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

2022-23 for Under Graduate Programme
(Outcome Based Education model with Choice Based Credit System)

B.Sc. Biotechnology Degree

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

Programme: Biotechnology

Eligibility:

A candidate who has passed in Higher Secondary Examination with any Academic Stream or Vocational Stream as one of the subjects under Higher Secondary Board of Examination and as per the norms set by the Government of Tamil Nadu or an Examination accepted as equivalent thereto by the Academic Council, subject to such conditions as may be prescribed thereto are permitted to appear and qualify for the **Bachelor of Biotechnology Degree Examination** of this College after a 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. To demonstrate a substantial understanding of concepts in key areas of Biotechnology and its applications.

2. To supplement the academic input of students by way of seminars, conferences, guest lectures and industrial visits.

3. To describe the common methods and applications of biotechnology with regards to microorganisms, plants, animals and Pharma industries.

PROGRAMME OUTCOMES:

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

PO Number	PO Statement
PO1	Students will be able to identify, analyze and understand problems related to biotechnology and finding valid conclusions with basic knowledge in biotechnology.
PO2	Graduates will be able to justify societal, health, safety and legal issues and understand his responsibilities in biotechnological practices.
PO3	Provide education that leads to comprehensive understanding of the principles and practices of biotechnology that will help to undertake any responsibility as an individual and as a team in a multidisciplinary environment.
PO4	Graduates will be able to demonstrate knowledge of project management when dealing with Biotechnology problems.
PO5	Students will possess hands-on technical skills necessary for supporting biotechnology research activity and empower students with the ability to think and solve problems in the field of biotechnology.

Credit Distribution Pattern for UG Programme:

Part	Subjects	No.of Papers	Credit	Semester No.
I	Tamil / Hindi / French/Malayalam	4	4 x 3 = 12	I to IV
II	English	4	4 x 3 = 12	I to IV
III	Core (Credits 2,3,4,5)	16-19	70	I to VI
	Inter Departmental Course (IDC)	4	16	I to IV
	Discipline Specific Elective (DSE)	3	3 x 4 =12	V & VI
	Skill Enhancement Course (SEC)	4	8	III ,IV,V& VI
	Internship Training	1	2	V
IV	Environmental Studies(AECC)	1	2	I
	Basic Tamil/ Advanced Tamil/ Human Rights & Womens' Rights (AECC)	1	2	II
	Generic Elective (GE) (AEEC)	1	2	V
	Innovation &IPR/ Innovation, IPR & Entrepreneurship (AECC)	1	2	VI
V	NSS/NCC/YRC/RRC/Yoga/ Sports/Clubs	-	2	I -II
TOTAL			**142**	

CURRICULUM

B. Sc BIOTECHNOLOGY

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
First Semester										
Part-I										
221TL1A1TA/ 221TL1A1HA/ 221TL1A1MA/ 221TL1A1FA	Language-I	Tamil-I : Ikkala Ilakkiyam / Hindi-I: Modern Literature / Malayalam-I: Modern Literature / French-I: Grammar, Translation And Civilization	4	1	-	3	50	50	100	3
Part-II										
221EL1A1EA	Language-II	Professional English – I	4	-	1	3	50	50	100	3
Part-III										
223BT1A1CA	Core - I	Cell Biology	4	1	-	3	50	50	100	4
223BT1A1CB	Core - II	Biochemistry	4	1	-	3	50	50	100	3
223BT1A1CP	Core Practical - I	Cell Biology and Biochemistry	-	-	4	6	50	50	100	2
222CE1A1IB	IDC - I	Chemistry for Biologists	4	-	-	3	50	50	100	4
Part-IV										
223MB1A1AA	AECC - I	Environmental studies	2	-	-	-	50	-	50	2
Part - V										
223BT1A1XA	Extension Activity	NSS/NCC/YRC/ RRC/Yoga/Sports	-	-	-	-	50	-	50	1
Total			22	3	5				700	22

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BoS- 13	AC - 13	GB - 18
16/8/22	6/9/22	10/9/22

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Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Second Semester										
Part-I										
221TL1A2TA/ 221TL1A2HA/ 221TL1A2MA/ 221TL1A2FA	Language - I	Tami-II: Ara Ilakkiyam/ Hindi-II: Modern Literature/ Malayalam-II: Modern Literature/ French-II:Grammar, Translation and Civilization	4	1	-	3	50	50	100	3
Part-II										
221EL1A2EA	Language - II	Professional English – II	4	-	1	3	50	50	100	3
Part-III										
223BT1A2CA	Core - III	Genetics	4	1	-	3	50	50	100	4
223BT1A2CB	Core - IV	Microbiology	4	1	-	3	50	50	100	3
223BT1A2CP	Core Practical - II	Genetics and Microbiology	-	-	4	6	50	50	100	2
224CS1A2IB	IDC - II	Python for Biologists	4	-	-	3	50	50	100	4
Part-IV										
221TL1A2AA/ 221TL1A2AB/ 225CR1A2AA	AECC - II	Basic Tamil/ Advanced Tamil /Human Rights and Women's Rights	2	-	-	-	50	-	50	2
Part-V										
223BT1A2XA	Extension Activity	NSS/NCC/YRC/ RRC/Yoga/Sports	-	-	-	-	50	-	50	1
Total			22	3	5				700	22

5/12/22

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Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Third Semester										
Part-I										
221TL1A3TA/ 221TL1A3HA/ 221TL1A3MA/ 221TL1A3FA	Language - I	Tamil-III/ Hindi-III/ Malayalam-III/ French-III	3	1	-	3	50	50	100	3
Part-II										
221EL1A3EA	Language - II	Professional English – III	3	1	-	3	50	50	100	3
Part-III										
223BT1A3CA	Core - V	Molecular Biology	4	-	-	3	50	50	100	4
223BT1A3CB	Core - VI	Biodiversity	4	-	-	3	50	50	100	4
223BT1A3CP	Core Practical - III	Molecular Biology and Biodiversity	-	-	4	6	50	50	100	2
222MT1A3IE	IDC - III	Basic Mathematics	4	-	-	3	50	50	100	4
223BT1A3SP	SEC Practical	Biotechniques	2	-	4	6	50	50	100	2
Total			20	2	8				700	22

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Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Fourth Semester										
Part-I										
221TL1A4TA/ 221TL1A4HA/ 221TL1A4MA/ 221TL1A4FA	Language - I	Tamil-IV/ Hindi-IV/ Malayalam-IV/ French-IV	3	1	-	3	50	50	100	3
Part-II										
221EL1A4EA	Language - II	Professional English – IV	3	1	-	3	50	50	100	3
Part-III										
223BT1A4CA	Core - VII	Immunology	5	-	-	3	50	50	100	5
223BT1A4CB	Core - VIII	Bioinformatics	4	-	-	3	50	50	100	4
223BT1A4CP	Core Practical - IV	Immunology & Bioinformatics	-	-	4	6	50	50	100	2
222PY1A4IA	IDC - IV	Biophysics	4	-	-	3	50	50	100	4
223BT1A4EP	SEC - II	Recombinant DNA Technology	2	-	3	6	50	50	100	2
Total			**21**	**2**	**7**				**700**	**23**

17/10/23

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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										
223BT1A5CA	Core - IX	Plant and Animal Biotechnology	4	1	-	3	50	50	100	5
223BT1A5CB	Core - X	Environmental Biotechnology	4	1	-	3	50	50	100	5
223BT1A5CC	Core - XI	Entrepreneurial Biotechnology	4	1	-	3	50	50	100	5
223BT1A5CP	Core Practical - V	Plant, Animal and Environmental Biotechnology	-	-	6	6	50	50	100	3
223BT1A5SA	SEC - III	Bioprocess Technology	3	-	-	3	50	50	100	2
223BT1A5DA	DSE - I	Clinical Trials	4	-	-	3	50	50	100	4
223BT1A5DB		Bioethics & Biosafety								
223BT1A5DC		Molecular Signaling								
223BT1A5TA	IT	Industrial Training	-	-	-	3	50	50	100	2
Part IV										
	GE		2	-	-	3	50	-	50	2
Total			**21**	**3**	**6**				**750**	**28**

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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										
223BT1A6CA	Core - XII	Genomics and Proteomics	4	1	-	3	50	50	100	5
223BT1A6CB	Core - XIII	Bionanotechnology	4	1	-	3	50	50	100	5
223BT1A6CP	Core Practical - VI	Genomics, Proteomics and Bionanotechnology	-	-	6	6	50	50	100	3
223BT1A6SA	SEC - IV	Stem Cell Technology	4	-	-	3	50	50	100	2
223BT1A6DA	DSE - II	Drug Design and Delivery	4	-	-	3	50	50	100	4
223BT1A6DB		Biomaterials								
223BT1A6DC		Synthetic Biology								
223BT1A6DD	DSE - III	Biomarker Technology	4	-	-	3	50	50	100	4
223BT1A6DE		Molecular Diagnostics								
223BT1A6DF		Food Technology								
Part-IV										
225BI1A6AA	AECC -III	Innovation and IPR	2	-	-	3	50	-	50	2
Total			**22**	**2**	**6**				**650**	**25**
Grand Total									**4200**	**142**

8.11.24
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DISCIPLINE SPECIFIC ELECTIVE

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

Semester V (Elective I)

List of Elective Courses

S. No.	Course Code	Name of the Course
1	223BT1A5DA	Clinical Trials
2	223BT1A5DB	Bioethics & Bio safety
3	223BT1A5DC	Molecular Signaling

Semester VI (Elective II)

List of Elective Courses

S. No.	Course Code	Name of the Course
1	223BT1A6DA	Drug Design & Delivery
2	223BT1A6DB	Biomaterials
3	223BT1A6DC	Synthetic Biology

Semester VI (Elective III)

List of Elective Courses

S. No.	Course Code	Name of the Course
1	223BT1A6DD	Biomarker Technology
2	223BT1A6DE	Molecular Diagnostics
3	223BT1A6DF	Food Technology

GENERIC ELECTIVE COURSES (GE)

The following are the courses offered under Generic Elective Course

Semester V (GE)

S. No.	Course Code	Course Name
1	223BT1A5GA	Mushroom Technology

EXTRACREDITCOURSES

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

Semester III

S. No.	Course Code	Course Name
1	223BT1ASSA	Biofertilizer Technology
2	223BT1ASSB	Environmental Management

CERTIFICATE COURSES

S. No.	Course Code	Course Name
1	223BT5A1CA	Plant Tissue Culture
2	223BT5A2CA	Molecular Diagnosis

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.

Mandatory

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		

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

Dr.N.G.P. Arts and Science College		
APPROVED		
BoS- 13 16/8/22	AC - 13 6/9/22	GB - 18 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

Dr.N.G.P. Arts and Science College
APPROVED

BoS- 13	AC - 13	GB - 18
16/8/22	6/9/22	16/9/22

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.

Dr.N.G.P. Arts and Science College		
APPROVED		
BoS- 13 16/8/22	AC - 13 6/9/22	GB - 18 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)

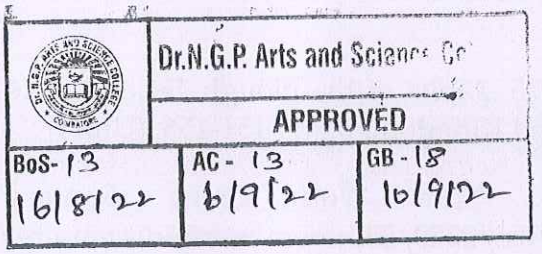
References

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
223BT1A1CA	CELL BIOLOGY	CORE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The basic components and functions of cell organelles
- The cell signaling, cycle, progression and its regulation
- The pathological progressions of a cell

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Define the process of cell architecture and composition	K2
CO2	Paraphrase the membrane organization for nutrient uptake	K2
CO3	Report the mode of transport relating to inter and intracellular mechanisms	K3
CO4	Sketch signaling events within cells	K3
CO5	Illustrate the cell cycle events and pathological progressions documentation, inspection and certification	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

223BT1A1CA	CELL BIOLOGY	SEMESTER I

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Cell Overview and Organelles 13 h

History - cell theory – scope – types and shapes - organization of prokaryotic and eukaryotic cell and their differences. Cytoskeleton – microtubules. Nucleus, endoplasmic reticulum (rough and smooth), golgi apparatus, mitochondria, ribosomes, chromosome, chloroplast, lysosome, peroxisome

Unit II Cell Organization 12 h

Cell membrane - structure and function, transport of nutrients and ions across the membranes. Diversity of plasma membranes (Trilamilar, bimolecular leaflet, lattice, micellar, fluid mosaic model). Desmosomes, plasmodesmata. Cell junctions – adherent, gap and tight junctions.

Unit III Cell Transport 10 h

Membrane transport types. General classes of transport systems- uniport, symport, antiport. Diffusion- passive and facilitated. Active transport- primary and secondary. The P-type ATPases (Na+K + -ATPase), ion channels (ligand- gated and voltage-gated).

Unit IV Cell Signaling 12 h

Cell Signalling-Intercellular signaling & intracellular signaling- forms of cell signaling-types of receptors-Signalling molecules-Responses to the Signaling Pathway-Termination of Signaling Pathways.

Unit V Cell Cycle 13 h

Cell cycle - Mitosis – meiosis and their significance. Cell Ageing – mechanism – theories (Free radical theory and somatic mutation theory). Cell death - necrosis, apoptosis. Difference between necrosis and apoptosis. Mechanism of apoptosis. Characteristics of cancer cell. Tumor cells - Stages of progression

VERIFIED 15/12/22 (Dr. ARUNA)

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Dr. P. CHIDAMBARA RAJAN M.Sc.,M.Phil.,Ph.D Head, Dept. of Biotechnology Dr.N.G.P. Arts and Science College Dr.N.G.P. Kalapatti Road, Coimbatore

Text Books

1 Rastogi, S.C., 2015, "Cell Biology", 3rd edition, New Age International Publishers, India

2 Islam, A. 2011, "Text Book of Cell Biology", 2nd edition, Books and Allied (P) Ltd. , India

References

1 De Roberties, D., 2020, "Cell and Molecular Biology", 8th Edition, Wolters Kluwer _ New Delhi

2 Lodish, H. & Baltimore D, 2016, "Molecular Cell Biology", 8th edition, W.H. Freeman & Company, New York, USA

3 Karp, G., 2002, "Cell and Molecular Biology", 3rd edition, John Wiley Sons. Inc, USA

4 Alberts, B., 1998, "Essential Cell Biology", 1st edition. Garland Publishers, USA

Controller of Examinations · College · Dr.N.G.P. Arts and Science

Dr.N.G.P. Arts and Science College
APPROVED
BS-13 16/8/22 | AC-13 6/9/22 | GB-A8 12/9/22

Dr.NGPASC
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VERIFIED 15/10/22 CDr-ARUN.P)

15/10/22

DEEP CHIDAMBA... HAN
Head, Dept. of Bio...
Dr.N.G.P. Arts and S...
Dr.N.G.P. - Kalapatti Road, Coimbatore

Course Code	Course Name	Category	L	T	P	Credit
223BT1A1CB	BIOCHEMISTRY	CORE	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The structure & function of bio molecules
- The aspects of metabolism & their regulatory pathways
- The classification, structure, functions of biomolecules and its metabolism

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Identify the concepts of biochemical pathways and carbohydrates	K2
CO2	Paraphrase the classification, structure, properties and metabolism of amino acids and protein	K2
CO3	Discuss the classification, structure, properties, biosynthesis and oxidation of lipids	K2
CO4	Compare the classification, structure, functions of nucleic acids and metabolism of nucleotides	K3
CO5	Categorize the classification of enzymes, mechanism of action and enzyme kinetics	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

223BT1A1CB	BIOCHEMISTRY	SEMESTER I

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I Carbohydrates 12 h

Structure, classification and functions of carbohydrates, Glycoproteins, Glycolipids Glycolysis, gluconeogenesis and Regulation. Krebs's cycle. Electron transport chain, Glyoxylate cycle, HMP shunt pathway, Glycogen synthesis and breakdown.

