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

(An Autonomous Institution, Affiliated to Bharathiar University, Coimbatore)
Approved by Government of Tamil Nadu & Accredited by NAAC with A++ Grade (3rd Cycle - 3.64 CGPA)
Dr. N.G.P. -Kalapatti Road, Coimbatore – 641048, Tamil Nadu, India
Web: www.drngpasc.ac.in | Email: info@drngpasc.ac.in | Phone: +91-422-2369100

Regulations 2022 – 23 for Undergraduate Programme

(Outcome Based Education model with Choice Based Credit System)

B.Sc Microbiology Degree

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

Programme : Microbiology

Eligibility:

A pass in Higher Secondary Examination with any Academic stream or Vocational stream with Biology/Zoology/Botany /Biotechnology/Microbiology/Life Science as one of the subject 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 Science (Microbiology)** Degree Examination of this College after a course study of three academic years.

Programme Objectives:

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

1. To inculcate practical knowledge in correlation with the theoretical knowledge.
2. To equip the students to meet the requirements of the current technology in Microbiology.
3. To motivate and train the students in various clinical and industrial sectors.
4. To encourage students to involve in research to explore microorganisms for the betterment of mankind.

PROGRAM OUTCOMES:

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

PO Number	PO Statement
PO1	To prepare microbiologists who are competent, creative, and highly valued professionals in academia, industry and private/public sector that is capable of excelling in careers of their choice.
PO2	To impart basic knowledge on the theoretical basis of the tools and techniques and to imbibe and demonstrate the practical skills in microbiology.
PO3	To disseminate knowledge in microbiological discipline and to promote and develop competency in microbiology that have enduring value beyond the classroom.
PO4	To instill a pattern of life-long learning and to translate the potentials of microorganisms to the welfare of biosphere.
PO5	To explore the scope of various branches of microbiology to become an entrepreneur.

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1. To inculcate practical knowledge in correlation with the theoretical knowledge.
2. To equip the students to meet the requirements of the current technology in Microbiology.
3. To motivate and train the students in various clinical and industrial sectors.
4. To encourage students to involve in research to explore microorganisms for the betterment of mankind.

Credit distribution

Credit distribution for all UG programmes

Part	Subjects	No.of Papers	Credit	Semester No.
I (12 Credits)	Tamil / Hindi / French/Malayalam	4	4 x 3 = 12	I & IV
II (12 Credits)	English	4	4 x 3 = 12	I & IV
III (108 Credits)	Core (Credits 2,3,4,5)	17	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
	Industrial Training	1	2	V
IV (8 Credits)	Environmental Studies(AECC)	1	2	I
	Basic Tamil/ Advance Tamil /Human Rights &Women's Rights(AECC)	1	2	II
	Innovation & IPR/Innovation, IPR &Entrepreneurship (AECC)	1	2	VI
	Generic Elective(GE) (AEEC)	1	2	V
V (2 Credits)	NSS/NCC/YRC/RRC/Yoga/Sports/Clubs	-	2	I -II
TOTAL CREDITS			**142**	

CURRICULUM

B.SC MICROBIOLOGY

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
First Semester										
Part - I										
221TL1A1TA	Language - I	Tamil-I:Ikkala Ilakkiyam	4	1	-	3	50	50	100	3
221TL1A1HA		Hindi-I: Modern Literature								
221TL1A1MA		Malayalam-I: Modern Literature								
221TL1A1FA		French –I: Grammar, Translation and Civilization								
Part - II										
221EL1A1EA	Language - II	Professional English - I	4	-	1	3	50	50	100	3
Part – III										
223MB1A1CA	Core - I	Fundamentals of Microbiology	3	-	-	3	50	50	100	3
223MB1A1CB	Core - II	Cell Biology	3	-	-	3	50	50	100	3
223MB1A1CP	Core Practical - I	Fundamentals of Microbiology and Cell Biology	-	-	5	6	50	50	100	3
223CL1A1IA	IDC - I	Biochemistry	3	-	-	3	50	50	100	3
223CL1A1IP	IDC Practical - I	Biochemistry	-	-	4	4	50	50	100	2
Part – IV										
223MB1A1AA	AECC-I	Environmental Studies	2	-	-	-	50	-	50	2
Part – V										
22MB1A1XA	Extension Activity	NSS/NCC/YRC/RRC/Yoga/Sports/ Club	-	-	-	-	50	-	50	1
Total			**19**	**1**	**10**				**800**	**23**

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Second Semester										
Part – I										
221TL1A2TA	Language - I	Tamil-II/ Ara Ilakkiyam	4	1	-	3	50	50	100	3
221TL1A2HA		Hindi-II/ Modern Literature								
221TL1A2MA		Malayalam- II/ Modern Literature								
221TL1A2FA		French – II/ Grammer,translation and Civilization								
Part – II										
221EL1A2EA	Language - II	Professional English - II	4	-	1	3	50	50	100	3
Part – III										
223MB1A2CA	Core - III	Microbial Physiology	3	1	-	3	50	50	100	3
223MB1A2CB	Core - IV	Microbial Genetics	3	-	-	3	50	50	100	3
223MB1A2CP	Core Practical - II	Microbial Physiology and Microbial Genetics	-	-	5	9	50	50	100	2
222CE1A2IQ	IDC - II	Basic Chemistry	2	-	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										
223MB1A2XA	Extension Activity	NSS/NCC/YRC/ RRC/Yoga/Sports / Club	-	-	-	-	50	-	50	1
Total			**18**	**2**	**10**				**700**	**21**

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										
223MB1A3CA	Core - V	Microbial Diversity	4	1	-	3	50	50	100	4
223MB1A3CB	Core - VI	Bioinstrumentation	3	1	-	3	50	50	100	3
223MB1A3CP	Core Practical - III	Microbial Diversity and Bioinstrumentation	-	-	6	9	50	50	100	3
222MTIA3IF	IDC - III	Principles of Biostatistics	4	-	-	3	50	50	100	4
223MB1A3SA	SEC - I	Food and Water Quality Analysis	2	1	-	3	50	50	100	2
Total			**19**	**4**	**7**				**700**	**22**

BoS Chairman/HOD
Department of Microbiology
Dr N. G. P. Arts and Science College
Coimbatore - 641 048

Dr.N.G.P. Arts and Science College
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BoS- 15th 10/06/2023 | AC - 15th 14/07/2023 | GB - 20th 05/08/2023

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										
223MB1A4CA	Core - VII	Immunology	4	-	-	3	50	50	100	4
223MB1A4EP	Core - VIII	Food Microbiology	2	-	4	6	50	50	100	4
223MB1A4CQ	Core Practical - IV	Immunology & Recombinant DNA Technology	-	-	6	6	50	50	100	3
223BT1A4IC	IDC - IV	Bioinformatics	3	-	-	3	50	50	100	3
223MB1A4SA	SEC-II	Recombinant DNA Technology	2	1	-	3	50	50	100	2
Total			**17**	**2**	**11**				**700**	**22**

18/10/23

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APPROVED

BoS- 16th	AC - 16th	CB - 21st
18/10/2023	13/12/2023	05/01/2024

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

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Fifth Semester										
Part – III										
223MB1A5CA	Core – IX	Medical Bacteriology	4	-	-	3	50	50	100	4
223MB1A5CB	Core - X	Virology	4	-	-	3	50	50	100	4
223MB1A5CC	Core - XI	Mycology and Parasitology	4	-	-	3	50	50	100	4
223MB1A5CD	Core - XII	Advanced Diagnostic Microbiology	3	-	-	3	50	50	100	3
223MB1A5CP	Core Practical - V	Medical Microbiology	-	-	6	9	50	50	100	3
223MB1A5SA	SEC-III	Microbial Fermentation	2	1	-	3	50	50	100	2
223MB1A5DA	DSE-I	Microbial Products and Process	4	-	-	3	50	50	100	4
223MB1A5DB		Dairy Microbiology								
223MB1A5DC		Communicable Diseases								
223MB1A5TA		Industrial Training					50	50	100	2
Part IV										
	GE		2	-	-	3	50	-	50	2
Total			**23**	**1**	**6**				**850**	**28**

BoS Chairman/HOD
Department of Microbiology
Dr. N. G. P. Arts and Science College
Coimbatore - 641 048

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BoS- 17th 05.04.24 | AC- 14th 17.04.24 | GB -

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

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Sixth Semester										
Part – III										
223MB1A6CA	Core - XIII	Environmental Microbiology	4	-	-	3	50	50	100	4
223MB1A6CB	Core - XIV	Agricultural Microbiology	4	-	-	3	50	50	100	4
223MB1A6CC	Core - XV	Downstreaming of Microbial Products	3	-	-	3	50	50	100	3
223MB1A6CP	Core Practical - VI	Environmental, Agricultural and Industrial Microbiology	-	-	6	9	50	50	100	3
223MB1A6SA	SEC-IV	Pharmaceutical Microbiology	2	1	-	3	50	50	100	2
223MB1A6DA	DSE-II	Phytochemical Drug Discovery	4	-	-	3	50	50	100	4
223MB1A6DB		Entrepreneurial Microbiology								
223MB1A6DC		Medical Laboratory Techniques								
223MB1A6DD	DSE-III	Microbial Fuel Technology	4	-	-	3	50	50	100	4
223MB1A6DE		Prospectives on Microbiology Lab Accreditation								
223MB1A6DF		Epidemiology and Public Health								
Part – IV										
225BI1A6AA	AECC-III	Innovation and IPR	2				50	-	50	2
Total			23	1	6				750	26
***Grand Total**									4500	142

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AC - 18th 26/11/2024
GB -

Dr.NGPASC
COIMBATORE | INDIA

GENERIC ELECTIVE COURSES (GE)

The following are the courses offered under Generic Elective

Semester - V

S. No.	Course Code	Sem	Course Name
1	223MB1A3GA	V	Food sanitation and Public Health

SELF STUDY COURSES

The following are the courses offered under self study

S. No.	Course Code	Sem	Course Name
1	223MB1ASSA	III	Good Laboratory Practices
2	223MB1ASSB	III	Food Sanitation

CERTIFICATE PROGRAMMES

The following are the programmes offered

S. No.	Course Code	Course Name
1	3MB5A	Pharmaceutical Quality Control & Testing
2	3MB5B	Biofertilizer Production and its field trial
3	3MB5C	Spirulina Cultivation and its value addition
4	3MB5D	HACCP and Food Safety

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		

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

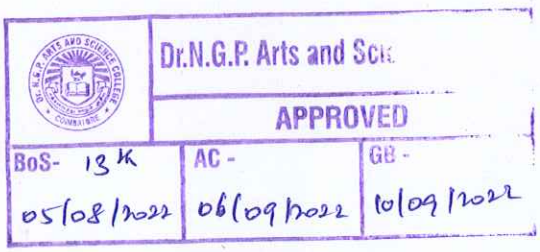
Unit II	**புதுக்கவிதைகள்**	13 h

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/m 05/08/2022 | AC - 06/09/2022 | GB - 10/09/2022

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

PREAMBLE

This course has been designed for students to learn and understand

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES

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

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

221TL1A1HA	HINDI- I: MODERN LITERATURE	SEMESTER I

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I 13 h

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

Unit II 13 h

कहानीकुंज- डॉवी.पी. 'अमिताभ'(पाठ 1-4)

Unit III 12 h

व्याकरण : शब्दविचार (संज्ञा, सर्वनाम,विशेषण)

Unit IV 12 h

अनुच्छेद लेखन

Unit V 10 h

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

Text Books

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

2 प्रकाशक: गोविन्दप्रकाशनसदरबाजार, मथुराउत्तरप्रदेश-281001

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

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

5 प्रकाशक: दक्षिण भारत प्रचार सभा चेनैई -17

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APPROVED

BoS- 13th	AC -	GB -
05/08/2022	06/09/2022	10/09/2022

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- 13th	AC -	GB -
05/08/2022	06/09/2022	10/09/2022

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
223MB1A1CA	FUNDAMENTALS OF MICROBIOLOGY	CORE	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- History and scope of microbiology
- Microscopy, staining, sterilization methods and culture media
- General characteristics of Fungi, Algae and protozoa

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Describe the emergence of systematic microbiology Provide details about the history of microbiology	K1
CO2	Gives technical ideas about the handling of microscopes Develop route map for bacteriological study	K1
CO3	Understand the aseptic techniques which are applicable in day today life.	K2
CO4	Describes the cultivation of various types of microbes and their handling.	K2
CO5	Interpret the knowledge of fungi and algae for human welfare.	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

223MB1A1CA	FUNDAMENTALS OF MICROBIOLOGY	SEMESTER I

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I History of Microbiology 8 h

History and Scope of Microbiology – Spontaneous generation theory and its disproval – Contribution of Leuwenhoek, Louis Pasteur, Robert Koch, Edward Jenner, Joseph Lister, John Tyndall, Salmon A .Waksman, Martinus W.Beijerinck, Elie Metchnikoff, Fannie Eilshmius Hesse, Paul Ehrlich. Scope of Microbiology.

Unit II Microscopy and Staining 7 h

Microscopy – Principles and application – Bright field, Dark field, Phase contrast, confocal, Fluorescence, SEM & TEM. Stains - Staining reactions – Types of staining – Simple, Differential (Gram's, Spore, AFB), Capsule and fungal staining.

Unit III Methods of Sterilization 7 h

Sterilization and Disinfection- Principles- Methods of Sterilization – Physical methods: Dry Heat, Moist heat, Filtration and Radiation. Chemical methods - Formaldehyde, Alcohol, Phenol and Gaseous sterilizing agents. Sterility Testing.

Unit IV Culture Methods 7 h

Culture Media - Types of Media – Enriched, Selective, Differential and Special Purpose Media, Transport media (Stuart's medium), Media for Anaerobes(Robertson cooked meat medium) - Pure culture techniques - Maintenance and Preservation of microbial cultures.

Unit V General characteristics of Fungi, Algae and Protozoa 7 h

Morphology, General Characteristics, and economic importance of Fungi (Aspergillus, Penicillium), Algae (Anabena, Spirogyra), Protozoa – (Euglena and Nostoc).

Text Books

1 *Joanne Wiley, Linda Sherwood, Christopher J Woolverton*, 2016, **Prescott's Microbiology**, *10th Edition, McGraw Hill Company & New York, United States*

2 *Michael J Pelczar, JR Chan ECS, Noel R Krieg*, 1985, **Microbiology**, *5th Edition, McGraw Hill Company & New York, United States.*

References

1 *Salle AJ*, 2014, **Fundamental Principles of Bacteriology**, *7th edition, Tata Mcgraw-Hill Publishing Company & New York, United States.*

2 *Michael Madigan, John Martinko, Kelly Bender, Daniel Buckley and David Stahl*, 2015, **Brock Biology of Microorganisms**, *14th edition, Pearsons Education Ltd & London, United Kingdom.*

3 *Atlas RM, 1997*, **Principles of Microbiology**, *2nd edition, Tata Mcgraw-Hill Publishing Company & New York, United States.*

4 *Jeffrey C Pommerville*, 2013, **Alcamo's Fundamentals of Microbiology**, 10th Edition, *Blackwell Publications & New Jersey, United States.*

Course Code	Course Name	Category	L	T	P	Credit
223MB1A1CB	CELL BIOLOGY	CORE	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The complexity and harmony of cell structure and functions of prokaryotic and eukaryotic life forms
- The cellular changes occur during different phases of life cycle
- To understand the different modes of cellular differentiation and division

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 functioning of the internal organelles of an prokaryotic cell	K2
CO2	Decipher the structure and functioning of the internal organelles of an eukaryotic cell	K2
CO3	Cognize the interactions in an eukaryotic and prokaryotic system and the changes that occurs inside the cell upon receiving a chemical / hormonal signal	K2
CO4	Understand the mode of transport of extracellular proteins from the cytoplasm to the exterior	K2
CO5	Decipher the reproduction methods or cell division strategies in a prokaryotic and eukaryotic system	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

223MB1A1CB	CELL BIOLOGY	SEMESTER I

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Prokaryotes - Eubacteria 8 h

Definition - Shape, arrangement and Size - Cell Organization - Structure and function - Cell wall- Gram positive and Gram negative – Cell membrane - Nuclear material - plasmids - ribosomes - inclusion bodies– Flagella – Pili – Capsule - Slime - Endospore formation

Unit II Eukaryotes 7 h

Eukaryotic Cell Organization - Structure and Function of – Cell wall - Cell membrane – Nucleus (organization of genetic material) – Mitochondria – Endoplasmic reticulum – Ribosomes - Golgi Apparatus -Lysosomes - Extra cellular matrix - Chloroplast & Cytoskeleton - actin filaments, intermediate filaments, microtubules - flagella - cilia

Unit III Cell Signaling & Cell-Cell Interaction 7 h

Cell-cell interactions in eukaryotes - adhesion junctions, tight junctions, gap junctions, and plasmodesmata - Quorum sensing (in prokaryotes) Cell Signaling - Signalling molecules and their receptors Function of cell surface receptors, Cyclic AMP pathway

Unit IV Protein Sorting and Transport 7 h

Extracellular protein transport - targeting and insertion of proteins in the ER, export of proteins to Golgi apparatus, Protein sorting and export from Golgi apparatus to Lysosomes

Unit V Cell Division 7 h

Prokaryotes - Binary fission in Bacteria – Eukaryotic Cell cycle and Cell division - Mitosis: Mitotic Spindle - Centromere - Centrioles (Prophase - Metaphase - Anaphase- Telophase). Meiosis: Stages and Synapsis (Crossing Over).

