Textbook of Advanced Instrumentation techniques", 1st edition, Narain Publishers & Distributors, India.

223BC1ASSA	SELF STUDY : HERBAL TECHNOLOGY	SEMESTER III

Total Credits: 1

Syllabus

Unit I Pharmacognosy

Pharmacognosy - Definition and history, Indian systems of medicine - Siddha, ayurvedha, and Unani systems. Taxonomy of locally available medicinal plants, their chemical constituents and medicinal uses - Classification of Crude drugs - Chemistry of Drugs - Future of pharmacognosy.

Unit II Medicinal plants

Classification of medicinal plants - Vernacular name and family - Geographical source, cultivation, collection, and processing for market and commerce in crude drugs. Morphological and histological studies,chemical constituents - Therapeutic and other pharmaceutical uses.Underground stem - ginger, Alpinia - Roots - Rauolfia - Belladona -Aerial parts - Bark - Cinchona.

Unit III Medicinal Properties

Leaves - Adathoda, Eucalyptus - Flower - Clove fruits seeds – Nux vomica Nutmegs, Gooseberry - unorganized drugs - Gum - Acacia – Resin - Turpentine, fixed oil - castor oil.

Unit IV Herbal medicines for Human ailments

Herbal medicines for Human ailments - Drugs Acting On Cardiac Diseases, Cerebral Diseases, Nasal, diseases - Blood pressure Drugs acting on Nervous system - Depressants. - Stimulants - Respiration and Drugs - Urogenital system and drugs - Psychoactive plants.

Unit V Herbal Biotechnology

Propagation of medicinal plants - Micro and macro propagation conservation of rare medicinal plants. Role of biotechnology in medicinal plants banks - cultivation of medicinal and aromatic plants – Drug adulteration - methods of Drug evaluation, Herbal food - Food processing - packaging - Herbal sale and Export of medicinal plants - marketing - Intellectual property rights - Export laws.

Text Books

1 Trease, George Edward, and William Charles Evans. 1972, "Pharmacognosy" 10th Edition, Bailliere Tindall, London.

2 Handa, S S and Kapoor, V K. "Pharamcognosy" by 2nd Edition, Vallabh Prakashan Publishers, New Delhi.

References

1 Jain S K.2012, "Medicinal Plants" . 12th Edition, New Delhi: National Book Trust, India.

2 Neelesh Malvia and SapnaMalviya, 2019, "Herbal drug Technology", CBS Publishers, NewDelhi.

3 Joshi SG, 2018, "Medicinal Plants", Oxford & Ibh Publisher, India.

223BC1ASSB	SELF STUDY : BIOENTREPRENEURSHIP	SEMESTER III

Total Credits: 1

Syllabus

Unit I Innovation

Introduction, concept of innovation. Innovation Posture, Propensity and Performance. Innovation Measurement. Competitiveness. Innovation process. Innovation Management Through Management of Knowledge and Education. Types and characteristics of innovation. Concept of Innovation Systems. Basic principles and types of innovation systems.

Unit II Entrepreneur

Concept of an entrepreneur. Characteristics of successful entrepreneur. Entrepreneurial decision process. Functions (managerial, promotional and commercial) and need of entrepreneur. Types of entrepreneurs. Distinction between an entrepreneur and a manager. Case study: N.R.Narayana Murthy: An exemplary Risk Taker and Dr.VergheseKurien- Indian Social Entrepreneur

Unit III Entrepreneurship and Agri-preneurship

Concept and growth of entrepreneurship in India (Pre-Independence and Post-Independence era). Role of entrepreneurship in economic development. Types of entrepreneurship.

Agri-preneurship: Introduction and need for Agri-preneurship. Opportunities and challenges in agri-preneurship. Suggestions for development. Case study: e-choupal of Indian Tobacco Company.

Unit IV Bioentrepreneurship

Basics of Bioentrepreneurship Introduction to bioentrepreneurship – Biotechnology in a global scale, Scope in Bioentrepreneurship. Opportunities for Bioentrepreneurship. Entrepreneurship development programs of public and private agencies (MSME, DBT, BIRAC, Startup and Make in India). Incubators for entrepreneurship with example.

Unit V Bioentrepreneurship Process

Initiation of biotech ventures, concept of venture capital, history of establishment of pioneer biotechnology companies. Product selection. Concept and types of business models. Licensing of biotechnological invention, valuation, NDA, technology transfer. Patent landscape, IP protection and commercialization strategies. Case study: Successful Bio-entrepreneurs in India.

Text Books

1. Dr.Khanka.S.S, 2012,"Entreprenerial Development", fourth edition, S Chand and Company Limited, New Delhi
2. Dr.Gupta.O.P,2015, "Fundamentals of Entrepreneurship", SBPD Publishing House, Agra

References

1. Jayshree Suresh, 2011, "Entrepreneurial Development", Fifth Edition, Margham Publications, Chennai.
2. Holger Patzelt, Thomas Brenner, 2008,"Handbook of Bioentrepreneurship", Springer Science and Business Media LLC, New York.
3. Howard Frederick, Allan O Connor, Donald F. Kuratko, 2016, "Entrepreneurship: Theory, Process, Practice", Fourth Edition, Cengage Learning Australia Pty Limited, South Melbourne.
4. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, 2017, "Entrepreneurship", Tenth Edition, McGraw-Hill Education, New York

14/6/23
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CHAIRMAN
Dr.N.G.P. Arts and Science College

Course Code	Course Name	Category	L	T	P	Credit
221TL1A4TA	TAMIL - IV	LANGUAGE- I	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- மொழிப்பாடங்களின் வாயிலாக தமிழரின் பண்பாடு நாகரீகம், பகுத்தறிவு ஆகியவற்றை அறியச் செய்தல்
- கலை மற்றும் மரபுகளை அறியச் செய்தல்
- மாணவர்களின் படைப்பாக்கத்திறன்களை ஊக்குவித்தல்

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	வாழ்க்கைத் திறன்கள் (Life Skills)- மாணவர்களின் செயலாக்கத் திறனை ஊக்குவித்தல்	K3
CO2	மதிப்புக்கல்வி (Attitude and Value education)	K4
CO3	பாட இணைச்செயல்பாடுகள் (Co-curricular activities)	K4
CO4	சூழலியல் ஆக்கம் (Ecology)	K4
CO5	மொழி அறிவு (Tamil knowledge)	K5

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓		✓	✓	
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	
CO5	✓	✓		✓	✓

COURSE FOCUSES ON

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights	✓	Gender Sensitization
✓	Social Awareness/ Environment	✓	Constitutional Rights/ Human Values/ Ethics

221TL1A4TA	TAMIL - IV	SEMESTER IV

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I **எட்டுத்தொகை** 10 h

1. நற்றிணை – குறிஞ்சித் திணை

I.பா.எண் : 01 – கபிலர்

II.பா.எண் : 88 – நல்லந்துவனார்

III.பா.எண் : 102 – செம்பியனார்

2. குறுந்தொகை – முல்லைத்திணை

I.பா.எண் : 65 – கோவூர்கிழார்

II. பா.எண் : 167 – கூடலூர்கிழார்

மருதத்திணை

I.பா.எண் : 08 – ஆலங்குடி வங்கனார்

II.பா.எண் : 61 – தும்பிசேர்கீரனார்

III.பா.எண் :196 – மிளைக் கந்தன்

நெய்தல் திணை

I.பா.எண் : 57 – சிறைக்குடி ஆந்தையார்

Unit II **எட்டுத்தொகை** 08 h

1. கலித்தொகை – பாலைக்கலி

I.பா.எண் : 09 – பெருங்கடுங்கோ

2. அகநானூறு – மருதத்திணை

I.பா.எண் : 86 – நல்லாவூர்கிழார்

3. புறநானூறு - I.பா.எண் : 188 – பாண்டியன் அறிவுடை நம்பி

II.பா.எண் : 192 – கணியன் பூங்குன்றனார்

III.பா.எண் : 279 – ஒக்கூர் மாசாத்தியார்

IV.பா.எண் : 312 – பொன்முடியார்

Unit III **பத்துப்பாட்டு** 10 h

1. பட்டினப் பாலை – கடியலூர் உருத்திரங் கண்ணனார் -1முதல் 218 வரிகள் வரை மட்டும்.

Unit IV **இலக்கிய வரலாறு** 10 h

1. எட்டுத் தொகை நூல்கள்
2. பத்துப்பாட்டு நூல்கள்

Unit V **இலக்கணம் மற்றும் திறனாய்வுப் பகுதி** 10 h

I.இலக்கணம்

1. அகத்திணை – அன்பின் ஐந்திணை - விளக்கம்
2. புறத்திணை – 12 திணைகள் - விளக்கம்

II.பயிற்சிப் பகுதி

சங்கப் பாடல்கள் குறித்து திறனாய்வு செய்தல்

Note: பயிற்சிப் பகுதியில் வினாக்கள் அமைத்தல் கூடாது

Text Book

செய்யுள் திரட்டு - மொழிப் பாடம் - 2022- 23

1 தொகுப்பு: தமிழ்த்துறை, டாக்டர் என்.ஜி.பி. கலை அறிவியல் கல்லூரி, வெளியீடு : நியூ செஞ்சுரி புக் ஹவுஸ், சென்னை – 600 098. (Unit I- V)

References

1 பேராசிரியர் புலவர் சோம. இளவரசு, எட்டாம் பதிப்பு -2014, தமிழ் இலக்கிய வரலாறு - மணிவாசகர் பதிப்பகம், சென்னை.

2 பேராசிரியர் முனைவர் பாக்கியமேரி, முதற் பதிப்பு- 2013, இலக்கணம் -இலக்கிய வரலாறு - மொழித்திறன் -பூவேந்தன் பதிப்பகம், சென்னை.

3 தமிழ் இணையக் கல்விக்கழகம்.<http://www.tamilvu.org/>

Course Code	Course Name	Category	L	T	P	Credit
221TL1A4HA	HINDI - IV	LANGUAGE- I	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the writing ability and develop reading skill
- the various concepts and techniques for criticizing literature
- the techniques for expansion of ideas and translation process

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the fundamentals of novels and stories	K1
CO2	Understand the principles of translation work	K2
CO3	Expose the knowledge writing critical views on fiction	K2
CO4	Build creative ability	K3
CO5	Apply the power of creative reading	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓		✓	✓	
CO4			✓	✓	✓
CO5	✓	✓	✓		✓

COURSE FOCUSES ON

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights	✓	Gender Sensitization
✓	Social Awareness/ Environment	✓	Constitutional Rights/ Human Values/ Ethics

221TL1A4HA	HINDI- IV	SEMESTER IV

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I 10 h

नाटक

Unit II 10 h

एकांकी

Unit III 10 h

काव्य मंजरी

Unit IV 10 h

सूचना लेखन

Unit V 08 h

अनुवाद अभ्यास- III

Text Books

1. लडाई – सर्वेश्वरदयाल सक्सेना प्रकाशक: वाणी प्रकाशन 21-A, दरियागंज नई दिल्ली-110002. (Unit I)
2. एकांकी पंचामृत – डॉ राम कुमार (भोर और तारा छोड्कर) प्रकाशक: जवाहर पुस्तकालय सदर बाजार, मथुरा उत्तर प्रदेश-281001. (Unit II)
3. काव्य मंजरी- (डा मुन्ना तिवारी) मैथिलीशरण गुप्त- मनुष्यता, जयशंकर प्रसाद- बीती विभावरी जागरी सूर्यकान्त त्रिपाठी निराला- तोडती पत्थर और भिक्षुक. (Unit III)
4. सूचना लेखन पुस्तक: व्याकरण प्रदिप – रामदेव प्रकाशक: हिन्दी भवन 36 इलाहाबाद -211024. (Unit IV)
5. अनुवाद अभ्यास (केवल अंग्रेजी से हिन्दी में) (पाठ 10 to 20) प्रकाशक: दक्षिण भारत प्रचार सभा चेनैई -17 (पाठ10 to 20). (Unit V)

Course Code	Course Name	Category	L	T	P	Credit
221TL1A4MA	MALAYALAM- IV	LANGUAGE - I	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the writing ability and develop reading skill
- the various concepts and techniques for criticizing literature, to learn the techniques for expansion of ideas and translation process
- the competency in translating simple Malayalam sentences into English and vice versa

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the fundamentals of novels and stories	K1
CO2	Understand the principles of translation work	K2
CO3	Expose the knowledge writing critical views on fiction	K2
CO4	Build creative ability	K3
CO5	Apply the power of creative reading	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓			✓	
CO2	✓				✓
CO3		✓	✓		
CO4	✓			✓	✓
CO5	✓	✓	✓		✓

COURSE FOCUS ON

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights	✓	Gender Sensitization
✓	Social Awareness/ Environment	✓	Constitutional Rights/ Human Values/ Ethics

221TL1A4MA	MALAYALAM- IV	SEMESTER IV

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I **Drama** 10 h

Saketham- Sreekandan Nair

Unit II **Drama** 10 h

Saketham- Sreekandan Nair

Unit III **Drama** 10 h

Saketham- Sreekandan Nair

Unit IV **Screen Play** 10 h

Perumthachan- Vasudevan Nair

Unit V **Screen Play** 08 h

Perumthachan- Vasudevan Nair

Text Books

1 Nair, Sreekandan C.N. 2023. Saketham, Drama. DC Books Kottayam, Kerala, India. (Unit I to III)

2 Nair, Vasudevan M.T. 1994. Perumthachan- Screenplay. DC Books Kottayam, Kerala, India. (Unit IV & V)

Reference

1 Sankarapillai. 2005. Malayala Nataka Sahithya Charithram, Kerala Sahithya Akademi Publishers, Kerala, India.

Course Code	Course Name	Category	L	T	P	Credit
221TL1A4FA	FRENCH- IV	LANGUAGE- I	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the Competence in General Communication Skills – Oral + Written- Comprehension & Expression
- the Culture, life style and the civilization aspects of the French people as well as of France
- the students to acquire Competency in translating simple French sentences into English and vice versa

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the Basic verbs, numbers and accents	K1
CO2	Apply the adjectives and the classroom environment in France	K2
CO3	Select the Plural, Articles and the Hobbies	K2
CO4	Measure the Cultural Activity in France	K3
CO5	Evaluate the sentiments, life style of the French people and the usage of the conditional tense	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓		✓	✓	
CO4	✓	✓	✓	✓	✓
CO5	✓		✓	✓	✓

COURSE FOCUSES ON

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights	✓	Gender Sensitization
✓	Social Awareness/ Environment	✓	Constitutional Rights/ Human Values/ Ethics

221TL1A4FA	FRENCH- IV	SEMESTER IV

Total Credits: 3
Total Instruction Hours: 48 h

Syllabus

Unit I 10 h

°Décrirequelqu'un. ° Comparer	En milieu professional, recruiter quelquún et justifier sonchoix.	S'exprimersur les styles de vêtemantReconnaitre des personnes à partit de descriptions.	Comprendre la description de personnesdans un extrait de roman.