Unit II Protein 12 h

Amino acid: Biosynthesis of amino acids, Essential and non essential amino acids, Properties and Metabolism of amino acids (Glycine and Tryptophan). Protein: Classification and Properties – four levels of protein structure & conformations, Ramachandran Plot and 3D Structure determination by amino acid sequences.

Unit III Lipids 12 h

Lipids: Nomenclature, Classification and biological significance. Simple Lipids and Compound lipids. Synthesis and metabolism of fatty acids (α, β and ω Oxidation of fatty acids). Cholesterol Biosynthesis andregulation. Phospholipids and Glycolipids metabolism- Glycerophospholipids and Sphingoglycolipids.

Unit IV Nucleic acids 10 h

Nucleic acids: Classification, structure and functions of nucleic acids, Biosynthesis of Purines and pyrimidines -De novo pathway, Salvage pathway, Regulation and Metabolism of Purine and pyrimidine.

Unit V Enzyme Kinetics 14 h

Enzymes: Nomenclature and Classifications. Coenzymes, Abzymes and Ribozymes. Mechanism of enzyme actions - Active site, Lock and Key model & Induce fit Hypothesis, Enzyme substrate complex formation. Kinetics: Derivation of Michaelis- Menton equation, Types of inhibitions - Competitive, Non Competitive, Uncompetitive, Feedback and Allosteric enzymes inhibition.

Text Books

1. Rodwell, V.W,Bender D.A, Botham K. M, Kennelly P.J, and Weil P A, 2018, Harper's Illustrated Biochemistry, 31st edition, McGraw Hill publications, New Delhi.
2. Berg, J.M., Stryer, L. et al. 2015, Biochemistry, 8th edition, Palgrave Macmillan Publications, India

References

1. K. Ramadevi, Ambika Shanmgam's Fundamentals of Biochemistry for Medical Students. 8th Edition 2016. Wolters Kluwer (India) Pvt, Ltd., New Delhi.
2. Lehninger, A.L. and Cox, M. M. 2013. Principles of Biochemistry. 6th edition. W. H. Freeman and Company, New York
3. Voet, D. and Voet, J. G. 2011. Biochemistry. 4th edition. John Wiley and Sons Inc. USA
4. Fromm, H.J. and Hargrovem M. 2012. Essentials of Biochemistry, Springer publisher

223BT1A1CP	CORE PRACTICAL - I : CELL BIOLOGY AND BIOCHEMISTRY	SEMESTER I

Total Credits: 2
Total Instructions Hours: 48 h

S.No	List of Experiments
1	Calculations of Molarity, Normality and Percentage Solution and Preparation of buffer in different pH - Phosphate, Acetate, Tris buffer
2	Simple staining of Bacteria and observation under stereomicroscope*
3	Microscopic observation of Monocot and Dicot Leaf, Root and Stem section
4	Staining of plant cells -Onion epidermal cells
5	Staining of starch granules
6	Mitotic preparation from onion root tip
7	Estimation of DNA by diphenylamine method
8	Estimation of Glucose by Anthrone method
9	Estimation of Fructose by Dinitro Salicylic Acid method
10	Estimation of Aminoacids by Ninhydrin method
11	Estimation of Ascorbic acid by DNPH method
12	Estimation of Protein by Lowry's or Bradford's method
13	
14	
15	

Note: Any 10 experiments from the above will be carried out

* Indicates DBT STAR College Scheme Experiment

References

1 Becker JM, Caldwell, G.A. and Zachgo, A., 2007, "Biotechnology- A laboratory Course", 2nd edition, Academic Press, USA

2 Sambrook, J., Green, M.R., 2012, "Molecular Cloning: A Laboratory Manual", 4th edition, Cold Spring Harbor, USA

3 Davey, J. and Lord, M. 2003, "Essential Cell Biology Volume 1: Practical Approach", 1st edition, OUP Oxford, UK

4 Lindenmayer D. and Burgman, M., 2005, "Practical Conservation Biology", 5th edition, CSIRO Publishing, Australia

Course Code	Course Name	Category	L	T	P	Credit
222CE1A1IB	CHEMISTRY FOR BIOLOGISTS	IDC	4	-	-	4

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

222CE1A1IB	CHEMISTRY FOR BIOLOGISTS	SEMESTER I

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Solutions 10 h

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

Unit II Acids and Bases 10 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 8 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, F2 - bond order– diamagnetism and paramagnetism

Unit IV Stereo Chemistry 10 h

Electron displacement effect in organic compounds - Inductive effect – Electromeric effect - Resonance effect, Hyperconjugation and Steric effect. 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 10 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.

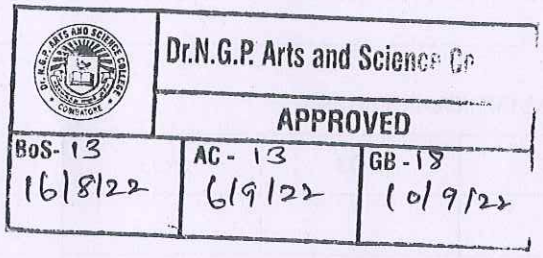
References

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



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	Understand the importance of natural resources in order to conserve for the future.	K2
CO2	Infer on Natural resources and its conservation	K2
CO3	Apply the knowledge on Biodiversity and its conservation	K3
CO4	Relate effects, causes and control of air, water, soil and noise pollution etc.,	K2
CO5	Build awareness about sustainable development and Environmental protection	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

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. Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006

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.

16/8/22

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

Dr.N.G.P. Arts and Science College
APPROVED

BoS- 13	AC - 13	GB - 18
16/8/22	6/9/22	6/9/22

Academic Council
Dr.V. Rajendran
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Dr.NGPASC
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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

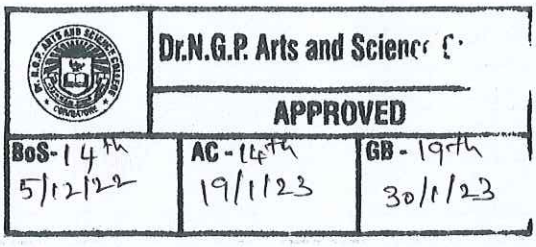
1 தமிழ் மொழிப்பாடம்-2022-2023,தொகுப்பு: தமிழ்த்துறை , டாக்டர் என்.ஜி.பி. கலை அறிவியல் கல்லூரி,கோயம்புத்தூர். வெளியீடு: நியூ செஞ்சுரி புக் ஹவுஸ் ,சென்னை. (Unit I to V)

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



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	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

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)

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	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

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.

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	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

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.	Organiser une 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 vue positif et négatif. S'informersur le prix. S'informersur la quantitité. Exprimer la quantitité.	En groupes, 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'interdictio n. 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- Imprime en Roumanie par Canale en Janvier 2012.(Unit I toIV)

Dr.N.G.P. Arts and Science College		
APPROVED		
BoS-14th 5/12/22	AC - 14th 19/1/23	GB - 19th 30/1/23

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, Aravind R.Nair, Veena Bhambhani. 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- 14th 5/12/22	AC - 14th 19/1/23	GB - 19th 30/1/23

Course Code	Course Name	Category	L	T	P	Credit
223BT1A2CA	GENETICS	CORE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Concepts of Mendelian and Non-Mendelian inheritance
- Theory of inheritance and gene interaction
- Overview on genetic disorders

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the history and concept of Mendelian laws	K2
CO2	Recognize the structure of chromosome, gene and its interaction	K2
CO3	Interpret chromosomal variations and genetic disorders	K2
CO4	Differentiate the natural horizontal gene transfer methods	K3
CO5	Classify the pedigree analysis and understand the population genetics	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

223BT1A2CA	GENETICS	SEMESTER II

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Mendelian & Non Mendelian Inheritance 12 h

History of Genetics, Mendel's work: Choice of experimental plant, Monohybrid Experiment, Dihybrid Experiment, Back Cross and Test Cross. Chromosomal theory of Inheritance, Extranuclear inheritance (mitochondrial, chloroplast), Maternal inheritance.

Unit II Concept of Gene, Alleles and Chromosome 12 h

Gene vs Allele, Multiple Alleles, Pseudo alleles, Lethal genes, penetrance. Gene Interactions: Allelic (Co-Dominance, Incomplete Dominance and pseudo-dominance), Non Allelic (Epistasis). Concept of loci on Chromosome, Structure of Prokaryotic and Eukaryotic chromosome, Karyotyping.

Unit III Chromosomal Variations and Abberations 12 h

Mutation: Spontaneous mutations (Point and Frame shift) and Induced mutations, Physical and Chemical mutagens, Numerical-Euploidy and Aneuploidy; Structural(deletion, duplication, inversion and translocation). Single Gene Disorders: Autosomal Dominant-Achondroplasia, Polycystic kidney, Autosomal Recessive -Cystic fibrosis, Sickle cell Anaemia, X-linked Dominant-Rett syndrome, X-linked Recessive-Haemophilia, Multifactorial- Cleft lip and palate

Unit IV Natural Horizontal Gene Transfer Methods 12 h

Genetic analysis of bacteria - Bacterial transformation, Conjugation (sex factor, Hfr strain, F'factor),Transduction in Bacteria(General and Specialized), Linkage and Crossing over, Recombination – Holliday model

Unit V Transposons and Population Genetics 12 h

Model organism for genetic analysis of development- Drosophila & Arabidopsis. Transposable elements of Prokaryotes (IS Elements, Composite and Tn3 Family) and Eukaryotes (Maize transposable elements), Retrotransposons. Gene frequency, Hardy-Weinberg law, calculating gene frequency, factors affecting gene frequency, Pedigree analysis

Text Books

1 Strickberger MW, 2013, "Genetics", 3rd Edition, Prentice Hall College Division, NewDelhi.

2 Winter PC, Hickey GI and Fletcher HL, 2000, "Genetics", 1st Edition, VivaBooks Pvt Ltd., India

References

1 Trun N and Trempy J, 2004, "Fundamental Bacterial Genetics", Black well publishing, Singapore

2 Strachan T and Read AP, 2006, "Human Molecular Genetics", 3rd Edition, Wiley & Sons, United States

3 Maquat L, 2018, "Molecular Biology", 5th Edition, CRC Press, United States

4 Brown TA, 1999, "Genetics", 3rd Edition, Chapman and Hall, London, UK

Course Code	Course Name	Category	L	T	P	Credit
223BT1A2CB	MICROBIOLOGY	CORE	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- Science of Microbiology and general techniques used
- Beneficial and harmful activities of microorganisms to humans
- Clinical Applications of microbiology.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamental concepts of microbiology	K1
CO2	Know the basics of media preparation and different sterilization techniques, Distinguish different phases in microbial growth and learn about nutritional classification	K2
CO3	Discuss the structure, reproduction and the causative diseases of bacteria	K3
CO4	Discuss the structure, reproduction and the causative diseases of Virus	K3
CO5	Discuss the structure, reproduction and the causative diseases of fungus	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

223BT1A2CB	MICROBIOLOGY	SEMESTER II

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I Concepts of Microbiology 12 h

History of Microbiology - Biogenesis Vs Abiogenesis, Contributions of Louis Pasteur, Robert Koch, Edward Jenner, Alexander Fleming. Microscopy – Bright field or Light, Dark Field, Phase contrast, Fluorescence; Electron Microscopy – Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM).

Unit II Media, Sterilization Techniques and Growth of Microbes 12 h

Sterilization- Methods - Physical – Dry Heat, Moist Heat, Cold sterilization and Chemical sterilization. Preparation of Culture Media – types. Growth curve - Determination of Generation Time, Measurement of Growth – Viable count, Turbidometry and Direct Cell count. Nutritional classification of microbes.

Unit III Bacteria – Structure and its causative diseases 12 h

Classification (Bergy's manual) - Bacterial Structure, Reproduction of Bacteria. Diseases caused by *Mycobacterium tuberculosis* (Tuberculosis), *Salmonella typhi* (Typhoid), *Vibrio cholera* (Cholera), *Clostridium tetani* (Tetanus) and *Staphylococcus aureus* (Skin Infections), *Corynebacterium diptheriae* (Diptheria).

Unit IV Virus – Structure and its causative diseases 12 h

Virus structure, Classification (Baltimore), Reproduction – Generalized and Specialized, Diseases caused by HIV (AIDS), Hepatitis B Virus (Jaundice), *Varicella zoster* (Chicken Pox), *Polio myelitis* (Polio), Viral gastroenteritis (stomach flu), Ebola and Corona virus 2019 (COVID-19)

Unit V Fungus – structure and its causative diseases 12 h

Fungal structure - classification - reproduction. Diseases caused by *Tinea rubrum* (body ring worm), *Tinea pedis* (athlete's foot), Candida species (bronchitis), *Actinomycetes isrelii* (oral infection), *Aspergillus fumigatus* (sinus), Fungal Eye Infections - Keratitis, Endophthalmitis, Yeast infection (Vaginal), Jock itch (*Tinea cruris*).

Text Books

1. Atlas M Ronald, 2015, "Principles of Microbiology", 2nd Edition, McGraw-Hill Publication, India.
2. Pelzar M, 2001, "Microbiology", 5th Edition, McGraw Hill Education (India) Pvt Ltd, India.

References

1. Brij Mohan Meena, 2018, Microbiology, 1st Edition, Paradise Publisher - Jaipur.
2. David Greenwood, Richard CB Slack, John F Peutherer, 2002, "Medical Microbiology – A Guide to Microbial Interactions: Pathogenesis, Immunity, Laboratory Diagnosis and Control", 16th Edition, Churchill Livingstone, Edinburgh.
3. Gerard J T, 2012, "Microbiology: An Introduction", 11th Edition, Benjamin Cummings Publishers, USA.
4. Joanne Willey, Kathleen Sandman, Dorothy Wood, 2020, "Prescott's Microbiology", 11th Edition, McGraw Hill Education, New York.

Dr.N.G.P. Arts and Science College		
APPROVED		
BoS- 14th 5/12/22	AC - 14th 19/1/23	GB - 19th 30/1/23

223BT1A2CP	CORE PRACTICAL - II : GENETICS AND MICROBIOLOGY	SEMESTER II

Total Credits: 2
Total Instructions Hours: 48 h

S.No	Contents
1.	Enumeration of microorganism from soil by serial dilution method
2.	Staining of Bacteria–Negative and Gram staining, Fungal Staining
3.	Observation of fungi under stereomicroscope*
4.	Bacterial growth curve by turbidimetry method
5.	Isolation of Auxotropic mutants by Gradient plate technique
6.	Determination of Thermal death time of bacteria
7.	Antibiotic sensitivity test - Kirby Bauer Method
8.	Methylene Blue Reduction test
9.	Determination of Phage Titre
10.	Sex chromatin observation from Buccal smear *
11.	Blood typing in humans for multiple alleles and Rh factor
12.	Problem solving in Pedigree Analysis

Note: 10 is Mandatory out of 12.

*DBT STAR College Experiment.

