Dr. N.G.P.ARTS AND SCIENCE COLLEGE (Autonomous)

REGULATIONS 2019-20 for Under Graduate Programme

(Outcome Based Education model with Choice Based Credit System)

B.Sc Microbiology Degree

(For the students admitted during the academic year 2020-21 and onwards)

Programme: B.Sc 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 are 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.

Guidelines for Programmes offering Part I& Part II for Two Semesters:

Part	Subjects	No.of Papers	Credit	Semester No.
I	Tamil / Hindi / French/Malayalam	2	2 x 3 = 6	I & II
II	English	2	2 x 3 = 6	I & II
III	Core (Credits 2,3,4)	18-20	70	I to VI
	Inter Departmental Course (IDC)		16	I to IV
	Discipline Specific Elective (DSE)	3	3 x 4 =12	V & VI
	Skill Enhancement Course(SEC)	4	4 x 3=12	III ,IV,V& VI
	Generic Elective(GE)	2	2 x 2=4	III & IV
	Lab on Project (LoP)	1	1	III to VI
IV	Environmental Studies(AECC)	1	2	I
	Value Education (VE) (Human Rights, Womens' Rights) (AECC)	2	4	II and III
	General Awareness(On-Line Exam) (AECC)	1	2	IV
	RM (AECC)	1	2	V
	Innovation, IPR, Entrepreneurship (AECC)	1	2	VI
V	Extension Activity NSS / Sports / Department Activity	-	1	I to VI
TOTAL CREDITS			**140**	

CURRICULUM

B.SC MICROBIOLOGY PROGRAMME

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
First Semester										
Part - I										
191TL1A1TA 201TL1A1HA 201TL1A1MA 201TL1A1FA	Language - I	Tamil-I/ Hindi-I/ Malayalam-I/ French –I	4	1	-	3	25	75	100	3
Part - II										
191EL1A1EA	Language - II	English – I	4	-	1	3	25	75	100	3
Part - III										
193MB1A1CA	Core	General Microbiology	4	1	-	3	25	75	100	4
193MB1A1CP	Core Practical	General Microbiology	-	-	6	6	40	60	100	3
203CL1A1IA	IDC	Biochemistry	3	1	-	3	25	75	100	3
203CL1A1IP	IDC Practical	Biochemistry	-	-	3	4	40	60	100	2
Part - IV										
193MB1A1AA	AECC	Environmental studies	2	-	-	3	-	50	50	2
Total			**17**	**3**	**10**				**650**	**20**

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Second Semester										
Part - I										
191TL1A2TA 201TL1A2HA 201TL1A2MA 201TL1A2FA	Language - I	Tamil-II/ Hindi-II/ Malayalam- II/ French – II	4	1	-	3	25	75	100	3
Part - II										
201EL1A2EA	Language - II	English – II	4	-	1	3	25	75	100	3
Part - III										
203MB1A2CA	Core	Cell Biology and Microbial diversity	4	1	-	3	25	75	100	4
193MB1A2CP	Core Practical	Cell Biology and Microbial diversity	-	-	6	9	40	60	100	3
192CE1A2IB	IDC	Chemistry	3	-	-	3	25	75	100	3
192CE1A2IP	IDC Practical	Chemistry Practical	-	-	4	3	40	60	100	2
Part - IV										
196BM1A2AA	**AECC**	**Human Rights**	2	-	-	3	-	50	50	2
Total			**17**	**2**	**11**	**-**	**-**		**650**	**20**

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Third Semester										
Part - I										
191TL1A3TA 191TL1A3HA 191TL1A3MA 201TL1A3FA	Language - I	Tamil-III/ Hindi-III/ Malayalam- III/ French – III	3	1	-	3	25	75	100	3
Part - II										
191EL1A3EA	Language - II	English - III	3	-	1	3	25	75	100	3
Part - III										
193MB1A3CA	Core	Microbial Physiology	4	1	-	3	25	75	100	4
193MB1A3CP	Core Practical	Microbial Physiology	-	-	6	6	40	60	100	3
194CS1A3IA	IDC	Biological Computing	3	-	-	3	25	75	100	3
193MB1A3SA	SEC	Culture Collection and Preservation Techniques	3	1	-	3	25	75	100	3
	GE		2	-	-	3	-	50	50	2
	LoP	Lab on Project	-	-	-	-	-	-	-	-
Part - IV										
191TL1A3AA 191TL1A3AB 195CR1A3AA	AECC	Basic Tamil / Advance Tamil/ Women's Rights	2	-	-	3	-	50	50	2
Total			**20**	**3**	**7**	**-**	**-**	**-**	**700**	**23**