Unit II 10 h

ExprimerPaccordou le désaccord. ° Se situerdans le temps.	En milieu professional, recruiter quelquún et justifier sonchoix.	Décrire des personnes. Comprendre des personnes qui experiment leur accord ouleurdésaccord.	Comprendre des différences de points de vueexprimétesdans de message électronique. Raconterunsourvenir.

Unit III 10 h

° Parlerde Pavenir.	Discuter de l'organisation d'un voyage de groupepuisprépar erune fiche projet et la templit.	Comprendreune chanson. Echangersursesprojets de vacancy	Comprendre le message d'une carte d'anniversaire

Unit IV 10 h

° Exprimer des souhaits. °Décrirequel qu'un	Discuter de l'organisation d'un voyage de groupepuisprépar erune fiche projet et la templit.	Discuter du programme de la soire à venir. Addresser des souhaits à quelqu'un.	Comprendre le message d'une carte d'anniversaire

Unit V 08 h

Make in Own Sentences based on the above Lessons

Text Book

1 LATITUDES 1 (Méthode de français) Pages from 128-151, Author : RegineMérieux, Yves Loiseau(Unit I to IV).

Course Code	Course Name	Category	L	T	P	Credit
221EL1A4EA	PROFESSIONAL ENGLISH - IV	LANGUAGE- II	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the skill-based learning for better communication
- the prevalent issues logically and present coherently
- the ideas accurately and clearly

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Develop the ability to appreciate ideas and think critically	K1
CO2	Integrate academic success into practical life skills	K2
CO3	Express challenges of a competitive environment and select the profession that best suits them	K2
CO4	Discuss with confidence in conversations, to initiate, sustain and close a conversation	K3
CO5	Identify a sense of social commitment	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	

COURSE FOCUSES ON

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights	✓	Gender Sensitization
✓	Social Awareness/ Environment	✓	Constitutional Rights/ Human Values/ Ethics

221EL1A4EA	PROFESSIONAL ENGLISH - IV	SEMESTER IV

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I Career 08 h

Leadership- Everyday leadership- Everyday leaders motivation- Qualities of a good leader- Professionalism- Creativity- Practical Application- Ways to become more creative- Six Thinking hats techniques

Unit II Art of Promoting 11 h

Selling your skills- Neuromarketing as a tool for influencing leaders- Using neuromarketing and psychology to get ahead- Recruiters and Clients decision making skills- Three steps to use neuromarketing for a successful life- Attention- storytelling- Perception and reputation- Recognize opportunities and openings before the competition- observation– Matching yourself with your leaders

Unit III Facing Challenges 10 h

Introduction-Panicky people- Negative people- Positive people- Facing challenges and taking initiatives – Importance of youth to face challenges and take initiative Benefits of Facing challenges- Facing challenges in life

Unit IV Effective Decision Making 10 h

Decision Making Process- Methods of Decision Making- Steps in DM- Theoretical Approaches to individual Decision Making- Optimizing Decision Theory- The Subjective Expected Utility Model- Steps to Effective Decision- Making- Effective Decision Making in Terms- Methods for team decision making- Confusion and decision making- Decision making styles

Unit V Practising Corporate Social Responsibility (CSR) 09 h

Corporate Social Responsibility (CSR)- definitions- Goal- Areas- Need- Benefits - Argument in favour/against of CSR- Factors that promote CSR – Limitations for implementing- India and Corporate Social Responsibility- Activities carried out by Companies in India- List of projects for funding under CSR- Implementation of CSR commitments

Text Books

1 Sharma, Prashant. 2022. Soft Skills. BPB Publications, 3rd Edition, New Delhi, India. (Unit I & II)

2 Alex. 2013. Managerial Skills. S. Chand Publishing, New Delhi, India. (Unit III to V)

3 Alex. 2009. Soft Skills. S. Chand Publishing, New Delhi, India. (Unit II)

4 E H McGrath S J. 2011. Basic Managerial Skills for All, 9th Edition, New Delhi, India. (Unit III)

References

1 Adair J. 1986. Effective Team Building: How to make a winning team. Pan Books, London, United Kingdom.

2 Dhanavel S P. 2010. English and Soft Skills, Orient Blackswan, Hyderabad, India.

3 Singh S R. 2011. Soft Skills. APh Publishing Corporation, New Delhi, India.

4 Lakshminarayanan K R, Murugavel T. 2015. Managing Soft Skills. Scitch Publications, Chennai, India.

Course Code	Course Name	Category	L	T	P	Credit
223BC1A4CA	INTERMEDIARY METABOLISM	CORE	5	-	-	5

PREAMBLE

This course has been designed for students to learn and understand

- importance of high energy compounds, electron transport chain
- biochemical processes in a biological organism that maintain the healthy operation of cells
- the combined activities of all the metabolic pathways that interconvert precursors, metabolites and products of Low Molecular Weight substances.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Describe the basic concepts of Bioenergetics, Electron Transport chain and mechanisms of oxidative phosphorylation	K2
CO2	Explain the pathways of carbohydrate metabolism and its energetics	K2
CO3	Illustrate the chemical logic of lipid metabolic pathways.	K3
CO4	Explain the nitrogenous Compound metabolism, biochemical basis of some diseases arising in amino acid metabolism and interrelations of Carbohydrate, fat and protein	K3
CO5	Analyze the nucleic acid metabolic pathways	K4

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A4CA	INTERMEDIARY METABOLISM	SEMESTER IV

Total Credits: 5

Total Instruction Hours: 60 h

Syllabus

Unit I Bioenergetics & Electron transport chain 13 h

Bioenergetics: - Free energy and the laws of thermodynamics; Role of high- energy compounds as energy currency of the cell; free energy of hydrolysis of ATP and other organophosphates. The basic metabolic pathways - anabolic, catabolic and amphibolic pathways.

Electron transport chain: - Role of respiratory chain in mitochondria; in energy capture; respiratory control. Oxidative phosphorylation: - Mechanism of oxidative phosphorylation; Chemiosmotic theory; uncouplers of oxidative phosphorylation.

Unit II Carbohydrate Metabolism 12 h

Glycolysis: - Pathways and energetics; Oxidation of pyruvate to acetyl CoA. TCA Cycle: Pathway and energetics; Gluconeogenesis; Glycogenesis and glycogenolysis. Pentose Phosphate Pathway (HMP shunt). Cori Cycle, Glucuronic Acid Cycle. Metabolism of other hexoses:- Fructose and galactose. Case studies.

Unit III Lipid Metabolism 12 h

Blood lipids. Oxidation of fatty acids: - Carnitine cycle; beta oxidation, alpha oxidation and omega oxidation. Biosynthesis of propionyl CoA. Biosynthesis of saturated fatty acids. Biosynthesis of unsaturated fatty acids: - Monounsaturated and polyunsaturated fatty acids. Biosynthesis and degradation:- Lecithin, cholesterol. Case studies.

Unit IV Amino acid Metabolism 12 h

Detoxification of Ammonia- Urea Cycle. Catabolism of amino acid: Oxidative deamination, non-oxidative deamination, transamination, amino acid decarboxylation, Metabolism of amino acid : Glycine, methionine, phenyl alanine, tyrosine, Leucine, lysine. Metabolic disorders: Maple syrup Urine Disease, Phenylketouria, tyrosinemia, homocystinuria. Interrelation between carbohydrates, fat and protein metabolism.

Unit V Nucleic Acid Metabolism 11 h

Nucleic acid: Metabolism of purines: de-novo synthesis, salvage pathways; catabolism of purine.

Metabolism of pyrimidines - de novo synthesis, salvage pathways; catabolism of pyrimidine.

Biosynthesis of deoxy ribonucleotides

Text Books

1. Bery J M Tymoezko and Stryer I, 2015 "Biochemistry", 8th edition, W.H.Freeman and Company, Newyork
2. Vasudevan D M, Sreekumari S, Kannan Vaidyanathan, 2022, "Textbook of Biochemistry for Medical Students", 10th Edition, Jaypee Brothers Medical Publishers, New Delhi.

References

1. Rodwell V W Bender D Botham K M Kennelly P J and Weil PA, 2018, "Harper's Illustrated Biochemistry", 31st Edition, he McGraw-Hill Inc, New York.
2. David L Nelson and Michael M Cox, 2017, "Lehninger Principles of Biochemistry",7th Edition, W.H.Freeman and company, Newyork.
3. Donald Voet Judith G Voet and Charlotte W Pratt, 2016, "Fundamentals of Biochemistry: Life at the Molecular Level", 5th Edition, Wiley Publishers,US
4. West, E S, Todd, W R, Mason H S and Van Brugge T J, 2001, 4th Edition, "The text book of Biochemistry", Macmillan Company, London.

Course Code	Course Name	Category	L	T	P	Credit
223BC1A4CB	NUTRITIONAL BIOCHEMISTRY	Theory	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Overview of human nutrition and nutritional disorders.
- The nutritional requirements of the human body and nutritional diseases.
- The measurement of energy expenditure

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Explain the composition of food and how foods are grouped. Construct a dietary chart.	K2
CO2	Measure the energy content in food. Relate the factors, which influence the BMR and SDA.	K2
CO3	Apply the nutritive values of macromolecules in a dietary chart.	K3
CO4	Identify the various primary nutritional diseases and conditional nutritional disorders.	K3
CO5	Describe the concept and plan of balanced diet for the prevention and treatment of nutritional disorders.	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	~~Social Awareness/~~ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A4CB	NUTRITIONAL BIOCHEMISTRY	SEMESTER IV

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to Food and nutrition 9 h

Function of foods and its relation to nutrition and health, essential nutrients, analysis of food composition, food habits and food groups. Antioxidants in Foods. Required dietary allowance (RDA) for different age groups. Carcinogens and Food additives, Fetal origin of Adulthood Diseases (FOAD). Microbiomes- Gut microbiota, Prebiotics, Probiotics.

Unit II Energy Metabolism 9 h

Measurement of energy expenditure: Direct & Indirect calorimetry. Definition of RQ, BMR and BMI, factors affecting RQ, BMR and BMI. Thermogenic effects of foods and factors affecting thermogenic effect. Energy requirements of men and women and factors affecting energy requirements. Role of dietary fibers in health.

Unit III Dietary Carbohydrates , lipids and Health 10 h

Physiological role and nutritional significance of carbohydrates and lipids. Carbohydrates - Chemical composition and importance, Glycemic index of foods and its uses, Artificial sweeteners. Sources and physiological functions of Essential fatty acids, Saturated fatty acids, Monounsaturated fatty acids and Polyunsaturated fatty acids, Omega 3 and omega 6 fatty acids and ratio. Phospholipids, Triacylglycerols and Cholesterol in the body.

Unit IV Dietary Proteins, Vitamins, Minerals and Health 11 h

Primary nutritional diseases: Essential and non-essential amino acids – their role in growth and development. Protein energy malnutrition (Marasmus and Kwashiorkar), Starvation, Techniques for the study of starvation. Protein metabolism in prolonged fasting. Protein sparing treatments during fasting. Basic concept of high protein low caloric weight reduction diets. Calcium, Phosphorus and Iron - Distribution in the body digestion,Sources, RDA, Absorption, Utilization,Transport, Excretion, Balance, Deficiency, Toxicity.Calcium: Phosphorus ratio, Role of iron in prevention of anemia. Importance of Iodine in human metabolism.