References

1. Sambrook J, Green M R, 2012, "Molecular Cloning: A Laboratory manual", 4th Edition, Cold Spring Harbor, USA.
2. Chaitanya K V, 2013, "Cell and Molecular Biology: A Lab Manual", Phi Publisher, India.
3. Cappuccino, 2005, "Microbiology: A Laboratory Manual", Pearson Education, UK.
4. Kannan N, 2002, "Laboratory Manual in General Microbiology", Panima Publishers, India

Course Code	Course Name	Category	L	T	P	Credit
224CS1A2IB	PYTHON FOR BIOLOGISTS	IDC	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The problem-solving techniques using Python.
- The basic operations in Python programming language.
- The concepts of Bio python.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand Digital computer as Data Analytics tool through Python.	K1
CO2	Illustrate Problem solving strategies using Functions.	K3
CO3	Analyze the method of solving simple problems through Python.	K4
CO4	Apply the theory behind Lists, Tuples and Dictionaries.	K3
CO5	Evaluate working knowledge of Bio python and its various functionalities	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

224CS1A2IB	PYTHON FOR BIOLOGISTS	SEMESTER II

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to Digital Computer and Python 10 h

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

Unit II Control Statements and Functions 10 h

Control Statements: Iteration - The for loop – While statement – if elif else statement – Input from keyboard Functions: 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

Unit III Strings and Lists 10 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 – Deleting elements from list – Built-in list operators – Built-in list methods.

Unit IV Tuples and Dictionaries 10 h

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

Unit V Introduction to Biopython 8 h

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

Text Books

1. E. Balagurusamy, 2016, "Introduction to Computing and Problem-Solving UsingPython", First Edition, McGraw-Hill 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", Second Edition,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..

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221TL1A2AA	PART - IV : 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	PART - IV : 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

1. தமிழ்நாடு - பாரதியார்
2. மனதில் உறுதி வேண்டும் - பாரதியார்
3. இன்பத்தமிழ் - பாரதிதாசன்
4. வேலைகளல்ல வேள்விகள் - 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 எழுதச் செய்தல்

Notes

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

பகுதி – அ

சரியான விடையைத் தேர்வு செய்தல் 10x1=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 இது அல்லது அது என்ற 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	Relate human 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 VenkataramandSandhiya. 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.

5/12/22
BoS Chairman/HoD
Department of Biotechnology
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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

Dr.N.G.P. Arts and Science College
APPROVED
BoS- 15th 10/08/2023 | AC - 15th 14/07/2023 | GB - 26th 05/08/2023

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.

Dr.N.G.P. Arts and Science College

APPROVED

BOS - 15th	AC - 15th	GB - 20th
10/06/2023	14/07/2023	05/08/2023

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 and Reading 09 h

Listening in casual conversation, Small group and Conference setting - Listening for Factual Information, Detail and Situation - Developing Listening skills- Why do we avoid Listening- Poor Listening - Disadvantages - Poor listening vs Effective Listening - Basics of Reading- efficient and inefficient readers- Advantages – Benefits and Effective reading and comprehension skills- Need for Developing Efficient Reading skills- Four Basic steps of Effective Reading - Stumbling blocks in becoming an effective Reader- Improving Vocabulary power- Strategies for Comprehending and Retaining content- Effective Note Taking while Reading.

Unit II Speaking 11 h

Purpose of General Conversations- Advantages, features of a good conversation- Tips for improving conversation- public speaking- importance of public speaking- Benefits, Tips, Overcoming fear of public speaking- Preparatory steps - Structuring the contents- Audience Awareness- Mode of Delivery.

Unit III Writing Skills 10 h

CV and Job Applications- How to make your letter stand out?- Employers expectation - Organize the material – Useful suggestions- Cover Letter- Content to be included – Tone of the letter - Report Writing- importance – features- Types – main parts – Feasibility report– Accident report- Scientific report- Memos – Introduction – Structure- Proposal Writing- Key factors- Types- Contents- Format- Evaluation.

Unit IV Effective Skills in Language 10 h

Using Word's Effectively- Mastering Spelling Techniques- Structuring Phrases and Clauses- Writing Effective Sentences– Building Effective paragraphs- Revising, Editing and Proof reading.

Unit V Soft Skills 08 h

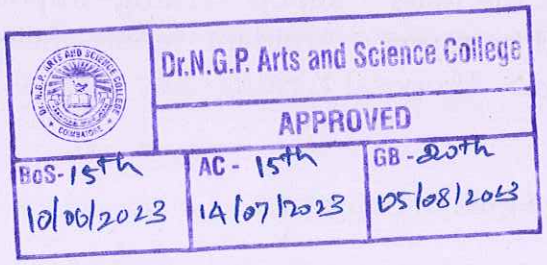
Introduction- What are soft skills?- Importance of soft skills- Attributes- Social soft skills- Thinking- Negotiating- Exhibiting- Identifying- Improving- Will formal training enhance your soft skills? - Soft Skills training -Train Yourself- Practicing soft skills- Measuring attitude – Self-Discovery: Importance of knowing yourself- Process - SWOT analysis – Benefits – Usage – SWOT Analysis grid.

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. Kumar, Sanjay and Lata Pushp. 2018. Language and Communication Skills for Engineers. First Edition, Oxford University Press, India. (Unit I, II, III)
3. Mohan, Krishna and Banerji, Meera. 2009. Developing Communication skills. 2nd Edition, Macmillcan, India. (Unit I, II, III, IV)
4. Alex. Soft Skills. 2009. S. Chand Publishing, New Delhi, India. (Unit V)

References

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



Course Code	Course Name	Category	L	T	P	Credit
223BT1A3CA	MOLECULAR BIOLOGY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The basic concept of life.
- The process of cellular mechanisms.
- The process of transcriptional events.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Learn the Basics of DNA and RNA	K1
CO2	Impart knowledge on the mode of DNA replication	K2
CO3	Provide in-depth knowledge of transcriptional events	K3
CO4	Focus on translational events and its role in gene Expression	K4
CO5	Know the concept of DNA Damage and repair Mechanisms	K1

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

223BT1A3CA	MOLECULAR BIOLOGY	SEMESTER III

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Historical and Conceptual Background 10 h

Discovery of DNA as genetic material - Griffith's experiment, Avery, Macleod and McCarty Experiment and Hershy and Chase experiment. Structure of Nucleoside and Nucleotide. Structure of DNA (Watson and Crick Model), Types of DNA (A-DNA, B-DNA and Z- DNA). Structure and Types of RNA (mRNA, tRNA and rRNA), Small interfering RNA(Si), Micro RNA (Micro RNA), Satellite RNA and Small Nuclear RNA (Sn).

Unit II Central Dogma & Replication 10 h

Over view of Central dogma, Experimental proof for Semi conservative method.Enzymes & accessory proteins involved in DNA replication. Replication process inprokaryotic & Eukaryotic DNA. Differences between Prokaryotic and eukaryoticreplication. Rolling circle model of replication.

Unit III Transcription 10 h

Importance of DNA binding Proteins, RNA polymerase. Mechanism of Transcription in prokaryotes & Eukaryotes. Differences between Prokaryotic and eukaryotic transcription. Post transcriptional Modifications in RNA - 5′ cap formation, 3′-end polyadenylation (Poly A Tail). Splicing and Processing of m-RNA, r-RNA & t- RNA. Transcriptional regulation in prokaryotes – *lac* operon and *trp* operon.

Unit IV Translation 10 h

Overview of Genetic code, wobble hypothesis. Mechanism of translation in Prokaryotes & Eukaryotes. Post translational modifications of proteins-Phosphorylation, Deformylation, Glycosylation, Acetylation, Amidation, Lipidattachment, S - Nitrosylation and Disulfide bond formation. Translationalinhibitors.

Unit V DNA Damage and DNA Repair 8 h

Repair mechanism-Nucleotide excision, base excision, Mismatch repair, Photo reactivation, SOS and recombination repair. Epigenetic Modifications

Text Books

1 Bruce Alberts,Rebecca Heald, et al., 2022,"Molecular Biology of The Cell", 7th Edition, W.W. Norton & Company, New York

2 Lodish H *et al.*, 2007, "Molecular Cell Biology", 4th Edition, American Scientific Books, United States

References

1 Jocelyn E Krebs, Benjamin Lewin, *et al.*,, 2011, " Genes XI",11th Edition, Jones & Bartlett Learing ,USA

2 Gerald Karp, 2007, " Cell and Molecular Biology, Concept and Experiments", 8th Edition, Wiley & Sons, USA

3 Freifelder D & Malacinski GM, 1996, "Essential of Molecular Biology", 2nd Edition, Panima Publishing Co, New Delhi.

4 De Robertis, 2011, " Cell and Molecular Biology", 8th Edition, Lippincott Williams & Wilkins,USA

Course Code	Course Name	Category	L	T	P	Credit
223BT1A3CB	BIODIVERSITY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The diversity and conservation of organisms.
- The importance of diversity.
- The ethics involved in conservation.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Identify the nature, concept and definition of Biodiversity, conservation strategies.	K2
CO2	Explain the Global patterns of Biodiversity	K2
CO3	Discuss biodiversity & major biomes of world	K2
CO4	Demonstrate biodiversity for sustainable development	K3
CO5	Analyze the ethics involved in conservation	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

223BT1A3CB	BIODIVERSITY	SEMESTER III

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Biodiversity Definition and Concepts 10 h

Definition and Scope of Biodiversity. Biodiversity and its types : Genetic Diversity, Species/Organismal Diversity, Ecological/Ecosystem Diversity, Landscape/Pattern Diversity, Agrobiodiversity, Bicultural Diversity and Urban Biodiversity

Unit II Global Patterns of Biodiversity 10 h

Catalogue and Discovering Species, Geographical Patterns of Species Richness, Biogeography, Importance of Distribution Patterns (Local Endemics, Sparsely Distributed Species, Migratory Species), GAP Analysis. Species & individual in the ecosystem - Habitat & niche, Ecological equivalence, Biological clock Basic behavioral patterns

Unit III Biodiversity Threats and Conservation 8 h

Specific flora & fauna. Overexploitation, threatening to living species, rare and endangered species, International Trade. Threats to Biodiversity - Animals threatened by International trade, Problems in Controlling International Trade (Enforcement, Reservations, Illegal Trade), In situ and ex situ conservation.

Unit IV Community Ecology - Plants and Animals 10 h

Interspecific interactions and Competition, Host-Parasite interactions, Predator-prey interactions, Plant herbivore interaction. Community ecology - Structure and function of communities, Stability and change in communities. Regulation of communities - Role of species diversity, Role of predators, Role of competition, Role of nutrients.

Unit V Biodiversity for Sustainable Development 10 h

Sustainable management of biodiversity: International and regional policies. Biodiversity Act, National Biodiversity Board. International conventions and treaties on conservation. Biodiversity Institutes in India: Zoological Survey of India, Botanical Survey of India, Forest Research Institute, Central Marine Fisheries Research Institute. Ethics of conservation: Legal, Ethical and Conservation issues related to uses of biodiversity, Global Conservation Issues.

Text Books

1 Krishnamurthy KV, 2003, "Textbook of Biodiversity", 1st edition, Science Publisher, India

2 Narendran TC, 2006, "An Introduction to Taxonomy", Zoological Survey of India, Kolkata.

References

1 Negi SS, 2008, "Biodiversity and its Conservation in India: Status, Threats and Conservation", 2nd edition, Saujanya Books., India

2 Jeffries MJ, 2006, "Biodiversity and Conservation", 1st edition, Routledge, UK.

3 Jeffery MI et al., 2008, "Biodiversity Conservation, Law and Livelihoods", 1st edition, Cambridge University Press, UK

4 Singh G, 2008, "Plant Systematics: Theory and Practice", Oxford & IBH Publishing Co. Pvt. Ltd., India.

223BT1A3CP	CORE PRACTICAL - III: MOLECULAR BIOLOGY AND BIODIVERSITY	SEMESTER III

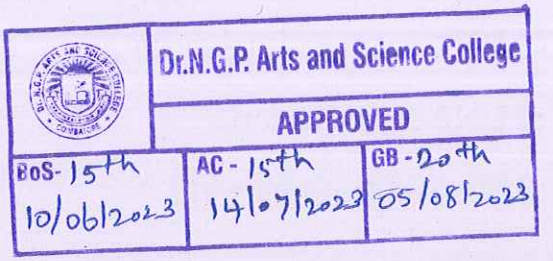
Total Credits: 2
Total Instructions Hours: 48 h

S.No	Contents
1	Isolation of DNA from Plant
2	Isolation of DNA from Animal tissue
3	Isolation of DNA from Bacteria
4	Isolation of Plasmid from Bacteria
5	UV mutagenesis
6	Transformation
7	Preparation of Herbaria – Five families (1 Plant from each family) with Authentication from authorized agencies*
8	Field visits to nearby Zoo, Forest, Nursery, and Culture collection centre – Herbaria/Botanical Garden*
9	Introduction to Biodiversity Database-IBIN
10	Preparation and Digitalization of Insects and Calculation of Species richness by line and plot analysis*
11	Prepare an audio-visual presentation about conservation to the youth & general public on some environment issues (e.g. Destruction of local biodiversity site like lakes, ponds or a forest patch, Human-wildlife conflict, Developmental activity that has potential threat to local biodiversity.) Minimum of 10 minutes duration.

*DBT STAR Status Experiments

References

1. Sambrook J, Green MR, 2012, "Molecular Cloning: A Laboratory manual", 4th edition, Cold Spring Harbor, USA
2. Chaitanya KV, 2013, "Cell and Molecular Biology: A Lab Manual", Phi Publisher, India
3. Lindenmayer D and Burgman M, 2005, "Practical Conservation Biology", 5th edition, CSIRO Publishing, Australia
4. Singh G, 2008, "Plant Systematics: Theory and Practice", Oxford & IBH Publishing Co. Pvt. Ltd., India.



Course Code	Course Name	Category	L	T	P	Credit
222MT1A3IE	BASIC MATHEMATICS	IDC	4		-	4

PREAMBLE

This course has been designed for students to learn and understand

- the basic concept and diagonalization of Matrices
- the fundamentals of statistics using Measures of central tendency and dispersion
- the concept of Correlation and Regression

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	identify the types of Matrices	K1
CO2	compute homogeneous and non-homogeneous linear equations	K2
CO3	explain the concept of Measures of Central Tendency	K2
CO4	solve the problems using Measures of Dispersion	K3
CO5	apply Correlation and Regression Analysis	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

222MT1A3IE	BASIC MATHEMATICS	SEMESTER III

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Matrices 9 h

Kind of matrices- symmetric matrix – skew symmetric matrix – Hermitian matrix – skew-Hermitian matrix – orthogonal matrix – unitary matrix – rank of a matrix – echelon form.

Unit II Homogeneous and Non-Homogeneous Linear Equations 10 h

Vectors – linear dependence and linear independence of vectors – consistency of nonhomogeneous linear equations - homogeneous equations - eigen values and eigen vectors - diagonalization of matrices - Cayley-Hamilton theorem - inverse of a matrix.

Unit III Measures of Central Tendency 10 h

Averages or Measures of central tendency - Arithmetic Mean(A.M.) - properties - calculation - median - calculation of median - mode - calculation of mode - advantages and disadvantages of A.M., median and mode - relation between mean, median, mode.

Unit IV Measures of Dispersion 9 h

Meaning and necessity of measures of dispersion - range - quartile deviation - mean deviation - standard deviation - properties - calculation of standard deviation

Unit V Correlation and Regression 10 h

Concepts of correlation and regression - bivariate data - bivariate frequency distribution – scatter diagram - correlation - covariance - correlation coefficient - properties - calculation of r - regression - properties - rank correlation.