Text Books

1. *Joanne Wiley, Linda Sherwood, Christopher J Woolverton,* 2017, **Prescott'sMicrobiology,** *10th edition, McGraw Hill Company, New Delhi, India*
2. *Karp G,* 2010, **Cell and Molecular Biology: Concepts and Experiments.** *6th edition. John Wiley & Sons. Inc.*

References

1. *Hardin J, Bertoni G and Kleinsmith LJ,* 2010, **Becker's World of the Cell,** *8th edition, Pearson, New Delhi, India*
2. *Tortora, Funke and Case,* 2018, **Microbiology,** *13th edition, Pearson Education, New Delhi, India*
3. *De Robertis, EDP and De Robertis EMF.* 2006, **Cell and Molecular Biology,** *8th edition. Lipincott Williams and Wilkins, Philadelphia*
4. *Cooper, G.M. and Hausman, R.E.* 2009, **The Cell: A Molecular Approach,** *5th Edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.*
5. *Arumugam N,* 2014, **Cell biology and molecular biology.** *8th edition. MJP publishers*

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

BoS- 13th	AC -	GB -
05/08/2022	06/09/2022	10/09/2022

223MB1A1CP	CORE PRACTICAL: FUNDAMENTALS OF MICROBIOLOGY AND CELL BIOLOGY	SEMESTER I

Total Credits: 3
Total Instructions Hours: 60 h

S.No	Contents
1	Preparation of cleaning solutions - Chromic acid
2	Media preparation – Nutrient Broth, Nutrient Agar (Plate, Deep, Slant and semisolid media)
3	Preparation of differential medium and selective medium
4	Decimal Dilution Technique
5	Pure culture techniques - Streak plate, Pour plate and Spread plate method.
6	Isolation and Enumeration of bacteria, fungi and actinomycetes from soil
7	Bacterial staining Techniques - Simple Staining & Differential staining - Gram's Staining, Acid Fast, Capsule and Spore staining
8	Fungal staining – Lacto phenol Cotton Blue Mount
9	Slide culture Technique (DBT Star Scheme)
10	Fungal Cell Observation by Stereo Microscope - Under DBT Star Scheme
11	Screening of PHB production - (DBT Star Scheme)
12	Microscopic studies of cell organelles - Plant and Animal cells
13	Observation of permanent slide for stages of mitosis and meiosis, Algae, Fungi and Protozoa

Note: 12 Experiments mandatory out of 14

References

1 *James.C.Cappuccino.* 2017. **Microbiology A laboratory manual.** *11th edition, Pearson education publishers.*

2 *Aneja. K.R.* 2012. **Experiments in Microbiology, plant pathology and biotechnology,** *4th Edition. New age publishers.*

3 *Kannan, N.* 2003. **Hand book of Laboratory culture media.** *1st edition, Panima publishing house.*

Course Code	Course Name	Category	L	T	P	Credit
223CL1A1IA	BIOCHEMISTRY	IDC	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The structure and properties of carbohydrates and lipids.
- The structure and properties of amino acids, proteins and nucleic acids.
- The essentials of minerals and vitamins and role of hormones.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Outline carbohydrate structure, classification and function.	K3
CO2	Know the structure and properties of lipids.	K3
CO3	Understand the structural and functional aspects of aminoacids and proteins.	K3
CO4	Describe the structure, types and properties of nucleic acids.	K3
CO5	Understand the types and significance of vitamins, minerals and hormones.	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

223CL1A1IA	BIOCHEMISTRY	SEMESTER I

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Carbohydrates 8 h

Carbohydrates – classification, structure, properties and chemical reactions of monosaccharide – Glucose, Fructose, Galactose, Mannose, Arabinose. Disaccharides – Maltose, Lactose and Sucrose. Polysaccharides – Homo polysaccharides – Starch, Glycogen and Cellulose and Hetero polysaccharides – Hyaluronic acid, Heparin, Chondroitin sulphate. Biological importance of sugar derivates – glycosaminoglycan, proteoglycan and glycoprotein and Bacterial cell wall polysaccharides.

Unit II Lipids 6 h

Lipids - Definition, classification of lipids, physiochemical properties. Storage lipids – types. Structural lipids – phospholipids, glycolipids and sphingolipids. Structure and biological role of cholesterol.

Unit III Amino acids and Proteins 7 h

Amino acids - Classification of amino acids, general properties, non protein amino acids. Peptide bond – structure and conformation, Proteins - classification and physiochemical properties. Organization of protein Structure – Primary, secondary tertiary, quaternary structure. Protein denaturation.

Unit IV Nucleic Acids and Enzymes 8 h

Nucleic acids - Structures of Purines, Pyrimidines, Nucleoside and Nucleotides. Properties of nucleic acids. DNA - Double helical structure, Isoforms. DNA denaturation and renaturation. RNA – Types, structure and function. Enzymes - Concepts of enzymes, classification, characteristic features, clinical and industrial applications.

Unit V Micronutrients 7 h

Micronutrients - Minerals in biological system and their importance – Iron, calcium, phosphorous, iodine, copper, zinc. Vitamins – Definition, classification - Fat soluble Vitamins - A, D, E and K. Water Soluble vitamins – Vitamin B Complex, Vitamin C - sources, functions and deficiencies. Hormones involved in regulatory metabolism- Insulin, Glucagon and thyroid hormones.

Text Books

1 *Jain J L, Jain S and Jain N,* 2012, **"Biochemistry"**, *1st Edition, S. Chand and Company Pvt Ltd, New Delhi.*

2 *Satyanarayana U and Chakrapani U,* 2013, **"Biochemistry"**, *4th Edition, Elsevier, India.*

References

1 *Deb AC,* 2001, **"Fundamentals of Biochemistry"**, *7th Edition New central Agency, Calcutta.*

2 *Cooper, G M and Hausman R E,* 2013, **The cell: A Molecular Approach**, *6th Edition, Sinauer Associates, Inc.Publishers, Sunderland, Massachusetts.*

3 **DM. Vasudevan , Sreekumari S., Kannan Vaidyanathan**, 2019. **Textbook Of Biochemistry For Medical Students**, *9th Edition, Jaypee Brothers Medical Publishers, India.*

4 https://www.khanacademy.org/search?page_search_query=biochemistry.

223CL1A1IP	IDC PRACTICAL - I BIOCHEMISTRY	SEMESTER I

Total Credits: 2
Total Instructions Hours: 48 h

S.No	Contents
1	Qualitative analysis of Mono saccharides – Pentose - Arabinose
2	Qualitative analysis of Hexoses - Glucose, Fructose
3	Qualitative analysis of Disaccharides - Sucrose, Maltose and Lactose
4	Qualitative analysis of Polysaccharide - Starch
5	Qualitative analysis of Histidine
6	Qualitative analysis of Tyrosine
7	Qualitative analysis of Tryptophan
8	Qualitative analysis of Arginine
9	Estimation of Acid Number
10	Estimation of Iodine Number
11	Quantification of Protein by Lowry's method
12	Quantification of Carbohydrate by DNSA method

Note: Out of 12- 10 Mandatory

References

1 *Sadasivam S and Manikam A,* 1996, **Biochemical methods,** *2nd Edition, New Age International publishers, New Delhi*

2 *Plummer D T,* 2004, **An Introduction to practical Biochemistry,** *3rd Edition, Tata McGraw-Hill Education Pvt. Ltd, New Delhi*

3 *Jayaraman J,* 2015, **Laboratory manual in Biochemistry,** *5th Edition, New Age International (P) Ltd.*

4 *Pattabiraman T N and SitaramaAcharya U,* 2015, **Laboratory Manual in Biochemistry,** *4th Edition. , All India Traveller Book Seller*

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

PREAMBLE

This course has been designed for students to learn and understand

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES

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

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

223MB1A1AA	ENVIRONMENTAL STUDIES	SEMESTER I

Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I Introduction to Environmental studies & Ecosystems 5 h

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

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

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

Unit III Biodiversity and Conservation 5 h

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

Unit IV Environmental Pollution, Environmental Policies & Practices 5 h

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

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

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

Environment and human health. Role of the Colleges, Teachers and Students in village adoption towards clean, green and make in villages in various aspects.

Text Books

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

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

References

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

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

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

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

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

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

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

BoS Chairman/HoD
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Dr.N.G.P. Arts and Science College
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05/04/2022	06/09/2022	10/09/2022

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

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

PREAMBLE

This course has been designed for students to learn and understand

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES

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

COURSE FOCUSES ON

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

221TL1A2TA	TAMIL - II: ARA ILAKKIYAM	SEMESTER II

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I அற இலக்கியம் 13 h

1. இலக்கிய வரலாறு- பதிணென்கீழ்க்கணக்குநூல்கள்

2.திருக்குறள்

அ. அறன்வலியுறுத்தல்- அ. எண் 04

ஆ. நட்பாராய்தல் - அ. எண் 80

இ. நாடு- அ. எண் 74

ஈ. குறிப்பறிதல்- அ. எண் 110

Unit II அற இலக்கியம் 13 h

1. நாலடியார் - அறிவுடைமை

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

3. இனியவைநாற்பது- பூதஞ்சேந்தனார் - முதல் 10 பாடல்கள்

Unit III அறநெறிக் கட்டுரைகள் 09 h

1. இலக்கியவரலாறு - தமிழ் உரைநடையின் தோற்றமும் வளர்ச்சியும்

2. கலைகள்-உ.வே.சா

3. சங்க நெறிகள்- வ.சுப.மாணிக்கம்

Unit IV அறநெறிக் கட்டுரைகள் 15 h

1. வீர வணக்கம் - க.கைலாசபதி

2. தமிழர் பண்பாடு - டாக்டர் சோ.நா.கந்தசாமி

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

Unit V பயிற்சிப் பகுதி 10 h

1.இலக்கணம்-வழு, வழுவமைதி,வழாநிலை

2.அலுவலகம் சார்ந்த கடிதம் -விண்ணப்பங்கள், வேண்டுகோள்,முறையீடு

3.படைப்பாக்கம்-பொதுத்தலைப்பில் கட்டுரைகள் எழுதுதல்

Text Book

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

References

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

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

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

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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 अपाट्मेंट्स , 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.

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

Unit II 12 h

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

Unit III 12 h

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

Unit IV 14h

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

Unit V 10 h

Make in Own Sentences

Text Book

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

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BoS- 14th 02/12/2022	AC- 16th 19.01.2023	GB- 19th 30.01.2023

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

PREAMBLE

This course has been designed for students to learn and understand

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES

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

COURSE FOCUSES ON

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

221EL1A2EA	PROFESSIONAL ENGLISH - II	SEMESTER II

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I Genre Studies 12 h

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

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

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

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

Unit II Listening Skills 10 h

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

Unit III Speaking Skills 14 h

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

Unit IV Reading Skills 12 h

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

Unit V Writing Skills 12 h

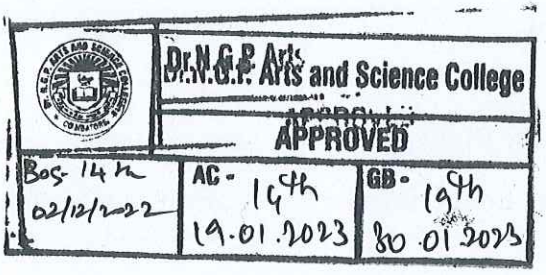
Inferring & Interpreting- Predicting Reorganizing Material- Summary Writing Based on the Reading Passages- Writing – Emails & Essay Writing (Descriptive or narrative)- Grammar - Tenses- Question Types: Wh/ Yes or No/ and Tags

Text Books

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

References

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



Course Code	Course Name	Category	L	T	P	Credit
223MB1A2CA	MICROBIAL PHYSIOLOGY	CORE	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- Fundamentals of microbial nutritional requirements and transport
- Growth pattern and energy generation during microbial metabolism
- Diversity of metabolic processes and techniques used to elucidate physiological processes

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the nutritional requirements, modes of nutrient uptake and classification of microorganisms	K2
CO2	Analyze the growth conditions and metabolism of microbes	K3
CO3	Apply the pathways of energy generation and Biosynthetic process for characterization of microbes	K3
CO4	Understand the ecological significance of anaerobic microbes	K2
CO5	Commercially synthesize essential amino acids by using microbes	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

223MB1A2CA	MICROBIAL PHYSIOLOGY	SEMESTER II

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I Nutritional requirement 9 h

Common nutritional requirement-macro elements, micro elements and trace elements. Nutritional requirements of Microorganisms- Autotrophs, Heterotrophs ,Chemotrophs, Copiotrophs and Oligotrophs- Nutrition uptake by cell wall- Passive and Facilitated diffusion, Active transport, Group translocation

Unit II Growth of Bacteria 10 h

Growth factors-Growth curve- Microbial growth-Batch culture, Continuous, Semi continuous, Synchronous and Biphasic growth - Calculation of generation time - Estimation of Microbial growth: Microscopic count, Turbidometric assay and TVC - Factors influencing microbial growth

Unit III Respiration & Energy Production 10 h

Aerobic respiration - EMP and its alternative pathways (HMP shunt & ED pathways) - TCA cycle – Electron transport – Energy generation via Oxidative and Substrate level phosphorylation - Calculation of ATP in aerobic cellular processes - Glyoxylate cycle - β oxidation of fatty acids

Unit IV Anaerobic Respiration 10 h

Anaerobic respiration – Methanogens - Sulphur and nitrogenous compounds and CO2 as final electron Acceptor - Fermentation – Alcoholic, Propionic, lactic and Mixed acid fermentation - Oxygenic and anoxygenic photosynthesis in bacteria

Unit V Biosynthesis of amino acid, Lipid and Cell wall 9 h

Biosynthesis of amino acids (Pyruvate family – Alanine, Leucine and Glutamic acid family) - Lipids (Phospholipids and Archeal lipids) -Biosynthesis of bacterial cell wall

Case study

Consider that you have isolated a rod shaped bacterium from a water sample that has the potential of producing a valuable compound. You have to identify the nutritional requirement of the organism that could enable a faster multiplication of the organism that could make the organism having potential for commercialization.

Text Books

1. *Joanne Wiley, Linda Sherwood, Christopher J Woolverton, 2017,* **Prescott's Microbiology**, *7th edition, McGraw Hill Company, New Delhi, India.*
2. *Reddy, S. M, and Ram Reddy S, 2007,* **Microbial Physiology**, *Scientific Publisher, India.*

References

1. *Gerhard Gottschalk, 1986,* **Bacterial Metabolism**, *2nd Edition, SpringerVerlag, New York*
2. *Moat A G, Foster J W, 1988,* **Microbial Physiology**, *4th edition, John Wiley & Sons, New Jersey, United States*
3. *Stanbury P T and Whitaker, 1984,* **Principles of Fermentation Technology**, *1st Edition, Adithya Books Pvt Ltd. New Delhi*
4. *Doelle HW, 1975,* **Bacterial Metabolism**, *2nd edition, Academic Press, United States.*

Course Code	Course Name	Category	L	T	P	Credit
223MB1A2CB	MICROBIAL GENETICS	CORE	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The concept of genetic material, Storage of genetic information, expression of genetic information
- Regulation of Gene expression
- Mutation and recombination of genes.

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 genetic material and its replication.	K2
CO2	Apply the principles of transcription and translation in gene expression	K3
CO3	Understand the adaptive strategies evolved among microbes by gene regulation in varied environment	K2
CO4	Understand the mutational types and DNA repair mechanism.	K3
CO5	Apply the horizontal gene transfer concepts in mapping of genes	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

223MB1A2CB	MICROBIAL GENETICS	SEMESTER II

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Genetic Material: Properties and Replication 7 h

DNA as genetic material: Transformation in Pneumococcus, Transforming principle is DNA and Hershey and Chase Experiment- RNA as genetic material - Structure of DNA and RNA - DNA Replication: Semi conservative by Meselson and Stahl's Experiment, Enzymology and Mechanism of DNA replication.

Unit II Gene Expression 7 h

Central Dogma - Transcription - Genetic Code: Organization of the code, Establishment of genetic code, Co linearity of gene and polypeptide - Translation: Ribosome, Initiation, Elongation and Termination – Post translational modification.

Unit III Regulation of Gene Expression 8 h

Induction - Repression - The operon model: lac (Inducible operon), trp (Repressible operon) - Quorum Sensing - Genetic regulation of Sporulation in Bacillus subtilis - Gene regulation in Eucarya and Archaea.

Unit IV Mutation and Repair 7 h

Mutation: Spontaneous and Induced - Effects of Mutations - Types of Mutation: Base substitution, Deletion, Insertion - DNA Repair: Nucleotide Excision repair, Direct Repair, Mismatch repair, Recombination repair, SOS reponse.

Unit V Recombination in Bacteria 7 h

Transformation - Transposable elements - Bacterial plasmids - Conjugation: F+ and F- Mating, Hfr conjugation and F' conjugation - Transduction: Generalized transduction, Specialized Transduction - Genome mapping of E.coli.

Case study

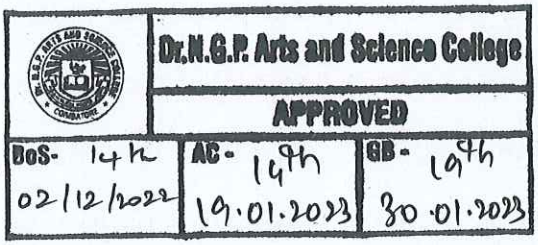
Consider that you have isolated a cocci bacterium from water sample. You have to isolate the DNA and determine its molecular weight and size.