Unit V Clinical Nutrition 9 h

Role of diet and nutrition in prevention and treatment of diseases: Dental Caries, Lactose Intolerance, Galactosemia and Glycogen Storage Diseases, Fluorosis, Atherosclerosis and Rheumatic disorders.

Vitamin deficiency disorders, Hypervitaminosis, Nutritional anaemias.

Conditional nutritional disorders: Disorders of gastrointestinal tract, liver, biliary tract, pancreas, heart and Diabetes, Obesity.

Text Books

1 Smolin and Grosvenor, 2016. Nutrition: Science and Applications, 4th Edition, Wiley

2 Gibney, Lanham-New, Cassidy and Vorster, 2013. Introduction to Human Nutrition, 2nd Edition, Wiley-Blackwell

References

1 Trueman P, 2011. Nutritional Biochemistry, 5th Edition, MJP Publishers.

2 Gibney, Margetts and Kearney, 2013. Public health Nutrition, The Nutrition Society, Blackwell Science.

3 Joshi Y K, 2010. Basic Clinical Nutrition, 2nd Edition, Jaypee Brothers, New Delhi.

4 Catharine Ross A, Benjamin caballero, Robert J Cousins, Katherine L Tucker, Thomas R Ziefer, 2014, "Modern Nutrition in Health and Disease", 11th Edition, Lippincott Williams and Wilkins-Newyork-London.

223BC1A4CP	CORE PRACTICAL : METABOLISM AND NUTRITIONAL BIOCHEMISTRY	SEMESTER IV

Total Credits: 2
Total Instructions Hours: 48 h

S.No	Contents
1	Uric acid by Phosphotungstate method
2	Phosphorus by ANSA method
3	Glucose by O-Toluidine Method
4	Hemoglobin by Cyanmethhemoglobin method
5	Protein by Biuret method
6	Computation of energy needs in males, females and special catogeries
7	BMI calculation and Waist-hip ratio
8	Estimation of ascorbic acid in fruit
9	Estimation of lactose in milk
	DBT Star Practicals
10	Detection of Adulteration in food
11	Estimation of calcium in Ragi and Iron in Drumstick
12	Methylene Blue dye Reduction Test (MBRT) for milk
13	Alkaline phosphatase test and lactometer analysis for milk
14	Effect of inhibitor on protein synthesis

Note:

References

1 Gowenlock A H, 2002,"Varley's Practical Clinical Biochemistry", 6th Edition, CBS Publishers, New Delhi

2 Sadasivam S and Manickam A, 2018, "Biochemical Methods" 3rd edition, New Age International Publishers, New Delhi.

3 Rama Sastri B V and ICMR, Gopalan C, 2016, "Nutritive Value of Indian Foods", Indian Council of Medical Research (ICMR), India.

Course Code	Course Name	Category	L	T	P	Credit
224CS1A4EP	PYTHON FOR BIOLOGISTS	IDC	3	-	2	4

PREAMBLE

This course has been designed for students to learn and understand

- Computing and Problem solving using Python
- The basic operations in Python programming language
- The concepts of Object Oriented Programming in Python

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Recognize Digital computer as Data Analytics tool through Python	K1
CO2	Illustrate Problem solving strategies using Functions	K2
CO3	Demonstrate the method of solving simple problems through in Python	K3
CO4	Apply the theory behind Lists, Tuples and Dictionaries	K3
CO5	Construct working knowledge of Object Oriented Programming in Python and Scientific Python Ecosystem	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓		✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓		✓	
CO4	✓		✓		✓
CO5		✓		✓	✓

224CS1A4EP	PYTHON FOR BIOLOGISTS	SEMESTER IV

Total Credits: 4]
Total Instructions Hours: 60 H

Syllabus

Unit I Introduction to Digital Computer, Introduction to Python 12H

Introduction to Digital Computer: Von Neumann concept - Storage - Programming Languages - Translators - Problem Solving Strategies: Problem Analysis - Algorithms - Flow Charts - Introduction to Python: Introduction- Python overview- Comments – Python Identifiers – Reserved keywords – Variables – Standard data types – Operators - Statements and Expressions - String Operations - Boolean Expressions

1. Create a python program to implement the different Operators.
2. Write a python program to implement Branching and Looping

Unit II Control Statements, Functions 12 H

Control Statements: Iteration - The for loop – While statement – if elif else statement – Input from keyboardFunctions: Introduction – Built-in functions – Composition of Functions - Type conversion – Type coercion – Date and time – dir() function – help() function – User defined functions – Parameters & arguments – Function calls – The return statement – Python recursive function - Writing Python Scripts

3. Create a python program to find the Perfect Number.
4. Create a python program for User Defined functions.

Unit III Strings and Lists **12 H**

Strings: Compound data type – len function – String slices – String traversal – Escape characters – String formatting operator – String formatting functions. Lists – Values and accessing elements – Traversing a list – Deletingelements from list – Built-in list operators – Built-in list methods.

5. Write a Python program to implement String Operations.
6. Create a python program to implement various String Functions

Unit IV Tuples and Dictionaries 12 H

Tuples: Creating tuples–Accessing values in tuples-Tuple assignment–Tuples as return values–Basic tuple operations–Built-in tuple functions-Dictionaries: Creating dictionary–Accessing values in a dictionary –Updating dictionary – Deleting elements from dictionary – Operations in dictionary – Built-in dictionary methods.

7. Create a python program to implement various operations on Tuples.
8. Create a python program to print Employee details using Dictionaries.

Unit V Introduction to Biopython **12H**

Biopython Installation-Biopython Components: Alphabet-Seq-MutableSeq-SeqRecord-Align-AlignIO-ClustalW-SeqIO-AlignIO-BLAST-Biological Related Data-Entrez-PDB-PROSITE-SeqUtils-Sequencing.

9. Write a python program to implement Biopython components
10. Write a python program to implement shape

Text Books

1. E. Balagurusamy, 2016, Introduction to Computing and Problem Solving UsingPython, First Edition, McGrawHill publication, New Delhi.(Unit I to IV)
2. Sebastian Bassi,2017,Python for Bioinformatics, Second Edition, CRC Press (Unit V)

References

1. Fabio Nelli ,2018, Python Data Analytics , SecondEdition,Apress,New York,.
2. Wes McKinney,2011, Python for Data Analysis: Data Wrangling with Pandas,NumPy, and IPythony, O'Reilly, USA.
3. Zed Shaw,2014, Learn Python the Hard Way, 3rd Edition, Addison-Wesley,USA,.
4. Mark Summerfield ,2018, Programming in Python 3, Second Edition, Pearson India Education Services Pvt. Ltd, Noida,.

Course Code	Course Name	Category	L	T	P	Credit
223BC1A4EP	BIOINFORMATICS	SEC	2	-	2	2

PREAMBLE

This course has been designed for students to learn and understand

- The basic concepts and scope of Bioinformatics
- The genomic data acquisition and analysis, comparative and predictive analysis of DNA and protein sequence, Phylogenetic inference etc
- The approaches to drug discovery using bioinformatics techniques

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Develop elementary knowledge of Bioinformatics	K3
CO2	Identify Nucleotide and protein sequencing and their analysis	K3
CO3	Construct global and local alignment search tool using BLAST and FASTA programs	K3
CO4	Analyze protein structure prediction using laboratory-based approaches	K4
CO5	Develop various approaches for target identification and validation in drug discovery	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

223BC1A4EP	BIOINFORMATICS	SEMESTER IV

Total Credits: 2

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to Bioinformatics 9 h

Introduction to Computational Biology and Bioinformatics, Definition, history, emerging areas, scope and application of Bioinformatics, Human Genome Project-Science, applications and ELSI. Useful Bioinformatics sites on www. Search Engines, Boolean search ("BUT", "NOT", "AND"). Data retrieval tool – NCBI, ENTREZ, DBGET and SRS

1 Data retrieval tools and methods-NCBI, PubMed, PMC, ENTREZ and SRS

Unit II Biological Databases 9 h

Nucleic acid sequence databases- EMBL, GEN BANK, DDBJ. Protein databases-SWISS PROT, TrEMBL, PIR, UniProt and Structure databases-PDB. Tools for screening gene mutations – Pmut, Sist

2 Sequence Database-GEN BANK,SWISSPROT

3 Structure Databases-PDB

Unit III Sequence Alignment 10 h

Sequence Alignment based on Matrices (BLOSUM and PAM), tools for sequence alignment – BLAST, FASTA, Clustal W, Phylogenetic analysis– WPGMA, UPGMA methods

4 Sequence similarity searching (NCBI, BLAST and FASTA

5 Multiple sequence alignment (Clustal)

6 Molecular phylogeny (PHYLIP

Unit IV Gene identification and prediction 10 h

Gene identification and prediction-pattern recognition. Protein primary structure analyses and prediction: identification and characterization

7 Sequence analysis using EMBOSS or GCG Wisconsin Package

8 Gene structure and function prediction (using Gen Scan, GeneMark)

9 Protein sequence analysis (ExPASy proteomics tools)

Unit V Drug Discovery 10 h

Introduction to drug discovery, Structure based drug design- Pharmacophore identification and Mapping, target identification, lead optimization, methods to identify lead compounds, high throughput screening, validation, Molecular Docking – Lipinski's rule

10 Homology Modeling using SPDBV

Text Books

1 Rastogi S C, Mendiratla N D and Rastogi P,2013," Bioinformatics methods and applications- Genomics, Proteomics and Drug Discovery", 4th edition Prentice Hall India

2 Lesk A M, 2019, "Introduction to Bioinformatics", 5th edition, Oxford University Press, New York

References

1 Baxevanis A D and Francis Ouellette B F, 2020," Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins", 3rd Edition, Wiley and Sons,UK

2 Polansski A and Kimmel M, 2010," Bioinformatics", first edition, Springer Pvt. Ltd., India

3 David Mount W, 2013, "Bioinformatics sequence and genome analysis", 2ndedition , CBS Publishers, New Delhi

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BoS 16th 16.10.23 | AC 16th 13.12.23 | GB 21st 05.01.24

Course Code	Course Name	Category	L	T	P	Credit
223BC1A5CA	GENETICS AND MOLECULAR BIOLOGY	CORE	5	-	-	5

PREAMBLE

This course has been designed for students to learn and understand

- An overview and concepts of genetics.
- Basic knowledge on mechanism of Central dogma of cell.
- The molecular basis of transmission of genetic information.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Recall the principles involved in Mendelian inheritance and non-Mendelian inheritance.	K2
CO2	Illustrate the discovery of DNA as genetic material, process of DNA replication, transcription, and translation in prokaryotes.	K2
CO3	Apply codon dictionary to identify the amino acids in the peptide, explain one gene one enzyme hypothesis.	K3
CO4	Develop knowledge of the molecular basis of RNA processing and Post-translational modifications.	K3
CO5	Outline the consequences of different types of mutations, DNA-repair systems, and principles of gene regulation in prokaryotic cells.	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2		✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓		
CO5	✓	✓	✓		✓

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A5CA	GENETICS AND MOLECULAR BIOLOGY	SEMESTER V

Total Credits: 5

Total Instruction Hours: 60 h

Syllabus

Unit I Genetics 12 h

Mendelian inheritance experiments and laws -mono-, di- and tri-hybrid crosses. Concept of gene - Allele, multiple alleles, pseudo allele, polymorphism, and lethal alleles. Extensions of Mendelian principles - Codominance, Incomplete dominance, Gene interactions, Pleiotropy, genetic versus environmental effects, Linkage and crossing over. Sex linked inheritance.

Unit II Genetics and Genetic Disorders 10 h

Gene pool, Gene frequency and factors influencing allele frequency. Maternal inheritance. Chromosomal aberrations, karyotyping. Genes and Pedigree in a population, Transposons- Types, Characteristics and Functions. Genetic Testing (Prenatal & Postnatal). Genetic Disorders- Sickle cell anemia, Down Syndrome, Thalassemia.

Unit III Replication and Transcription 16 h

DNA Sequences - Highly repetitive, moderately repetitive, and unique DNA sequences, Cot value. DNA as genetic material - experimental evidences. Semi conservative mechanism - Meselson and Stahl experiment. Mechanism and enzymology of replication in prokaryotes. Inhibitors of replication.

Prokaryotic transcription - Role of RNA polymerases and sigma factor, initiation, elongation and termination (Rho - dependent and independent). Inhibitors of transcription, post transcriptional modifications in prokaryotes and eukaryotes. RNA as genetic material - Retroviruses, reverse transcription.

Unit IV Genetic Code and Translation 10 h

Genetic Code - definition, salient features of genetic code. Prokaryotic protein biosynthesis - Translational activation of Amino acids, initiation, elongation and termination of protein synthesis. Inhibitors of protein biosynthesis. Post-translational modification of proteins.

Unit V Mutation, DNA Repair and Regulation of Gene expression 12 h

Concept of mutation and mutagens – Physical, chemical and biological mutagens.