Note: Theory 20% and Problems 80%

Text Books

1 DuraipandianP and UdayabaskaranS,2014, "Allied Mathematics - Volume I", First Edition, S.Chand& Company Pvt Limited, New Delhi.(Unit I to II)

2 Das N G,2018,"Statistical Methods", First Edition, Mc Graw Hill Education(India) Private Limited, Chennai.(Unit III to V)

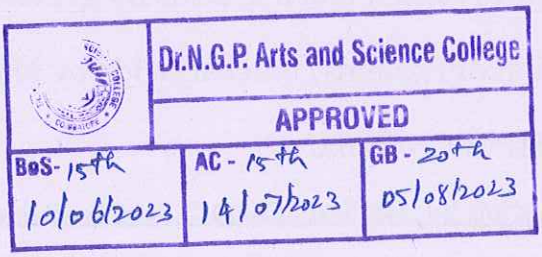
References

1 Howard Anton and Chris Rorres, 2019, "Elementary Linear Algebra", Eleventh Edition, Wiley India Pvt Ltd., New Delhi.

2 Hans Schneider and George Phillip Barker, 2013, "Matrices and Linear Algebra", SecondEdition, Dover Publications Inc., New York

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

4 Veer Bala Rastogi., 2011,'Fundamentals of Bio-Statistics', 2nd Edition. Ane Books Pvt.Ltd, New Delhi



223BT1A3SP	SEC I: BIOTECHNIQUES	SEMESTER III

Total Credits: 2
Total Instructions Hours: 72 h

S.No	Contents
1	Laboratory Safety, rules and regulations.
2	Working Principles of Laminar Air Flow, Autoclave, Hot Air Oven and Incubator
3	Principles and types of centrifugation
4	Study of UV absorption spectra of macromolecules (protein, nucleic acid,) - Colorimeter and Spectrophotometer
5	Standardization of pH meter using standard buffers
6	Buffer preparations
7	Separation of amino acids by TLC and Paper Chromatography
8	Separation of Proteins/Nucleic acids by gel electrophoresis
9	Quantification of Proteins/Nucleic acids by Nanodrop
10	HPLC and HPTLC - Demo
11	Lab Visits - KMCH, SITRA, DRDO, Central Instrumentation Centre - BU, IFGTB
12	Repairing and Calibration of instruments

References

1. Walker J, Wilson K, 2000, "Principle & Technique – Practical Biochemistry", 5th edition, Cambridge university press, UK
2. Rakesh S. Sengar , Amit Kumar , Reshu Chaudhary , Ashu Singh, 2018, "Advances in Molecular Techniques", 1st edition, CRC Press, USA
3. Sawhney SK, Randhir S, 2006, "Introductory Practical Biochemistry", 3rd edition, Narosa publishing House, India
4. Boyer, Rodney F Benjamin and Cummins, 2001, "Modern Experimental Biochemistry", 2nd edition, Pearson Education, UK

223BT1ASSA	SELF STUDY - BIOFERTILIZER TECHNOLOGY	SEMESTER III

Total Credits: 1

Syllabus

Unit I Introduction to Biofertilizers

An introduction to fertilizers, synthetic fertilizers, natural fertilizers, inorganic fertilizers, organic fertilizers, bio-fertilizers - importance, advantages and constraints.

Unit II Culturing Methods

Isolation, culturing methods, enumeration and identification of microbial species - Rhizobium, Azospirillum Azotobacters, blue green algae and phosphate solubilisers.

Unit III Rhizobium

Morphology of Rhizobium, Azospirilium, Azotobacters, blue green algae and phosphate solubilisers and maintenance - inoculant preparation.

Unit IV Preparation of Inoculants

Preparation of microbial inoculants - large-scale production of microbes – their application as biofertilizers - crop responses to biofertilizers

Unit V Algae and Biofertilizers

Azolla - distribution, morphological and biochemical characteristics – cyanobacterial symbionts - azolla biofertilizer technology - organic matter and composting – method of processes, applications and limitations

Text Books

1 Rao, N.S. 2000. Biofertilizers in Agriculture. 2nd edition. Oxford & IBH publishing Co. New Delhi

2 Sundararaj, D.D. and Thulasidas, G. 1993. Botany of Field Crops. 2nd edition. McMilan India Ltd. India

References

1 Jeswani, L.M. and Balddev, B. 1990. Advances in Pulse Production Technology. 1st edition. ICAR. New Delhi..

2 Malsen, L.J.G.V. and S. Somaatmadja. 1993. PROSEA - Plant Resources of South East Asia. No.1. Pulses. 2nd edition. International Book Distributors, Dehradun.

3 Prohit, S.S. 2003. Ecology and environment and pollution. 1st edition. Agrobios publications. India

4 Varma. P.S. 1998. Concept of ecology. 1st edition. Chand & Co Ltd. India .

223BT1ASSB	SELF STUDY - ENVIRONMENTAL MANAGEMENT	SEMESTER III

Total Credits: 1

Syllabus

Unit I Ecology and Ecosystem

Ecology - ecosystem and their types - definitions - environmental components and interrelationships - physical, chemical and biological characteristics of environment energy flow and materials cycling.

Unit II Pollution

Definition - source of pollution - types of pollution - air, water, soil, noise and radioactive pollution - environmental sanitation - environmental issues - global - national - regional and local

Unit III Environmental Standards

Prescribed environmental standards - WHO - Pollution Control Board – risk probability and hazards to humans - toxicology - chemical hazards - biological hazards: disease development and developing countries.

Unit IV Pollution Control Methods

Pollution control methods - physical, chemical and biological - waste water treatment - activated sludge process, oxidation ponds and trickling filter - anaerobic process.

Unit V Environmental Management

Tool for environment management - Environmental Impact Assessment – waste minimization techniques - environmental planning in urban development – natural resources and sustainable development - environmental ethics.

Text Books

1 Joseph, K. and Nagendra, R. 2004. Essentials of Environmental Studies. 2nd edition. Pearson Education. New Delhi

2 Tyler, M.J.R.2004. Environmental Science. 2nd edition. Thomson Brooks/Cole Publishing. Singapore.

References

1 Dhamejam, S.K. 2005. Environmental Science and Engineering. 2nd edition. Kataria sons. Delhi

2 Dubey, R.C. 2006. Environmental Health Ecological Perspectives. 3rd edition. Jones and Bartlett Publishers. USA

3 Dash, M.C. 1998. Fundamentals of Ecology. 2nd edition. Tata McGraw Hill. India .

4 Scragg, A. 2007. Environmental biotechnology. 2nd edition. Oxford university press. India.

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APPROVED

BoS- 15th	AC -15th	GB - 20th
10/06/2023	14/07/2023	05/08/2023

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'u n. ° 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

ExprimerPaccor dou 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'u n	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 : ReginеMérieux, 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
223BT1A4CA	IMMUNOLOGY	CORE	5	-	-	5

PREAMBLE

This course has been designed for students to learn and understand

- the cells of immune system
- the different techniques in immunology
- the applications of immune techniques.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts in immunology	K1
CO2	Learn basics of Immune Response and Transplantation Technology	K2
CO3	Discuss and distinguish different antigen antibody interactions, Allergic reactions and Tumour immunology	K3
CO4	Learn about different antibody production techniques	K3
CO5	Awareness on types of vaccines and its significance	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

223BT1A4CA	IMMUNOLOGY	SEMESTER IV

Total Credits: 5

Total Instruction Hours: 60 h

Syllabus

Unit I Basic concepts of Immunology 12 h

History and scope of immunology - Hematopoiesis - Infections and immunity - types of immunity - cells of the immune system- primary and secondary lymphoid organs - immunoglobulin structure - function and synthesis; memory cells, , lymphocyte differentiation.

Unit II Types of immune response 12 h

Complement systems - structure and function of MHC class I and II molecules - antigen recognition and presentation - Humoral and Cell mediated immune responses - immune suppression and immune tolerance – Transplantation immunology- Graft rejection.

Unit III Hypersensitivity and Tumor immunology 12 h

Antigen- antibody reaction, Hypersensitivity - IgE mediated, antibody mediated, immune complex mediated and delayed type hypersensitivity. Tumor immunology- tumor associated antigens, Immune response to tumor. Auto immune disorders. Treatment to Auto immune disorder.

Unit IV New Generation Antibodies 12 h

Hybridoma and monoclonal antibody production, immune diagnosis and applications - human monoclonal antibodies, catalytical antibodies – complement fixation - assessment of immune complexes in tissues.

Unit V Vaccinology 12 h

Vaccines- Immunization types- Vaccine types- live attenuated vaccines, killed vaccines and purified polysaccharide vaccines- toxoid vaccines – recombinant vaccines - DNA vaccines- Subunit Vaccines-RNA Vaccines and Protein Vaccines.

Text Books

1 Kuby J, 2003, "Immunology ", 5th edition, W.H. Freeman and Company, New York.

2 Rao CV, 2002, "Textbook of Immunology", 1st edition, Narosa Publishing House, India

References

1. Riot I, 1988, "Essentials of Immunology", 6th edition, Blackwell Scientific Publications, USA.
2. Tizard A, 1995, "Immunology ", 4th edition, Saunders college publishers, USA.
3. Ramesh, 2016, "Immunology", 1st edition, McGraw Hill Education, India Private Limited. .
4. Ed Harlow, David Lane, 1988, "Antibodies Laboratory Manual", Cold Spring Harbor Laboratory Press, USA.

Course Code	Course Name	Category	L	T	P	Credit
223BT1A4CB	BIOINFORMATICS	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- biological databases and their applications.
- the applications of various tools.
- biology better in terms of computer algorithms..

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Insight on storage and retrieval of data	K1
CO2	Understanding biological databases with applications	K2
CO3	Discuss and distinguish the types of protein structures and its implications in function	K3
CO4	Explain the sequences and its alignment which determines several roles of biomolecules	K3
CO5	Comprehend the molecular modelling and visualization for drug designing	K3

MAPPING WITH PROGRAMME OUTCOMES

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

COURSE FOCUES ON

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

223BT1A4CB	BIOINFORMATICS	SEMESTER IV

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to Bioinformatics 10 h

Introduction to Bioinformatics and AI. Big Data – Biological data. Retrieval of information. Evolution of Bioinformatics –history, scope and applications. Search engines, Entrez, PubMed, DDBJ. Commercial softwares used for biological information (Geneious, CLC genomics workbench, AMBER)

Unit II Biological databases 10 h

Types.Nucleic acid databases (NCBI, EMBL, DDBJ), protein databases (PDB, Expasy, Swiss Prot, Prosite), specialized databases (Gene Ontology GO, DrugBank, ChEMBL & KEGG), model organism databases (FlyBase, Mouse Genome Database MGD & ZFIN).

Unit III Protein structures 10 h

Physical properties – structural and sequence database for proteins – CATH, SCOP, FSSP – fold classification based on structure. Primary, secondary, tertiary, super secondary structures of proteins. Structure and functional relationship of proteins. Protein structure prediction (I-TASSER, Phyre2 and QUARK)

Unit IV Sequence Alignment and Genomics 9 h

Introduction to sequence alignments and dynamic programming: Local alignment, global alignment, pairwise and multiple alignment. FASTA – characteristics, BLAST and its types. Phylogenetic trees - evolutionary relationship using PHYLIP and MEGA X. Gene expression analysis – cDNA microarray. EST databases (DBEST, UNIGENE).

Unit V Molecular Docking 9 h

Docking – Principle, steps. Lead compound (Celecoxib as a lead COX-2 inhibitor), protein target (HIV protease for antivirals). Computer Aided Drug Designing and applications. High throughput screening- working and applications. Molecular modelling and visualization (PyMol). QSAR. Human Genome project.

Text Books

1 Shanmughavel P, 2006, "Trends in Bioinformatics", Pointer Publishers, Jaipur, India.

2 Lesk AM, 2003, "Introduction to Bioinformatics", Oxford University Press, New Delhi.

References

1 Andrew R Leach, 2001, "Molecular Modeling: Principles and Application", Pearson Publishers, United Kingdom.

2 Hans X, 2008, "Basic principles and applications", Wiley publications, United States

3 Yvonne C Martin, 1998, "Designing bioactive molecules three-dimensional techniques and applications", American Chemical Society, United States

4 Leo, Albert, Hockma, Hansch, Corwin, 1995, "Exploring QSAR", 2nd edition, American Chemical Society, United States.

223BT1A4CP	CORE PRACTICAL IV: IMMUNOLOGY & BIOINFORMATICS	SEMESTER IV

Total Credits: 2
Total Instructions Hours: 48 h

S.No	Contents
1.	Blood grouping and Rhtyping *
2.	Preparation of Serum
3.	Precipitin ring test
4.	Single Radial Immunodiffusion
5.	Double Radial Immunodiffusion
6.	Immunoelectrophoresis
7.	Rocket Immunoelectrophoresis
8.	Retrieving data from Biological Databases.*
9.	Retrieving articles with filter criteria (PubMed)
10.	Pairwise alignment using BLAST.
11.	Construction of phylogenetic trees.
12.	Visualization of protein structures and interpretation.
13.	Molecular Docking

Note: *DBT STAR College Experiment.

References

1 Sambrook J, Green M R, 2012, "Molecular Cloning: A Laboratory manual", 4th Edition, Cold Spring Harbor, USA.

2 Chaitanya K V, 2013, "Cell and Molecular Biology: A Lab Manual", Phi Publisher, India.

3 Cappuccino, 2005, "Microbiology: A Laboratory Manual", Pearson Education, UK.

4 Kannan N, 2002, "Laboratory Manual in General Microbiology", Panima Publishers, India

Course Code	Course Name	Category	L	T	P	Credit
222PY1A4IA	BIOPHYSICS	IDC	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- To study the application of physics to biological systems
- To learn the concepts and techniques of biophysics
- To find the applications of biophysics in molecular studies and medicine.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Learn basic of Molecular Biophysics	K1
CO2	Understand the Membrane Biophysics, Physical Properties of membrane and Membrane potentials.	K2
CO3	Know the biophysical techniques applied in understating biomolecules.	K2
CO4	Learn about Neurobiophysics; Nervous System, Visionary System and Hearing System.	K3
CO5	Know the Role of Radiation Physics in applied medical diagnosis & treatment.	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

222PY1A4IA	BIOPHYSICS	SEMESTER IV

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to Biophysics 10 h

Introduction - Molecular Biophysics; Thermodynamics of biological system: First and second laws of thermodynamics, activation energy. Bioenergetics: Basic concept of energy coupling reactions in biological processors, Energy requirements in cell metabolism, high energy bonds, energy currency of cell.

Unit II Membrane Biophysics 09 h

Physical properties of membrane: Elastic properties, Elastic constants, Charge-induced microstructures and domain. Membrane melting - Membrane potentials: Cell surface charge, Resting membrane potential, Action potential, Membrane impedance and capacitance, Transmembrane potential, Total electrochemical potential.

Unit III Biophysical Techniques and Methods 10 h

Introduction to Light: Reflection, Refraction, Diffraction, Interference phenomena - Refractometry: Refraction of light and Snell's law, Refractive index, Principle, design, Working and application of Abbe's refractometer - Polarimetry, Viscometry, Static scattering techniques, Dynamic scattering techniques, X-Ray Diffraction and Molecular Structure, Optical tweezers, Patch clamping, Molecular dynamics, Potential energy contour tracing.

Unit IV Neurobiophysics 09 h

Introduction: The nervous system; Synapse, Physics of membrane potentials, Membrane potential due to diffusion, Voltage clamp, Sensory mechanisms : The Eye; The visual receptor, Electrical activity and visual generator potentials, Neural aspects of vision, Visual communications, Physical aspects of hearing - The Ear; Elementary acoustics, Theories of hearing.

Unit V Radiation and Medical Biophysics 10 h

Basics of radiation physics: Isotopes, Isobars, Isotones, Isomers, Radioactivity, General properties of alpha, beta and gamma radiations, Radiation units - Radiolysis of water, Production of free radicals and their interactions, Radiation chemical yield and G value, Target theory, Single hit & Multi hit theory, Effect of

radiation on nucleic acids, Proteins, Enzymes - Radioisotopes in biology, Medicine (Therapy and diagnosis), Agriculture, Biological applications of radioisotope, Radio-labeling and Tracer techniques, Radiation sterilization of medical product.