Text Books

1. *Joanne M Willey, Linda M Sherwood and Christopher J Woolverton, 2019,* **Prescott, Harley and Klein's Microbiology**, *7th Edition McGraw Hill Higher Education, USA.*
2. *Eldon John Gardner, Michael J Simmons and D Peter Snustard, 2015* **Principles of Genetics**, *8th Edition Wiley India Pvt Ltd., New Delhi.*

References

1. *David Freifelder, 2000,* **Microbial Genetics**, *7th Edition Narosa Publishing House, New Delhi.*
2. *Monroe W Strick Berger, 2015,* **Genetics**, *3rd Edition Pearson Education India, New Delhi.*



223MB1A2CP	CORE PRACTICAL II: MICROBIAL PHYSIOLOGY AND MICROBIAL GENETICS	SEMESTER II

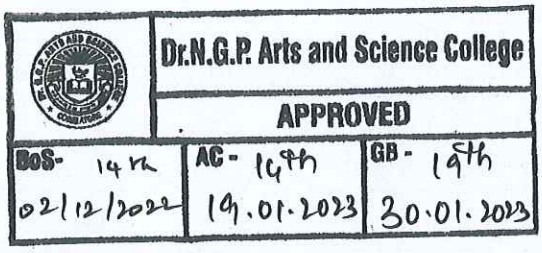
Total Credits: 2
Total Instructions Hours: 60 h

S.No	Contents
1	Measurement of Microbial growth – Haemocytometer
2	Measurement of Microbial growth – Bacterial growth Curve
3	Utilization of Amino Acid as Carbon source - Indole test
4	Acid and Non acid end products (MR-VP test)
5	Catalase test and Oxidase test
6	Preferential sugar utilization and H2S production test – TSI
7	Starch hydrolysis, Casein hydrolysis test, Gelatin liquefaction
8	Urease, Citrate utilization test and Nitrate Reduction Test
9	Effect of pH and Temperature on microbial growth **(DBT Star Scheme)**
10	Extraction of chromosomal DNA from Bacteria
11	Extraction of plasmid DNA from Bacteria
12	Estimation of DNA by Diphenylamaine reaction **(DBT Star Scheme)**
13	Separation of DNA using agarose gel electrophoresis **(DBT Star Scheme)**
14	Isolation of antibiotic resistant bacterial colonies through gradient plate technique

Note: End Semester Practical Examination requires completion of 12 experiments out of 14.

References

1. *James.C.Cappuccino. 2017,* **Microbiology A laboratory manual**, *11th edition, Pearson education publishers.*
2. *Aneja. K.R. 2012,* **Experiments in Microbiology, plant pathology and biotechnology**, *4th Edition. New age publishers.*
3. *Maniatis, T. Tritsch E F and Sambrook J, 2010,* **Molecular Cloning. A Laboratory manual**, *Cold Spring Harbor Laboratory, New York.*
4. *Plummwer D.T. 1977,* **An Introduction to practical biochemistry**, *Tata McGraw Hill, Bombay*



Course Code	Course Name	Category	L	T	P	Credit
222CE1A2IQ	BASIC CHEMISTRY	IDC	2	-	4	4

PREAMBLE

This course has been designed for students to learn and understand

- The concept of expressing concentration of solutions
- The concepts and principals of volumetric analysis
- 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	Outline the acid and basic properties of solutions	K2
CO3	Predict the concept of the bonding in molecules	K2
CO4	Describe the basic concepts of the organic compounds and analysis	K2
CO5	Show the methodology of volumetric estimations	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

222CE1A2IQ	BASIC CHEMISTRY	SEMESTER II

Total Credits: 4

Total Instruction Hours: 70 h

Syllabus

Unit I Solutions 14 h

Normality, molarity, molality, mole fraction, mole concept. Primary and secondary standards - preparation of standard solutions. Principle of Volumetric analysis (with simple problems).

1 Estimation of oxlaic acid by $KMnO_4$ using a standard oxalic acid solution.

2 Estimation of $KMnO_4$ by thiosulphate using a standard potassium dichromate solution.

Unit II Acids and Bases 14 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.

3 Estimation of HCl by NaOH using a standard oxalic acid solution.

4 Estimation of Na_2CO_3 by HCl using a standard Na_2CO_3 Solution.

Unit III Chemical bonding 14 h

Types of bonding - Ionic Bond: Nature of ionic bond, factors influencing the formation of ionic bond, Covalent and coordinate bond.

5 Preparation of Inorganic Complexes: Tetraamminecopper(II)sulphate.

6 Preparation of Inorganic Complexes: Preparation of Hexathiourealead(II) nitrate.

7 Preparation of Prussianblue.

Unit IV Basic Organic Chemistry 14 h

Nomenclutre, phesical and chemical properties and preparation of carboxilic acid, amine, phenol, amide.

8 Test for Phenols

9 Test for Amines

10 Test for Acids

Unit V Volumetric Estimations 14 h

Chemistry and application of oxidation and reducing agents- $KMnO_4$, $K_2Cr_2O_7$, $LiAlH_4$, $NaBH_4$.

11 Estimation of iron(II) by potassium dichromate using standard Mohr's salt solution.

12. Estimation iron (II) sulphate by $KMnO_4$ using a standard Mohr's salt solution.

Text Books

1 *Bahl Arun, Bahl B.S., 2016,* **Organic Chemistry**, *22nd Edition, S. Chand & Company*

2 *M. K. Jain, S. C. Sharma, 2007,* **Organic Chemistry**, *Shoban Lal Nayin Chand*

References

1 *Gopalan R, 2004,* **Elements of Analytical Chemistry**, *Sultan Chand & Sons*

2 *Puri, Sharma and Pathania., 2017,* **Principles of Physical Chemistry**, *47th Edition, Vishal Publishing Company*

3 *Madan, R. D, 2019,* **Modern Inorganic Chemistry**, *Revised Edition, Delhi: S. Chand & Company*

4 *Gurdeep Raj, 2014,* **Advanced Inorganic Chemistry**, *Volume II Edition, Uttar Pradesh: Krishna's Educational Publishers*

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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APPROVED
BoS- 14th 02/12/2022 | AC- 14th 19.01.2023 | GB- 14th 30.01.2023

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

1தமிழ்நாடு - பாரதியார்

2.மனதில் உறுதி வேண்டும் - பாரதியார்

3. இன்பத்தமிழ் - பாரதிதாசன்

4.வேலைகளல்லவேள்விகள் - தாராபாரதி

5.தமிழா! நீ பேசுவது தமிழா! - காசியானந்தன்

6. நட்புக் காலம் (10 கவிதைகள்) - அறிவுமதி கவிதைகள்

Unit II கட்டுரை 05 h

கட்டுரைத் தொகுப்பு -நல்வாழ்வு - டாக்டர் மு.வரதராசன்

1. நம்பிக்கை

2. புலனடக்கம்

3. பண்பாடு

Unit III இலக்கணம் 04 h

1.வல்லினம் மிகும் மற்றும் மிகா இடங்கள்

2. ர ,ற,ல,ழ,ள,ந,ண,ன – வேறுபாடு அறிதல்

Unit IV கடிதங்கள் 05 h

1.பாராட்டுக் கடிதம்

2.நன்றிக் கடிதம்

3.அழைப்புக் கடிதம்

4. அலுவலக விண்ணப்பங்கள்

Unit V பயிற்சிப் பகுதி 04 h

படைப்பாக்கப் பகுதி

பொதுத் தலைப்புகளில் கவிதை ,கட்டுரை எழுதச்செய்தல்

Notes

அக மதிப்பீட்டுத் தேர்வு - வினாத்தாள் அமைப்பு முறை மொத்த மதிப்பெண்கள் - 50

பகுதி –அ

சரியான விடையைத் தேர்வு செய்தல் 10 x1=10

பகுதி –ஆ

கோடிட்ட இடங்களை நிரப்புக. 10x2=20

பகுதி –இ

இரண்டு பக்க அளவில் விடையளிக்க 2x10=20

குறிப்பு:

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

Text Book

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

References

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

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

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

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

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

PREAMBLE

This course has been designed for students to learn and understand

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

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	understand the basic concepts ofHuman Rights	K1
CO2	describe the Fundamental Rights	K2
CO3	relateHuman Right Violations and Redressal Mechanism.	K3
CO4	state the Rights to Women and Child	K2
CO5	apply Civil and Political Rights of Women	K3

MAPPING WITH PROGRAMME OUTCOMES

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

COURSE FOCUSES ON

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

225CR1A2AA	HUMAN RIGHTS AND WOMEN'S RIGHTS	SEMESTER II

Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I **Introduction to Human Rights** 04 h

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

Unit II **Human Rights in India** 05 h

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

Unit III **Human Right Violations and Redressal Mechanism** 05 h

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

Unit IV **Rights to Women and Child** 05 h

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

Unit V **Civil and Political Rights of Women** 05 h

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

Text Books

1 *LalitParmar, 1998,* **Human Rights**, *Anmol Publications Pvt. Limited, New Delhi.*

2 *Krishna Pal Malik, 2009,* **Women & Law**, *Allahabad Law University, New Delhi.*

References

1 *Mandagadde Rama Jois, 2015,* **Human Rights**, *Bharatiya Values, BharatiyaVidyaBhavan Publications, Mumbai.*

2 *Paras Diwan and PiyushDiwan, 1994,* **Women and Legal Protection**, *South Asia Books, Andhra Pradesh.*

3 *Venkataramand Sandhiya. N, 2001,* **Research in Value Education**, *APH Publishing Corporation, New Delhi.*

4 *Anand A S, 2008,* **Justice for Women: Concerns and Expressions**, *Universal Law Publishing Co., New Delhi.*

BoS Chairman/HOD 2/12/22
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BoS- 14th	AC- 14th	GB- 19th
02/12/2022	19.01.2023	30.01.2023

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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

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

PREAMBLE

This course has been designed for students to learn and understand

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES

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

COURSE FOCUSES ON

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

221TL1A3HA	HINDI – III	SEMESTER III

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I 10 h

पद्य – काव्य पराशर (भोलानाथ)

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

Unit II 10 h

हिन्दी साहित्य का इतिहास: (साधारण ज्ञान)

Unit III 10 h

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

Unit IV 10 h

संवाद लेखन

Unit V 08 h

अनुवाद अभ्यास-III (केवल हिन्दी से अंग्रेजी में)

(पाठ 10 to 20)

Text Books

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

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

PREAMBLE

This course has been designed for students to learn and understand

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES

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

COURSE FOCUS ON

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

221TL1A3MA	MALAYALAM - III	SEMESTER III

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I **Poetry** 10 h

Kumaranasan

Unit II **Poetry** 10 h

Kumaranasan

Unit III **Poetry** 10 h

Kumaranasan

Unit IV **Poetry** 10 h

Vayalar Ramavarma

Unit V **Poetry** 08 h

Vayalar Ramavarma

Text Books

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

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

Reference

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

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

PREAMBLE

This course has been designed for students to learn and understand

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES

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

COURSE FOCUSES ON

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

221TL1A3FA	FRENCH - III	SEMESTER III

Total Credits: 3
Total Instruction Hours: 48 h

Syllabus

Unit I 10 h

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

Unit II 10 h

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

Unit III 10 h

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

Unit IV 10 h

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

Unit V 08 h

Make in Own Sentences based on the above Lessons

Text Book

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

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

PREAMBLE

This course has been designed for students to learn and understand

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES

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

COURSE FOCUSES ON

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

221EL1A3EA	PROFESSIONAL ENGLISH - III	SEMESTER III

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I Listening 08 h

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

Unit II Reading 09 h

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

Unit III Speaking 10 h

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

Unit IV Advanced English and Writing Skills 11 h

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

Unit V Soft Skills 10 h

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

Text Books

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

References

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

Course Code	Course Name	Category	L	T	P	Credit
223MB1A3CA	MICROBIAL DIVERSITY	CORE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The fundamentals of microbial classification
- The kingdoms of microbial diversity
- General properties of Archaea, actinomycetes, fungi, algae, protozoa and virus.

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 microbial classification.	K2
CO2	Classify microbes based on their desired properties.	K2
CO3	Exemplify the physiology and metabolism of Archaebacteria and actinomycetes.	K2
CO4	Summarize the classification of fungi and algae	K2
CO5	Categorize the divisions of protozoa and virus	K2

MAPPING WITH PROGR6AMME OUTCOMES

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

COURSE FOCUS ON:

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

223MB1A3CA	MICROBIAL DIVERSITY	**SEMESTER** III

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Concept of microbial classification 12 h

Introduction - Natural, Phenetic, Phylogenetic, Genotypic and Numerical Taxonomy - Taxonomic ranks. Classical, Morphological, Physiological and Metabolic, Ecological characteristics - Genetic analysis - Molecular characteristics - Nucleic acid base composition, Nucleic acid hybridization, Nucleic acid sequencing, Genomic finger printing, Amino acid sequencing. Phylogenetic tree.

Unit II Divisions of life 12 h

Whittaker Five kingdom - Cavalier & Smith eight kingdom - Higher level classification of Eucarya. Outline of Bergey's Manual of Systematic Bacteriology - Volume 1to 5.

Unit III Archaea and Actinomycetes 12 h

Introduction - Ecology- classification - cell wall and membranes - Genetics and molecular biology - metabolism. General properties of Extremophiles. Actinomycetes -general characteristics-classification- importance.

Unit IV Fungi and Algae 12 h

Fungi - Alexopolus classification -Myxomycota - Eumycota. Algae - Fritsch classification of Algae - Chlorophyceae, Xanthophyceae, Chrysophyceae, Bacillariophyceae, Cryptophyceae, Dinophyceae, Chloromonadineae, Eugleninae, Phaeophyceae, Rhodophyceae, Myxophyceae.

Unit V Protozoa and Virus 12 h

Protozoa- general characteristics-classification - Sarcomastigophora, Sporozoa, Cnidospora, Ciliospora. Viruses - General properties -Baltimore classification.

Case study

The organism is predominantly aquatic, photosynthetic that lacks true roots, stems, leaves, and free living as well as symbiotic. It is used as a source of fuel, fertilizer, and nutritional supplements for living organisms. Explore the characteristics of the organism which supports for classification.

Text Books

1 Joanne Wiley, Linda Sherwood, Christopher J Woolverton, 2016, "Prescott's Microbiology", 10th Edition, McGraw Hill Company & New York, United States.

2 Michael J Pelczar, 2023, "Microbiology", Fifth Edition, McGraw Hill Company & New York, United States.

References

1 Salle AJ, 2014, "Fundamental Principles of Bacteriology", 7th Edition, Tata Mcgraw-Hill Publishing Company & New York, United States.

2 Michael Madigan, John Martinko, Kelly Bender, Daniel Buckley and DavidStahl, 2015, "Brock Biology of Microorganisms", 14th Edition, Pearsons Education Ltd & London, United Kingdom.

3 Atlas RM, 1997, "Principles of Microbiology", 2nd Edition, Tata Mcgraw-Hill Publishing Company & New York, United States

4 Jeffrey C Pommerville, 2013, "Alcamo's Fundamentals of Microbiology", 10th Edition, Blackwell Publications & New Jersey, United States

Course Code	Course Name	Category	L	T	P	Credit
223MB1A3CB	BIOINSTRUMENTATION	CORE	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The basic principles of buffer, pH and biochemical calculations
- The working principles of instruments used in microbiology
- The techniques in separation, purification & quantification of Biomolecules

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic calculations used in solution preparation	K1
CO2	Demonstrate the instruments used in microbiology laboratory	K1
CO3	Separate the biomolecule in a solution based on their density	K3
CO4	Estimation of micro and macromolecules by Beer and Lambert's law	K3
CO5	Examine the presence of biomolecules using suitable separation techniques	K3

MAPPING WITH PROGRAMME OUTCOMES

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

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

223MB1A3CB	BIOINSTRUMENTATION	SEMESTER III

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I Buffers and pH Meter 9 h

Basic concepts -Solute, Solvent, Molarity, Molality, Normality. Preparation of solutions - Molar and Normal- Calculation methods. Buffers - Types of Buffers. pH meter - Instrumentation - calomel and glass electrode – Applications - Biosensor - Principle, types and applications

Unit II Basic Microbiology Instruments 10 h

Principle, Instrumentation, and Applications of Autoclave, Hot air oven, Incubator,

Laminar air flow, metabolic shaker, Lyophilizer. Biosafety cabinets – Introduction and types- Soxhlet Apparatus- Rotary vacuum evaporator- Distillation unit- Membrane filtration unit

Unit III Centrifugation 10 h

Centrifugation: Principle- Types and Applications of Centrifuges –Low speed, High speed, Microfuge-Ultra centrifuge- Analytical and Differential Centrifuge- Types of rotors -Methods of centrifugation- Differential centrifugation - Density gradient centrifugation-Zonal centrifugation, Isopycnic centrifugation.

Unit IV Spectrophotometer 9 h

Colorimetry- Beer and Lambert's law- Principle, Instrumentation and Applications- Spectrometry – UV -Visible Spectrophotometer. Spectrofluorimeter.

Unit V Chromatography and Electrophoresis 10h

Chromatography–principles and applications- Paper, Thin layer, Column and HPLC. Electrophoresis –SDS – PAGE and Agarose gel electrophoresis

Case study: The organism was isolated from the stream of the Velliangiri hill which produced pleasant pigment and has significant antimicrobial properties. Separate the pigment using chromatography techniques and identify the structure of the compound.

223MB1A3CP	CORE PRACTICAL: MICROBIAL DIVERSITY AND BIOINSTRUMENTATION	SEMESTER III

Total Credits: 3
Total Instructions Hours: 72 h

S.No	Contents
1	Measurement of Microbial cell size by Micrometry
2	Preparation of Buffers-Acidic, neutral and alkaline range
3	Isolation and Identification of algae from water sample by inverted microscope - Under DBT Star Scheme
4	Isolation and morphological characterization of fungus from environmental samples-under DBT Star Scheme
5	Analysis of water sample - MPN techniques
6	Extraction of chlorophyll pigments from plant/algae
7	Density Gradient Centrifugation – Sucrose Gradient
8	Estimation of Protein - Lowry *et al.*, method
9	Estimation of sugars - DNSA method
10	Separation of amino acids -Thin Layer & paper Chromatography
11	Separation of microbial pigment - Column chromatography
12	Isolation and identification of bacteria from skin/oral cavity - Under DBT Star Scheme
13	Isolation and identification of microorganisms from seafood

Note: 11 Experiments mandatory out of 13

Text Books

1 Veerakumari L, 2011, "Bioinstrumentation", 1st Edition. MJB Publishers, New Delhi.

2 BajpaiPK (2010). "Biological Instrumentation and Methodology". Revised edition, S.Chand & Co. Ltd., New Delhi.

References

1 Palanivelu P, 2004, "Analytical Biochemistry and Separation techniques". 3rd edition, MKU Coop, Press Ltd., Palkalai Nagar, Madurai.