Concept of missense, nonsense, point mutation, transition, transversion, and frameshift mutation. DNA repair mechanism – Direct /UV, Excision, Mismatch repair and SOS response. Gene expression in prokaryotes - Concept of Lac operon and trp Operon

Text Books

1 Benjamin A. Pierce, 2019, "Genetics: A Conceptual Approach", 7th Edition, W H Freeman & Co, New York.

2 Jeyanthi, G.P., 2009, "Molecular Biology", 1stEdition, MJP Publisher, Chennai.

References

1 Jocelyn E. Krebs, Elliott S. Goldstein, Stephen T. Kilpatrick, 2017, "Lewin's Genes XII", 12th Edition, Jones and Bartlett Publishers, Inc., United States.

2 Karp, G., Iwasa, J., and Marshall, W., 2015, "Karp's Cell and Molecular Biology: Concepts and Experiments", 8th Edition, John Wiley and Sons, New Jerssey

3 Klug, W.S., Cummings, M.R., Spencer, C.A., Palladino, M.A., and Killian, D., 2018,"Concepts of Genetics", 12th Edition, Pearson Education, London.

4 Lodish, H., Berk, A., Kaiser, C.A., Krieger, M., Bretscher, A., Ploegh, H., Amon A and Martin, K.C., 2016,"Molecular Cell Biology", 8th Edition, W.H. Freeman, New York.

Course Code	Course Name	Category	L	T	P	Credit
223BC1A5CB	PLANT BIOCHEMISTRY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Diverse physiological and biochemical processes that occur in plants
- Role of metabolic processes specific for plants
- Defense mechanisms in plants due to which plants survive under stresses

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Explain the stress physiology and biochemical events associated with water transport	K2
CO2	Summarize the biochemistry of photosynthetic process and photorespiration.	K2
CO3	Illustrate the cycles of elements and relate the roles of macro and microelements in plant growth.	K2
CO4	Outline the biochemical processes of plant development. Experiment with plant hormones.	K2
CO5	Identify the toxic compounds in plants and understand the biochemistry of secondary metabolites in plant defense mechanism.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A5CB	PLANT BIOCHEMISTRY	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Plant Cell and Physiology of Plants 9 h

Plant cell – Structure and functions of subcellular organelles. Diffusion and Osmosis in plants and their significance. Mechanism of water absorption, Ascent of sap. Transpiration - types, mechanism of transpiration and factors affecting transpiration. Structure, function and mechanisms of action of phytochromes, cryptochromes and phototropins. Stress response in plants- Biotic and Abiotic stress.

Unit II Photosynthesis and photorespiration 10 h

Photosynthetic apparatus, Role of photosynthetic pigments – chlorophyll, carotenoids and phycobilin. Light reactions, two kinds of chemical system – photo system I and II, cyclic and non-cyclic phosphorylation. Inhibitors of Photosystems. Evidences in support of light reaction – Hill's reaction, Arnon's work and Emerson effect. Calvin's cycle (C3 plants), Hatch – Slack cycle (C4 cycle) and CAM plants. Photorespiration.

Unit III Cycles of elements and Plant Nutrition 9 h

Nitrogen cycle: Ammonification, nitrification, nitrate reduction and denitrification. Nitrogen fixation- symbiotic and non-symbiotic nitrogen fixation. Sulphur cycle and phosphorus cycle. Gene manipulation of nitrogen fixation genes. Biological functions of essential elements and their deficiency symptoms in plants: Macronutrients - Carbon, Hydrogen, Oxygen, Nitrogen, Sulfur, Phosphorus, Calcium, potassium, Magnesium and Iron. Micronutrients - Manganese, Boron, Copper, Zinc, Molybdenum and Chlorine. Soil less Culture: Hydrophonics, Aerophonics and Aquaphonics.

Unit IV Biochemistry of Plant development 10 h

Plant Growth Hormones: Chemistry, biosynthesis, mode of action and physiological effects of auxins, gibberellins, cytokinins, abscisic acid and ethylene. Plant growth inhibitors and retardants. Biochemistry of Floral Development, seed dormancy and germination, fruit ripening and Senescence. Photoperiodism and vernalization.

Unit V Secondary metabolites and defense mechanism 10 h

Nature, distribution and biological functions of alkaloids, terpenes, flavonoids, poly phenols, tannins, lignin and plant steroids. Toxins of plant origin. Basic methods to identify the secondary metabolites. Applications of secondary metabolites - Drug development, Biopesticides and Biofertilizers. Secondary metabolites in defense mechanism - Polyamines, Brassinosteriods, Jasmonic acid and Salicylic acid - structural and functional characteristics

Text Books

1 Verma S.K., and Verma M., 2013, "A textbook of Plant Physiology, Biochemistry and Biotechnology", 6th edition, S. Chand & Co, New Delhi.

2 Goodwin Y.W., and Mercer E.I., 2003,"Introduction to Plant Biochemistry", 2nd edition, CBS Publishers and distributors, New Delhi.

References

1 Buchanan B.B., Gruissem W., and Jones R.L., 2015, "Biochemistry and Molecular Biology of Plants", 2nd edition, Wiley Blackwell, New Jersey.

2 Heldt H.W., and Piechulla B., 2016, "Plant Biochemistry", 4th edition, Academic Press, Cambridge, United States.

3 Taiz L., Zeiger E., Moller I.M., and Murphy A., 2015, "Plant Physiology",6th edition, Sinauer Associates, Sunderland.

4 Lea P.J., and Leegood R.C., 1999, "Plant Biochemistry and Molecular Biology", 2nd edition, John Wiley and Sons, Chichester, England.

Course Code	Course Name	Category	L	T	P	Credit
223BC1A5CC	IMMUNOLOGY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- the components of immune system and its functions
- about the Immune diseases
- the applications of immunological techniques

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Explain the types of immune responses; Illustrate the Cells of the immune system.	K2
CO2	Distinguish the antigen and antibodies; Classify the complement pathway and cytokines.	K3
CO3	Describe antigen and antibodies interactions; Transform the interaction into different assays.	K3
CO4	Compare the types of hypersensitivity reactions; Explain the autoimmune diseases, Cancer immunology, and transplantation immunology.	K4
CO5	Elaborate on pandemic, endemic, epidemic diseases. Explain the types of vaccines.	K4

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A5CC	IMMUNOLOGY	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Cells of the Immune system 10 h

History of Immunology, Innate and Acquired immunity, antibody and cell mediated immune response, primary and secondary lymphoid organs, structure of T, B and NK cell, Receptors on the lymphocytes, structure and function of Neutrophils, Eosinophils and Basophils, Macrophages-Phagocytosis and inflammation.

Unit II Antigen, Antibodies Complement and Cytokines 10 h

Antigen-properties, specificity, cross reactivity, antigenecity, Immunogenicity, antigen determinants, Haptens, adjuvants, self-antigen [MHC]. Antibodies-Structure, properties, classes, sub classes, Monoclonal and Polyclonal Antibodies and functions of Immuno-globulins. Complement pathways, cytokines: IFN, TNF, CSF and its functions.

Unit III Assays based on Antigen and Antibodies interactions 8 h

Antigen and antibody interaction- precipitation reaction-Precipitation in gel: Immune diffusion -Oudin, Oahley-Fulthope procedure, radial immune-diffusion and Ouchterlony procedure, Immuno-electrophoresis; Agglutination: Agglutination inhibition, Widal test; Principle and application: RIA, ELISA, Electro chemiluminescense, CMIA (Chemilumiscense Microparticle Immuno Assay), Immuno turbidometry. MMF (Microphenolic acid assay),Coomb's test.

Unit IV Hypersensitivity, Autoimmune disease, Cancer immunology and Transplantation Immunology 10 h

Allergy and Hypersensitivity – type – I, II, III and IV their clinical manifestation. Auto Immune diseases – Rheumatoid arthritis - Myasthenia gravis. Cancer immunology: Tumor: Lymphoid tumor, Resistant to tumors: NK Cells, Tumor immuno therapy.

Transplantation– Allograft rejection, graft Vs Host reaction, Immuno-suppressors–mechanism of graft rejection. Immunity to bacteria & Virus

Unit V AIDS, Influenza virus and Vaccines 10 h

Infectious diseases and Vaccines Pandemic disease - Influenza and COVID 19,

endemic disease -Malaria epidemic disease – AIDS and immune responses for the diseases – case studies.

Vaccination: Passive and active immunization, HERD immunity, basic aspects of immune responses to vaccines, Recombinant vaccines, DNA vaccines, mRNA vaccine, Influenza vaccine and COVID 19 vaccine, Benefits and adverse effects of vaccination

Text Books

1 Richard A Goldsby, Thomas J.Kindt, Barbara A Osborne, 2018, "Kuby's Immunology", 5th Edition, W.H.Freeman and Company, England.

2 Ananthanarayanan R and Yayaraman Panikar, 2013, "Text book of microbiology", 9th Edition, University Press Private Ltd., India

References

1 Jenni Punt, Sharon Stranford, Patricia Jones and Judy Owen, 2019, "Kuby Immunology", 8th edition, Macmillan Learning, US.

2 Tizard, Ian R., 2004, "Immunology (An Introduction)", 10th Edition, Thomson Publishers, Delhi.

3 Nandini Shetty, 2005, " Immunology", 2nd Edition, New Age International Publishers, Delhi.

4 Delves P.J., Martin S.J., Burton D.R. and Roitt I.M., 2016, "Roitt's Essential Immunology", 13th Edition, Wiley-Blackwell, USA.

223BC1A5CP	CORE PRACTICAL : PLANT BIOCHEMISTRY	SEMESTER V

Total Credits: 2
Total Instructions Hours: 48 h

S.No	Contents
1	Qualitative Analysis of phytoconstituents from medicinal plants
2	Estimation of reducing sugars (fructose) by Nelson-Somogyi method from fruits
3	Determination of protein by Lowry's method
4	Isolation, Estimation of Chlorophyll, and separation by TLC
5	Estimation of starch from potato by Anthrone method
6	Estimation of free amino acids by Ninhydrin method
7	Determination of total crude fat/oil by Soxhlet method
8	Estimation of Total Phenols by Folin Ciocalteau Reagent
9	Qualitative tests for oil
10	Determination of alpha amylase activity/proteinases/lipases from germinating seed
11	Isolation of genomic DNA from plant tissue
12	Preparation of plant tissue culture Media, Sterilization and Initiation of Callus culture.
13	Demonstration of Micropropagation and Regeneration
14	Demonstration of Hydrophonics

References

1. Carson S, Miller H B, Srougi M and Witherow D S, 2019, "Molecular Biology Techniques: A classroom laboratory manual", 4th edition, Academic Press, Cambridge, England.
2. Sadasivam S and Manickam A, 2018, "Biochemical Methods", 3rd edition, New Age International Publishers, New Delhi.
3. Green M R and Sambrook J, 2014, "Molecular Cloning - A Laboratory Manual", 4th Edition, Cold Spring Harbor Laboratory Press, USA.
4. Giri C C and Archana G, 2007, "Plant Biotechnology – Practical Manual", 1st edition, I.K. International, New Delhi.

223BC1A5CQ	CORE PRACTICAL : IMMUNOLOGY AND MOLECULAR BIOLOGY	SEMESTER V

Total Credits: 2
Total Instructions Hours: 48 h

S.No	Contents
1	Single radial immunodiffusion
2	Double radial immunodiffusion
3	Immuno electrophoresis
4	Haemagglutination test
5	Lymphocyte separation
6	Rheumatoid Arthritis test
7	Isolation of chromosomal DNA from *E. coli* cells and its Quantification (DBT Practical)
8	Isolation of total RNA from Yeast cells and its Estimation (DBT Practical)
9	Separation of DNA by agarose gel electrophoresis (DBT Practical)
10	Amplification of a DNA fragment by PCR (DBT Practical)
11	Transformation of *E. coli* cells with plasmid DNA (DBT Practical)
12	Demonstration of Western Blotting and Northern Blotting (DBT Practical)
13	Restriction digestion (RFLP) (DBT Practical)

References

1. Frank C. Hay, Olwyn M R Wesstwood, 2008, "Practical Immunology", 4th Edition, Wiley-Blackwell, USA.
2. Karp, G. 2010, "Cell and Molecular Biology: Concepts and Experiments" 6th Edition. John Wiley & Sons. Inc. United States
3. Watson, J. D., Baker T.A., Bell, S. P., Gann, A., Levine, M., and Losick, R., 2008 "Molecular Biology of the Gene", 6th Edition. Cold Spring Harbour Lab. Press, Pearson Pub, Canada

Course Code	Course Name	Category	L	T	P	Credit
223BC1A5SA	RECOMBINANT DNA TECHNOLOGY	SEC	3	-	-	2

PREAMBLE

This course has been designed for students to learn and understand

- Importance of PCR, sequencing techniques, vectors, cloning methods.
- Techniques, strategies and applications of rDNA technology.
- Acquaintance with the merits and demerits of genetically modified products.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	State the fundamental principles and enzymes used in rDNA technology	K1
CO2	Discuss various types of vectors & its cloning strategies	K2
CO3	Articulate the construction of DNA & cDNA library, recombinant DNA screening methods	K2
CO4	Explain the versatile techniques employed in recombinant DNA technology	K3
CO5	Examine the production of transgenic organisms, recombinant products and its ethical aspects.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A5SA	RECOMBINANT DNA TECHNOLOGY	SEMESTER V

Total Credits: 2

Total Instruction Hours: 36 h

Syllabus

Unit I Introduction and tools of recombinant DNA (rDNA) Technology 7 h

Aim and scope of rDNA technology. Isolation of Nucleic acids. Tools of rDNA technology – Restriction endonucleases – types and features. DNA Polymerases, Klenow DNA Polymerase I, Transferases, Polynucleotide kinases, Alkaline phosphatases and Ligases. Linkers and Adaptors. Safety guidelines of recombinant DNA research.