Text Books

1 Vasantha Pattabhi, Gautham N, 2002, "Biophysics", 1st Edition, Kluwer Academic Publishers, United States.

2 Rodney M.J, Cotterill, 2002, "Biophysics: An Introduction", 2nd Edition, John Wiley & Sons Ltd, United States.

References

1 Tom A Waigh, 2007, "Applied Biophysics - A Molecular Approach for Physical Scientists", 1st Edition, John Wiley & Sons Ltd, United States.

2 Jay L Nadeau, 2018, "Introduction to Experimental Biophysics, Biological Methods for Physical Scientists", 2nd Edition, CRC Press, United States.

3 Glaser, Roland, 1999, "Biophysics", 1st Edition, Springer-Verlag Berlin, Heidelberg.

4 Parke, William C, 2020, "Biophysics: A Student's Guide to the Physics of the Life Sciences and Medicine", 1st Edition, Springer International Publishing, United States.

Course Code	Course Name	Category	L	T	P	Credit
223BT1A4EP	RECOMBINANAT DNA TECHNOLOGY	SEC	2		3	2

PREAMBLE

This course has been designed for students to learn and understand

- To evaluate the concept of rDNA technology
- To determine types of vectors used inrDNA technology.
- The applications of rDNA technology

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Imparts knowledge on importance of steps in recombinant DNA Preparation, introduction and selection	K2
CO2	Explain the features of various types of bacterial cloning vectors	K2
CO3	Explain the features of various types of cloning vectors for yeast, animal and plant	K2
CO4	Describe and apply various molecular techniques	K3
CO5	Demonstrate the different applications of recombinant based products	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

223BT1A4EP	RECOMBINANAT DNA TECHNOLOGY	SEMESTER IV

Total Credits: 2

Total Instruction Hours: 60 h

Syllabus

Unit I Fundamentals of recombinant DNA Technology 6h

History and scope of rDNA technology, Strategies of cloning, Cutting and Joining of DNA – Linker and Adapters, enzyme involved in cloning, Features of host cell.

Practical 6h

1. Isolation of Genomic DNA from Animal, Plant and Bacteria*
2. Restriction Mapping
3. Ligation

Unit II Cloning vectors 6 h

Plasmids – properties of plasmid, types of plasmids, plasmid compatibility and incompatibility, copy number and its control. Features of Bacterial Vectors, E. coli vectors – pBR322 and pUC vectors.

Practical 6h

4. Isolation of Plasmid from bacteria*
5. Antibiogram analysis

Unit III PCR and DNA Libraries 6h

PCR and its types. Construction of cDNA and genomic DNA libraries. DNA sequencing, Probes – probe construction and labeling.

Practical 6 h

6. DNA Amplification by PCR
7. cDNA construction

Unit IV Gene Transfer methods 6 h

Introduction of cloned genes into -cell transformation, particle bombardment, liposome mediation and Electroporation.

Practical 6h

8. Transformation
9. Conjugation

Unit V Blotting Techniques 6 h

Blotting techniques – Southern, Northern, Western. ELISA and its Types

Practical 6h

10. Western blotting
11. ELISA

Note: *DBT STAR College Experiment.

Text Books

1. Brown, T. A, 1998, "Introduction to Gene Cloning", 3rd Edition, Stanley Thornes Publishing Ltd..
2. Primrose, S. B, 2003, " Principles of Gene Manipulation", 6th Edition, Blackwell Science Ltd.

References

1. Ernst. L. Winnacker, 2003, " From Genes to Clones", 2nd Edition, Panima Publishing Corporation.
2. James. D. Watson, 2001, "Recombinant DNA Technology", 2nd Edition, WH Freeman and company.
3. Brown, T. A, 2016, "Gene Cloning and DNA Analysis", 7th Edition, Wiley Blackwell.
4. Primrose, S.B. and Twyman, R. 2013, " Principles of Gene Manipulation and Genomics", 7th Edition, Wiley Blackwell.

17/10/2023
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CHAIRMAN
Dr.N.G.P. Arts and Science College

Course Code	Course Name	Category	L	T	P	Credit
223BT1A5CA	PLANT AND ANIMAL BIOTECHNOLOGY	CORE	4	1	-	5

PREAMBLE

This course has been designed for students to learn and understand

- The fundamentals of Plant tissue culture and its application in laboratory settings.
- Plant genetic engineering techniques and its applications.
- Production of animal cells in culture and its maintenance.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Impart knowledge on basics of plant tissue culture and its requirements	K2
CO2	Acquire knowledge about the gene transfer techniques and applications	K2
CO3	Understand the genetic engineering and gene modification in agriculture	K3
CO4	Gain insight on animal cell culture methods	K4
CO5	Highlight the maintenance of animal cells in culture	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

223BT1A5CA	PLANT AND ANIMAL BIOTECHNOLOGY	SEMESTER V

Total Credits: 5

Total Instruction Hours: 60 h

Syllabus

Unit I **Plant tissue culture** 12 h

Design and Layout of PTC lab - Tissue culture media - Composition and its preparation. Plant Tissue Culture applications- Micropropagation, Callus culture, somatic embryogenesis, suspension culture, embryo culture, haploid culture, protoplast culture and fusion, Somoclonal variation, artificial seeds and hardening.

Unit II **Gene transfer** 12 h

Plant transformation technology- Ti and Ri plasmids, binary & co-integrated vector systems, viral vectors and their applications. CaMV and 35S promoters. genetic markers-reporter genes- Cloning Strategies- Gene transfer methods in plants - Direct DNA transfer methods (electroporation, gene gun, microinjection), *Agrobacterium* mediated nuclear transformation.

Unit III **Plant Genetic Engineering** 12 h

Applications of Plant Genetic Engineering – crop improvement, herbicide resistance, insect resistance, virus resistance, plants as bioreactors. Genetic modification in Agriculture - transgenic plants, genetically modified foods (rice, pineapple, soybean), ecological impact of transgenic plants.

Unit IV **Animal cell culture** 12 h

Facilities for animal cell culture- infrastructure.Culture media- Physical, chemical and metabolic functions of different constituents of culture medium. Balanced salt solutions, Role of carbon dioxide, serum, growth factors, glutamine in cell culture. Serum and protein free defined media and their applications. Risks in a tissue culture laboratory and safety - biohazards. Equipment, culture vessels.

Unit V **Animal Cell, Tissue and Organ culture** 12 h

Primary cell culture techniques - mechanical disaggregation, enzymatic disaggregation, separation of viable and non-viable cells, FACS. Mass culture of cells - manipulation of cell line selection - types of cell lines -maintenance of cell lines - immobilization of cells and its application - synchronization of cell cultures. Cryopreservation. Medical/pharmaceutical products of animal cell culture.

Text Books

1 Singh B D, 2006, "Plant Biotechnology", 1st Edition, Kalyani Publishers.

2 Ranga M M, 2000, "Animal Biotechnology", 1st Edition, Agrobios.

References

1 Razdan M K, 2002, "Introduction to Plant tissue culture", 2nd Edition, Oxford & IBH publishing company.

2 Chawla H S, 2013, "Introduction to Plant Biotechnology", 3rd Edition, Oxford & IBH publishing company.

3 Jennie P Mathur and David Barnes, 1998, "Animal Cell Culture Methods", Volume 57, Academic Press.

4 Ian Freshney R, 2015, "Culture of Animal Cells", 7th Edition, Wiley Blackwell.

Course Code	Course Name	Category	L	T	P	Credit
223BT1A5CB	ENVIRONMENTAL BIOTECHNOLOGY	CORE	4	1	-	5

PREAMBLE

This course has been designed for students to learn and understand

- The ecosystem and organization.
- The chemistry involved in environment.
- The management of sustainable environment.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the structure and organization of ecosystem	K2
CO2	Manage and control the pollution and wastage	K3
CO3	Comprehend chemistry behind environmental effects	K3
CO4	Comprehend the environmental policies	K3
CO5	Comprehend the biological remediation of pollutants	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

223BT1A5CB	ENVIRONMENTAL BIOTECHNOLOGY	SEMESTER V

Total Credits: 5

Total Instruction Hours: 60 h

Syllabus

Unit I **Ecology and Ecosystem physiology** 12 h

Introduction to ecology - Definition, Objective of ecological Studies, Classification of ecology, Ecology Levels. Ecosystem-Definition, Structure of an ecosystem (Abiotic and Biotic components). Energy flow in ecosystem- Trophic levels, Food chain, Food web and Ecological succession. Ecological pyramids (Numbers, Biomassand Energy).Biogeochemical cycle-Nitrogen and Phosphorous.

Unit II **Environmental pollution** 13 h

Environmental pollution- Types, Causes, Effects and Controls measures, Human health risks (Air, Water, Soil, Noise and Nuclear hazards). Global environmental problems- Ozone depletion, Greenhouse effect, Global warming and Acid rain.

Unit III **Waste management** 12 h

Chemistry of water- Alkalinity and acidity of water, Hardness of water, Concept of BOD, COD and TDS. Bio-Indicators of water quality. Waste water treatment- Primary, Secondary, Tertiary. Solid waste management –Types of waste, Disposal methods.

Unit IV **Environmental policies** 10 h

Environment laws- Environment Protection Act, Air (Prevention & control of Pollution) act, Water (Prevention and control of Pollution) act. International agreements- Montreal and Kyoto protocols, Convention on Biological Diversity (CBD).

Unit V **Bioremediation and bioenergy** 13 h

Bioremediation –Types and techniques (In Situ and Ex Situ Bioremediation), Microorganisms involved in bioremediation, Factors affecting bioremediation, Advantages and disadvantages of bioremediation, Super bugs. Bioleaching of ore- Chemistry of bioleaching (Direct and Indirect mechanisms), Methods of leaching, Examples of bioleaching of metals (Copper and Iron). Biogas production (Anaerobic digestion), Microbial biofuels.

Text Books

1. Singh Y K, 2006, "Environmental Science", 1st Edition, New Age International (P) Limited, India.
2. Agarwal S K, 2007,"Environmental Biotechnology",1st Edition, APH Publishing, India.

References

1. Martin Alexander, 1999, "Biodegradation and Bioremediation", 2nd edition, AcademicPress, USA.
2. Alan Scragg, 2007, "Environmental Biotechnology",2nd edition, Oxford university press.
3. Miller G T, Scott JR, Spool man E, 2010, "Environmental Science". 13th Edition, Yolanda Cossio Publisher, USA.
4. Mohapatra P K, 2006, "Textbook of Environmental Biotechnology",1st edition, IK International Publishing House Pvt Ltd, India.

Course Code	Course Name	Category	L	T	P	Credit
223BT1A5CC	ENTREPRENEURIAL BIOTECHNOLOGY	CORE	4	1	-	5

PREAMBLE

This course has been designed for students to learn and understand

- Entrepreneurial opportunities in Biotechnology.
- Research and Development and finance.
- IPR and start up.

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 Entrepreneurship strategy	K2
CO2	Know the concepts of business, budget and financial sources	K2
CO3	Understand the knowledge centres andResearch and Development	K2
CO4	Learn about funding, funding agenciesand policies	K2
CO5	Apply the IPR, Startups in Biotech industry	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

223BT1A5CC	ENTREPRENEURIAL BIOTECHNOLOGY	SEMESTER V

Total Credits: 5

Total Instruction Hours: 60 h

Syllabus

Unit I Basics of Bioentrepreneurship 10 h

Introduction, Biotechnology in India and global skills, the Significance of the Biotechnology Entrepreneur, Biotechnology Entrepreneurship Versus General Entrepreneurship, Entrepreneurship and Intrapreneurship. The Biotechnology Entrepreneur, Essential Biotechnology Entrepreneurial Characteristics, Four Backgrounds of Biotechnology Entrepreneurs, Driving Forces behind a Biotech Entrepreneur's Decisions, Learning from "Failure".

Case study: Innovation in Today's world in the field of Biotechnology

Unit II Management and Finance 13 h

Types and sources of Innovation. Search for a business idea, concept of project and classification, project identification, project formulation, project design, project report, project appraisal, SWOT analysis. Budget and planning process. Sources of financial assistance, approaching loan from bank and other financial institutions, production and marketing.

Case study: How Small Tech fits into the Larger Plan

Unit III Knowledge Centres and R &D 13 h

Knowledge centres - Universities, innovation centre, research institutions and business incubators. R&D - technology development and up gradation, assessment of technology development, managing technology transfer, industry visits to successful bio-enterprises, quality control, technology transfer agencies, Understanding of regulatory compliances and procedures (CDSCO, NBA, GLP, GCP & GMP).

Case study: Science to Technology - and, what's worthwhile

Unit IV Funding 12 h

Funding of biotech businesses- Financing alternatives, Venture Capital funding, funding for biotech in India. Support mechanisms for entrepreneurship - Bioentrepreneurship efforts in India, difficulties in India experienced, organizations supporting biotech growth, areas of scope, funding agencies in India, biotech policy initiatives .

Case study: Building, sustaining or exiting a successful novel company

Unit V Biotech enterprises and IPR 12 h

Desirables in start-up, setting up Small, Medium & Large-scale industry, Quality control in Biotech industries, Location of an enterprise, steps for starting a small industry, incentives and subsidies, exploring export possibilities. Government schemes and development programs for commercialization of technology (Biotech Consortium India Limited, MSME, DBT, DST, BIRAC, Startup and Make in India). Intellectual Property Protection Strategies for Biotechnology Innovations - Introduction to Copyrights, Trademarks, Patents, Contracts relating to Intellectual Property, Collaborative Research Projects.

Case study: Bioentrepreneurs Profile in Biotechnology

Text Books

1. Craig Shimasaki, 2014, "BiotechnologyEntrepreneurshipStarting, Managing, and Leading Biotech Companies", Academic Press (Imprint of Elsevier).
2. Michael L. Salgaller, 2010,"Biotechnology Entrepreneurship from Science to Solutions -- Start-Up, Company Formation and Organization, Team, Intellectual Property, Financing", Logos Press.)

References

1. Peter Kolchinsky, 2005, "The Entrepreneurs Guide to a Biotech Startup", fourth Edition, www.evelexa.com
2. Robert Mellor with Gary Coulton, Anne Chick, Antonia Bifulco, Noha Mellor and Alan Fisher, "Entrepreneurship for Everyone: A Student Textbook" SAGE Publications.
3. Florentina Matei, Daniela Zirra, 2019, "Introduction to Biotech Entrepreneurship: From Idea to Business - A European Perspective", Springer Nature Switzerland
4. https://fastercapital.com/content/Biotech-entrepreneurship--How-to-enter-and-succeed-in-the-fast-growing-and-competitive-biotechnology-sector.html.
5. https://onlinecourses.nptel.ac.in/noc24_de06/preview
6. https://onlinecourses.nptel.ac.in/noc24_ge15/preview
7. https://ugcmoocs.inflibnet.ac.in/index.php/courses/view_ug/199

223BT1A5CP	CORE PRACTICAL V: PLANT, ANIMAL AND ENVIRONMENTAL BIOTECHNOLOGY	SEMESTER V

Total Credits: 3
Total Instructions Hours: 72 h

S.No	Contents
1	In vitro germination of seeds
2	Micro propagation
3	Callus induction
4	Artificial Seed production
5	Cell Suspension Culture
6	Protoplast isolation and fusion*
7	Isolation of Chick Embryo fibroblast*
8	Isolation of Liver and Spleen cells
9	Animal Cell count and Cell Viability test*
10	Analysis of chloride content from ground water obtained from various sources
11	Determination of alkalinity present in different sources of water
12	Analysis of Acidity present in ground water from different sources
13	Determination of Chemical Oxygen Demand
14	Determination of MPN from the given water sample

Note: * DBT STAR Experiments

References

1. Satish Kumar Sinha, 2012, "Plant Tissue Culture: Theory and Practice", 1st Edition, Oxford Book Company

2. Ian Freshney R, Amanda Capes-Davis, 2021, "Freshney's Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications", 8th Edition. Wiley-Blackwell.