2 Keith Wilson and John Walker, 2010, "Principles and Techniques of Biochemistry and Molecular Biology", 1st Edition, Cambridge University Press, UK

3 Plummer T David, 2004, "An Introduction to Practical Biochemistry", 3rd Edition, Tata McGraw Hill Publishers, New Delhi.

4 Cromwell, 2015, "Biomedical Instrumentation And Measurement", 2nd Edition, Pearson Publishers India.

References

1 James.C.Cappuccino. 2017, "Microbiology A laboratory manual", 11th edition, Pearson education publishers.

2 Aneja. K.R. 2012, "Experiments in Microbiology, plant pathology and biotechnology", 4th Edition. New age publishers.

3 Maniatis, T. Tritsch E F and Sambrook J, 2010, "Molecular Cloning. A Laboratory manual", Cold Spring Harbor Laboratory, New York.

4 Sadhasivam S and Manickam A. 2018, "Biochemical Methods", 3rd Edition, New Age International Publishers

Course Code	Course Name	Category	L	T	P	Credit
222MT1A3IF	Principles of Biostatistics	IDC	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES

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

COURSE FOCUSES ON

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

222MT1A3IF	Principles of Biostatistics	SEMESTER III

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Probability Distributions 10 h

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

Unit II Sampling distributions 9 h

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

Unit III Estimation 9 h

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

Unit IV Hypothesis testing 10 h

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

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

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

Note: Theory 20% and problem 80%

Text Books

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

References

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

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

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

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

Course Code	Course Name	Category	L	T	P	Credit
223MB1A3SA	FOOD AND WATER QUALITY ANALYSIS	SEC	2	1	-	2

PREAMBLE

This course has been designed for students to learn and understand

- Analysis of food and water quality
- System of Quality Assurance
- Food safety and standards

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the quality of food products	K2
CO2	Analyze and evaluate the quality of water	K2
CO3	Cognize and implement specific QA systems for industries	K2
CO4	Learn methods of food and water quality	K2
CO5	Explain the Food Safety Programs	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

223MB1A3SA	FOOD AND WATER QUALITY ANALYSIS	SEMESTER III

Total Credits: 2

Total Instruction Hours: 36 h

Syllabus

Unit I Food Quality Control 7 h

Food Quality control- Principle. Food quality indices-meat and meat products, fish and fish products, milk and dairy products, vegetables and fruit products, pulses, spices, coffee and tea.

Unit II Water Quality 7 h

Quality of surface waters, Water quality in flowing waters, Water quality in impounded waters, Groundwater quality, Water quality standards, Microbiological quality of drinking water (MPN technique), and Chemical quality of drinking water.

Unit III Quality Assurance 7 h

Quality assurance- definition, Different systems- GAP,GMP, TQM,ISO and FSSA. Indian food standards- Voluntary and Obligatory standards (PFA, FPO, MMPO, AGMARK etc.,) Codex alimentarius.

Unit IV Quality determination 8 h

Sensory evaluation: Requirement and methods. Sensory parameters: colour, flavour, texture, taste, aroma, general acceptability. Subjective and Objective test of sensory parameters. (Differential test, Descriptive test, rating test, Sensitivity threshold test)

Unit V Food Safety 7 h

Food safety- characterization and risk analysis- food hazards: Physical, chemical and biological systems. Hazard Analysis Critical control Point (HACCP) and its implementation.

Case study: Study the food safety measures and analyze food quality in an institutional food units.

Text Books

1 Frazier. W.C and D.C Westhoff, (2008). Food Microbiology. (5th Edn.) Delhi: McGraw Hill publishing Co.

2 Hammer, M.J., and Hammer, M.J., Jr., "Water and Wastewater Technology," 7 th Edition, Prentice- Hall, Inc., Englewood Cliffs, New Jersey, 2012.

References

1 Early R.1995 Guide to quality Management Systems forFood Industry. Blackie Academic.

2 Macrae R Roloson R &Sadlu MJ 1994. Encyclopedia of food Science &Technology & Nutrition Vol XVI. Academic Press .

3 Amerine MA, Pangborn RM &Rosslos EB 1965. Principles of Sensory evaluation of food. Academic Press.

4 Adams. M. R and M. D Moss,. (2008). Food Microbiology. (3 Edn.) New Delhi: Panama Publishers.

5 D Kumar Bhatt, Priyanka Tomar,. (2010). An Introduction to Food Science Technology and Quality Management. (Edn.) New Delhi: Kalyani Publishers..

6 www.fssai.gov.in

223MB1ASSA	SELF STUDY: GOOD LABORATORY PRACTICES	SEMESTER III

Total Credits: 1

Syllabus

Unit I Chemical Labelling & Safety

Chemical Labelling & Safety - Safe handling of chemicals and equipment in the laboratory. Handling and disposal of infected, dangerous materials, accidents, safety measures, emergency treatment.

Unit II Good Manufacturing Practice

Good Manufacturing Practice - Good Laboratory Practices (GLPs)- Fire Safety Regulatory Agencies.

Unit III Regulatory Agencies

International and federal regulatory agencies that impact the work of Microbiology - WHO, FDA, CDC, EPA, FSSAI.

Unit IV Equipments and SOPs

Emergency Equipment & Standard Operating Procedures – Maintenance of emergency equipment in a laboratory setting - evaluating Standard Operating Procedures (SOPs) and safety plans.

Unit V Calibration of Equipments

Calibration of equipment and apparatus - Microscope, Biological Safety Cabinets, Centrifuge, Refrigerator, Autoclave and Incubator, Balances, Micro pipettes and pH meter.

Text Books

1 Mark Gregory Slomiany, 2009, "The indispensable guide to Good laboratory practices", Second edition, Create Space Independent Publishing Platform, Scott Valley.

2 Sandy Weinberg, 2007, "Good Laboratory Practice Regulations",, Fourth Edition. CRC Press, US

References

1 Jurg P Seiler, 2005, Good Laboratory Practice, Second Edition, Springer Publishers, US..

2 Mindy J. Allport Settle. 2010, "Good Laboratory Practice – Nonclinical Laboratory Studies Concise Reference", Pharma Logika.

3 Kannan N, 1996, Laboratory manual of General Microbiology, 2nd edition, Panima Publishing House, New Delhi, India..

4 Aneja K R, 2012, Experiments in Microbiology, Plant pathology and Biotechnology, 4th Edition, New Age Publishers, New Delhi, India.

223MB1ASSB	SELF STUDY: FOOD SANITATION	SEMESTER III

Total Credits: 1

Syllabus

Unit I Food Laws and Regulations

Food Laws and Regulations – Essential commodities Act, Standards of Weights and Measures Act, Agmark, Bureau of Indian Standards, Export and Quality Control, Prevention of Food Adulteration Act.

Unit II Food additives and contaminants

Food additives and contaminants, food colours flavouring agents and related substances, sweeteners, preservatives, antioxidants, emulsifying and stabilizing agents, antimicrobial substances, -Indirect additives, residues, contaminants and adulterants, pesticide residues, contaminants from packaging material, Metallic contaminants , adulterants Irradiated Food.

Unit III Hygiene and sanitation

Hygiene and sanitation in food sector – pest control measures, Garbage and Sewage disposal, Water – Sources, purification, Hazards Analysis & Critical Control Point (HACCP), Good Manufacturing Practices (GMP).

Unit IV International Organizations

International Organizations – FAO (Food & Agriculture Organization), WHO(World Health Organization), Codex Alimentaruis, ISO, WTO.

Unit V National Organizations

National Organizations – ICMR, ICAR, Council for social welfare, Ministry of Health & Family Welfare – delivery Health Services in India.

Text Books

1. Julie Lewthwaite, 2014, "Introduction to Food Safety", 1st Edition, Lulu Press Inc. Morrisville.
2. Norman Marriott, Gill Robertson. 1997, "Essentials of Food Sanitation. Springer Science & Business Media, Germany.

References

1. Roday S, 2011, "Food Hygiene and Sanitation". 2nd Edition, Tata McGraw-Hill Education, New York.
2. Norman G. Marriott, M. Wes Schiling & Robert B. Gravani. 2018, "Principles of Food Sanitation", Sixth Edition, Springer Publications, US.
3. Stanga, 2010, "Sanitation: Cleaning And Disinfection In The Food Industry, John Wiley, New Jersey.
4. Frazier WC and Westhoff DC, 2008, "Food Microbiology", 4th Edition, McGraw Hill, New York.

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

Unit II 10 h

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

Unit III 10 h

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

Unit IV 10 h

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

Unit V 08 h

Make in Own Sentences based on the above Lessons

Text Book

1 LATITUDES 1 (Méthode de français) Pages from 128-151, Author : 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
223MB1A4CA	IMMUNOLOGY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The immune system, its interaction with pathogens.
- The Concept of Allergy and Hypersensitivity reactions.
- Responses to stimulation and vaccines.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the process of inflammation and Immunity and importance of cell and organs of the immune system.	K2
CO2	Understand the cellular pathways of humoral/cell-mediated adaptive responses.	K2
CO3	Analyses the four types of hypersensitivity for the Immunologic mechanism involved.	K3
CO4	Perform various diagnostic processes	K3
CO5	Interpret different antigenic determinants within the system.	K3

MAPPING WITH PROGR6AMME 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

223MB1A4CA	IMMUNOLOGY	SEMESTER IV

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I History and Scope of Immunology 10 h

History and Scope of Immunology. The basis of defence mechanisms. Cells of immune system- Hematopoiesis, Lymphoid cells and Myeloid cells and Organs of immune system- Primary and Secondary lymphoid organs (Thymus, Bone marrow, Lymph node, Spleen). Phagocytosis

Unit II Types of immunity 9 h

Types of immunity- Cell mediated immunity, humoral immunity, Antigen and Antibody types, Complement pathways -Classical, alternate and lectin pathway; Apoptosis-types, inflammation. Immunoglobulin – structure, Isotypes, and functions.

Unit III Allergy and Hypersensitivity 10 h

Allergy and Hypersensitivity - Classification types and Mechanisms. Autoimmunity mechanisms and autoimmune response diseases: cell specific: Systemic Lupus Erythematosis and Organ Specific: Myasthenia Gravis

Unit IV Antigen-Antibody reactions 10 h

Antigen-Antibody reactions - Agglutination: Direct, indirect, RPR and Hemagglutination. Precipitation: Counter Current electrophoresis, rocket electrophoresis, Double Immuno Diffusion. ELISA. Radio immune assay (RIA). Monoclonal antibodies and its applications.

Unit V Immuno hematology 9 h

Immuno hematology - Blood transfusion - ABO grouping - Rh factor. Tissue transplantation - HLA typing - Mechanism of acceptance and rejection. Immunodeficiency disease: primary (Bruton disease), secondary (AIDS).

Case study - The patient 24 years old had significant swelling of multiple joints including the right wrist, right elbow, and left ankle. The joints were erythematous and tender to touch.

Text Books

1. Roitt I M, 2011, **Roitt's Essential Immunology**, 12th Edition, John Wiley and Sons Ltd, USA.
2. Basir F, 2012, **Text Book of Immunology**, 2nd edition, Prentice Hall India Learning Private Limited.

References

1. Tizard I R, 1998, **Immunology an Introduction**, 4th Edition, Thomson publishers, Australia
2. Kuby J, 2002, **Immunology**, 5th Edition, W.H.Freeman publishers, New York.
3. Rao C V, 2008, **An Introduction to Immunology**, Narosa Publishing House, Chennai.
4. Nandhini Shetti, 2009, **Immunology - an Introductory Text Book** , 1st Edition, New Age International Ltd, New Delhi..
5. https://youtu.be/SyvOPXeg4ig?feature=shared
6. https://youtu.be/yIMz9pkT9xQ?feature=shared
7. https://archive.nptel.ac.in/content/storage2/courses/102103038/download/module2.pdf

Course Code	Course Name	Category	L	T	P	Credit
223MB1A4EP	FOOD MICROBIOLOGY	CORE	2	-	4	4

PREAMBLE

This course has been designed for students to learn and understand

- The importance of microorganisms in food
- The food borne diseases and outbreaks
- General properties of food sanitation

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 microorganisms in food.	K3
CO2	Know the procedures involved in food borne diseases	K3
CO3	Understand the causes of food spoilage	K3
CO4	Explore the procedures involved in fermented food and dairy products	K3
CO5	Apply the principles of food sanitation	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

223MB1A4EP	FOOD MICROBIOLOGY	SEMESTER IV

Total Credits: 4

Total Instruction Hours: 72 h

Syllabus

Unit I Importance of microbes in food 16 h

Food and Microorganisms – Important microorganisms in food (Bacteria, Mold, Yeast and Black fungus); Factors affecting the growth of microorganisms in food – pH, temperature moisture, Osmotic pressure, Nutrient content, Inhibitory substances andbiological structure.

1. Factors affecting growth of microbes in food – pH, temperature, osmotic pressure

Unit II Food borne diseases 14 h

Food borne diseases – Food poisoning -- Food borne infections –Bacterial and Mycotoxins- Investigation of food poisoning outbreaks.

1. Evaluation of milk quality – Resazurin test
2. Microbial Limit test

Unit III Spoilage of food 14 h

Spoilage of food - meat – canned foods.

1. Isolation of microbes from spoiledmeat.
2. Isolation of microbes from canned foods.

Unit IV Fermented food and dairy products 14 h

Fermented food – Bread, fermented fish and meat products – Fermented dairy products – Yoghurt and cheese, Prebiotics and Prebiotics. Fermented beverages: Wine and sauerkraut.

1. Preparation of Wine from fruits
2. Isolation of Lactobacillus from curd
3. Preparation of Sauerkraut

Unit V Microbiology in Food Sanitation 14 h

Food borne diseases – Food poisoning -- Food borne infections–Bacterial and Mycotoxins- Investigation of food poisoning outbreaks.
Bacteriology of Water – Microbiology of Food Product – Good Manufacturing Practices – Hazard Analysis – Critical Control Points

1. Isolation of indicator in water- S. aureus
2. Isolation of indicator organisms in food- Salmonella sp. and Shigella sp.

Text Books

1. Frazier. W.C and Westhoff. D.C, 2017, **Food Microbiology**, 5th edition, Tata Macgraw Hill publishing Co., New Delhi.
2. Adams M.R. and Moss M. O., 2015, **Food Microbiology** 4th Edition, Panima Publishers, New Delhi.

References

1. Roger Y Stainer, 2003, **Basic Food Microbiology**, 5th Edition, CBS Publishers, India.
2. Jay J M, 2006, **Modern Food Microbiology**, 6th Edition,Van Nostra And Rainhokdd Co, USA.
3. Dubey R C, and Maheswari D K, 2023, **A Textbook of Microbiology**, 4th Edition, S. Chand Publishing. New Delhi.

223MB1A4CQ	CORE PRACTICAL: IMMUNOLOGY & RECOMBINANT DNA TECHNOLOGY	SEMESTER IV

Total Credits: 3
Total Instructions Hours: 72h

S.No	Contents
1	Blood Profiling- Estimation of Total Blood count and Differential Blood count, Hemoglobin, ESR
2	Preparation of serum and plasma.
3	Agglutination slide test - Blood grouping
4	Agglutination tube test - WIDAL test
5	Precipitation – Rocket immunoelectrophoresis (Under DBT Star scheme)
6	Double Immunodiffusion – Outcherlony method
7	Isolation of drug resistant organism - gradient plate technique
8	Isolation of Auxotrophic mutants using replica plating.
9	Isolation and Quantification of RNA (Under DBT Star scheme)
10	Carcinogenicity testing - AMES Test
11	Detection of beta galactosidase – ONPG Test
12	Transformation of bacteria with recombinant DNA- blue white screening

Note: 12 Experiments mandatory out of 14

References

1. T.A. Brown, 2023, **Gene Cloning and DNA Analysis: An Introduction**, 7th edition, Wiley-Blackwell Publications & New Jersey, United States.
2. Walt Ream, Katharine G. Field, 2021, **Molecular Biology Techniques: An Intensive Laboratory Course**, 5th Edition, Academic Press (Elsevier).
3. Sheedy, F. J., & Walker, K. T. 2016. **Practical Immunology**. Wiley-Blackwell
4. Chapel, H., Haeney, M., & Misbah, S. 2014. **Essentials of Clinical Immunology**. John Wiley & Sons.

Course Code	Course Name	Category	L	T	P	Credit
223BT1A4IC	BIOINFORMATICS	IDC	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The biological databases and their applications
- The applications of various Bioinformatics tools
- The 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	Understand the biological databases with applications.	K2
CO2	Explain the concept of genomes and gene prediction.	K2
CO3	Distinguish the types of protein structures and its implications in functions.	K3
CO4	Comprehend the molecular modelling and visualization for drug designing.	K3
CO5	Apply and comprehend the tools used in Bioinformatics and phylogenetic 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

223BT1A4IC	BIOINFORMATICS	SEMESTER IV

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Introduction to Bioinformatics 8 h

Basics of Cell-Chromosome-Genome-Genes and DNA-Central Dogma. Introduction to DNA sequencing - Illumina, Pyro 454 and Ion torrent. Biological Databases: DNA sequence Database-Protein Database and Sequence analysis tools.

Unit II Genomics 7 h

Genome Mapping-Assembly and Comparison. Structural and Functional Genomics. RNA sequencing and Transcriptomics. Gene Prediction: Computational Methods of Gene Prediction, difficulties and application of gene prediction.