Unit II Vectors and gene cloning 9 h

Vectors - Basic feature, Plasmids, Bacteriophages, Cosmids, Artificial chromosomes, Shuttle vectors, Expression vectors - one example for each vector type. Cloning hosts for each vector. Introduction of cloned genes into cell – transformation, particle bombardment, liposome mediation, microinjection, ultrasonication and electroporation.

Unit III Construction of libraries and Screening of recombinants 5 h

Construction of Genomic and cDNA library. Screening and selection of recombinant clones: Colony hybridization, Marker genes, reporter genes, Insertional inactivation – Blue-white screening.

Unit IV Recombinant DNA techniques 7 h

Probes - probe construction and labeling. Principle of polymerase chain reaction (PCR) and applications, RT PCR - principle, technique and application. Genetic Finger Printing – RFLP, RAPD, site directed mutagenesis. Principle and procedure of Southern, Northern and Western blotting. DNA sequencing: Outline of Sanger's method – applications, Next Generation Sequencing (NGS), Gene mapping - Chromosome walking.

Unit V Applications of recombinant DNA technology 8 h

Applications of rDNA technology in animals: Production and applications of transgenic mice, role of ES cells in gene targeting in mice. Production of insulin, human growth factor and vaccine. Gene therapy, human genome project and its application, DNA microarray, Protein engineering. Ethical issues in GM products.

Text Books

1 Brown, T.A., 2016, "Gene Cloning and DNA Analysis - An Introduction", 7th edition, Blackwell Scientific Publications. India.

2 Primrose, SB., and Twyman, R., 2019, "Principles of Gene Manipulation and Genomics ", 9th edition, Wiley Blackwell, USA.

References

1 Glick R. Bernard and Pasternak J. Jack., 2002, "Molecular Biotechnology", 3rd edition, ASM press, Washington D.C.

2 David W. Russell and Joseph Sambrook, 2012, "Molecular Cloning: A Laboratory Manual", 4th edition, Cold Spring Harbor Laboratory Press, New York.

3 Keya Chaudhuri, 2013, "Recombinant DNA Technology", The Energy and Resources Institute (TERI), New Delhi.

4 James D. Watson, Amy A. Caudy, Richard M. Myers, and Jan A. Witkowski, 2007, "Recombinant DNA: Genes and Genomes – A Short Course", 3rd edition, W.H. Freeman & Co Ltd., New York.

5 Rajagopal K., 2012, "Recombinant DNA technology and Genetic Engineering", Tata McGraw Hill Education Private Limited, Noida, India.

Course Code	Course Name	Category	L	T	P	Credit
223BC1A5DA	BLOOD BIOCHEMISTRY AND HEMATOLOGY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The basic composition and functions of blood
- Interpretation of normal values in hematology, covering red blood cell count, white blood cell count, platelet count, and other indices essential for clinical diagnosis.
- The knowledge of hematopoietic disorders and Immunohematology

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Identify the components of blood plasma and their functions, as well as the morphological characteristics of blood cells	K1
CO2	Infer the haematological parameters and its analysis	K2
CO3	Classify hematological disorders and interpret diagnostic tests in clinical contexts	K3
CO4	Understand the physiology of hemostasis and Coagulation disorders	K4
CO5	Exposure to blood transfusion and immunohematology techniques	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A5DA	BLOOD BIOCHEMISTRY AND HEMATOLOGY	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to Blood Composition and Function 10 h

Overview of blood -Definition, classification, basic functions, composition of blood - Plasma: Components and functions, Formed elements: Red blood cells, white blood cells, platelets. Blood Cell Morphology: Morphological characteristics of different blood cells, Interpretation of blood smears. Hematopoiesis: Process of blood cell formation, Organs involved in hematopoiesis. Blood Groups - ABO blood group system, Rh factor and its significance

Unit II Introduction to Hematological parameters 10 h

Haemoglobin (Hb): Structure and functions. Haemoglobin estimation – Spectrophotometric and gasometric method.

RBC Count and WBC Count by Bulk and micropipette method, Erythrocyte Sedimentation Rate, Complete blood count (CBC), Red blood cell indices and their clinical significance. Comprehensive Metabolic Panel (CMP). Acid base balance - Normal range, disturbances in acid base balance - acidosis, alkalosis and its analysis by blood gas test.

Unit III Hematological Disorders 10 h

Classification, causes, pathophysiology, symptoms, diagnosis and treatment options of hematological disorders- Hemoglobinopathies: Thalassemia, Red cell G6PD deficiency; WBC: Leukocytosis, leukopenia, Neutropenia, leukaemia, Myelodysplastic syndrome; Platelets: Thrombocytosis and thrombocytopenia, Immune thrombocytopenic purpura (ITP), Thrombotic thrombocytopenic purpura (TTP)). Pancytopenia.

Unit IV Hemostasis in blood Coagulation & Hematological Techniques 10 h

Physiology of hemostasis: Coagulation - cascade, role of clotting factors and coagulation inhibitors. Fibrinolysis and Test for blood fibrinolytic activity. Coagulation Studies - Prothrombin time (PT), Clot Retration test, activated partial thromboplastin time (aPTT), International normalized ratio (INR), D-dimer assay. Anticoagulant therapy - Heparin, warfarin, direct oral anticoagulants (DOACs)

Unit V Blood Transfusion and Immunohematology 8 h

Blood transfusion - Procedure, types & complications. Blood donation and storage, Blood banks. Hematopoietic stem cell transplantation- High resolution HLA typing using next-generation sequencing. Immunohematology: Direct and indirect Coombs tests. Molecular methods in blood group genotyping - DNA Sequencing and Pirosequencing

Text Books

1. Guyton, Arthur C., John E. Hall., 2000, "Textbook of Medical Physiology." 9th Edition, W B Saunders Co Ltd, London

2. Kenneth Kaushansky, Marshall A. Lichtman, Josef Prchal, Marcel M. Levi, Oliver W. Press, Linda J. Burns, Michael Caligiuri., 2015, "Williams Hematology". 9th Edition, McGraw Hill Professional, New York

References

1 Smith, J. A., 2020, "Blood Biochemistry and Hematology: Understanding Blood Composition and Function", Academic Press, United States.

2 Harmening, D.M., Hutson, L.M., 2024, "Clinical Hematology and Fundamentals of Hemostasis", 6th edition, Rush University, Chicago.

3 Mukherjee, K.L., 2010, "Medical Laboratory Technology - a Procedure Manual for Routine Diagnostic Tests" Vol. II. Tata Mc Graw – Hill Publishing Company Ltd. (New Delhi).

4 Villatoro, V., & To, M., 2019, "A laboratory guide to clinical hematology", 1st Edition, University of Alberta, Canada.

Course Code	Course Name	Category	L	T	P	Credit
223BC1A5DB	ENVIRONMENTAL BIOCHEMISTRY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- An overview and concepts of environmental biochemistry.
- Basic knowledge on fundamental of ecology.
- Global environmental issues and International laws

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Recall the Environmental components and Hydrological cycle	K1
CO2	Illustrate the concept of ecosystems, aquatic ecosystem, terrestrial ecosystem, energy flow in ecosystems, nutritional flux	K2
CO3	Apply the Classification of biomes, major biotic elements of each biome and their characteristics	K3
CO4	Develop knowledge of the Global environmental issues and International laws	K4
CO5	Outline the consequences of Phytoremediation and Chemical toxicology	K1

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
✓	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A5DB	ENVIRONMENTAL BIOCHEMISTRY	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Environmental features 10 h

Environmental components: Atmosphere, structure and chemical composition of atmosphere, Internal structure of the Earth, rocks and their classification. Classification of trace elements, mobility of trace elements. Biogeochemical cycles and Hydrological cycle. Soil formation, soil profile, soil classification, soils of India. Global Water Balance

Unit II Ecology & Pollution 10 h

Fundamentals of Ecology: Definition, subdivisions. Ecosystems: concept of ecosystems, aquatic ecosystem, terrestrial ecosystem, energy flow in ecosystems, nutritional flux. Carbon foot Print- ecology & Conservation, Carbon Credits. Environmental Sample Collection and Processing; Environmental pollution, Sampling of air, soil and water pollutants. Hydrocarbons, substituted hydrocarbons, oil pollution surfactants.

Unit III Biomes and Biodiversity 8 h

Biomes: Classification of biomes, major biotic elements of each biome and their characteristics. Population growth curves, life history strategies (r & k selection); concept of meta population. Biodiversity: Types of diversity; Genetic diversity, Species diversity and Ecosystem diversity. Gene banks; Cryopreservation. National Biodiversity Strategies and Action Plans (NBSAPs)

Unit IV Environmental laws 10 h

Global environmental issues and International laws: Global warming and International initiatives to control global warming. Green house effect, ozone depletion, acid rains, hazardous waste, CITES etc. Environmental policies in India. Important environmental treaties signed by India. Earth's carbon cycle, carbon sequestration, sustainable development. Water quality parameters- pH, Dissolved Oxygen (DO), Chemical Oxygen demand (COD); Biological Oxygen demand (BOD).

Unit V Bioremediation and Technology 10 h

Bioremediation: Introduction and types of bioremediation, bioremediation of surface soil and sludge, bioremediation of subsurface material, Phytoremediation In situ and Ex-situ technologies, Phytoremediation. Chemical toxicology: Biochemical effects of heavy metals (Pb, As, Hg, Cd), pesticides, insecticides, herbicides, weedicides, larvicides, Biocontrol of plant pathogens; Integrated pest management-practical implementation, Role of biotechnology in management of resources; Uses of Technology; Microbes in Human Welfare

Text Books

1 Gary W. Barrett., Eugene Odum.,2008,"Fundamentals of Ecology" 2nd edition, Oxford & IBH publishing Co.pvt..ltd, New Delhi.

2 Dr.S.S Dara and Dr.D.D Mishra, 2014, "Textbook of environmental chemistry and pollution control" revised edition, S.Chand & company Pvt Ltd, New Delhi.

References

1 Anil Kumar DE, Arnab Kumar DE,2010,"Environment and ecology" 2nd edition, New Age International Pvt, Publishers, New Delhi.

2 Dr.P.S.Verma &Dr.V.K.Agarwal.S,2019,"Environmental Biology (Principles of Ecology)",13th edition, S. Chand Publishing & Company Ltd New Delhi.

3 Arnab Kumar DE (AKDE).,2017,"Environmental Chemistry" 8th edition, New age International Pvt (Ltd), Publishers, New Delhi.

4 Majid Husain 2013,"Environment and Ecology: Biodiversity, Climate Change and Disaster Management",3rd edition, Access Publishing India Pvt (Ltd),New Delhi.

Course Code	Course Name	Category	L	T	P	Credit
223BC1A5DC	DAIRY BIOCHEMISTRY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The standard composition of dairy products for quality check
- The adulterations and food processing techniques in dairy industries
- The analytical instruments and techniques used for diary biochemistry

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Outline about the standard levels of physical, chemical and microbial counts of dairy products	K1
CO2	Describe about the adulterations in milk and milk products	K2
CO3	Explain Food processing of milk products	K3
CO4	Elucidate instrumentation and analytical techniques for quality check and food processing	K3
CO5	Discuss about the major functional bodies for dairy industries	K4

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A5DC	DAIRY BIOCHEMISTRY	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Standard composition of milk 10 h

Standard composition- Physical properties and chemical properties of milk. Milk proteins-classification. Milk microbiology – microbial load, beneficial microbes and somatic cell count. FSSAI standards for milk.

Unit II Adulteration in dairy products 8 h

Adulterants in milk: Definition, different types, health implications. Adulteration in milk products: Cheese- Cellulose powder, Butter - vegetable oils and maize dough, ice creams, infant milk powder, curd and other value added products.

Unit III Food Processing 10 h

Receipt and filtration, separation of milk components, pasteurisation, homogenisation, deodorisation, product specific processing, packaging and storage. Value added products from milk: manufacturing methods and limitations.

Unit IV Instruments and techniques involved in dairy industries 10 h

Quality check: Lactometer and butyrometer. Analytical techniques: GCMS, HPLC and LCMS in testing milk metabolites. Microbial analysis: methylene blue and phosphate test, standard plate count, total bacterial count and total coli form count. Instruments used in processing: homogeniser, pasteurizer, aging vats, aseptic, UHT & ESL filling & process machinery.

Unit V Dairy organizations 10 h

Government concerns for dairy: Department of animal husbandry and dairy, Ministry for food processing India, FSSAI. Global agencies: International Dairy Federation, global dairy platform. Funding agencies for dairy products.