3. Jayanta Kumar Patra, Gitishree Das, Swagat Kumar Das, Hrudayanath Thatoi, 2020, "A Practical Guide to Environmental Biotechnology (Learning Materials in Biosciences)". 1st Edition, Springer Verlag, Singapore.

4. Tyler Miller G, Scott Spoolman, 2010, "Environmental Science", 13th Edition, Brooks/Cole.

Course Code	Course Name	Category	L	T	P	Credit
223BT1A5SA	BIOPROCESS TECHNOLOGY	SEC	3	-	-	2

PREAMBLE

This course has been designed for students to learn and understand

- The basics of bioprocess technology.
- The various types of fermentations and fermentors.
- The upstream and downstream processing in fermentation technology.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamentals of bioprocess technology	K1
CO2	Study the media components and its optimization in bioprocess technology	K2
CO3	Know about the design of various types of fermentors	K3
CO4	Gain knowledge on recovery and purification of fermentation products	K4
CO5	Identify the applications of bioprocess technology	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

223BT1A5SA	BIOPROCESS TECHNOLOGY	SEMESTER V

Total Credits: 2

Total Instruction Hours: 36 h

Syllabus

Unit I Introduction to Bioprocess Technology 8 h

Overview of bioprocess technology and its significance- Milestones of fermentation technology-Types of fermentation- Types of fermentation Products- Microbial fermentation methods-Solid state fermentation- Submerged fermentation (Batch, Fed-batch & Continuous). Isolation - Screening-primary and secondary screening, methods and maintenance of industrially important microbes. Strain improvement methods. Quality control in culture maintenance. Regulatory constraints of bioprocess technology.

Unit II Media for Industrial fermentations 8 h

Sterilization of media and fermentor -Criteria for fermentation media- media components-water, carbon sources, nitrogen Sources, minerals, buffers, chelators, precursors, inducers, antifoams–trace elements - Control parameters- pH, temperature, dissolved oxygen-agitation & aeration-Inoculum for fermentation. Media optimization - Plackett burmann and Response surface methodology. Software's used for optimization.

Unit III Design of a fermentor 8 h

Basic architecture and functions of a fermentor-construction materials- agitator-baffles-sparger- stirrer glands & bearings-addition of inoculums, nutrients and other supplements-sampling-feed ports- sensor probes (acid-base sensors & DO probe)-valves-steam trapes- foam control-temperature control. Types of fermentor-batch bioreactor- stirred type bioreactors-airlift bioreactors-fluidized bed reactor-packed bed reactor-bubble column bioreactor

Unit IV Recovery and Purification of fermentation products 6 h

Removal of microbial cell and other solid matters-foam separation-precipitation-filtration-centrifugation-cell aggregation and flocculation-cell disruption-physio-chemical methods-Chromatography – adsorption, ion exchange, gel permeation, affinity, reverse phase high performance chromatography-drying-quality assessment & packaging.

Unit V Applications & Digitalization in fermentation technology 6 h

Fermentation applications in industry- Organic acids (Citric acid)-Aminoacid (L-Glutamic acid) - Brewing (beer, wine)-Antibiotic production (Ampicillin) – Vitamin (Riboflavin), Solvent (Ethyl alcohol) - Production of SCP, biogas, biofertilizers, biopesticides, biopolymer, Recombinant protein production (Peptide vaccine). Automation in fermentation technology.

Text Books

1 Stanbury P F & Whitaker A, 2010, "Principles of Fermentation Technology", Oxford: Pergamon Press.

2 El-Mansi M & Bryce C F, 2007, "Fermentation Microbiology and Biotechnology", Boca Raton: CRC/Taylor & Francis.

References

1 Shuler M L & Kargi F, 2002, "Bioprocess Engineering: Basic Concepts", Upper Saddle River, NJ: Prentice Hall.

2 Rao D G, 2010, "Introduction to Biochemical engineering", 1st edition, McGraw-Hill publications.

3 Gerald Reed, 2007, "Industrial Microbiology by Prescott and Dunns", 4th edition, Chapman & Hall publications.

4 Paulie M Doran, 2005, "Bioprocess Engineering Principles", Academic Press.

Course Code	Course Name	Category	L	T	P	Credit
223BT1A5DA	CLINICAL TRIALS	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The regulations on clinical trials.
- The difference between different phases of clinical trials.
- The different guidelines applicable.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the phases of pre-clinical trials	K2
CO2	Gain knowledge on clinical guidelines and regulations of DCGI	K2
CO3	Comprehend the ethics of clinical trials	K3
CO4	Infer the information on various guidelines of international organization.	K3
CO5	Interpretdata in the consent forms and information sheets.	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

223BT1A5DA	CLINICAL TRIALS	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Phases of Clinical Trials 8 h

Introduction to Pharmaceutical Industry, Drug development process, Preclinical testing. Clinical Trials - Phase I, Phase II A and B, Phase III A and B, Phase IV and Types of Post marketing surveillance.

Unit II Clinical Trials Planning 10 h

Sponsor's responsibilities, Essential documentation and investigator's Brochure, Protocol design, CRF design, Informed Consent Documents - Subject Information Sheet and Informed Consent Form, Ethics Committee Approvals.

Unit III DCGI and FDA Regulations 10 h

DCGI – roles and responsibilities - Clinical research regulation of DCGI.FDA Regulations for Clinical Trials, FDA Guidelines and Information Sheets, FDA Compliance Program Guidance Manuals, FDA Bioresearch Monitoring Program (BIMO), ICMR Guidelines for clinical trials, Limitations and drawbacks in clinical trials.

Unit IV Ethical Guidelines 10 h

Ethical Guidelines for Biomedical Research in Human and animal Subjects, Central Ethics committee on Human Research (CECHR), Ethics in Clinical Research for Communicable and Non Communicable Diseases. Ethics concerned with microbiology and serology studies.

Unit V Guidelines of Various Organizations 10 h

History of GCP, ICH Guidelines for Good Clinical Practice, Central Drugs Standardization and Control Organization, Protected Health Information (PHI), Obtaining Informed Consent under HIPAA. The declaration of Helsinki, The Belmont Report (1979), Schedule Y and Schedule H.

Text Books

1 Katzung BG, 1995, "Basic and Clinical Pharmacology", 12th Edition, Prentice Hall of Intl.

2 Murugesh N, 2014,"A Concise text book of Pharmacology", 7th Edition, Sathya Publications.

References

1 HackshawA, 2009, "A Concise Guide to Clinical Trials", 1st Edition, Wiley Publishers.

2 Chin R, and Bruce Y L, 2008, "Principles and Practice of Clinical Trial Medicine", 1st Edition, Academic Press.

3 Weinberg S, 2009, "Guide Book for Drug Regulatory Submissions", 1st Edition, John Wiley & sons

4 Haynes RB, Sackett DL, Guyatt GH, and Tugwell P, 2005, "Clinical Epidemiology: How to Do Clinical Practice Research", 3rd Edition, Lippincott-Williams and Wilkins

Course Code	Course Name	Category	L	T	P	Credit
223BT1A5DB	BIOETHICS & BIOSAFETY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The issues related to ethical framework.
- Legal issues concerning biotechnology products and genes.
- Classical examples of patented products.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Gather knowledge about lab safety and committees involved	K2
CO2	Understand the role of bioethics in the field of biotechnology and its products	K3
CO3	Gain insight on types of IPR and its licensing	K3
CO4	Imbibe art of patenting and strategies involved.	K3
CO5	Highlight the global scenario on IPR	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

223BT1A5DB	BIOETHICS & BIOSAFETY	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Biosafety Basics 09 h

Good Lab Practices, Introduction to Biological Safety Cabinets, Primary Containment for Biohazards, Biosafety Levels, GMOs and LMOs and their environmental impact, Roles of Institutional Biosafety Committee, RCGM, GEAC.

Unit II Genes and Bioethics 09 h

Bioethical issues related to Healthcare & medicine Food& agriculture. Genetic engineering, Human Genome Project. Genetic Testing, types, pros and cons, informed consent. Socio-economic problems and environmental problems relating to bioethics.

Unit III Copyright and Patents 10 h

Definition, Concept of Intellectual Property, Kinds of Intellectual Property Patents, Copyrights, Designs, Trademarks, Geographical Indication, Infringement of IPR, protection and Remedies, Licensing and its types.

Unit IV Features of Patenting 10 h

Requirement of patentable novelty, Inventive step, Prior art, Classifying products as patentable and non-patentable, Procedure for applying for patent, Patent Infringement and related case studies Biological Patentability. Biopiracy and Bioprospecting. Farmers Rights and Plant breeders rights Biodiversity.

Unit V Patented Products 10 h

Traditional knowledge and patent issues with relevance to Indian context. Basmati rice patent case, turmeric patent case, Neem leaves patent, superbug patenting.

Text Books

1 Deepa Goel, 2013, "IPR Biosafety and Bioethics",1st edition, Pearson Education.

2 Sateesh M K, 2008, "Bioethics and Biosafety", 1st Edition, I.K.International Publishing House.

References

1 Catherine J Holland, 2007, "Intellectual Property: patents, trademarks, copyrights, trade secrets", 1st edition, Entrepreneur Press.

2 Srinivasan K and Awsthi H K, 1997, "Laws of Patents", 1st edition, Jain Book Agency.

3 Thomas H Murray and Maxwell J Mehlman, 2005, "Encyclopedia of Ethical, Legal and Policy issues in Biotechnology", 1st edition, Wiley Interscience.

4 https://www.who.int/csr/resources/publications/biosafety/Labbiosafe Microsoft Word - LBM2+ final for pdf.doc (who.int)

Course Code	Course Name	Category	L	T	P	Credit
223BT1A5DC	MOLECULAR SIGNALING	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Molecular signaling mechanisms, pathways, and their implications.
- Cell communication processes, receptors, and signal transduction.
- Signaling molecules, messengers, and therapeutic targeting strategies.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of molecular signaling and the roles of signaling molecules, ligands, and messengers	K2
CO2	Acquire knowledge about different types of signaling receptors and their mechanisms of action	K2
CO3	Learn the molecular mechanisms, regulation, roles of various signaling pathways in diseases condition	K3
CO4	Impart the knowledge on clinical implications of various signaling pathways	K3
CO5	Evaluate the potential of targeting molecular signaling pathways for therapeutic interventions	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

223BT1A5DC	MOLECULAR SIGNALING	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to Molecular Signaling 09 h

Introduction to molecular aspects of cell signaling, Paracrine, Autocrine, Endocrine, Synaptic signalling, and juxtacrine signalling. Signaling Molecules, Ligands and Receptors. first messenger - hormone or neurotransmitter, Second messengers - cyclic nucleotides (e.g., cAMP, and cGMP), ions (e.g., Ca2+), phospholipid-derived molecules (e.g., inositol triphosphate), and gas (e.g., nitric oxide-NO).

Unit II Signaling Receptors 09 h

Signaling Receptors: types of receptors, Intracellular receptors, cell surface receptors, Ligand-gated ion channel receptors, Enzyme linked receptors, G protein-coupled receptors (GPCRs) Receptor tyrosine kinases (RTKs), Cytokine receptors, Chemokine receptors and Phosphatase receptors.

Unit III Molecular Signaling Pathways - I 10 h

Molecular Mechanism, Regulation, Role and Clinical Implications of Akt/PKB signaling, 5' AMP-activated protein kinase, cAMP-dependent pathway, Ubiquitin-Proteasome Pathway, Hedgehog signaling pathway, Hippo signaling pathway and CaMKII protein family, Insulin signal transduction pathway and calcium signaling.

Unit IV Molecular Signaling Pathways - II 10 h

Molecular Mechanism, Regulation, Role and Clinical Implications of -STAT signaling pathway, MAPK/ERK pathway, PI3K/AKT/mTOR pathway, transforming growth factor beta (TGFB) signaling pathway, VEGF signaling pathway, Nodal signaling pathway and Wnt signaling pathway.

Unit V Signaling Pathway in Targeted Therapy 10 h

Molecular Signaling Pathways as therapeutic targets - Cancer, Chordoma, allergic diseases, cardiac failure, Sickle cell disease (SCD), Autism Spectrum Disorder, hepatitis B, immunodeficiencies, Fatty Acid Oxidation Disorders, Respiratory Chain Disorders and Mitochondrial Genetic Disorders.

Text Books

1 Jacques Robert, 2015, "Textbook of Cell Signaling in Cancer", Springer Nature.

2 Wendell Lim, Bruce Mayer, Tony Pawson, 2014, "Cell Signaling: principles and mechanisms", 1st Edition, Garland Science, USA.

References

1 John T. Hancock, 2021, "Cell Signaling", 1st Edition, OUP Oxford, UK.

2 Peter J Kennelly, Kathleen M Botham, Owen McGuinness, Victor W Rodwell, P Anthony Weil, 2022, "Harper's Illustrated Biochemistry", 32nd Edition, McGraw Hill. USA.

3 Martin Beckerman, 2005, "Molecular and Cellular Signaling", 1st Edition, Springer New York, NY. USA

4 Kasirajan Ayyanathan, 2021, "Cancer Cell Signaling: Targeting Signaling Pathways toward Therapeutic Approaches to Cancer", 1st Edition, CRC Press, USA.

5 Ralph A Bradshaw, Edward A Dennis, 2009, "Handbook of Cell Signaling", 2nd Edition, Academic Press, UK.

223BT1A5GA	GENERIC ELECTIVE: MUSHROOM TECHNOLOGY	SEMESTER V

Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I **Basic concepts of Mushroom Technology** 05 h

Mushroom Technology - Introduction, History and Scope. Edible and Poisonous Mushrooms. Importance and nutritive value of edible mushrooms. Mushroom research centers in India.

Unit II **Types of mushroom and its cultivation** 05 h

Cultivation of button mushroom (*Agaricus bisporus*), milky mushroom (*Calocybe indica*), oyster mushroom (*Pleurotus sajorcaju*) and paddy straw mushroom (*Volvariella volvcea*).

Unit III **Production, Harvest and Storage methods** 05 h

Isolation and culture of spores, culture media preparation. Production of mother spawn, multiplication of spawn - Inoculation Technique.

Unit IV **Cultivation technology** 05 h

Substrates, composting technology, bed, polythene bag preparation, spawning - Cropping and its importance.

Unit V **Mushroom production** 04 h

Harvest -types and Storage methods and post marketing surveillance and types.

Text Books

1 Krishnamoorthy, A.S *et al*, 1991, "Oyster Mushrooms", 2nd Edition, TNAU Department of Plant Pathology, Tamil Nadu.

2 Suman, B C, and Sharma V P, 2007, "Mushroom Cultivation in India. 1st Edition. Daya Publishing House.

References

1. NIIR Board of Consultants and Engineers, 2011, "Handbook on Mushroom Cultivation and Processing", 1st Edition, Asia Pacific Business Press Inc, India.
2. Biswas S, 2012, "Mushrooms: A Manual for Cultivation", 1st Edition. PHI Learning Private Limited, New Delhi
3. Thapa, C.D *et al.* 2017, "Mushroom Culture", 1st Edition, Agrimoon.com.
4. Russel S, 2018, "Essential guide to Mushroom Cultivation", 2nd Edition. Storey Publishing, United States.