Unit III Proteomics 7 h

Introduction to protein structure, visualization, comparison and classification. Secondary and tertiary protein structure prediction using bioinformatics tools and methods of protein modeling.

Unit IV Bioinformatics in Computer-Aided Drug Design 7 h

Introduction to CADD and drug discovery process. Structural Bioinformatics in drug discovery-SAR and QSAR techniques in drug design. Molecular docking and AutoDock tools.

Unit V Applied Bioinformatics Tools 7 h

Introduction to Bioinformatics search tools-Entrez and ExPASy. Sequence alignment: DNA Sequence analysis-Protein sequence analysis-Pairwise and Multiple sequences Alignment. Database search-Motif Search (Protein Motifs and Domain Prediction)-Molecular Modeling and Phylogenetic tree construction and analysis.

Text Books

1. Rastogi SC , Mendiratta N and Rastogi P, 2013, "Bioinformatics: Methods and Applications: Genomics, Proteomics", 4th Edition, Prentice Hall India Learning Private Limited.
2. Zhumur Ghosh and Bibekan and Mallick, 2009, "Bioinformatics: Principles and Applications", OUP India; Illustrated, 2nd Edition, Oxford University Press.

References

1. Rui Jiang, Xuegong Zhang and Michael Q. Zhang, 2013, "Basics of Bioinformatics", 1st Edition, Tsinghua University Press, Beijing and Springer-Verlag Berlin Heidelberg.
2. Teresa Attwood, 2007, "Introduction to Bioinformatics", 1st Edition, Pearson Education.
3. Campbell, A.M. and L. J. Heyer, 2007,"Discovering Genomics, Proteomics and Bioinformatics", 2nd Edition, Pearson Education
4. Siddiqui AA, 2020, "Computer Aided Drug Design", 1st Edition, CBS publishers, USA .

Course Code	Course Name	Category	L	T	P	Credit
223MB1A4SA	RECOMBINANT DNA TECHNOLOGY	CORE	2	1	-	2

PREAMBLE

This course has been designed for students to learn and understand

- The utilization of different DNA manipulating enzymes and its exploitation for beneficial applications
- The development of clones and transform them into organisms, making them to produce new products
- On how to utilize the microbial system in developing products of commercial importance

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Apply the ideas on restriction modification system, towards evolution of recombinant DNA technology	K3
CO2	Reframe different vectors in the development of new recombinants	K3
CO3	Deploy the specific type of vector in recombination experiments	K3
CO4	Have an idea on the transmission of recombinant vectors inside the organisms	K3
CO5	Deploy techniques in identifying microorganisms having recombinant polynucleotide	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

223MB1A4SA	RECOMBINANT DNA TECHNOLOGY	Semester IV

Total Credits: 2

Total Instruction Hours: 36h

Syllabus

Unit I Introduction to rDNA Technology 8H

History and Scope of rDNA technology - Restriction modification system - Gene manipulating enzymes – Restriction Enzymes – Discovery, types and mode of action,DNA Polymerases I,II & III, Taq polymerase, Klenow fragment - Ligases - Methylases - Reverse transcriptase. Applications of Gene cloning.

Unit II Isolation of Purified Polynucleotide 7 h

Isolation and Purification of DNA(Chromosomal and Plasmid)- Isolation and Purification of RNA - Chemical Synthesis of DNA – Development of Genomic DNA Library and cDNA Library.

Unit III Vectors 7h

Plasmid based Vectors - Natural vectors – pSC101, pSF2124 and pMB1.Artificial vectors - pBR322 & pUC. Phage based Vectors- ʎ phageandM13. Hybrid Vectors - Phagemid, Phasmid and Cosmid. Artificial chromosomes - BACs; - Eukaryotic vectors –YAC, Shuttle vectors.

Unit IV Gene Transfer Techniques 7 h

Biochemical methods - calcium phosphate, DEAE dextran mediated, Lipofection. Physical methods - Electroporation, Microinjection, Particle bombardment, Ultrafection. Biological - Viral mediated transduction.

Unit V Screening & Characterization of recombinant DNA 7 h

Screening: Direct: Antibiotic resistance, lacZ complementation (Blue-white selection), plaque phenotype; Indirect: Immunochemical detection - Nucleic acid hybridization, Blotting - Dot and Colony Blotting; Chromosome walking. Chromosome jumping.

In 2020 there was a viral pandemic disease that shook the entire world. Design a recombinant product that could have tackled the virus by developing immunity in individuals, in the form of an active or passive vaccine.

Text Books

1. Brown, T.A. 2020, **Gene Cloning and DNA Analysis: An Introduction,** Wiley-Blackwell. 8th Edition, New Jersey, United States.

2. Thieman, W.J. and Palladino, M.A. 2019, **Introduction to Biotechnology, Books a la Carte.** 4th Edition, Pearson Education, Noida.

References

1. Krebs, J.E., Goldstein E.S. and Kilpatrick S.T. 2018. **Lewin's Gene XII,** Jones &Bartlelt Publishers, Boston. United States.

2. Primrose, S.B. and Twyman, R.M. 2016. **Principles of Gene manipulation and Genomics,** 8th Edition, John Wiley and Sons Ltd, Wiley-Blackwell. United Kingdom.

3. Bernard R. Glick, Jack J. Pasternak, Cheryl L. Patten. 2010. **Molecular Biotechnology. Principles and Applications of Recombinant DNA.** 4th Edition. ASM Press. University of Michigan. United States.

4. Susan, R.B. 2008. **Biotechnology,** Cengage Learning Pvt. Ltd., New Delhi.

5. https://archive.nptel.ac.in/courses/102/103/102103013/#downloads

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Course Code	Course Name	Category	L	T	P	Credit
223MB1A5CA	MEDICAL BACTERIOLOGY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The concept of infectious disease cycle
- The pathogenicity of medically important gram positive & negative organisms
- The emergence and prevention of antimicrobial resistance

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Comprehend infectious disease cycle	K2
CO2	Determine the morphology, cultural characteristics, and pathogenesis of gram positive bacteria	K3
CO3	Identify and classify the gram negative bacteria.	K3
CO4	Differentiate the morphology, cultural characteristics, and pathogenesis of other medically important bacteria	K3
CO5	Understand the importance of antimicrobial resistance and nosocomial infections	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	☐ Gender Sensitization
☑ Intellectual Property Rights (IPR)	☐ Social Awareness / Environment
☑ Innovations	☐ Constitutional Rights / Human Values / Ethics

223MB1A5CA	MEDICAL BACTERIOLOGY	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Infections 10h

Infections – Sources, methods and types of infections – Definitions – Epidemic, Pandemic and Endemic diseases – Epidemiology of infectious diseases – Infectious Disease cycle – Investigation of epidemics – Control of Epidemics.

Unit II Medically important Gram-positive bacteria 10 h

Morphology, Pathogenecity and Laboratory diagnosis of *Staphylococcus aureus, Streptococcus pneumonia, Streptococcus pyogenes, Enterococcus faecalis, Coryebacterium diptheriae, Bacillus anthracis, Clostridium botulinum, Clostridium tetani, Listeria monocytogenes.*

Unit III Medically important Gram-negative bacteria 10 h

Morphology, Pathogenecity and Laboratory diagnosis of *Neisseria gonorrhea, Neisseria meningitides, Haemophilus influenza, Helicobacter pylori, Legionella, Yersinia pestis, Vibrio cholera, E. coli, Salmonella typhi, Shigella dysentriae, Campylobacter jejuni, Pseudomonas aeruginosa, Klebsiella pneumoniae, Proteus vulgaris*

Unit IV Miscellaneous bacteria 8 h

Morphology, Pathogenecity and Laboratory diagnosis of *Mycobacterium tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira interrogans, Chlamydia trachomatis, Rickettsia prowazekii, Coxiella burnetii.*

Unit V Antimicrobial Resistance 10 h

Antimicrobial Resistance – Mechanisms – Factors that favor the spread of antimicrobial resistance – Environment, Drug, Patient, Physician – Multi Drug Resistance (MRSA) - Control of Antibiotic resistance. Opportunistic pathogen (*Acinetobacter baumanii*) - Nosocomial infections.

Case study

At 35 year old women presented with abdominal pain and bloody diarrhea. She experienced fever, chills, nausea and vomiting. A stool culture was sent to the microbiology laboratory. Identify the organism and its importance in causing infection.

Text Books

1 Ananthanarayanan R and CK Jayaram Panicker, 2005, "Textbook of Microbiology". Orient Longman.

2 Chakraborty P, 2013, "A Text book of Microbiology", New Central Book Agency Pvt Ltd. Calcutta.

References

1 Bailey and Scotts, 1994, "Diagnostic Microbiology", 9th Edition, Baron and Finegold CVMosby Publications.

2 Jawetz E Melnic JL and Adel berg EA., 1998, "Review of Medical Microbiology", Lange Medical Publications, USA.

3 Mackie and McCatney, 1994, "Medical Microbiology", Volume No I and II, Churchill Livingston, 14th Edition

Course Code	Course Name	Category	L	T	P	Credit
223MB1A5CB	VIROLOGY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The history and concept of viral reproduction.
- The life cycle of bacteriophages and eukaryotic viruses.
- The morphology, pathogenicity and laboratory diagnosis of medically important viruses.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the general characteristics of viruses.	K3
CO2	Recognize the lytic cycle of bacterial viruses	K2
CO3	Gain the knowledge on lysogeny and its induction of lysogens.	K3
CO4	Categorize the eukaryotic viruses.	K3
CO5	Acquire knowledge on viruses of human beings and antiviral drugs.	K3

MAPPING WITH PROGR6AMME OUTCOMES

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

COURSE FOCUS ON:

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

223MB1A5CB	VIROLOGY	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Morphology and General characteristics 10 h

Early development of Virology – Morphology and General characteristics of viruses - Structure of viruses - Virion size, Helical and icosahedra capsid, Nucleic acids, viral envelopes and enzymes - Concept of viroids, virusoids, satellite viruses and prions - Classification and Nomenclature of viruses – Baltimore system of Classification.

Unit II Lytic cycle 10 h

ds DNA lytic phages – Coli phages-T4 phage, The one step growth, Adsorption, penetration, synthesis, assembly and release of phage particles - ss DNA phage - φX 174, Rolling circle replication , theta replication.

Unit III Lysogeny 8 h

Temperate bacteriophages, lambda phage, Induction of lysogens, Generation of defective phages and their uses – Screening of lysogenic phages.

Unit IV Viruses of plants, fungi and algae 10 h

Reproduction of plant viruses (TMV, CaMV and BMV), Plant virus infection control mechanisms - Viruses of fungi and algae.

Unit V Human viral infections 10 h

Pathogenicity and diagnosis - HBV, Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Polio virus, Emerging viral diseases: Ebola, Corona and Chickungunya - Oncogenic viruses (Epstein Barr Virus, Human Papilloma virus) - Viral vaccines and antiviral drugs

Case study: Analyze outbreaks of nosocomial infections caused by viruses, within healthcare facilities at Coimbatore.

Text Books

1. Paul Hyman and Stephen T. Abedon, 2018, "Viruses of Microorganisms ", 1st Edition, Caister Academic Press., Ashland, OH 44805, USA.
2. Pelczar M., Chan E.C.S. and Krieg, N.R, 1993, "Microbiology", 6th Edition, Tata Mc Grew Hill Publishing Co. Ltd., New Delhi.

References

1. Dimmock, 1998, "Introduction to Modern Virology", 5th Edition, Blackwell scientific publications.
2. Rogger Hull, 2001, "Mathews Plant Virology', 4th Edition, Academic press.
3. Matthias J. Reddehase, 2013, "Cytomegaloviruses: From Molecular Pathogenesis to Intervention (Vol. 2)", 2nd Edition, Caister Academic Press., Ashland, OH 44805, USA.
4. Ananthanarayanan R and CK JayaramPanicker, 2005, "Introduction to Medical Microbiology", 2nd Edition, Orient Longman.

Course Code	Course Name	Category	L	T	P	Credit
223MB1A5CC	MYCOLOGY AND PARASITOLOGY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The general characteristic and classification of medically important fungi
- The cutaneous, subcutaneous, systemic and opportunistic mycoses.
- The types of host and the different types of parasites

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Gain knowledge on general properties of fungi and mycological techniques	K2
CO2	Learn the morphology, cultural characteristics and pathogenesis of cutaneous and subcutaneous mycosis.	K3
CO3	cognize the morphology, cultural characteristics and pathogenesis of systemic and opportunistic mycosis.	K3
CO4	Understand protozoans and metazoans are and to understand their interactions with the host	K2
CO5	Explore the life cycle and pathogenicity of Platyhelminthe and Nematode	K3

MAPPING WITH PROGR6AMME OUTCOMES

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

COURSE FOCUS ON:

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

223MB1A5CC	MYCOLOGY AND PARASITOLOGY	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I General characteristics and classification of fungi 10 h

General properties of fungi – morphology, taxonomy, nomenclature and classification of medically important fungi – virulence factors of fungi causing infection. antifungal susceptibility testing, quality control, preservation and culture collection of fungi.

Unit II Cutaneous and Subcutaneous Mycoses 9 h

Superficial cutaneous mycoses-Malasseziosis, Piedra and Dermatophytosis- Tinea pedis, Tinea corporis. Subcutaneous Mycoses-Mycetoma, Sporotrichosis. Allergic fungal disease, mycotoxicoses and mycetismus.

Unit III Systemic and Opportunistic mycoses 10 h

Systemic mycoses – Histoplasmosis, Blastomycosis. Opportunistic mycoses – Candidiasis, Aspergillosis and Miscellaneous Mycoses – Oculomycosis, Otomycosis.

Unit IV Introduction to Parasites 9 h

Definition, Host, Types of host; Protozoans - Classification and Characteristics; Metazoans - Classification and Characteristics; Mode of Transmission of parasitic infections. Host and Parasites responses.

Unit V Parasitic Protists , Platy helminthes and Nematodes 10 h

Study of Morphology, Life Cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of *Giardia intestinalis, Plasmodium vivax.* Platyhelminthes- *Taenia solium.* Nematodes- *Ascaris lumbricoides, Ancylostoma duodenale.*

Case study: What are the predisposing factors for candidiasis, and how do they contribute to infection development?

Text Books

1 Jagadish Chander, 2018, "Text Book of Medical Mycology", 4th Edition, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi..

2 Subash Chandra Praja, 2013, Textbook of Medical Parasitology: Protozoology & Helminthology, 4th Edition, All India Publishers & Distributor, New Delhi, India

References

1 Reba Kanungo, 2017, "Ananthanarayan & Panicker's Text book of Microbiology", 10th Edition, Paperback, Orient Black Swan..

2 Reiss E. Shadomy H.J. and Lyon G.M, 2011, "Fundamental Medical Mycology", Wiley-Blackwell.

3 Brooks G., Carrol K.C., Butel J. and Morse S, 2012, "Jawetz Melnick and Adelberg Medical Microbiology", 26th Edition, Lange Medical Publications.

4 Peter L Chiodini, Moody A H, Manser D W, 2001, Atlas of Medical Parasitology and Helminthology, 4th Edition, Churchill Livingstone, London

Arora D R, Brij Bala Arora, 2020, Medical Parasitology, 5th Edition, CBS Publishers, New Delhi, India

Course Code	Course Name	Category	L	T	P	Credit
223MB1A5CD	ADVANCED DIAGNOSTIC MICROBIOLOGY	CORE	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- significance of molecular diagnostics
- Immunoassay methods involved in advanced diagnostics
- Applications of hybridization, amplification and genome sequencing techniques in pathogen identification

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Acquire the knowledge on basics and significance of molecular diagnostic methods.	K1
CO2	Able to diagnose infectious diseases using immunoglobulins	K3
CO3	Adopt suitable blotting and hybridization technique in disease diagnosis.	K3
CO4	Apply different PCR and fingerprinting techniques in disease diagnosis.	K3
CO5	Apply various genome sequencing methods for diagnosis of infectious diseases.	K3

MAPPING WITH PROGR6AMME OUTCOMES

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

COURSE FOCUS ON:

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

223MB1A5CD	ADVANCED DIAGNOSTIC MICROBIOLOGY	SEMESTER V

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Introduction to Molecular diagnostics 8 h

Molecular diagnostics - differences in traditional and molecular diagnostics – Significance of molecular diagnostics – Scope of Molecular diagnostics - Rise of diagnostic industry in Indian and global scenario.

Unit II Advanced Diagnosis using Immunoglobins 8 h

Introduction - antigen-antibody binding interactions and assays - monoclonal and polyclonal antibodies. Agglutination - RIA, ELISA's, Western blot-Chemiluminescence, Immunofluorescence.

Unit III Blotting and Hybridization Techniques 8 h

Protein and Nucleic acid extraction and analysis (PAGE & AGE); Blotting: Southern (*E.coli*), northern (Herpes virus), Western (HIV) dot blot (*Salmonella typhi*) In-situ hybridization (FISH) (*Pseudomonas* sp.); Nucleic acid probe preparation.

Unit IV Amplification and DNA fingerprinting methods 7 h

Nucleic acid amplification methods and types of PCR in disease diagnosis: Reverse Transcriptase-PCR (SARS CoV2), Real-Time PCR (*Mycobacterium tuberculosis*), Mulitplex PCR (Influenza Virus), RAPD DNA fingerprinting (Leptospira sp.)

Unit V Genome Sequencing 7 h

Direct Sequencing: Whole Genome Sequencing and Target Sequencing. Sanger Sequencing (*Vibrio* sp.,) New Generation sequencing Method- Illumina (Influenza A), Metagenomics (Respiratory Viruses), Microarray (*Clostridium botulinum*).

Case study

A patient admitted with pulmonary disease symptom at tertiary care hospital. Physician having doubt about causative agent, could not find that agent through conventional methods. It's very urgent to treat the patient because of severe symptoms. Finally, they decided to go for advanced rapid diagnostics method. Could you suggest accurate and quick advanced diagnostic method to detect the infectious agent?