Text Books

1. Wong N.P, et al, 1988,"Fundamental of Dairy Chemistry", 3rd edition.Van Nostrand, Reinhold Company, New York..
2. Fox P. F, et al, 1998,"Dairy Chemistry and Biochemistry", 1st edition. Blackie Academic Professional, Champman and Hall, London.

References

1. Law B.A, 1997,"Microbiology and Biochemistry of Cheese and fermented milks", 2nd edition. Blackie Academic and Professional, Chapman and Hall, London.
2. Srinivas D and Praf A, 1997,"Food Proteins and their Applications", 1st edition. Marcel Dekker, New York.
3. Turker G.A, and Woods, L.F.J, 1995, "Enzymes in Food Processing" 1st edition.Blackie Academic Professionals, London..
4. Turker, G.A. and Woods, LFJ, 1995. Enzymes in Food Processing. Blackie Academic Professionals.

Williams P.A and Phillips G.O, 2000, "Gums and Stabilizers for the Food Industry", 1st edition. Royal Society of chemistry, United Kingdom.

223BC1A5GA	GENERIC ELECTIVE: ORGANIC FARMING: PRINCIPLES AND PRACTICES	SEMESTER V

Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I Introduction to Organic Farming 5 h

Organic farming: definition, concept, principles. Difference between conventional and organic farming. Relevance of organic farming in global and Indian scenario, future prospects. SWOT analysis of Indian organic farming.

Unit II Organic Farm Management 5 h

Organic Farm Management - Land preparation - Tools and Technique, Preparation of seed bed , manuring, sowing, watering and raising of seedling.

Unit III Nutrient Management 4 h

Organic residues, organic manures, composting, vermicomposting, green manures and biofertilizers, Indigenous liquid organic manures.

Unit IV Plant Protection and Production 5 h

Indigenous liquid formulations for crop production and plant protection. Weed management, disease prevention and management, insect pest management practices.

Urban farming systems: concept and use of vertical farming, roof-top farming.

Unit V Marketing and economy of organic farming 5 h

Block chain technology. Marketing and export potential, inspection, certification, labeling and accreditation procedures for organic farming and organic produce. Socio-economic impact of organic farming. Field visit.

Text Books

1 Shetty. P. K., Claude Alvares, Ashok Kumar Yadav, 2014, "Organic Farming and Sustainability", National Institute of Advanced Studies, IISc Campus, Bangalore, India.

2 Sharma, A, 2002, "A Hand Book of Organic Farming", Agrobios, India.

References

1 Palaniappan, S.P and Anandurai, K, 2010," Organic Farming – Theory and Practice", Scientific Publishers, India.

2 Rana SS, 2011, " Organic Farming", Department of Agronomy, College of Agriculture, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur, Himachal Pradesh, India.

3 Allen V. Barker, 2010, "Science and Technology of Organic Farming", CRC Press, Taylor & Francis Group, United States.

4 Harshita Joshi, 2019," Growing a Home Garden: A Simple Guide for Beginners", Agrihortico, India.

4/4/24
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Academic Council
17/04/2024
CHAIRMAN
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Course Code	Course Name	Category	L	T	P	Credit
223BC1A6CA	CLINICAL BIOCHEMISTRY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- the constituents and collection body fluids
- the disorders of carbohydrate, lipid, amino acids, purine, pyrimidine and porphyrin metabolism
- the clinical principles underlying the investigations in human disease

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Outline the constituents and collection body fluids	K2
CO2	Illustrate about Diabetes mellitus, other carbohydrate related disorders and its diagnosis	K3
CO3	Explain about Lipids related disorders and its diagnosis	K3
CO4	Evaluate the disorders of amino acid, purine, pyrimidine and porphyrin metabolism and its diagnosis	K4
CO5	Analyze the enzymes in disease and Demonstrate the Liver, Renal and Thyroid function tests	K4

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A6CA	CLINICAL BIOCHEMISTRY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Sampling of biological material 10 h

Urine: Volume, pH, colour, specific gravity. Normal and abnormal Constituents. Blood: Normal and abnormal constituents of blood. Other body fluids: CSF, pleural fluid and aspirated fluids. A brief review of units and abbreviations used in expressing concentrations and standard solutions. Specimen collection: blood, urine, stools, sputum and saliva. Storage and Transport of biological samples.

Unit II Disorders of Carbohydrate metabolism 10 h

Disorders of Carbohydrate metabolism: Diabetes mellitus: Normal glucose level in blood, renal threshold and regulation of blood glucose concentration, aetiology, types of diabetes mellitus, Acute and chronic complications of Diabetes mellitus and diagnosis- Urine testing, random blood sugar, GCT, HbA1c and GTT. Galactosemia, Fructosuria and Glycogen storage diseases.

Unit III Disorders of lipid metabolism 9 h

Disorders of lipid metabolism: lipoproteinemias, Fatty liver, Hypo and hypercholesterolemia, Atherosclerosis - aetiology, clinical features and complication.

Coronary artery disease and Stroke - aetiology, clinical features and complication. Diagnosis- Lipid Profile, Apo A, Apo B, LpA.

Unit IV Disorders of amino acids metabolism 9 h

Disorders of amino acids metabolism -Etiology, clinical manifestation and diagnosis of phenyl ketonuria, cystinuria, alkaptonuria, Homocystinuria, Fanconi's syndrome, albinism and tyrosinemia, Disorders of purine, pyrimidine and porphyrin metabolism- Hyperuricemia and gout. Lesch- Nyhan syndrome. Orotic aciduria, porphyrias.

Unit V Liver, Renal and Thyroid function test, Clinical Enzymology 10 h

Liver Function tests- jaundice-types, clinical features and test based on bile pigments, Serum enzymes, PT. Renal function tests-Clearance tests-urea, creatinine, PAH test. Thyroid function tests-Significance and measurement of T3, T4 and TSH values

Clinical enzymology-Definition of Functional and non-functional plasma enzymes. Isozymes and diagnostic tests, enzyme patterns in acute pancreatitis, bone disorders and myocardial infarction.

Text Books

1. Burtis and Bruns, 2014, "Tietz fundamentals of Clinical Chemistry and Molecular Diagnostics", 7th edition, Saunders, US.
2. William J Marshal, Marta Lapsley, Andrew P Day and Ruth M Ayling, 2014, "Clinical Biochemistry: metabolic and Clinical aspects", 3rd edition, Churchill Livingstone, London.

References

1. T.M. Delvin (editor), 2010, "Text book of biochemistry with clinical correlation", 7th edition, John wiley& Sons Inc. USA.
2. Larry jameson.J, Anthony S.Fauci, Dennis L Kasper, Stephen l Hauser, 2012, "Harrison's Internal Medicine", 20th Edition, MC Graw Hill Publishers, New York.
3. Phlip.D.Mayne, 2002, " Clinical Chemistry in diagnosis and treatment", 6th edition, Arnold Association Publication, New Delhi.
4. Nader Rifai, Andrea Rita Horvath, Carl T.Wittwer , 2019, "Tietz Textbook of Clinical Chemistry and Molecular Diagnostics" ,8th edition, , Saunders Publishers, US.

Course Code	Course Name	Category	L	T	P	Credit
223BC1A6CB	HORMONAL BIOCHEMISTRY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The diverse group of hormones and their specific mechanism of action
- Regulatory functions & their interrelationship in the endocrine disorders
- Management of endocrine disorders

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Summarize classification and mechanism of action of various hormones	K2
CO2	Describe biochemical actions & endocrine disorders of hypothalamic hormones and pituitary hormones	K2
CO3	Illustrate the biosynthesis, physiological actions & pathophysiology of thyroid and parathyroid hormone	K3
CO4	Interpret the biochemical actions and pathophysiology of pancreatic and GI tract hormones	K3
CO5	Summarize the biochemical effects of adrenal and reproductive hormones	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A6CB	HORMONAL BIOCHEMISTRY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to Endocrine System 10 h

Hormones- definition, classification- Chemical nature and mechanism of action. Receptors- Structural features and regulation. Role of second messengers in hormone action. Feedback regulation of hormones

Unit II Hypothalamus and pituitary hormones 10 h

Hypothalamic Releasing Factors and Pituitary hormones: Secretion, transport, regulation and biological effects. Hypo and Hyper activity of pituitary hormones: Acromegaly, Dwarfism, Diabetes Insipidus.

Unit III Thyroid hormones and Calcium Homeostasis 8 h

Biosynthesis, secretion, transport, regulation and biological effects of thyroid hormones. Hypo and hyperthyroidism. Anti-thyroid agents

Role of parathyroid hormones, Calcitonin and Calcitriol in maintaining calcium and phosphorus homeostasis. Hypo and hyper parathyroidism.

Unit IV Pancreatic and Gastro intestinal hormones 10 h

Pancreas - Islets of Langerhans- cell types, biological effects of Insulin and Glucagon. Disorders of hypo and Hyper secretion of pancreas.

Gastro intestinal hormones. Adipocyte hormones: Adiponectin and leptin; Appetite and satiety control. Happy Hormones: Biological effects

Unit V Adrenal hormones and reproductive hormones 10 h

Biosynthesis, secretion, transport, biological effects of adrenal cortical and medullary hormones, Adrenal gland disorders.

Male and female sex hormones. Interplay of hormones during ovarian and uterine phases of menstrual cycle; Placental hormones; role of hormones during parturition and lactation. Hormone based contraception. Reproductive hormone disorders- Menorrhea, Menorrhagia, Premenstrual syndrome, Polycystic Ovary Syndrome, Menopause

Text Books

1 Nelson, D. L., & Cox, M. M, 2017, "Lehninger principles of biochemistry", 7th edition, W. H. Freeman and Company, NewYork.

2 Widmaier, E.P., Raff, H. and Strang, K.T. 2008, "Vander's Human Physiology", 11th edition., McGraw Hill International Publications, New York .

References

1 Hadley, M.C. and Levine, J.E., 2007, "Endocrinology", 6th edition, Pearson Education, New Delhi.

2 Melmed, S., Polonsky, K. S.P., Larsen, P. R. and Kronenberg, H. M., 2015, "Williams Textbook of Endocrinology", 12th edition, Elsevier Health publishers, Netherland.

3 Hall, J.E., 2015, "Guyton and Hall Textbook of medical physiology", 13th edition , W.B. Saunders company publisher, USA.

4 Murray, R., Granner, D., Mayes, P. and Rodwell, V., 2006, "Harper's Illustrated Biochemistry", 27th Edition, McGraw-Hill Education, New York.

223BC1A6CP	CORE PRACTICAL: CLINICAL AND HORMONAL BIOCHEMISTRY	SEMESTER VI

Total Credits: 2
Total Instructions Hours: 48 h

S.No	Contents
1	Estimation of blood glucose by Ortho-toluidine method)
2	Glucose tolerance test
3	Estimation of Total protein in serum by Biuret Method
4	Estimation of Cholesterol in serum by Zak's method
5	Serum lipid profile – Kit method
6	Estimation of Urea in serum by DAM TSC method
7	Estimation of Alanine Transaminase (ALT) activity in Serum
8	Estimation of Aspartate Transaminase (AST) activity in Serum
9	Estimation of Alkaline phosphatase (ALP) activity in serum
10	Estimation of creatinine in urine by picric acid method
11	Estimation of serum Ca2+
12	Estimation of serum TSH, T3 and T4
13	HCG based pregnancy test
14	Estimation of serum electrolytes

References

1. Gowenlock A H, 2006, "Varley's Practical clinical biochemistry", 6th edition, CBS Publishers, New Delhi.
2. Victor J Temple, Rachael Rowe, Nigani Willie and Samson Grant, 2013, "A Practical Manual in Biochemistry & Clinical Biochemistry", 4th edition, University of Papua New Guinea Press, Papua New Guinea.
3. Luxton R, 2008, "Clinical Biochemsitry", 2nd Edition, Scion Publishing Limited, England.
4. William J Marshal, Marta Lapley,Andrew P Day, Ruth M Ayling, 2014, "Clinical Biochemistry: metabolic and Clinical aspects", 3rd edition, Churchill Livingstone, London.

Course Code	Course Name	Category	L	T	P	Credit
223BC1A6SA	MOLECULAR DIAGNOSTICS	SEC	4	-	-	2

PREAMBLE

This course has been designed for students to learn and understand

- the important parameters in the design of a quality system for molecular analysis
- techniques required in order to perform the molecular diagnostics protocols
- the significance of laboratory procedures to the appropriate disease process

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Summarize the basics of molecular diagnostics	K2
CO2	Describe the various tests used for predicting disorders	K3
CO3	Illustrate the PCR techniques for diagnosis of disease	K3
CO4	Interpret the applications of immune techniques	K4
CO5	Explain the procedure and ethical issues in Prenatal and pre-implantation	K5

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A6SA	MOLECULAR DIAGNOSTICS	SEMESTER VI

Total Credits: 2

Total Instruction Hours: 48 h

Syllabus

Unit I Basics of Molecular Diagnostics 10 h

Introduction and history of diagnostics, Applications in various medical field. Cytogenetic testing- Karyotyping, Chromosome banding analysis, Comparative genomic hybridization (CGH), Chromosomal microarray analysis, Chromosomal microarray analysis and Chromosome banding analysis. Fluorescence insitu hybridization.