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Academic Council Dr.N.G.P. Arts and Science College CHAIRMAN 17/4/2024

Course Code	Course Name	Category	L	T	P	Credit
223BT1A6CA	GENOMICS AND PROTEOMICS	CORE	4	1	-	5

PREAMBLE

This course has been designed for students to learn and understand

- Basic concepts of the genome, sequencing and analysis of Genome
- Basic concepts of the proteome, sequencing and analysis of Genome
- Applications of genomics and proteomics

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Gain insights on Genome mapping and annotation	K1
CO2	Understand Microarrays and their applications	K2
CO3	Identify the protein sequence through MALDI	K3
CO4	Analyse Protein by Quantitative Proteomics	K4
CO5	Learn applications of Proteomics	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

223BT1A6CA	CORE: GENOMICS AND PROTEOMICS	SEMESTER VI

Total Credits: 5

Total Instruction Hours: 60 h

Syllabus

Unit I Genome Analysis 12 h

Access and retrieving genome project information from web - Comparative genomics. Identification and classification of genome using molecular markers, 16S rRNA typing/sequencing, Fragment Assembly and Expressed Sequence Tag (EST). Whole Genome sequencing - Sanger and Gilbert method - Next Generation Sequencing - Gene predictions. Gene Expression profiling. GENSCAN. Genomic and cDNA libraries. Metagenomics

Unit II Microarray based approaches 12 h

Oligonucleotide design, Data collection, Image processing, Data transformation and normalization, Statistical analysis to identify differentially expressed genes and Microarray data classification. Comparison of SACE and DNA Microarrays. Transcriptomics

Unit III Protein Databases 12 h

Protein databases - UniProt, RCSB, InterPro, PDB. Database of Protein family trees - SMOS.2, LenVarDB, 3PFDB, SUPFAM, MegaMotifbase, DSDBASE, Peptide Sequencing - Mass spectrometry - Fundamentals, Ionization sources, Mass analyzers, MALDI sample preparation and analysis. Hybrid mass spectrometry configurations, in-gel & in-solution digestion.

Unit IV Quantitative Proteomics 12 h

Introduction to quantitative proteomics - Relative and Absolute Quantification, Label Free Quantification -Spectral Counting. Gel based quantitative proteomics – Fluorescence 2-D Difference Gel Electrophoresis (FDIGE) and Labelled Quantification - *In vivo* labeling (SILAC & TAILS) and *In vitro* labeling (iTRAQ & TMT). Peptide Mapping and Peptide Fingerprinting

Unit V Advancements in Proteomics 12 h

Functional Proteomics, Interaction proteomics - Biochemical approaches: Direct analysis, affinity purification and protein chips. Applications of proteomics in OMICS and its translational research (Metabolomics, Metabonomics and Neutriproteomics). Challenges in Proteomics.

Text Books

1. Xiong, J. 2006. Essential Bioinformatics. Cambridge University Press, Cambridge
2. Soundararaja, S. 2002. Introduction to Bioinformatics. 1st edition. Himalaya Publishing House.

References

1. Dan E Krane and Michael L. Raymer. 2003. Fundamental concepts of Bioinformatics. 1stedition. Benjamin Cummings.
2. GladisHelenHepsyba,S.,andHemalatha,C.R.2009. BasicBioinformatics, 1st edition. MJP publisher
3. Twyman, R. 2014.Principles of Proteomics. 2ndEdition. Taylor and Francis Group, UK.
4. Westermeier, R. Naven,T.Höpker, HR. 2008. Proteomics in Practice: A Guide to Successful Experimental Design. Wiley-VCH, USA.

Course Code	Course Name	Category	L	T	P	Credit
223BT1A6CB	BIONANOTECHNOLOGY	CORE	4	1	-	5

PREAMBLE

This course has been designed for students to learn and understand

- The Basics of Bionanotechnology and its characteristics
- The latest trends of bionanoparticles in all fields
- The drug delivery system in nanotechnology

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Learn basic of Bionanotechnology	K2
CO2	Understand the basic of Bionanomachinery and protein folding	K2
CO3	Elucidate the functional concept of biomaterials	K2
CO4	Learn about microarray technology, Nanobiosensors, Biochips and its application	K2
CO5	Comprehend the drug delivery system and cancer biology based on bionanotechnology	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/FOs	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

223BT1A6CB	CORE: BIONANOTECHNOLOGY	SEMESTER VI

Total Credits: 5

Total Instruction Hours: 60 h

Syllabus

Unit I Introduction to Nanotechnology 10 h

Key features of Nano-size, size determination – XRD and Particle size analyzer. Comparison of particle behavior at nanosize to macrosize. Strategies for Nanoarchitecture (top down & bottom up approaches). Introduction to Nanobiotechnology – Biogenic nanoparticle synthesis from plants, bacteria and yeast. Biomolecular design.

Unit II Structural Bionanotechnology 13 h

Structural principles of Bionanotechnology: Natural Bionanomachinery – (Eg: Lotus leaf effect, Gecko lizard, fish hair structures, butterfly wings). Overview of Nanodevices - Strategies for construction of Nanodevices using Carbon as a raw material. Protein folding Aspects: Stable structure, Globular proteins, Role of chaperones in folding, lipid bilayer, DNA based nanostructures.

Unit III Functional Bionanotechnology 13 h

Principles of Functional Bionanotechnology. Information-driven nanoassembly: Energetics; Biomaterials- Filaments and fibrils, Minerals combined with biomaterials for specific applications. Biomolecular sensing taste and light sensors. Machine phase Bionanotechnology- Muscle sarcomeres and nerves).

Unit IV Clinical based Bionanotechnology 12 h

Differentiation of Nanoparticles and Nanosystems. Conventional drug delivery & targeted drug delivery – its role and advantages; Clinical Trials involved in Bionanotechnology.

Unit V Applications of Bionanotechnology 12 h

Principles, types and applications of Bionano-imaging, Magnetic nano-particles, nano-biosensors, biochips, biorobotics, nanopore technology and nanoarrays in medicine, agriculture, food and environmental science. Opportunities and challenges of Nanotechnology.

Text Books

1 Niemeyer, C.M. and Mirkin, C.A. 2004. Nanobiotechnology: Concepts, Applications and Perspectives. 1st Edition. Wiley-VCH, Germany.

2 Shoseyov, O. & Levy, I. 2007. Nanobiotechnology: Bioinspired Devices and Materials of the Future. 1st Edition. Humana Press, USA.

References

1 Shah, MA and Shah, KA. 2019. Nanotechnology - The Science of Small. 2nd Edition. Wiley Sons, India.

2 Poole, CP and Owens, FJ. 2020. Introduction to Nanoscience & Nanotechnology. 2nd Edition. Wiley India Pvt. Ltd., India.

3 Sanders, WC. 2018. Basics Principles of Nanotechnology. 1st Edition. CRC Press, USA.

4 Varghese, T and Balakrishna, KM. 2016. Nanotechnology: An Introduction to Synthesis, Properties and Applications of Nanomaterials. 1st Edition. Atlantic Press, India.

5 https://archive.nptel.ac.in/courses/118/107/118107015/

6 https://www.classcentral.com/subject/nanotechnology?free=true

7 https://nptel.ac.in/courses/118106019

223BT1A6CP	CORE PRACTICAL: GENOMICS, PROTEOMICS AND BIONANOTECHNOLOGY	SEMESTER VI

Total Credits: 3
Total Instructions Hours: 72 h

S.No	Contents
1.	Data Submission in genomic databank and protein databank
2.	Pairwise and multiple Sequence Alignment & Analysis by Clustal Omega
3.	Phylogenetic Analysis by MEGAx and interactive view for rooted phylogenetic trees and networks by Dendroscope3
4.	Protein Structure Prediction by AlphaFold, MODELLER and Rosetta
5.	Structure Databases & Visualization using PyMol, JMol, Cn3D and STING
6.	Protein Function Prediction sequence-based using InterPro, Pfam, PredictProtein, ProFunc and structure-based by COFACTOR
7.	Helix parameters identification by Heliquest
8.	Calculation of phi and psi angles in proteins using PyMOL, Chimera and VMD (Visual Molecular Dynamics)
9.	Structure validation and Protein Data Bank by PROCHECK, Ramachandran Plot tools in PyMOL/Chimera
10.	Proteomics data analysis by ProteoWizard tool
11.	Synthesis of Nanoparticles using herbal plants*
12.	Spectral analysis of Nanoparticles obtained from herbal sources*
	Antibacterial screening of metallic Nanoparticles.*

Note: * DBT STAR College Experiments.

References

1 Tramontano, A., 2005,"Ten Most Wanted Solutions in Protein Bioinformatics", 1st Edition, CRC Press, USA.

2 Lesk, A.M., 2014, "Introduction to Bioinformatics", 4th Edition, Oxford Publications.

3 Deepa Parvathi, V and Rajagopal, K., 2017, "A Practical Manual on Synthesis of Nanoparticles and its Applications in Biology", 1st Edition, DigitalAge Publishers, Chennai.

Course Code	Course Name	Category	L	T	P	Credit
223BT1A6SA	STEM CELL TECHNOLOGY	SEC	4	--	--	2

PREAMBLE

This course has been designed for students to learn and understand

- The features of stem cell, pluripotency and reprogramming of stem cells
- The differentiation and tools to study stem cells
- The clinical application of stem cell biology

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Learn the establishment of embryonic stem cells	K2
CO2	Understand in vitro differentiation, specification and computational tools	K2
CO3	Comprehend the regulatory mechanism in stem cells	K3
CO4	Highlight clinical application of stem cell technology	K3
CO5	Know the ethics of premature translation of stem cell interventions	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

223BT1A6SA	SEC: STEM CELL TECHNOLOGY	SEMESTER VI

Total Credits: 2

Total Instruction Hours: 48 h

Syllabus

Unit I **Introduction to stem cell** 09 h

Introduction to stem cells - *in vivo* and *in vitro*. Development of stem cells - Early development, gastrulation and lineage commitment, specification and development of primordial germ cells. Human stem cells and its plasticity with regard to research, cord blood stem cell

Unit II **Pluripotency and Reprogramming** 09 h

In vitro stem cell regeneration - establishment of embryonic stem cells (ESC), Characterization of pluripotent stem cells (PCS), Molecular mechanism underlying pluripotency, Induction of pluripotency, Potential of induced puripotent stem cells (iPSCs) in clinical applications, Reprogramming using defined factors and its mechanisms

Unit III **Differentiation of Stems cells and its tools** 10 h

In vitro differentiation, specification during development in adults, Trans differentiation and direct programming. Computational tools to dissect stem cells heterogeneity, in vitro cultures of adult stems cells to analyze differentiation capacity

Unit IV **Regulatory mechanisms in stem cell technology** 10 h

Histone modification, spatial organization of genome during ESC development and differentiation. Generation of chimeric animals and animal cloning; Pro-nuclear injection of blastocysts, transplantation of blastocysts into pseudo-pregnant mice and generation of chimeric and knockout animals

Unit V **Clinical Applications of stem cell technology and ethics** 10 h

Clinical application of stem cell technologies with reference to adult stem cell disease modeling and therapy. Stem cell therapy guidelines and clinical trials. Embryo ethics - ethics of egg donation, premature translation of stem cell interventions. Access to future stem cell therapies awareness to the public

Text Books

1 Meshore, E and Plath K. 2010. The Cell Biology of Stem Cells. Springer Science Business Media.LLC.Landes Biosciences, Germany

2 Kalloasm, M.S.2011. Embryonic Stem Cells. Basic Biology to Biogengineering. Intech Open Access Publisher, UK

References

1 Clarke, M.and Frampton, J. 2020. 1st Edition. Core Concepts in Stem Cell Biology. Routledge Taylor & Francis Group, UK

2 Lanza, R. and Atala, A. 2014. Essentials of Stem Cell Biology. Elseivier, Netherlands

3 Li,S. Herureuz,N.L., Elisseeff, J. 2011. Stem Cell and Tissue Engineering. 1st Edition. World Scientific Publishers, Singapore

4 Slack, J.M.W.2017. The Science of Stem Cells. John Wiley & Sons, Inc., USA

Course Code	Course Name	Category	L	T	P	Credit
223BT1A6DA	DRUG DESIGN AND DELIVERY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The study of drug design, development and delivery systems
- The Cheminformatics and its Application in Drug Development
- The Computer Aided Drug Design (CADD) and its role

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the Drug Design and Development, Role of Organic Chemistry, SAR & SQAR	K2
CO2	Learn the Targets Based Drug Design	K2
CO3	Impart knowledge on the pharmacophore, application of cheminformatics in Lead Compound Discovery	K3
CO4	Know the Computer Aided Drug Design (CADD), tools, SBDD & LBDD	K3
CO5	Learn the Various Target Based Drug Delivery Systems, Challenges and obstacles in drug delivery	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

223BT1A6DA	DSE: DRUG DESIGN AND DELIVERY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to Drug Design 09 h

Introduction to Drug Design and Discovery, History and Evolution of the contemporary drug discovery process. Role of organic chemistry in Drug Discovery, Design and Development. Molecular properties and interactions of drug molecules. Structure Activity Relationships (SAR) and Quantitative SAR (QSAR) techniques in drug design.

Unit II Drug Design 09 h

Types of Drug design and Drug development, difference between drug design and drug development. Classical Targets in Drug Discovery - Enzymes, Inhibition of Enzymes, G-Protein-Coupled Receptors (GPCRs), Ion Channels and Membrane Transport Proteins (Transporters).

Unit III Cheminformatics 10 h

Cheminformatics - Introduction to pharmacophore, methods in docking simulations, Applications in ADME-tox and Limitations. Role of Cheminformatics and Molecular Diversity in Lead Discovery. Sources of Lead Compounds, Screening, Identification, Modification and Lead Optimization.

Unit IV Computer Aided Drug Design (CADD) 10 h

Introduction and classification of CADD. Drug design based on bioinformatics tools, Molecular docking, De novo design, Structure Based Drug Design (SBDD) and Ligand Based Drug Design (LBDD). Challenges and emerging problems in CADD, Legal & ethical considerations in drug development.

Unit V Drug Delivery & Drug Delivery Systems 10 h

Introduction to drug delivery and targeting systems. Controlled drug release, parenteral and non parenteral routes of drug delivery and targeting - Oral, buccal, sublingual, GI tract, transdermal, nasal and pulmonary drug delivery. Gene delivery systems and Vaccine delivery. Challenges and obstacles to targeted drug delivery.

Text Books

1 MohaneCoumar. S. 2021. Molecular Docking for Computer-Aided Drug Design: Fundamentals, Techniques, Resources and Applications. 1st edition. Academic Press, USA.

2 Anees Ahmad Siddiqui. Harish Kumar. SubuhiKhisal. 2020. Computer-Aided Drug Design. 1st edition. CBS Publishers, USA.

References

1 RamaraoPoduri. 2021. Drug Discovery and Development from Targets and Molecules to Medicines. 1st edition. Springer, USA.

2 Tarun Bhatt. SurendraNimesh. 2021. The Design and Development of Novel Drugs and Vaccines. 1st edition. Academic Press, USA.

3 Osman F Guner. 2020. Pharmacophore Perception, Development, and Use in Drug Design. 1st edition. TBS Publishers, USA.

4 Anya M Hillery. Kinam Park. 2017. Drug Delivery Fundamentals and Applications. 2nd edition. CRC Press, USA.

Course Code	Course Name	Category	L	T	P	Credit
223BT1A6DB	BIOMATERIALS	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The basic concepts of Biomaterials
- The naturally occurring Biomaterials
- About the different types of biomaterials and its application medical field

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Define Biomaterials and its applications	K2
CO2	Explain the Biomaterials extracted from Protein.	K2
CO3	Explain the Biomaterials extracted from Carbohydrates	K3
CO4	Illustrate the Biopolymers synthesis and its uses	K4
CO5	Infer Biocompatibility materials used in medical field	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

223BT1A6DB	DSE: BIOMATERIALS	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I **Fundamentals of Biomaterials** 10 h

Biomaterials- properties of biomaterials, Surface Properties and Surface Characterization of Biomaterials, Role of Water in Biomaterials. Applications of biomaterials in medical field.

Unit II **Protein as Biomaterials** 10 h

Collage and Gelatin-Alginate: Structure, Preparation and application. Fibroin (protein in silk): Production and its use.