Text Books

1. Thomas J Kindt, Barbara A Goldsby, Richard Osborne 2018, "Kuby's Immunology", 8th Edition, W. H. Freeman Publishers, New York.
2. William B Coleman, Gregory J Tsongalis, 2005, "Molecular Diagnostics: For the Clinical Laboratorian", 2nd Edition, Hanuma Publishers, New Delhi.

References

1. Upadhya and Nath, 2016, "BiophysicalChemistry: Principles and Techniques", 4th Edition, Himalaya Publishing House Pvt. Ltd. New Delhi.
2. George P. Patrinos (Editor), Wilhelm Ansorge (Editor), Phillip B. Danielson Dr. (Editor),. 2016, "Molecular Diagnostics ", 3rd Edition, Academic press, USA.
3. Keith Willson and John Walker, 2010, " Principles and Techniques of Biochemistry and Molecular Biology", 7th Edition, Cambridge University Press, US.
4. Lele Buckingham and Maribeth L. Flaws, 2019, "Molecular Diagnostics: Fundamentals, Methods & Clinical applications", 3rd Edition, F. A. Davis Company, Philadelphia.

223MB1A5CP	CORE PRACTICAL: MEDICAL MICROBIOLOGY	SEMESTER V

Total Credits: 3
Total Instructions Hours: 72 h

S.No	Contents
1	Processing of clinical samples: Skin, Urine, Pus, Blood, Sputum and Faeces.
2	Isolation and identification of Bacterial pathogens: *Staphylococcus aureus, Streptococcus* sp., *E. coli, Salmonella, Klebsiella , Pseudomonas, Proteus* sp.,
3	Isolation and identification of clinically important fungi: *Candida* sp., and *Aspergillus* sp., by inverted microscope - Under DBT Star Scheme
4	Cultivation of Virus – Egg Inoculation method (Demonstration).
5	Isolation and titration of Coliphages
6	Tube agglutination – WIDAL
7	Determination of Minimal Inhibitory Concentration – Broth dilution method
8	Cultural characteristics of Aspergillus sp, Penicillium sp and Candida sp, - Under DBT Star Scheme
9	LPCB staining for fungal identification by Light Microscope - Under DBT Star Scheme.
10	Precipitation – RPR
11	Immunodiffusion – Radial and Ouchterlony's
12	Immunoelectrophoresis – Rocket and Counter current

Note: 10 Experiments mandatory out of 12

References

1. James. C. Cappuccino, 2017. Microbiology A Laboratory manual. 11th edition, Pearson education publishers.
2. Aneja K. R. 2012 Experiments in Microbiology, plant pathology and biotechnology, 4th edition, New age publishers.
3. Kannan. N 2003. Hand book of Laboratory culture media . 1st edition, Panima publishers house.
4. Rajan S. Selvi Christry.R, 2019, Experimental Procedures in Lifesciences, CBS Publishers & Distributors Pvt Ltd

Course Code	Course Name	Category	L	T	P	Credit
223MB1A5SA	MICROBIAL FERMENTATION	SEC	2	1	-	2

PREAMBLE

This course has been designed for students to learn and understand

- To comprehend the fermentation and its importance.
- To analyze the application of economically important microorganisms for the large scale production.
- To have an understanding on the types of fermentations, harvesting and purification process.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Aquire knowledge on fermentation and its working mechanisms.	K2
CO2	Understand the types and mechanism of various fermentor.	K2
CO3	Explore the knowledge on industrial important microorganisms.	K3
CO4	Understand the concept of industrial scale up Production techniques.	K3
CO5	Know the downstream process of Intracellular and Extracellular products.	K3

MAPPING WITH PROGR6AMME OUTCOMES

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

COURSE FOCUS ON:

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

223MB1A5SA	MICROBIAL FERMENTATION	SEMESTER V

Total Credits: 2

Total Instruction Hours: 36 h

Syllabus

Unit I Fermentation and types 8 h

Fermentation – Major types of organisms used in fermentation. Microbial growth kinetics, Batch culture, Continuous Culture, Fed – Batch – Types, applications, fermentation kinetics - Baffles, Agitator, Impellers and Antifoaming agents.

Unit II Types of Fermentor 8 h

Fermentor and types-basic functions of a Fermentor for microbial and animal cell culture – alternative vessel design, common measurements and control systems. Sensors – solutions to common problems in fermentation, anaerobic fermentation. Control of fermentation – requirements for control, design of a fermentation control systems, sensors and controllers, control of incubation, aeration and agitation.

Unit III Industrially important strains 8 h

Industrially important strains – Screening methods – Strain development for Improved yield – Mutation, Recombination and protoplast fusion.

Unit IV Industrial scale Production 7 h

Production of beverages – beer and wine – vitamin B12 and Riboflavin – Antibiotics – penicillin – production of enzymes – Amylases and Proteases – methods of immobilization.

Unit V Downstream process 7 h

Downstream process Biochemistry – Intercellular and extracellular – Centrifugation, filtration, Floatation – solvent extraction, precipitation – Breakage of cells – Physical and Chemical methods.

Case study

Analyze the effluent for toxic and other hazardous components which pollute the environment.

Text Books

1 Patel A H, 2011, Industrial Microbiology, 2nd Edition. Mac Millan Publishers, United States.

2 Crueger W, Crueger A, 1991, Biotechnology, A textbook of Industrial Microbiology, Sinauer Associates Inc., United States.

References

1 Prescott and Dunn, 2004, Industrial Microbiology, 4th edition, CBS publishers Ltd., India.

2 Dubey R C, Textbook of Biotechnology, 2015, 4th edition, S Chand and Co Ltd. New Delhi, India

3 Stanbury P T, Whitaker, 1995, Principles of Fermentation Technology, 3rd Edition, Pergamon, United Kingdom.

4 https://nptel.ac.in/courses/102/103/102103015/

Course Code	Course Name	Category	L	T	P	Credit
223MB1A5DA	MICROBIAL PRODUCTS AND PROCESS	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- the production of yeast products using Microorganisms
- the importance of Microorganisms in biofertilizer production
- to explore the ideas in commercial level

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Gain knowledge about economic aspects of microbial products	K4
CO2	Exemplify the ideas about the production and types of Bioethanol and Biofertilizer	K3
CO3	Recognize the commercial production of Biopolymers using Microorganisms	K3
CO4	Explore the production and standardization of vaccine	K4
CO5	Summarize the vaccine standardization	K3

MAPPING WITH PROGR6AMME OUTCOMES

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

COURSE FOCUS ON:

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

223MB1A5DA	MICROBIAL PRODUCTS AND PROCESS	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I **Microbial Products** 8 h

Single Cell Protein and its Economic Aspects: Bacterial, Actinomycetes, Fungal and Algal Proteins – Brewer's and Baker's yeast – Food and Fodder yeast – Mushroom (Agaricus, Oyster) and Products from Higher fungi (Morchella esculenta,).

Unit II Production of Bioethanol & Biofertilizer 10 h

Production, Methods and Uses of Bioethanol (S cerevisiae) – Biodiesel (Chlorella) – Biohydrogen (Chlamydomonas) – Biogas (Methanobacteria). Biofertilizer - Types, Mass production.

Unit III Biopolymer production 10 h

Production of Polyhydroxybutyrate (PHB) – Xanthan – Alginate – Cellulose. Adhesive Protein - Rubber - Polyhydroxyalkanoates - Hyaluronic acid.

Unit IV Microbial products with pharmaceutical importance 10 h

Vaccines – Preparation of Live (MMR, BCG, Oral Polio), killed (Covaxin, Rabies) vaccine and recombinant vaccine (Covishield)- Toxoid.

Unit V Standardization of vaccine – 10 h

WHO guidelines in vaccine standards- Quality control- virulence test, environmental risk assessment, interference test, stability test, purity test, safety test, potency test.

Case study

Propose a plan outlining the steps the pharmaceutical company should take to implement and maintain vaccine standardization throughout the production process. Include considerations for ongoing quality control, monitoring, and adaptation to emerging regulatory requirements.

Text Books

1. Patel A H, 2012, "Industrial Microbiology", 2nd Edition, Trinity Press, NewDelhi..
2. El-Mansi E M T, Bryce C F A, Dahhou B, Sanchez S, Demain A L, Allman AR, 2012, "Fermentation Microbiology and Biotechnology", 3rd Edition, CRC Press, USA.

References

1. Bernard R Glick, Jack J Pasternek, Cheryl L Patten, 2010, "Molecular Biotechnology - Principles and Applications of Recombinant DNA", 4th Edition, ASM Publishers, USA..
2. Puvanakrishnan R, Sivasubramanian S, Hemalatha T, 2012, "Microbial Technology - Concepts amd Applications", 1st Edition, MJP Publishers, New Delhi.
3. https://agritech.tnau.ac.in/org_farm/orgfarm_biofertilizertechnology.html.

Course Code	Course Name	Category	L	T	P	Credit
223MB1A5DB	DAIRY MICROBIOLOGY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- the basics of dairy processing and fermented products
- diseases associated with milk and milk products
- quality standards of dairy products

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Acquire the knowledge on dairy processing operations	K2
CO2	Describe the different fermented dairy products	K2
CO3	Analyze and identify the milk borne diseases causing microorganisms	K3
CO4	Evaluate the quality of milk	K3
CO5	Gain knowledge about Government regulatory practices and policies for quality assurance of dairy products	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

223MB1A5DB	DAIRY MICROBIOLOGY	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Processing of Milk in dairy industries 10 h

Milk - Introduction, composition, Microorganisms in Milk – Bacteria, Yeasts, Moulds. Starter Cultures – Starter cultures and their biochemical activities. (Streptococcus thermophillus, Lactobacillus bulgaricus) Dairy processing: Pasteurization, UHT treatment, homogenization, Membrane processing, storage and transportation of milk. Judging and grading of milk and its products.

Unit II Microbial Products of Milk 10 h

Production of Dairy products: Overview and Fluid Milk Products, Concentrated and Dried Milk Products, condensed milk. Cultured Dairy Products: Whipped Cream, Ice Cream and Cheese. Fermented milk products – Cultured butter milk, Kefir and labneh.

Unit III Diseases associated with milk 10 h

Milk borne diseases, antimicrobial systems in milk, sources for contamination of milk – bacterial with examples of infective and toxic types – Clostridium, Salmonella, Shigella, Staphylococcus, Campylobacter, Listeria. Mycotoxins in milk with reference to Aspergillus sp.

Unit IV Quality Analysis of Milk 10 h

Sensory analysis of milk – Determination of specific gravity, fat, SNF, TS, acidity and pH in milk and their significance and interpretation – Determination and significance of MBR Test – SPC – Phosphatase activity in milk – common adulterants in milk and their detection techniques – advanced analytical techniques in milk and milk products.

Unit V Quality Assurance 8 h

Microbiological quality standards of food. Government regulatory practices and policies. FDA, WHO, EPA and ISI. HACCP – Food safety, safety of dairy products, control of hazards.

Case study

You are a quality assurance personal associated with a private milk industry. Your company is procuring milk from farmers for distribution. Suppose you get to know that the quality of milk is not up to the level, what investigations you would perform to understand the quality of milk procured.

Text Books

1 Clarence Henry Eckles, 2012, "Milk & Milk Products", 4th Edition, Tata McGraw Hill publishing company Ltd, New Delhi.

2 Jay. JM, Martin. JL, David. AG, 2006, "Modern Food Microbiology" 7th Edition, Springer-Verlag New York Inc. USA

References

1 Robinson. RK, 2002, "Dairy Microbiology Handbook", 3rd Edition, John Wiley & Sons, Inc, USA.

2 Roday. S, 2017, Food Hygeine and Sanitation. Mcgraw Hill Education.

3 De. S, 2001, "Outlines of Dairy Technology, Oxford Univ. Press, New Delhi.

4 Adams. MR, Moss. MO, 2005, "Food Microbiology", New age international Pvt Ltd publications.

5 https://archive.nptel.ac.in/courses/126/105/126105013/

Course Code	Course Name	Category	L	T	P	Credit
223MB1A5DC	COMMUNICABLE DISEASES	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- the communicable disease transmission, control and eradication.
- the health regulations related to communicable disease
- the different types of communicable diseases

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the transmission and control measures of communicable diseases	K2
CO2	Comprehend routes of communicable diseases from poor hygiene, fecal-oral and food transmission	K2
CO3	Recognize communicable diseases from soil, water, and skin.	K3
CO4	Identify communicable diseases from air, body fluid and insect borne	K3
CO5	Emphasize on communicable diseases from Zoonoses and emerging diseases.	K2

MAPPING WITH PROGRAMME OUTCOMES

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

COURSE FOCUS ON:

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

223MB1A5DC	COMMUNICABLE DISEASES	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Transmission and control measures of communicable diseases 10 h

Communicable disease – agent – transmission – host factor- environment – communicable disease theory – control principles and methods – vaccination, vector control, treatment and mass drug administration – control strategy and organization – outbreak investigation, survillence, control and eradication – Health regulations – National and international.

Unit II Poor hygiene, Food-borne and fecal-oral diseases 9 h

General Characteristics, Mode of Transmission and Control Measures: Poor hygiene Disease – scabies – dermatophytosis – Pinta, Trachoma –Fecal-oral Disease – Cholera, Giardia, – Food-borne Disease – Campylobacter Enteritis, Intestinal fluke.

Unit III Soil, Water and Skin diseases 9 h

General Characteristics, Mode of Transmission and Control Measures: Disease of soil contact – Ascaris, Tetanus – Disease of water contact – Buruli Ulcer, Guinea Worm – Skin Infections – Chickenpox, Streptococal Skin infection, Leprosy.

Unit IV Airborne, Insect borne and Body fluid diseases 10 h

General Characteristics, Mode of Transmission and Control Measures: Airborne infection – Acute Reparatory Infection, Influenza, Whooping Cough – Disease Transmitted through Body Fluids – Gonorrhoea, Marburg Disease – Insect-borne Disease – Malaria, Dengue.

Unit V Zoonoses and emerging disease] 10 h

[General Characteristics, Mode of Transmission and Control Measures: Ectoparasite Zoonoses – Plague, Typhus – Domestic and Synanthropic Zoonoses – Rabies, Brucellosis – New and Emerging Diseases – Arboviruses, Corona.

Case study

Investigate the causative agent for the following complications of the patient admitted in the hospital with the symptoms of vomiting, diarrohea, headache and abdominal cramp. The case history of the patient who delight to travel various places.

Text Books

1. Roger Webber. 2016. "Communicable Disease – A global Perspective", 5th Edition, CABI - USA.
2. David L. Heymann. 2008. "Control of Communicable Diseases Manual", 19thEdition, Amer Public Health Assn, USA.

References

1. Apurba S Sastry and Sandhya Bhat, 2021, "Essentials of Medical Microbiology", 3rd Edition, Jaypee Brothers Medical Publishers
2. Agarwal S et al., 2009, "Text Book of Public Health and Community Medicine", 1st Edition, Department of Community Medicine, Armed Force Medical College, Pune
3. John E et al. 2020. "Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases", 9th Edition, Elsevier.
4. https://microbenotes.com/communicable-vs-non-communicable-diseases/

Course Code	Course Name	Category	L	T	P	Credit
223MB1A5GA	FOOD SANITATION AND PUBLIC HEALTH	GE	2	-	-	2

PREAMBLE

This course has been designed for students to learn and understand

- food laws and regulation guidelines
- food contamination and spoilage
- The organisms causing food spoilage

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the food sanitation laws and regulations	K2
CO2	Know the food contaminants in various food products	K2
CO3	Explore the food spoilage and preservation methods	K3
CO4	Explore food infection and food intoxication of microbes	K3
CO5	Understand the importance of international organizations	K3

MAPPING WITH PROGR6AMME OUTCOMES

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

COURSE FOCUS ON:

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

223MB1A5GA	FOOD SANITATION AND PUBLIC HEALTH	SEMESTER V

Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I Food Spoilage 4 h

Food spoilage - Food Preservation – types – High temperature and low temperature and preservatives.

Unit II Food Contamination 5 h

Contamination of foods – types of contamination – Physical, Chemical, Biological and Allergen – Source of contamination – Prevention of contamination. Role of personal hygiene in food contamination.

Unit III Food borne disease 5 h

Food borne infections - Escherichia coli, Salmonellosis. Food borne intoxications - Botulism. Prevention of food borne diseases.

Unit IV Food Sanitation, food laws and regulations 5 h

Sanitation- microorganisms related to food sanitation - Sanitation law (PFA), regulations and guidelines (FSSAI) – Principles of HACCP.

Unit V Govt. organization on public Health] 5 h

[Government Health Organization in India - ICMR, Ayush, Council for social welfare, Ministry of Health & Family Welfare – Health Services Delivery in India.

Case study

Analyze the problem patient admitted with the complication of diarrhea, vomiting headache and fever persistent for the last 24 hrs.

Text Books

1. Norman G. Marriott, M. Wes Schiling & Robert B. Gravani. 2018, "Principles of Food Sanitation", Sixth Edition, Springer Publications, US..
2. Agarwal S *et al.*, 2009, "Text Book of Public Health and Community Medicine", 1st Edition, Department of Community Medicine, Armed Force Medical College, Pune.