Unit II Diagnosis of Genetic Disorder 10 h

Strategy of Genetic Testing- Family History, Pedigree chart, Biochemical analysis and samples used. Samples used for Genetic disorder testing. Case study for pedigree analysis and Sequencing Demonstration. Sequencing based diagnosis: Whole genome sequencing (WGS), Multiplex Ligation dependent Probe Amplification (MLPA), Allelic susceptibility test for multifactorial disorders (Neural Tube Defect, Cleft Lip and Palate, Cardio Vascular Disorder, Male infertility)

Unit III Applications of PCR in diagnosis of diseases 10 h

Applications of PCR- PCR based microbial typing: RT-PCR, Eubacterial identification based on 16S rRNA sequences- Amplified Ribosomal DNA Restriction analysis (ARDRA)- Culture independent analysis of bacteria- DGGE and TRFLP. Molecular diagnosis of fungal pathogens based on 18S rRNA sequences- Detection of viral pathogens through PCR. Application of metagenomics.

Unit IV Immunodiagnostics 10 h

Immunodiagnostics - Introduction, antigen-antibody binding interactions and assays;. Immunohistochemistry assay - Detection of Breast cancer, colon cancer and detection of Hepatitis B infection.

Unit V Prenatal and pre-implantation diagnosis 8 h

Risk evaluation (Mendelian risk, empirical risk), Prenatal and pre-implantation diagnosis. Noninvasive: Triple test, Ultrsonography (USG), Invasive: Amniocentesis (AC), chorionic villi sampling (CVS), Fetal blood sampling (FBS),

Population screening for genetic disorders, Treatment and management of genetic disorders

Genetic Counseling, Ethical and legal issues in genetic counseling

Note

1 Case study for pedigree analysis and Sequencing Demonstration – only for Internal Assessment

Text Books

1 David E Bruns, Edward R Ashwood, Carl A Burtis, 2017, " Fundamentals of Molecular Diagnostics", 1st Edition, Saunders Group, United States

2 W.B. Coleman, 2006,"Molecular Diagnostics for the Clinical Laboratorian" 2nd Edition, Humana Press, United states.

References

1 William B Coleman, Gregory J, Tsongalis, 2009, "Molecular Pathology: The Molecular Basis of Human Disease" 1st edition, Academic Press, Unites State.

2 Lele Buckingham, Maribeth L, 2007, "Flaws Molecular Diagnostics: Fundamentals, Methods & Clinical applications", 3rd Edition, F.A. Davis Company, United State.

3 Richard J Epstein, Human Molecular Biology, 2003, "An Introduction to the Molecular Basis of Health and Disease", Cambridge University Press, United Kingdom.

4 David H Persing, Fred C Tenover, James Versalovic, Yi-Wei Tang, Elizabeth R Unger, David A, Relman, and Thomas J White, 2003,"Molecular Microbiology: Diagnostic Principles and Practice", ASM Press, Washington DC.

Course Code	Course Name	Category	L	T	P	Credit
223BC1A6DA	NEUROBIOCHEMISTRY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Overview of nervous system organization and function.
- Neuronal transmission in the body.
- Pathways and mechanisms of neuronal disorders.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Describe the morphogenesis of the central nervous system	K2
CO2	Illustrate the functioning of the components of the nervous system	K3
CO3	Elucidate the role of different neurotransmitters in nerve impulse conduction	K4
CO4	Examine the process of vision, olfaction and taste sensation in detailed pathways	K4
CO5	Analyze the neurologic process behind the different neurological diseases	K4

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A6DA	NEUROBIOCHEMISTRY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Morphogenesis of central nervous system 10 h

Structure and functions of central nervous system: The brain and the spinal cord. Structure and functions of Peripheral Nervous System Structure and functions of neuron. Types of neurons: multipolar, bipolar, pseudo-unipolar and unipolar. Neuroglia: astrocytes, oligodendrocytes, microglia, and ependymal cells. Myelinated axons.

Unit II Functions of Nervous System 10 h

Neuron, Sensory Receptors, Effectors, information processing, memory. Structure and permeability of neuronal membrane: membrane transport proteins, mode of transport, synapse: types (chemical and electrical), Physiologic Anatomy of the Synapse: Presynaptic Terminals, resting membrane potential, Action Potential and propagation, equilibrium membrane potential, Ion Channels (properties and classification), Second Messenger system, Excitation/inhibition in post synaptic membrane.

Unit III Neurotransmitters 10 h

Neurotransmitters: definition, properties, classes, mechanism of neurotransmitter release. Synthesis, release, physiological and clinical considerations of acetyl choline, GABA, dopamine, nor epinephrine, epinephrine, serotonin, histamine, nitric oxide and novel neurotransmitters. Receptors: nicotinic acetyl choline, NMDA and opioid receptors. Mechanisms of Regulation of Receptors: Desensitization and Down- Regulation.

Unit IV Visual, Olfaction and Taste system 9 h

Visual system: components of eye, cells of cons and rod, different layers of eye, photoreceptors, photo transduction, visual cycle. Olfaction and Taste: organization, receptors, sensory transduction, central pathways for olfaction and taste.

Unit V Neurological diseases 9 h

Pathophysiology, clinical intervention and Management of neurological diseases: Alzheimer's disease, Parkinson's disease, Schizophrenia, Huntington's disease, Epilepsy and Depression disorder.

Text Books

1 Allan Siegel, Hreday N. Sapru, 2018, "Essential Neuroscience", 4th Edition, Lippincott Williams & Wilkins, a Wolters Kluwer business, United States.

2 John E. Hall, Arthur C. Guyton, 2021, "Guyton and Hall Textbook of Medical Physiology", 14th edition, Saunders, an imprint of Elsevier Inc., United States.

References

1 Alan Longstaff, 2011, "Instant notes. Neuroscience", 3rd edition, Taylor & Francis Group, United Kingdom.

2 Dale Purves, George J. Augustine, David Fitzpatrick, William C. Hall,Anthony-Samuel lamantia, James O. Mcnamara, S. Mark Williams, 2017, "Neuroscience", 6th edition, Sinauer Associates, Inc. USA.

3 Kim E. Barrett, Susan M.Barman, Scott Boitano, William F. Ganong Heddwen L. Brooks, 2019, "Ganong's Review of Medical Physiology", 26th edition, McGraw Hill Education, United States.

4 Harald Sontheimer, 2015, "Diseases of the Nervous System", 1st Edition, Academic Press, United State.

Course Code	Course Name	Category	L	T	P	Credit
223BC1A6DB	MARINE BIOCHEMISTRY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- the Biochemical composition as well as the nutritional and medicinal value of shellfish and raw fish
- the Digestion, absorption mechanism and respiratory functions
- the Endocrine Glands and its osmoregulation mechanism

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Explain about Physiology of digestion and Respiration	K2
CO2	Illustrate about Dissolved gases & Classification of Marine sediments present in ocean	K3
CO3	Demonstrate the different endocrine glands and its osmoregulation	K3
CO4	Summarize the significance of biochemical composition and its Nutrition of algae and Fish.	K2
CO5	Analyze the bioactive compounds that serves as marine natural products	K4

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A6DB	MARINE BIOCHEMISTRY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Physiology of digestion and Respiration 10 h

Digestion and absorption. Digestive enzymes and their role with food habits. Respiratory structures and functions - factors affecting respiration, Role of transport of O2 and CO2, Adaptations to hypoxia and anoxia.

Unit II Dissolved gases, Marine sediments & Chemical composition of seawater 10 h

Carbon dioxide system and oxygen in the sea, hydrogen sulphide and noble gases - methane. Origin and physical properties of sediments, classification of marine sediments. Chemical composition of seawater: Ionic composition of seawater, major and minor constituents, trace elements, their importance and distribution; Concept of chlorinity and salinity; Nitrogen, phosphorus and silicon cycles.

Unit III Endocrine systems and Osmoregulation 9 h

Physiology of Endocrine system, hormones of reproduction in fin fishes and shell fishes. Moulting in crustaceans. Physiology of ionic and osmoregulation - ions in body fluids, mechanism of ionic regulation, responses to osmotic conditions, types of osmoregulatory adaptations. Biochemistry and physiology of Osedax worms, hagfish, polar fish.

Unit IV Marine biology & Biochemical constituents 10 h

Introduction and history of marine science. Biochemical Composition of raw fish and algae. The nutritive and medicinal value of fish and algae: Protein, fat, carbohydrates, moisture, ash, oils, minerals, vitamins etc. Nutritional value of preserved and processed fish and algae.

Unit V Marine natural products & Human Impact 9 h

Bioactive compounds from marine algae, isolation and mode of action. Eicosonoids and related compounds from marine algae. Medicinal uses marine algae. Cultivation of marine Algae. Human Impact on Marine Ecosystems: Pollution (plastics, heavy metals) and overfishing, and their biochemical implications.

Text Books

1 Steven Emerson, John Hedges, 2008, "Chemical oceanography and the Marine carbon cycle", Ist Edition, Cambridge University Press, UK.

2 John Morrissey, James L. Sumich, Deanna R. Pinkard-Meier, 2016, "Introduction to the Biology of Marine Life" 11th Edition, Bartlett Publisher, US.

References

1 Jeffrey S Levinton, 2017," Marine Biology-Function, Biodiversity, Ecology", 5th Edition, Oxford University Press, London.

2 Susan M Libes, 2009, "Introduction to Marine Biogeochemistry", 2nd Edition, Academic Press Inc, USA.

3 Vernberg, W.B. and F.J. Vemberg, 2011, "Environmental Physiology of Marine Animals", 1st Edition, Springer Verlag Berlin, New York.

4 James Travis Jenkins, 2013. "A Textbook of Oceanography", Pearson Education India, 11th Edition, Hard press Publishing, UK.

Course Code	Course Name	Category	L	T	P	Credit
223BC1A6DC	SPORTS BIOCHEMISTRY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Functioning of human physiology during sports and exercise
- Physiological changes that occur during sports
- Nutrition for sports persons

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Explain the importance of sports, exercise and games	K2
CO2	Demonstrate change in the muscle metabolic changes during and after exercise	K2
CO3	Identify the changes in cardio respiratory system during exercise	K3
CO4	Examine the physical fitness	K3
CO5	Analyze on the nutritional requirements for sports	K4

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	
CO2	✓	✓	✓	✓	
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A6DC	SPORTS BIOCHEMISTRY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I **Sports, Exercise & Games** 11 h

Introduction, calisthenics, Gymnastics, combative and swimming; Yogasana and its importance – Padmasana, Vajrasana, Dhanurasana, and Suryanamaskar; Track and field events – Running and Jumping Team events – Kabaddi.

Unit II **Skeletal Muscle System & Metabolic Systems in Exercise** 10 h

Skeletal muscle types relation with different types of activities; strength, power and endurance of muscles. Muscle metabolic systems in exercise: Recovery of muscle metabolic systems after exercise. Role of hormones in skeletal muscle metabolism.

Unit III **Cardio Respiratory Systems** 9 h

Muscle blood flow and cardiac output during exercise; Oxygen consumption and pulmonary ventilation in exercise; Hypoxia and hypercapnia. Hormones involved in cardio respiratory systems.

Unit IV **Physical Fitness Assessment** 6 h

Body composition; body fat percentage by skin fold method, BMI; Ideal height, weight assessment of muscle mass based on age.

Unit V **Nutrition for Sports and Exercise** 12 h

Nutritional considerations for sports person: Carbohydrate - Energy source for sports and exercise; carbohydrates composition for pre-exercise, during and recovery period. Fat - Role as an energy source; effect of fasting and fat ingestion. Protein - Protein requirement during exercise, recovery process and protein supplement. Vitamins - Role of B-complex vitamins. Minerals - Role of Potassium and sodium.

Text Books

1 B.N. Dash, 2009, "Health and Physical Education", Neelkamal Publications Pvt Ltd, Telungana.

2 M. Swaminathan, 2001, "Advanced text book of Food and Nutrition", Vol I – II, Bappco, Bangalore.

References

1 J.E. Hall, 2010, "Guyton and Hall Text book of Medical Physiology", 12th Edition, Elsevier Health Sciences, Amsterdam, Europe.

2 A.C. Guyton, 1996, "Human Physiology and Mechanism of Disease", 5th Edition, W. B. Saunders Publication, Philadelphia.

3 Kraure and Mohan, 2005, "Food, Nutrition and Diet Therapy", 6th Edition, W. B. Sounders Company, Philadelphia.

Course Code	Course Name	Category	L	T	P	Credit
223BC1A6DD	PHARMACEUTICAL BIOCHEMISTRY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Physico- chemical properties and pharmaceutical uses of agents belonging to the therapeutic class.
- The action of drugs on living systems.
- The needs to obtain experience in pharmaceutical research.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Explain the ADME properties of drugs	K2
CO2	Summarize the ligand receptor interaction concept	K2
CO3	Illustrate the drug metabolism and adverse effects	K3
CO4	Identify the structural activity relationship of different class of drugs	K3
CO5	Categorize and demonstrate depth and breadth of knowledge in pharmaceutical science	K4

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A6DD	PHARMACEUTICAL BIOCHEMISTRY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction, Pharmacodynamics and Kinetics 10 h

Introduction and History of Drugs, Classification of drugs, routes of drug administration, passage of drugs across biological membrane, binding of drugs to plasma proteins. Absorption, Metabolism, Distribution and Elimination (ADME) of drugs, factors influencing drug absorption and elimination of drugs. Toxicity assessment: acute, sub chronic, chronic exposure.