Unit III **Carbohydrates as Biomaterials** 10 h

Carbohydrates: Modified carbohydrates; Acting as lubricants for biomedical applications; Bacterial Polydextrose; Carbohydrates modified from enzymes, Cellulose and Chitin-Chitosan: structure, preparation and application

Unit IV **Biopolymers** 8 h

Biopolymers: Synthesis from a simple biological monomer - hyaluronate polymer; Dextrans, Rubber produced by bacteria and fungi, PHB, PCL; Production of a copolymer of PHB and PHV.

Unit V **Biocompatibility materials** 10 h

Metallic Implant materials, Ceramic implant materials, Polymeric implant materials, Skin and Maxillofacial implant and blood interfacing implants.

Text Books

1 Buddy D. Ratner, Allan S. Hoffman, Frederick J. Schoen, M.D, Jack E. Lemons, 2013, "Biomaterials Science An Introduction to Materials in Medicine", 3rd Edition, Elsevier Inc.

2 Ratledge, C. and Kristiansen, B., 2001, "Basic Biotechnology", 2nd Edition, Cambridge University Press.

References

1 Yoshiharu D, 1990, "Microbial polyesters", 1st Edition, VCH Weinheim Publishers.

2 Joon Park and Lakes R. S, 2007, "Biomaterials: An Introduction", 3rd Edition, Springer Verlag Publishers.

3 David Byrom, 1991, "Novel materials from biological source", 1st Edition, Macmillan Publishers Limited.

4 Masoud Mozafari, 2020, "Handbook of Biomaterials and Biocompatibility", 1st Edition, Woodhead Publishing.

Course Code	Course Name	Category	L	T	P	Credit
223BT1A6DC	SYNTHETIC BIOLOGY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The fundamental understanding of synthetic biology.
- The emphasizes responsible innovation, covering biosafety, biosecurity and ethical considerations synthetic biology.
- The multidisciplinary approach towards future development in synthetic Biology.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concept of Synthetic Biology	K2
CO2	Gain knowledge on Synthetic biological design	K2
CO3	Comprehend the principle of DNA Synthesis and System Biology	K3
CO4	Infer the information on Cell lines and synthetic life	K3
CO5	Inculcate the knowledge application of Designed biological 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

223BT1A6DC	DSE: SYNTHETIC BIOLOGY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I **Introduction to Synthetic Biology** 8 h

Information Storage in Biology – DNA Structure, DNA Replication, and PCR. Information flow in Biology – Genetic code and Proteins. Controlling the flow of Information in Biology – Transcriptional Control, Translational control and, RNA regulation.

Unit II **Basic Concepts in Engineering** 10 h

Systematic Design, Synthetic biology design cycle and its role in systematic design. The registry and part characterization. Information system – The SynBIS system and BioCAD concept. Modelling, Norbert Weiner, Signal Theory- analysis of periodic signals, Time and frequency domains, Systems and Control Theory. Block Diagram, Laplace transform method.

Unit III **Foundational Technologies** 10 h

Enabling Technologies- Genome sequences, Open Online databases, DNA Sequencing, DNA Synthesis and System Biology. Foundations -Standard DNA Assembly, Standard Measurement, Modelling, Parts registries and Upcoming Technologies.

Unit IV **Minimal Cells and Synthetic Life** 10 h

Minimal Cells – Natural Minimal Cells, Genome Reduction, Synthetic Life, Genome Synthesis and Designer Cells. Origins of Life in nature and in the lab – The RNA world, Chemical replicating systems, Parts, Devices and Systems – Parts - Promoter, Operator, Ribosome Binding site, Protein coding sequence and Terminators. Simple systems – Feedback Loops, Switches, Oscillators, Edge detector and Counters. Turning Secondary Structure of mRNA in and around parts - RBS matching and Insulators.

Unit V **Applications of Designed Biological Systems** 10 h

Potential for development, Criteria for development, Challenges in developing applications, Constructing Microbial cell factories, Protein products, Fuels, Commodity chemicals, Materials, Specialty chemicals and drugs. Medical and Health applications, Biosensors, Smart therapeutics, Tissue engineering and

patterning. Synthetic Biology for a Sustainable world – Bioremediation, Biomining, Engineering crops and commensal soil organisms. Societal Impact of synthetic Biology – Public Health and Environmental Risks, Biosecurity and Biohacking, Public value and new global inequality.

Text Books

1. Dickinson, Ellis, Freemont, Kitney, Polizzi and Stan, 2012, "Synthetic Biology - Primer", Revised Edition, Imperial College Press and World Scientific Publishing Co. Pte. Ltd.
2. Huimin Zhao and An Ping Zeng, 2018, "Synthetic Biology – Metabolic Engineering" 1st Edition, Springer International Publishing.

References

1. Darren N.Nesbeth, 2016, "Synthetic Biology - Hand Book" 1st Edition, CRC Press, USA.
2. Shailza Singh, 2016, "Systems Biology Application in Synthetic Biology", 1st Edition, Springer,India.
3. Lee S Y, Nielsen and Stephanopoulous G,2018, "Synthetic Biology- Part, Devices and Application", 8th Edition, Wiley- VCH, Germany
4. Natalie Kuldell, Rachel Bernstein, Karen Ingram and Kathryn M Hart, 2015, "BioBuilder", 1st Edition, O'Reilly Media, Inc.,CA.

Course Code	Course Name	Category	L	T	P	Credit
223BT1A6DD	BIOMARKER TECHNOLOGY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The application of markers in biology
- The biosensing devices and their working
- The technological advancement in biomarkers

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts on markers	K2
CO2	Value the importance of proteomics and genomics	K3
CO3	Comprehend the transcriptome and its role	K3
CO4	Diagnose the diseases and cures using biomarkers	K3
CO5	Understand the applications of biomarkers	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

223BT1A6DD	DSE: BIOMARKER TECHNOLOGY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I **Basics about Biomarkers** 09 h

Introduction - history - milestones - biomarkers. Types of biomarkers in the biological sciences. Genomics - Proteomics - Transcriptomics – Metabolomics relating to biomarkers.

Unit II **Types of Biomarkers** 09 h

Analysis of proteins - Analysis of transcripts - study of RNA profiling - identification of genomic DNA - comprehension of metabolites and intermediary products.

Unit III **Biomarkers Databases** 10 h

Biomarker Databases - MarkerDB -clinical and therapeutic decision making - gobiomdbplus (comprehensive database) - Charles River database.

Unit IV **Biomarkers in Drug Development** 10 h

Screening markers - toxicity markers - efficacy markers - drug development using biomarkers - disease management with examples.

Unit V **Applications of biomarkers** 10 h

Prediction of diseases - diagnostics uses - prognostic applications - staging markers - safety biomarker - susceptibility biomarker - case studies relating to different types of biomarkers in diseases

Text Books

1 Veenstra, TD and Yates, JR. 2006. Proteomics for Biological Discovery. John Wiley & Sons, USA

2 Hubert,R. 2006. Protein Biochemistry and Proteomics (The Experimenter Series), Academic Press, USA

References

1 Dale, W. J and Schantz M. 2014. From Genes to Genomes. 3rd edition, Wiley, John & sons.

2 Ridley, M. 2019. Genome: Autobiography of a species in 23 chapters. 1st edition, Harper Perinnial Publishing, USA.

3 James Watson D, 2001, "Recombinant DNA technology". 2nd Edition, WH Freeman and company, United Kingdom.

4 Campbell, A.M. and L. J. Heyer, 2007,"Discovering Genomics, Proteomics and Bioinformatics", 2nd Edition, Pearson Education

Course Code	Course Name	Category	L	T	P	Credit
223BT1A6DE	MOLECULAR DIAGNOSTICS	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The Microbes and its involvement in causing life threatening disease.
- The identification and characterization of microbes using different molecular techniques
- The applications of molecular diagnosis.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the epidemiology of diseases	K2
CO2	Gain knowledge on molecular diagnosis	K2
CO3	Comprehend the principle of molecular diagnosis	K3
CO4	Infer the information on various guidelines in clinical diagnosis.	K3
CO5	Inculcate the knowledge application of molecular techniques in different fields.	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

223BT1A6DE	DSE: MOLECULAR DIAGNOSTICS	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I **Epidemiology of Disease** 8 h

Introduction to Disease - Types -Characteristics - Classification of Diseases - Epidemiological aspects of diseases of national importance - Epidemiological aspects of Non - Communicable Diseases - Emerging and Re - Emerging Diseases.

Unit II **Overview of Molecular Diagnostics** 10 h

History of diagnostics - Age of molecular diagnostics: Significances, Scope - Rise of Diagnostic industry in Indian and global scenario - Molecular Techniques in diagnosis of diseases - Biomarkers in disease diagnostics - Different terminology used in clinical laboratories.

Unit III **Molecular Techniques for Nucleic Acid** 10 h

Agarose gel electrophoresis, PCR, qPCR, Multiplex-PCR, RFLP, DNA fingerprinting, Southern Blotting, Electrophoresistechniques, DNA Sequencing. Introduction to primer designing.

Unit IV **Molecular Techniques for Protein** 10 h

SDS-PAGE electrophoresis, 2D gel electrophoresis, western blotting and ELISA.Chromatography method of separation and detection: high performance liquid chromatography. Identification of a molecules by mass spectrometry: introduction to thetechnique, its applications in diagnostics and basic interpretation of the mass spectrometergraphs.MALDI- TOF and data interpretations.

Unit V **Diagnosis method of various diseases.** 10 h

Traditional disease diagnosis methods and tools – infection caused by *Salmonella* and *Mycobacterium*. Diagnosis of Candidiasis. Diagnosis of Pox and Hepatitis viruses. Diagnosis of Protozoan disease (Amoebiasis and Leishmanisasis). Cancer- different types of cancers, genetics of cancer- oncogenes, tumour suppressor genes. Methods available for the diagnosis of genetic diseases and metabolic disorders.

Text Books

1 David E. Bruns, Edward R, Ashwood and Carl A Burtis, 2007, "Fundamental of Molecular Diagnostics", 1stEdition, W B Saunders Co Ltd;

2 William B Coleman, Gregory J Tsongalis, 2005, "Molecular Dianostics: For the Clinical Laboratorian" 2ndEdition, Hanuman Publishers, New Delhi.

References

1 George P. Patrinos, Wilhelm Ansorge, Phillip B. Danielson, 2016, "Molecular Diagnostics" 3rd Edition, Academic Press, USA.

2 Last JM, 2001, "Dictionary of Epidemiology", 4th Edition, Oxford University Press, New York.

3 Sintchenko V, 2010," Infectious Disease Informatics, Springer Science, Business media, LLC.

4 Greenwood, D, Slack R and Peutherer J, 1997, "Medical Microbiology", ELST Publishers.

Course Code	Course Name	Category	L	T	P	Credit
223BT1A6DF	FOOD TECHNOLOGY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The role of microbes in food industry
- The food preservation techniques in food industry
- The food safety and quality control system

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understanding the basics of food technology	K1
CO2	Gain information on role of microbes in food	K2
CO3	Comprehend the food preservation techniques	K3
CO4	Corelate the food techniques in food industries	K3
CO5	Articulate the food safety techniques in food industries	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

223BT1A6DF	DSE: FOOD TECHNOLOGY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to Food Technology 9 h

Introduction to food biotechnology and related industries; general aspects of food industry, world food demand and Indian scenario, constituents of food, quality and nutritive aspects. GM Foods; Single cell Protein (SCP) production, mushroom production technology.

Unit II Food additives & preservation techniques 10 h

Food additives- definitions, need for food additives, classification and functions of different additives: thickeners, antioxidants, colouring agents, flavouring agents, sweeteners, emulsifiers; Probiotics, Prebiotics and Synbiotics - Production & importance; Preservation techniques: refrigeration & freezing, dehydration, heating, irradiation, antimicrobial agents used in food preservation.

Unit III Fermented foods and Food Packaging 10 h

Fermented Foods: Dairy products - Milk, Curd, Yoghurt, Cheese, Kafir production technologies; Pickle, Kimchi, Sauerkraut, Miso, Kombucha; Soft and Alcoholic Beverages. Introduction to Food Packaging: definition, factors involved in the evolution and selection of a food package. Types of packaging; Aseptic packaging of foods: sterilization techniques of packaging materials; Active Food Packaging.

Unit IV Food Contaminants and adultrants 9 h

Food borne diseases. Food Allergens. Food Adultration. Food colors (natural & artificial food colourants). Food flavoring agents. Properties & function of Emulsifiers & Stabilizers in food. Artificial Sweeteners – Saccharine, Acesulfane, Aspartame & Sucrolose). Food Contaminants.

Unit V Food Safety and Quality Control 10 h

Introduction to concepts of food safety and food quality assurance. Hazard analysis and critical control point (HACCP), Role of international regulatory agencies: USFDA and ISO. Indian food laws and standards: Prevention of Food Adulteration (PFA) Act, Fruit Products Order (FPO), Meat Products Order (MPO), Cold Storage Order (CSO), Role of AGMARK Standard, Bureau of Indian Standards (BIS) and Food Safety and Standards Authority of India (FSSAI).

Text Books

1 Byong H. Lee, 2014, Fundamentals of Food Biotechnology, 2014, Wiley Blackwell.

2 Richard Coles, Derek McDowell, Mark J. Kirwan, 2009, Food Packaging Technology, Wiley- Blackwell.

References

1 H. Douglas Goff; Arthur Hill; and Mary Ann Ferrer, Dairy science and technology e-book.

2 Subrotha H, Surajith M, Birendra K.M, 2015, Dairy Product technologies Recent Advances, Daya Publishing House.

3 Keith H. Steinkraus, 2004, Industrialization of indigenous fermented foods. CRC Press.

4 Stephanie Clark, Stephanie Jung, and Buddhi Lamsal, 2014, Food Processing: Principles and Applications, Wiley Blackwell.

Course Code	Course Name	Category	L	T	P	Credit
225BI1A6AA	INNOVATION AND IPR	AECC	2	-	-	2

PREAMBLE

This course has been designed for students to learn and understand

- 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 Creativity, Invention and innovation	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	✓			✓	✓

Course Focuses on

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

225BI1A6AA	AECC: INNOVATION AND IPR	SEMESTER VI

Total Credits: 2
Total Instruction Hours: 24 h

Syllabus

Unit I Introduction 5 h

Meaning of Creativity, Invention and Innovation - Types of Innovation - Relevance of Technology for Innovation - Need for Intellectual Property Right (IPR) - Kinds of IPR – National IPR Policy.

Unit II Patents 5 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 - Infringement of Patent

Case Study: Patent Infringement the Apple vs Samsung.

Unit III Trademarks 5 h

Origin of Trade Marks System - Types - Functions - Distinctiveness and Trademarks - Meaning of Good Trademark - Rights granted by Registration of Trademarks - Infringement of trademark - Difference between Patents and Trademarks

Case Study: A trademark infringement the Coca-Cola Company vs Bisleri International Pvt. Ltd.

Unit IV Copyright 5 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: Vanilla Ice vs David Bowie & Queen.

Unit V Geographical Indications 4 h

Introduction and Concept of Geographical Indications - History - Administrative Mechanism - Benefits of Geographical Indications - Infringement of registered Geographical Indication

Case Study: Protecting the Geographical Indication for Darjeeling Tea.

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 India", First Edition, Cengage Learning India Private Limited, New Delhi.
2. Ghawlarhs, 2020, "Introduction to Intellectual Property Rights", CBS, New Delhi.

References

1. Ahuja V. K. 2017, "Law relating to Intellectual Property Rights and quot India", Lexis Nexis, Mumbai.
2. Neeraj P, Khusdeep D. 2014," Intellectual Property Rights", First Edition, PHI learning Private Limited, New Delhi.
3. http://www.bdu.ac.in/cells/ipr/docs/ipr-eng-ebook.pdf.
4. https://knowledgentia.com/knowledgeate.

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