References

1. Rabindra Nath Roy *et al.*, 2013, Text Book of Preventive and Social Medicine", 4th Edition, Jaypee Brothers Medical publisher, New Delhi.
2. Stanga, 2010, "Sanitation: Cleaning And Disinfection In The Food Industry, John Wiley, New Jershey.
3. NPTEL – Food Spoilage and Preservation

17/4/24

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Course Code	Course Name	Category	L	T	P	Credit
223MB1A6CA	ENVIRONMENTAL MICROBIOLOGY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The environmental ecosystems and microbial interactions.
- The role of microbes in soil, air and water environment.
- The microbial waste management and bioremediation.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the positive and negative roles of microorganisms in the environment.	K2
CO2	Identify the microbial communities in soil environment.	K2
CO3	Assess the distribution and types of microbes in air and water.	K3
CO4	Apply microbes for solid and liquid waste management.	K4
CO5	Apply bioremediation techniques to address the environmental contaminants.	K4

MAPPING WITH PROGRAMME OUTCOMES

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

COURSE FOCUS ON:

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

223MB1A6CA	ENVIRONMENTAL MICROBIOLOGY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I **Introduction to Environmental Microbiology** 9 h

Environment ecosystems – types – Lithosphere, Hydrosphere, Atmosphere. Energy flow, Food chain and Food web. Microbial interactions – Positive and Negative – Commensalism, Synergism, Mutualism, Cooperation, Amensalism, Parasitism, Predation. Biofilm formation.

Unit II **Microbiology of Soil** 10 h

Microbes in Soil: Occurrence, diversity, adaptations and potential applications of oligotrophs, thermophiles, psychrophiles, radiation tolerants, metallophiles, acidophiles, alkalophiles and halophiles.

Unit III **Microbiology of Air and Water** 10 h

Aerobiology: Introduction – Bioaerosols – Distribution of microbes in air – Transport of microbes to air – outdoor and indoor air transmission – Bioaerosol control in laboratory. Biological indicators – Lichens. Water microbiology: Microbial components of water – BOD, COD and Eutrophication - Indicator microbes.

Unit IV **Waste management** 10 h

Biomass waste management of plant residues: Lignocellulolytic microorganisms - Enzymes – Applications: Bioleaching, Biofuels, Animal feed production. Treatment of Sewage -Primary, secondary and tertiary treatments – Composting - Landfill development.

Unit V **Bioremediation** 9 h

Bioremediation of environmental pollutants: Mineral leaching by bacteria -Heavy metal degradation by Bioaccumulation – Degradation of Pesticides, Petroleum hydrocarbons - Microbial enhanced oil recovery - Super bugs - Biogas production - Plastic degrading microorganisms.

Case study: Tamil Nadu's Vellore district is home to a major leather tanning industry, which generates significant quantities of chromium-laden wastewater. Improperly treated wastewater has led to soil and water contamination in the area. How can biosorption and bio reduction processes help in detoxifying pollutants from leather tanning industries?

Text Books

1 Ronald M. Atlas and Richard Bartha, (1992). Microbial Ecology: Fundamentals and Applications, 3rd Edition, Redwood City, CA Benjamin/Cummings.

2 Joanne Willey, Kathleen Sandman and Dorothy Wood (2016), Prescott's Microbiology, 10th Edition, McGraw Hill, USA.

References

1 William H. Schlesinger and Emily S. Bernhardt, (2013). Biogeochemistry: An Analysis of Global Change. (3rd Edition) Academic Press.

2 Maier RM, Pepper IL and Gerba CP,. (2009). Environmental Microbiology. 2nd Edition, New Delhi:Academic Press.

3 Thomas D. Brock and Michael T. Madigan, (1993). Principles of Microbial Ecology. 1st Edition, Prentice Hall, USA.

4 Alexander,M. (1977). Introduction to soil microbiology. 2nd Edition, John Wiley & Sons, Inc.,. New York.

5 Environmental Microbiology Notes - Microbe Notes

Course Code	Course Name	Category	L	T	P	Credit
223MB1A6CB	AGRICULTURAL MICROBIOLOGY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The role of microorganisms in soil health
- Soil structure and microbial interactions
- Pathogenic microorganisms and plant diseases

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Do soil management for better crop yield	K2
CO2	Opt, cultivate and formulate suitable microbial inoculum for better farming practice (e.g., mycorrhizae and rhizobia)	K2
CO3	Identify and protect plant infectious diseases	K2
CO4	Formulate suitable bio-control agents for sustainable agricultural practice	K2
CO5	Develop bio-fertilizers for enhancing soil fertility	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

223MB1A6CB	AGRICULTURAL MICROBIOLOGY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I **Basics of soil** 9 h

Soil - Physical and Chemical properties –kinds of soil microorganisms – nutritional types – organotrophs, litho, auto, chemoautotrophs, chemoorganotrophs and heterotrophs - Factors influencing microbial growth

Unit II **Plant and microbial interactions** 10 h

Role of microbes in nutritional transformation – carbon - humus formation, nitrogen, phosphorous, sulphur. Plant - microbe interactions – rhizosphere. Biological nitrogen fixation – biochemistry of nitrogen fixation. Rhizobium - legume symbiosis, azospirillum, azotobacter. Mycorrhiza. Phyllosphere microorganisms – endophytes.

Unit III **Plant diseases** 9 h

Bacterial disease – citrus canker, blight of paddy, fungal diseases- tikka leaf spot, Wilt of cotton, Viral disease – TMV, Vein clearing disease. Principles and methods of plant disease management.

Unit IV **Bio-control agents** 10 h

Types - bacterial, fungal, viral and protozoal- *Bacillus thuringiensis, Bacillus sphaericus, Bacillus popilliae, Pseudomonas* sp., Microbial control of plant pathogens Trichoderma, Use of Baculovirus, NPV virus, Microbial herbicides.

Unit V **Biofertilizer – Bio inputs for agriculture** 10 h

Commercial production methods of bacterial biofertilizers - Nitrogen fixing organism (Rhizobium, Azobacter, Azospirillum), phosphate solubilizing bacteria. Mycorrhizal biofertilizer (AM), PGPR (*Pseudomonas* sp.,), Alga - azolla - cultivation and mass production, Carrier- based inoculants, application, quality control and agronomic importance.

Case study:

Identify and describe three different types of biofertilizers that could be used in this region. What specific benefits does each type offer in terms of soil health and crop productivity?

Text Books

1 Subba Rao, N. S (2021). Advances In Agricultural Microbiology (1st Edition) Butterworth Publisher.

2 Martin Alexander (2002), Introduction to Soil Microbiology (4th Edition), Wiley-Inter science publisher.

References

1 Atlas Ronald. M (2019). Principles Of Microbiology, 2nd Edition, C. Brown Publishers

2 Jagajjit Sahu, Anukool Vaishnav, Harikesh Bahadur Singh (2022). Plant-Microbe Interactions, 1st Edition, CRC Press.

3 Eldor A. Paul (2015). Soil Microbiology, Ecology and Biochemistry, 4th Edition, Academic Press Publishers.

4 S. K Gosal, Jaspreet Kaur (2020). Microbial Biotechnology: A Key to Sustainable Agriculture, 1st Edition, CRC Press.

5 D. J. Bagyaraj, G. Rangaswami (2007). Agricultural Microbiology, 2nd Edition, Prentice Hall Of India Pvt. Ltd, New Delhi.

6 http://surl.li/ysrtrb

7 http://surl.li/xxwcuj

Course Code	Course Name	Category	L	T	P	Credit
223MB1A6CC	DOWNSTREAMING OF MICROBIAL PRODUCTS	CORE	3		-	3

PREAMBLE

This course has been designed for students to learn and understand

- The importance of downstreaming Process
- The different types of separation methods.
- The methods of purification and characterization of final product

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts and importance of microbial products	K3
CO2	Apply the methods of microbial product separation	K3
CO3	Describe the method membrane filtration methods	K4
CO4	Cognize the chromatographic method for purification	K4
CO5	Design a new product formulation	K4

MAPPING WITH PROGRAMME OUTCOMES

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

COURSE FOCUS ON:

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

223MB1A6CC	DOWNSTREAMING OF MICROBIAL PRODUCTS	SEMESTER VI

Total Credits: 3

Total Instruction Hours: 36

Syllabus

Unit I **Downstreaming Process** 7h

Introduction - Principles of downstream process, Characteristics of bio- molecules - Cell disruption methods (Enzymatic, mechanical and chemical). Pretreatment and stabilization of bio products

Unit II **Separation methods** 8h

Filtration methods (microfiltration, ultrafiltration). Centrifugation principles and applications. Precipitation techniques (salting out, solvent extraction).

Unit III **Isolation of products** 7h

Isolation of products – Adsorption, liquid liquid extraction, two-phase extraction Membrane separation Types of membranes; Types of membrane processes (Dialysis; Ultrafiltration; microfiltration and Reverse Osmosis,) Precipitation of proteins

Unit IV **Product Purification** 7h

Paper; TLC; Adsorption; Ion exchange, Size exclusion, affinity chromatographic Gas chromatography; HPLC; FPLC.

Unit V **Final product formulation** 7h

Techniques for concentrating products (Crystallization, drying, evaporation, lyophilization) Formulation strategies for stability and bioactivity. Regulatory considerations and quality control in downstream processing.

Case study: A biotech company is producing a microbial enzyme using a fermentation process, but struggles with low purity and high operational costs in downstream processing. Analyze the challenges in product recovery, purification, and yield optimization. Suggest cost-effective methods to enhance downstream efficiency while maintaining product integrity. What key factors should be prioritized for scale-up?

Text Books

1 Chromatographic and Membrane Processes in Biotechnology by C.A. Costa and J.S. Cabral. Publisher: Kluwer Academic Publishers- 2012.

2 Upstream and downstream processing of bioproducts by R. Puvanakrishnan, S. Sivasubramanian , T. Hemalatha MJP Publishers (16 June 2019.

References

1 P.A. Belter, E.L. Cussler and W.S. Hu, (1988), Bioseparations: Downstream Processing for Biotechnology, 2nd Edition, John Wiley and Sons publisher.

2 J.E. Bailey and D.F. Ollis (2017), Biochemical Engineering Fundamentals, 2nd Edition, McGraw Hill publisher.

3 R. Puvanakrishnan, S. Sivasubramanian, T. Hemalatha (2019), Upstream and Downstream processing of Bioproducts, MJP Publishers.

4. Downstream Processing (DSP) of Products

5. Downstream processing and its steps - Microbiology Notes

223MB1A6CP	CORE PRACTICAL: ENVIRONMENTAL, AGRICULTURAL AND INDUSTRIAL MICROBIOLOGY	SEMESTER VI

Total Credits: 3
Total Instructions Hours: 72 h

S.No	Contents
1	Microbial air monitoring by settle plate method
2	Microbial analysis of water by membrane filtration method
3	Estimation of BOD of waste water
4	Microbial degradation of synthetic dyes#
5	Isolation of free-living nitrogen fixer – Azotobacter, symbiotic nitrogen fixer - Rhizobium from root nodule and Phosphate solubilizer - *Pseudomonas* sp
6	Isolation of VAM spores from rhizosphere soil
7	Production of Biofertilizer#
8	Immobilization of microbial cells - sodium alginate
9	Alcohol production and estimation - wine
10	Production and assay of extracellular enzyme - amylase
11	Sterility checking of pharmaceutical products - open inoculation method
12	Microbial limit test for a pharmaceutical product
13	Callus development from plant - Demonstration#

- Under DBT Star Scheme

References

1 James.C.Cappuccino. 2017. Microbiology A laboratory manual. 11th Edition, Pearson education publishers.

2 Aneja. K.R. 2012. Experiments in Microbiology, plant pathology and biotechnology, 4th Edition. New age publishers.

3 Rangasamy, G and D J Bagyaraj. 2007 Agricultural microbiology, 2nd edition, PHI Learning Pvt. Ltd, New Delhi.

4 Mitchell R. 1974. Introduction to Environmental Microbiology, 1st Edition, Prentice Hall Inc., Englewood Cliffs.

Course Code	Course Name	Category	L	T	P	Credit
223MB1A6SA	PHARMACEUTICAL MICROBIOLOGY	SEC	2	1	-	2

PREAMBLE

This course has been designed for students to learn and understand

- The history, concept, and development of chemotherapeutic agents.
- The mechanism of antibiotic resistance and quality control of pharmaceutical products
- The regulatory aspects of pharmaceutical products.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Adopt suitable chemotherapeutic agents for controlling microbes.	K2
CO2	Recommend alternative therapeutics against drug resistant pathogens.	K3
CO3	Ensure sterility in raw materials used in pharmaceutical industry	K4
CO4	Ensure sterility in pharmaceutical products.	K4
CO5	Adhere and implement national and international pharmaceutical regulations	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	☐ Gender Sensitization
☑ Intellectual Property Rights (IPR)	☑ Social Awareness / Environment
☐ Innovations	☑ Constitutional Rights / Human Values / Ethics

223MB1A6SA	PHARMACEUTICAL MICROBIOLOGY	SEMESTER VI

Total Credits: 2

Total Instruction Hours: 36 h

Syllabus

Unit I **Introduction to chemotherapeutic agents** 7h

History and development of chemotherapeutic agent-properties of antimicrobial agents: natural, semisynthetic and synthetic - Chemotherapeutic agents for infectious diseases with their mode of action; antibacterial, antifungal, antiviral, antiprotozoal.

Unit II **Antibiotic resistance and development of new therapeutics** 7 h

Development of antibiotic resistance- mechanism of antibiotic resistance- antimicrobial peptides: properties, sources and applications. Phage therapy: introduction, types of phages involved in phage therapy and applications of phage therapy - plant based therapeutic agents-, eugenol and curcumin.

Unit III **Active pharmaceutical Ingredients and aseptic process** 7 h

Types of active pharmaceutical ingredients and general formulations - principles of sterilizations with respect to pharmaceutical industries- sterilization methods of pharma products: Moist heat, dry heat, Radiation, gaseous and filtration -microbial spoilage of pharma products, sources of contamination.

Unit IV **Quality control of pharmaceutical products** 8 h

Introduction to quality control- quality control parameters – methods involved in quality control: environmental monitoring – settling plate method, air sampling, surface monitoring, personnel monitoring. Product quality control: microbial limit test, Bacterial endotoxin test, sterility test, microbial identification by MALDI – ToF and PCR. Pharmaceutical product validation and its types.

Unit V **Pharmacopoeia and regulatory agencies** 7 h

Introduction to pharmacopoeia; FDA regulation and Indian Pharmacopoeia, British Pharmacopoeia, US Pharmacopoeia; Reimbursement of drugs and biological; recall procedures, legislative perspectives; GMP and SOP in pharmaceuticals; WHO guidelines, ICH process.

Case study: Investigate a mold contamination event in a clean room and detailing the identification, remediation, and preventative actions to ensure product sterility.

Text Books

1. Stephen P. Denyer, Norman A. Hodges, Sean P. Gorman, Brendan F. Gilmore (2011), "Hugo and Russell's Pharmaceutical Microbiology", 8th Edition, Wiley-Blackwell publications.
2. Ashutosh Kar (2019), "Pharmaceutical Microbiology", 1st Edition, New Age International (P) Ltd Publishers.

References

1. Rajesh Bhatia (2000), "Quality Assurance in Microbiology", 1st Edition, CBS.
2. Geoffrey Hanlon and Norman Hodges (2013), "Essential Microbiology for pharmacy and pharmaceutical science", Wiley Blackwell.
3. S. P. Vyas & V. K. Dixit (2003), "Pharmaceutical Biotechnology", CBS Publishers & Distributors, New Delhi.
4. Gregory Gregoriadis (2001), "Drug Carriers in biology & Medicine", Academic Press New York.
5. www.pdfdrive.net.in
6. https://globaledge.msu.edu/industries/pharmaceuticals/regulatory-agencies

Course Code	Course Name	Category	L	T	P	Credit
223MB1A6DA	PHYTOCHEMICAL DRUG DISCOVERY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- the role of phytochemicals in drug discovery and development
- the techniques for extracting, purifying, and identifying bioactive plant compounds
- the pharmacodynamics and pharmacokinetics of phytochemicals.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	gain a deep understanding of the role of phytochemicals in plants in drug discovery.	K2
CO2	apply separation and analytical techniques for the identification and structural characterization of plant-derived compounds.	K3
CO3	apply in vitro and in vivo techniques to evaluate the biological activities of phytochemicals.	K3
CO4	gain proficiency in using computational tools for enhancing the drug discovery process	K3
CO5	Ensure approval of plant based drugs as per guidelines	K3

MAPPING WITH PROGRAMME OUTCOMES

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

Course focuses on

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

223MB1A6DA	PHYTOCHEMICAL DRUG DISCOVERY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I **Introduction to phytochemicals** 9 h

Overview of phytochemicals- Definition, classification (primary and secondary metabolites), and significance in plants. Historical context- traditional uses of plants in medicine and the evolution of phytochemical research - ethnopharmacology- study of how different cultures utilize plant-based medicines.

Unit II **Extraction and separation techniques** 10 h

Methods of extraction- solvent extraction, steam distillation, maceration, ultrasound assisted extraction, microwave assisted extraction, pressurized liquid extraction, supercritical fluid extract and enzyme assisted extraction - separation techniques- chromatography (TLC, Column, HPLC, HPTLC and GC) - spectroscopic techniques for the structural characterization of bioactive phytochemicals - FT-IR, NMR spectroscopy and mass spectrometry.

Unit III **Bioactivity screening** 10 h

In vitro – antibacterial, antifungal, antiviral, anti-inflammatory, cytotoxic and antioxidant activity. *In vivo* - antidiabetic, anticancer studies- pharmacokinetics - ADME, toxicology – pharmacodynamics - ethical considerations- ethnobotany, biodiversity conservation, and intellectual property rights.

Unit IV **Structure-Activity Relationship (SAR) and optimization** 9 h

SAR principles- correlating chemical structure with biological activity -lead optimization- strategies for modifying structures to enhance efficacy and reduce toxicity - computational methods - use of bioinformatics and cheminformatics in drug design (molecular modeling, docking, QSAR)

Unit V **Regulatory and quality control** 10 h

Regulatory framework - overview of drug approval processes for phytochemicals- quality control - Identification and authentication of plants - organoleptic, phytochemical analysis – morphological and physico-chemical properties mentioned in Indian Pharmacopoeia (IP), British Herbal Pharmacopoeia (BHP), Ayurvedic Pharmacopoeia of India (API) - WHO guidelines.