Unit II Receptor concept 8 h

Definition of Receptor, Agonist and Antagonist, Drug receptor interaction. Receptor types - G-protein coupled receptor, Receptors with intrinsic ion channel, Enzymatic receptors, receptors regulating gene expression. Isolation of receptors, consequences of drug receptor interaction, binding forces in drug receptor interaction.

Unit III Drug Metabolism and Elimination 10 h

Phase I and Phase II reactions. Metabolism via hydroxylation, N-Oxidation, azo and nitro reduction, Oxidative deamination, purine oxidation, dehalogenation, hydrolysis, action of choline esterase.

Physiological importance of xenobiotic metabolism. Elimination of drugs from the body with reference to renal system.

Unit IV Chemotherapy and Plant derived drugs 10 h

Chemotherapy: Mode of action of sulfonamides, anti-metabolites of folate, purines and pyrimidines. Mode of action of Antibacterial - ampicillin, Antifungal agents - amphotericin; Antiviral - Acyclovir, Interferon; Antimalarial – Chloroquine, Anti-tubercular drugs – Streptomycin. Cytotoxic drugs -5Fluorouracil drug and Cyclophosphamide. Natural products: Alkaloids, Terpenoids, Flavonoids – anthocyanin.

Unit V Drugs acting on CNS, Cardiovascular, GI tract and ADR 10 h

CNS – mode of action of barbiturates, salicylates, MAO inhibitors and drugs for Parkinson's and Alzheimers disease with an example. Cardio-vascular disease - mode of action of diuretics, ACE inhibitors- β blockers, heparin, cardiac glycosides

with an example. GI tract - mode of action of antacids, drugs for peptic ulcer, diarrhea and constipation with an example. Adverse responses and side effects of drugs: Allergy, drug intolerance, drug addiction, drug abuses and their biological effects.

Text Books

1 Satoskar, R.S., Nirmala N. Rege, Bhandarkar, S.D., 2015,"Pharmacology and Pharmacotherapeutics", 24th Edition, Popular Prakashnan Pvt. Ltd.,Mumbai.

2 Tripathi, K.D., 2019,"Essentials of Medical Pharmacology", 7th Edition, Jaypee Brothers, Medical Publishers, New Delhi.

References

1 David A Williams, and Thomas L Lemke, 2017, "Principles of Medicinal Chemistry", 7th Edition, Lippincott Williams and Wilkins, United States.

2 Brunton, L. Knollmann, B. and Hilal-Dandan, R. 2022, "Goodman and Gilman's the Pharmacological Basis of Therapeutics", 13th edition, McGraw Hill Education, New York.

3 Palmer, M., Chan, A., Diekmann T., Honek, J., 2012,"Biochemical Pharmacology", 1st edition, Wiley, United states.

4 Patrick L. Graham, 2013, "An introduction to Medicinal chemistry", 5th Edition, Oxford University Press, United Kingdom.

Course Code	Course Name	Category	L	T	P	Credit
223BC1A6DE	BIOPROCESS TECHNOLOGY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The basic concepts of fermentation technology and its types, bioreactors and their types and conditions responsible for fermentation
- The production of antibiotics, amino acids, vitamins and single cell protein from microbial source
- Downstream processing to convert them as value added products.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Explain isolation, screening, fermentation, bioreactor optimization.	K3
CO2	Evaluate the methods of downstream processing of metabolites	K4
CO3	Illustrate industrial alcohol production, beverages, microbes.	K3
CO4	Analyze the microbial production of bioactive compounds	K4
CO5	Examine the Microbial Products in Food, Environment and Agriculture Industry	K4

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

✓	Skill Development		Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A6DE	BIOPROCESS TECHNOLOGY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to fermentation technology 9 h

Isolation and screening of industrially important microbes, Inoculum preparation, strain improvement for better yield. Fermentation-Submerged and solid-state fermentation, Bioreactors – types, parts and their functions – optimization conditions, aeration, agitation, foam control process control equipment's.

Unit II Downstream Processing 9 h

Introduction, removal of microbial cells and solid matter, foam separation, precipitation, filtration, centrifugation, cell disruption, liquid extraction, chromatography, membrane process. Drying and crystallization.

Unit III Industrial applications of microbes 10 h

Industrial production of alcohol (butanol, ethanol, glycerol), alcoholic beverages – Wine and Beer. Microbes in mineral recovery - Bioleaching and Biosorption, Production of Biomass, Production of Single cell protein and Mushrooms.

Unit IV Microbial production of bioactive compounds 10 h

Production of bacterial and fungal polysaccharide, Biosynthesis of Peptidoglycan, Industrial Production of Penicillin and streptomycin. Vitamins - B12 and riboflavin. Production of aminoacids (lysine, glutamic acid, arginine, threonine). Organic acids (acetic acid, citric acid, lactic acid)

Unit V Microbial Products in Food, Environment and Agriculture Industry 10 h

Production, harvest, recovery and uses – Baker's yeast, milk products. Effluent treatment -BOD, COD and disposal of effluents. Bioconversion of Methane or CO2 to edible protein production. Formulation of Biofertilizer (Rhizobium, Pseudomonas) and Biopesticides (Bacillus thuringiensis)

Text Books

1 Joanne. M. Willey, Linda M. Sherwood, Christopher. J.Wollverton, 2011, "Prescott's Microbiology", 8th Edition, Mc Graw Hill International, New York

2 El-Mansi, E.M.T. Bryce C.F.A. Daou, B, Sanchez.S, Demain.A.L., 2014, "Fermentation Microbiology & Biotechnology", 3rd Edition, Taylor & Francis, Group, UK.

References

1 Lanshing M, Prescott, John. P. Harley, Donald A Klein, 2009 "Microbiology", 4th Edition, Mc Graw Hill International Edition, New York.

2 Srivastava M L, (2008). "Fermentation Technology", 1st Edition, Narosa Publishing House, New Delhi

3 Prave P, Faust U, Sittig W, Sukatsch D A, 2004, "Fundamentals of biotechnology", 2nd Edition, Panima Publishing Corporation, New Delhi

4 Patel A H, 2016,"Industrial Microbiology", 2nd Edition, Trinity Press, New Delhi.

Course Code	Course Name	Category	L	T	P	Credit
223BC1A6DF	BIORESOURCES AND BIOPROSPECTING	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- bioprospecting aspects related to Plants, Marine planktons and microorganisms
- the importance of analytical techniques for exploring the medicinal wealth
- bioprospecting features related to product production and their regulation

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Explain the bioresources and types of Bioprospecting	K2
CO2	Demonstrate plant sources and plant products	K3
CO3	Evaluate Marine and Microbial sources and prospecting	K3
CO4	Understand analytical tools in drug discovery	K4
CO5	Analyze regulations for bio prospected products for commercialization	K4

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

223BC1A6DF	BIORESOURCES AND BIOPROSPECTING	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to Bioresources and Bioprospecting 10 h

Bioresources- Classification and taxonomy; Biodiversity: Components of biodiversity (genetic diversity, population level diversity, species diversity) and Importance. Bioprospecting: Definition, Introduction, Phases of Bioprospecting. Chemical prospecting, Bionic prospecting and Gene prospecting

Unit II Plant Bioprospecting 10 h

Medicinal and Aromatic plants: Separation of secondary metabolites, Authentication and preservation of plant specimens.

Drugs derived from plants: Antitumor agent - Etoposide, Vinblastine, Vincristine. Cardiotonic - Convallotoxin, Acetyldigoxin. Anti-inflammatory - Aescin, Bromelain. Choleretics - Curcumin.

Unit III Marine and Microbial Bioprospecting 10 h

Marine Bioprospecting: Sources of marine planktons, Isolation and cultivation of Marine Yeast and its industrial applications. Isolation of bioactive chemicals from Seaweeds and their applications

Microbial Bioprospecting: Sources of microbial origin and its bioprospecting for industrial enzymes, bioprospecting novel antifoulants and anti-biofilm agents from microbes.

Unit IV Bioprospecting and Drug discovery 9 h

Drug discovery in traditional medicine, Modern tools in drug discovery, Natural Product Activity and Species Source Database, ADME - Lipinski's rule-Swiss ADME, Molecular Docking - SWISS DOCK, AUTODOCK

Unit V Regulations for Bio prospected products 9 h

Bioprospecting Act: Introduction, Regulatory legislation and convention in Bioprospecting, Exemption to Act. Product development procedures and policies: Approval and IPR, protection policies of Bioprospecting.

Text Books

1 Russell,P. and Lima, N., 2017, "Bioprospecting", 1st edition, Springer, New York

2 Scheppler, J.A., Cassin,P.E. and Gambier, R.M., 2014, "Biotechnology Explorations: Applying the fundamentals, 1st edition, ASM Press, USA

References

1 Khare, C. P., 2008, Indian medicinal plants: an illustrated dictionary, 1st edition, Springer, New York.

2 Bull, A.T., 2003, Microbial Diversity and Bioprospecting, ASM Press, 3rd edition, USA.

3 Sunkel, V. 2010, Marine bioprospecting and natural product research: the investigation of novel marine microorganisms for the production of biologically active metabolites, 1st edition, Lambert Academic Publishing, Germany.

Course Code	Course Name	Category	L	T	P	Credit
223BC1A6AA	INNOVATION, IPR AND ENTREPRENEURSHIP	AECC-III	2	-	-	2

PREAMBLE

This course has been designed for students to learn and understand

- The role of Entrepreneurship in Economic Development and basics of Intellectual Property Rights, Copy Right Laws, Trade Marks and Patents
- ethical and professional aspects related to intellectual property law context
- Intellectual Property (IP) as a career option

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concept of innovation, IPR, entrepreneurship and its role in economic development	K2
CO2	Know the value, purpose and process of Patent	K2
CO3	Understand the basics of trademarks and industrial designs	K2
CO4	Acquire knowledge about copyright and copyright law	K2
CO5	Identify Geographical Indications	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1		✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓			✓	
CO4	✓		✓		✓
CO5	✓	✓	✓	✓	✓

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights		Gender Sensitization
✓	Social Awareness/ Environment	✓	Constitutional Rights/ Human Values/ Ethics

223BC1A6AA	INNOVATION, IPR AND ENTREPRENEURSHIP	SEMESTER VI

Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I Introduction to Innovation and Entrepreneurship 05 h

Meaning of Creativity, Invention and innovation - Types of Innovation - Introduction and the need for Intellectual Property Right (IPR) - Kinds of IPR – National and International IPR Policy. Entrepreneurs-Concept, characteristics, Functions, need and types, Entrepreneurial decision process. Role of Entrepreneurship in Economic Development.

Case Study: Jayabharati Viswanath: A case of Ladel to Leather.

Unit II Patents 05 h

Introduction and origin of Patent System in India- Conceptual Principles of Patent Law in India - Process for obtaining patent - Rights granted to a Patentee -Validity of patent- Infringement of Patent.

Case Study: Apple Inc. v. Samsung Electronics Co. Ltd. (2020)

Unit III Trademarks 05 h

Origin of Trade Marks System - Types - Functions - Distinctiveness and Trademarks - Meaning of Good Trademark - Rights granted by Registration of Trademarks - Infringement of trademark.

Case Study: Merck v. Mylan Pharmaceuticals (2016)

Unit IV Copyright 05 h

Introduction and Evolution of Copyright - Objectives and fundamentals of Copyright Law - Requirements for Copyrights - Works protectable under Copyrights - Authorship and Ownership - Rights of Authors and Copyright owners - Infringement of Copyright.

Case Study: J.K. Rowling and Warner Bros. v. Steve Vander Ark (2007)

Unit V Geographical Indications 04 h

Introduction and Concept of Geographical Indications - History - Administrative Mechanism - Benefits of Geographical Indications - Infringement of registered Geographical Indication

Case Study: Darjeeling Tea v. Tea Board of India (2012)

Note: Case studies related to the above topics to be discussed (Examined internal only)

Text Books

1 Nithyananda, K V. 2019, "Intellectual Property Rights" Protection and Management. Cengage Learning India Private Limited, New Delhi, India.

2 Dr.S.S.Khanka, 2020,"Entrepreneurial Development", S Chand and Company Limited, New Delhi, India.

References

1 Ahuja, V K. 2017, "Law relating to Intellectual Property Rights", 3rd Edition, Lexis Nexis, Gurgaon, India.

2 Neeraj, P., & Khusdeep, D. 2014, "Intellectual Property Rights",1st Edition, PHI learning Private Limited, New Delhi,India.

3 http://www.bdu.ac.in/cells/ipr/docs/ipr-eng-ebook.pdf.

4 https://knowledgentia.com/knowledgeate

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