Case study: Identify the folk medicines and medicinal plants using in and around of your native. Further, explore the presence of bioactive compounds by using literatures.

Text Books

1 Javed Ahmad, Javed Ahamad (2020), Bioactive Phytochemicals: Drug Discovery to Product Development, Benthom Books Publishers.

2 Andreas Hofmann and Samuel Clokie (2018), Wilson And Walker's Principles and Techniques of Biochemistry and Molecular Biology , Cambridge University Press.

References

1 N. Raaman (2012), Experimental Phytochemical Techniques, New India Publishing Agency.

2 Dr. A. Charles , Dr. C. Gopi and Dr. P. Adwin Jose, (2022), Phytochemicals and Bioactivity : A Simple Guide to researchers who interested in Phytochemicals, Notion Press.

3 Hafiz Ansar Rasul Suleria, Masood Sadiq Butt and Megh R. Goyal (2021), Phytochemicals from Medicinal Plants, Apple Academic Press Inc.

Course Code	Course Name	Category	L	T	P	Credit
223MB1A6DB	ENTREPRENEURIAL MICROBIOLOGY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- the basic concept of entrepreneurship
- the microbial fermentation products
- the patenting processes.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Empower and guide entrepreneurs for spin-off	K2
CO2	Explore the suitable microbes to produce fermented products.	K2
CO3	Scale-up the production and market the mushrooms and biofertilizers.	K3
CO4	Ferment and market ethanol on a large scale.	K3
CO5	Apply and protect IPR through patenting process.	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	☐ Gender Sensitization
☑ Intellectual Property Rights (IPR)	☑ Social Awareness / Environment
☑ Innovations	☑ Constitutional Rights / Human Values / Ethics

223MB1A6DB	ENTREPRENEURIAL MICROBIOLOGY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I **Introduction to Entrepreneurship** 9 h

Entrepreneur development activity - Government, private and NGOs contributions to entrepreneurs- risk assessment - Generation of project - project identification - preparation of project report- Establishment of small scale industries.

Unit II **Entrepreneurship in Microbiology** 10 h

Microbial cells as fermentation products - Baker's yeast, food and feed yeasts- yogurt and cheese- Bacterial insecticides - Legume inoculants - Algae (Spirulina). Enzymes as fermentation products - Bacterial and Fungal amylases, proteases, pectinases, invertases and other enzymes.

Unit III **Mushroom and biofertilizer production** 9 h

Mushroom cultivation and composting -Agaricus campestris, Agaricus bisporus, and Volvariella volvaciae; preparation of compost, filling tray beds, spawning, maintaining optimal temperature, casing, watering, harvesting and storage. Biofertilizers - Historical background - Chemical fertilizers versus biofertilizers - Organic farming - Rhizobium sp, Azospirillum sp and Azotobacter sp.

Unit IV **Large scale production of breweries** 10 h

Brewing: Beer and wine - media components, preparation of medium, Microorganisms involved, maturation, carbonation, packaging, keeping quality, contamination, by products. production of Industrial alcohol-ethanol- Fermentation Economics

Unit V **Patents for Entrepreneurs** 10 h

Patents and secret processes -procedure of patenting, composition, subject matter and characteristics of a patent, inventor, infringement, cost of patent - patents in India and other countries.

Case study: Consider a small biofertilizer company that has successfully launched. What challenges might they face when scaling up production, and what strategies could they employ to overcome these challenges?

Text Books

1 A.H. Patel. Industrial Microbiology (2016), 2nd Edition, Laxmi Publications, New Delhi.

2 Koen Venema and Ana Paula do Carmo (2015), 2nd Edition, Probiotics and Prebiotics: Current Research and Future Trends.

References

1 Yuan kun lee and seppo Salminen (2009), 2nd Edition, Handbook of Probiotics and Prebiotics, John Wiley & Sons publisher.

2 Nduka Okafor (2007), 5th Edition, Modern Industrial Microbiology, Science Publishers Enfield, NH, USA.

3 Michael J. Waites, Neil L. Morgan, John S. Rockey, Gary Higton (2013), Industrial Microbiology: An Introduction. Wiley Blackwell Publishers.

4 Lester Earl Casida (2019), Industrial Microbiology, Published by New Age International (P) Ltd.

5 Casida, L E JR, (2019). Industrial Microbiology. New Age International Publishers

Course Code	Course Name	Category	L	T	P	Credit
223MB1A6DC	MEDICAL LABORATORY TECHNIQUES	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The organization of clinical laboratory
- The processing of clinical samples
- The importance of SOP in laboratory testing

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Establish a new laboratory and become an entrepreneur.	K3
CO2	Extract and handle blood samples for different tests.	K3
CO3	Perform biochemical tests for diagnosing metabolic disorders.	K3
CO4	Process and report clinical samples.	K3
CO5	Prepare pathological slides for histopathological analysis.	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	☐ Gender Sensitization
☑ Intellectual Property Rights (IPR)	☐ Social Awareness / Environment
☑ Innovations	☐ Constitutional Rights / Human Values / Ethics

223MB1A6DC	MEDICAL LABORATORY TECHNIQUES	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I **Introduction to Clinical laboratory** 9 h

Basic laboratory principles - Organization of clinical laboratory - Biosafety in containment laboratory - National and International GLP (Good Laboratory Practices) - Role of medical laboratory technician - personnel hygiene and safety measures.

Unit II **Hematology** 9 h

Blood Collection Techniques: Veinpuncture, finger prick, anticoagulants used in hematology- Total Count, Differential Count, Hematocrit, Erythrocyte Sedimentation Rate, Bleeding Time & Clotting Time. ABO Blood group system.

Unit III **Clinical Biochemistry** 10 h

Introduction to Clinical Biochemistry: Role of biochemistry in disease diagnosis, types of biochemical tests. Separation of serum and plasma - Detection of blood glucose, Cholesterol, creatinine, albumin and Bilirubin. Profiling - Liver function test (LDL and HDL level), Renal function tests (creatinine).

Unit IV **Processing of Urine, Stool and Sputum sample** 10 h

Collection, transport and Storage of Urine, Stool and Sputum sample. Macroscopic and Microscopic examination – Urine, sugar, albumin, bile salts, Bilirubin, bile pigments and ketone bodies. Stool – Cyst, Ova, Mucus, Pus, RBC, Reduced sugar, Occult blood. Sputum –Petroff's method, AFB staining.

Unit V **Histopathology and Biomedical Waste Management** 10 h

Histopathological Techniques: Tissue processing (Dehydration, clearing, and embedding), fixation (formalin, alcohol, Bouin solution), microtome, staining (Hematoxylin and eosin, special stains). Biomedical waste management – Bureau of Indian Standards- danger signs and Symbols.

Case study: During a pre-surgery screening, a patient is found to have an Rh-negative blood type. Explain the significance of this finding in blood transfusion and discuss the measures to ensure compatibility.

Text Books

1 Ananthanarayanan R and CK Jayaram Panicker (2020). Textbook of Microbiology, 11th Edition, Delhi: Orient Longman.

2 Monica Cheesbrough (2018), District Laboratory Practice in Tropical Countries, 2nd Edition, USA: Cambridge University Press.

References

1 Richard A. McPherson and Matthew R. Pincus (2021), Henry's Clinical Diagnosis and Management by Laboratory Methods, 24th Edition, Elsevier, USA.

2 Carl A. Burtis and David E. Bruns (2018), Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. (6th Edition), Elsevier, USA.

3 Mary Louise Turgeon (2018), Clinical Laboratory Science: Concepts, Procedures, and Clinical Applications, 9th Edition, Elsevier, USA.

4. https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/med_lab_tech_students/medicallabtechnology.pdf

Course Code	Course Name	Category	L	T	P	Credit
223MB1A6DD	MICROBIAL FUEL TECHNOLOGY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The utilization of microorganisms as an alternative source of energy
- Explore the possible avenues for the utilization of biofuel developed
- Future of Microbial fuel cells and its applications

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Exploit microorganisms in developing biofuel.	K3
CO2	Utilize microorganisms for the production of bioethanol.	K3
CO3	Produce biogas using microorganisms and explore new avenues for its utilization.	K3
CO4	Use algae predominantly to develop alternative forms of biodiesel.	K3
CO5	Produce electric current using biowastes and microorganisms.	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	☐ Gender Sensitization
☑ Intellectual Property Rights (IPR)	☑ Social Awareness / Environment
☑ Innovations	☑ Constitutional Rights / Human Values / Ethics

223MB1A6DD	MICROBIAL FUEL TECHNOLOGY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to Microbial Fuels 9 h

Overview of microbial fuels and their significance - Historical background and development of biofuels - Classification of microbial fuels (bioethanol, biogas, biodiesel, biohydrogen) - Advantages of microbial fuels over conventional fossil fuels - Environmental and economic impact of microbial fuel technologies

Unit II Bioethanol Production 9 h

Microbes in bioethanol production (yeasts, bacteria) - Substrates used - sugarcane, corn, lignocellulosic biomass, and agricultural waste - Pretreatment of substrates - Physical (size reduction, steam explosion), chemical (acid/alkali, organosolv process), Biological (microbial) - Fermentation processes - Genetic engineering approaches to enhance ethanol yield - Future prospects in bioethanol production.

Unit III Biogas Production 10 h

Anaerobic digestion process and stages (hydrolysis, acidogenesis, acetogenesis, methanogenesis) - Microbial communities and metabolic pathways in biogas production - Feedstock for biogas production: agricultural waste, food waste, wastewater sludge - Design and operation of biogas plants (small-scale vs. industrial-scale) - Applications, limitations, and advancements in biogas technology.

Unit IV Biodiesel and Algal Fuels 10 h

Microorganisms used in biodiesel production (algae, bacteria) - Biochemical pathways for lipid production in microalgae - Cultivation techniques for algal biomass (open ponds, photobioreactors) - Extraction and transesterification process for biodiesel production – Approaches to enhance lipid yield from algae.

Unit V Biohydrogen and Emerging Microbial Fuel Technologies 10 h

Microbial pathways for hydrogen production (dark fermentation, photo-fermentation) - Role of photosynthetic bacteria and cyanobacteria in biohydrogen production - Design and optimization of microbial fuel cells (MFCs) - Electrogenic bacteria and electron transfer mechanisms in MFCs - Integration of microbial fuel technologies for sustainable energy solutions - Future trends and innovations in microbial fuels research.

Case study: A city has implemented microbial fuel cells (MFCs) to treat its wastewater while generating electricity. What specific advantages does MFT offer in this urban context compared to conventional wastewater treatment methods?

Text Books

1 Farshad Darvishi Harzevili, Maryam Najafpour Darzi (2017). Microbial BioEnergy: Hydrogen Production. 1st Edition. CRC Press, USA.

2 Graeme M. Walker (2010). Bioethanol: Science and Technology of Fuel Alcohol. 1st Edition. Woodhead Publishing, UK.

References

1 Nijaguna. B. T (2006), Biogas Technology: Towards Sustainable Development. 1st Edition, New Age International Publishers, India.

2 Michael A. Borowitzka, Navid R. Moheimani (2013), Algae for Biofuels and Energy. 1st Edition, Springer, Germany.

3 N. El Bassam (2010), Handbook of Bioenergy Crops: A Complete Reference to Species, Development, and Applications. 1st Edition, Earthscan, UK.

4. https://pmc.ncbi.nlm.nih.gov/articles/PMC10223362/

Course Code	Course Name	Category	L	T	P	Credit
223MB1A6DE	PROSPECTIVES ON MICROBIOLOGY LAB ACCREDITATION	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- the concepts of laboratory accreditation
- the components of quality management system
- safety and compliances in laboratory procedures

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Process documentation for national/international accreditation process	K2
CO2	Develop and implement a QMS in microbiology labs	K3
CO3	Ensures having checklists for quality in laboratory	K3
CO4	Apply bio-safety measures during laboratory operations	K3
CO5	Use laboratory information management systems (LIMS) in capturing data during processing	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	☐ Gender Sensitization
☐ Intellectual Property Rights (IPR)	☑ Social Awareness / Environment
☐ Innovations	☐ Constitutional Rights / Human Values / Ethics

223MB1A6DE	PROSPECTIVES ON MICROBIOLOGY LAB ACCREDITATION	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I **Introduction to laboratory accreditation** 10h

Definition and importance of laboratory accreditation, overview of accreditation bodies at national (NABL – National Accreditation Board for Testing and Calibration Laboratories; BIS – Bureau of Indian Standards) and international levels (ILAC – International Laboratory Accreditation Cooperation; ISO/IEC 17025) -The role and importance of accreditation in ensuring quality and reliability.

Unit II **Quality management system** 10 h

Components of QMS (Quality Management System) - development and implementation of QMS in microbiology labs - quality assurance guidelines from relevant regulatory agencies. Standard operating procedures (SOPs) for specific microbiological tests in soil, water, and food samples.

Unit III **Quality Control (QC) techniques** 10 h

Routine QC practices in microbiology- Use of reference materials and calibration Standards -Internal quality control protocols. Conducting internal and external audits – checklist, procedures, and reporting.

Unit IV **Safety and compliance in laboratory procedures** 9 h

Safety Protocols and emergency procedures- regulatory compliance requirements for microbiology laboratory at different biosafety levels -environmental and ethical considerations associated with different laboratories

Unit V **Laboratory information management system** 9 h

Data reporting and traceability -ensuring data accuracy and security- Databases for sharing -comparison of inter-laboratory protocols and data.

Case Study: Visit Kovai Medical Centre and Hospital, Coimbatore, microbiology laboratory and submit your observations as report.

Text Books

1 Ahmed Mohamed Tharwat (2013), Laboratory Quality/Management: A Workbook with an Eye on Accreditation, Xlibris Publishers.

2 Chakraborty P (2013), Accreditation of Laboratories, Lap lambert Academic Publishing.

References

1 ISO/IEC 17011:(2004), Conformity assessment—general requirements for accreditation bodies accrediting conformity assessment bodies. Geneva, International Organization for Standardization.

2 ISO 9000: (2005), Quality management systems-fundamentals and vocabulary. Geneva, International Organization for Standardization.

Course Code	Course Name	Category	L	T	P	Credit
223MB1A6DF	EPIDEMIOLOGY AND PUBLIC HEALTH	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The history and overview of Epidemiology.
- The communicable diseases Epidemiology.
- The concepts and practices of public health.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts and approaches of Epidemiology.	K2
CO2	Apply transmission epidemiological models to investigate infectious disease outbreak.	K2
CO3	Use the knowledge of typology, risk factors to study the epidemiology of communicable diseases in India.	K3
CO4	Connect public health concepts and approaches for effective interventions.	K3
CO5	Develop skills and exposure to core public health competencies.	K4

MAPPING WITH PROGRAMME OUTCOMES

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

COURSE FOCUS ON:

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

223MB1A6DF	EPIDEMIOLOGY AND PUBLIC HEALTH	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I **Introduction to Epidemiology** 9 h

Definition and objectives of Epidemiology - Historical evolution of Epidemiology - Epidemiological approach - Concept and determinants of health and disease - Difference between Epidemiology and preventive medicine.

Unit II **Infectious disease Epidemiology** 10 h

Basic concepts of outbreak investigation - Case studies on Field Epidemiology - transmission dynamics models: SIS and SIR models - Basic reproductive number (R0) - Endemic vs. epidemic - Effective reproductive number (Rt) - Eradication threshold - Estimating R0 - Vaccine efficacy.

Unit III **Epidemiology of Communicable diseases** 10 h

Communicable diseases: Concept, typology, Risk factors. Epidemiology and burden of Communicable diseases in India - Public health interventions - Emerging and re-emerging tropical diseases - Epidemiology of major diseases of public health importance: Avian influenza (H5N1), COVID 19, Monkey pox, Kyasanur Forest Disease (KFD).

Unit IV **Public Health Concepts and Goals** 10 h

Public health: Introduction, definition and history - Conceptual understanding of health, disease and medicine - Review of modern public health - Evidence based health policy - Health planning in India - Primary health care as an approach to public health.

Unit V **Core Competencies to Practice Public Health** 9 h

Public health preparedness - Public Health Response - Public, private, NGOS participation in health service delivery - Public health surveillance - Health impact assessment and Public health ethics - Conceptual framework of one health.

Case Study: A rural area with many migrant workers saw 25 cases of Tuberculosis (TB) over six months, largely due to overcrowded housing and limited ventilation. Educational sessions on TB symptoms and prevention were offered in multiple languages to address language barriers. Community health workers were also trained to improve outreach. The health department provided mass screenings, free tests, and implemented directly observed therapy (DOT) for confirmed cases to ensure treatment completion. Why is DOT important for TB treatment?

Text Books

1 Park. K (2011), Epidemiology of communicable diseases. Text book of preventive and social medicine, 23rd Edition, Banarsidas Bhanot Publishers, India.

2 Lilienfeld, D. E., and Stolley, P. D (1994), Foundations of epidemiology, 3rd Edition, Oxford University Press, USA.

References

1 Merrill R. M (2015), Introduction to epidemiology, 6th Edition, Jones and Bartlett Publishers.

2 Gordis L. (2014), Epidemiology, 5th Edition, WB Sanders Co, Philadelphia.

3 Bailey, S. and Handu D (2012), Introduction to Epidemiologic research methods in Public Health Practice, 1st Edition, Jones and Bartlett Publishers.

4 Teutsch, S. M., and Churchill R. E (2000), Principles and practice of public health surveillance, 2nd Edition, Oxford University Press, USA.

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	☐ Gender Sensitization
☑ Intellectual Property Rights (IPR)	☑ Social Awareness / Environment
☑ Innovations	☐ Constitutional Rights / Human Values / Ethics

225BI1A6AA	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.

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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