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Fourth Semester										
Part - I										
191TL1A4TA 191TL1A4HA 191TL1A4MA 201TL1A4FA	Language - I	Tamil-IV/ Hindi-IV/ Malayalam- IV/ French – IV	3	1	-	3	25	75	100	3
Part - II										
191EL1A4EA	Language - II	English - IV	3	-	1	3	25	75	100	3
Part - III										
193MB1A4CA	Core	Immunology	3	1	-	3	25	75	100	3
193MB1A4CB	Core	Bioinstrumentation	3	-	-	3	25	75	100	3
193MB1A4CP	Core Practical	Immunology and Bioinstrumentation	-	-	5	9	40	60	100	2
192MT1A4IC	IDC	Mathematics	3	-	-	3	25	75	100	3
193MB1A4SA	SEC	Quality Assurance in Microbiology	3	-	-	3	25	75	100	3
	GE		2	-	-	3	-	50	50	2
	LoP	Lab on Project	-	-	-	-	-	-	-	-
Part - IV										
191TL1A4AA 191TL1A4AB 192PY1A4AA	AECC	Basic Tamil / Advanced Tamil/ General Awareness	2	-	-	3	-	50	50	2
Total			**22**	**2**	**6**				**800**	**24**

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Fifth Semester										
Part - III										
193MB1A5CA	Core	Medical Bacteriology	4	-	-	3	25	75	100	4
193MB1A5CB	Core	Medical Mycology	4	-	-	3	25	75	100	4
193MB1A5CC	Core	Virology	3	1	-	3	25	75	100	3
193MB1A5CD	Core	Food Microbiology	3	-	-	3	25	75	100	3
193MB1A5CP	Core Practical	Food & Medical Microbiology and Genetics	-	-	6	9	40	60	100	3
193MB1A5SA	SEC	Pharmaceutical Microbiology	3	-	-	3	25	75	100	3
193MB1A5DA/ 193MB1A5DB/ 193MB1A5DC	DSE		4	-		3	25	75	100	4
193MB1A5LA	LoP	Lab on Project	-	-	-	-	50	-	50	1
Part - IV										
192MT1A5AA	**AECC**	Research Methodology	2	-	-	3	-	50	50	2
193MB1A5CT	IT	Industrial Training	**Grade A to C**							
Total	**23**	**-**	**6**			**-**			**800**	**27**

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Sixth Semester										
Part - III										
193MB1A6CA	Core	Industrial Microbiology	3	-	-	3	25	75	100	3
193MB1A6CB	Core	Environmental and Agricultural Microbiology	3	1	-	3	25	75	100	3
193MB1A6CC	Core	Medical Parasitology	3	1	-	3	25	75	100	3
193MB1A6CP	Core Practical	Applied Microbiology and Recombinant DNA Technology	-	-	6	9	40	60	100	3
193MB1A6SA	SEC	Entrepreneurial Microbiology	3	-	-	3	25	75	100	3
193MB1A6DA/ 193MB1A6DB/ 193MB1A6DC	DSE		4	-	-	3	25	75	100	4
193MB1A6DD/ 193MB1A6DE/ 193MB1A6DF	DSE		4	-	-	3	25	75	100	4
Part - IV										
195BI1A6AA	**AECC**	Innovation and IPR	2	-	-	3	-	50	50	2
Part - V										
193MB1A6XA		Extension Activity				-	50	-	50	1
Total			**22**	**2**	**6**	**-**	**-**	**-**	**800**	**26**
Grand Total									**4400**	**140**

DISCIPLINE SPECIFIC ELECTIVE

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

Semester V (Elective I)

List of Elective Courses

S. No.	Course Code	Name of the Course
1.	193MB1A5DA	Microbial Genetics
2.	193MB1A5DB	Algal Biotechnology
3.	193MB1A5DC	Microbial Technology

Semester VI (Elective II)

List of Elective Courses

S. No.	Course Code	Name of the Course
1.	193MB1A6DA	Recombinant DNA Technology
2.	193MB1A6DB	Extremophiles
3.	193MB1A6DC	Phage Biology

Semester VI (Elective III)

List of Elective Courses

S. No.	Course Code	Name of the Course
1.	193MB1A6DD	Molecular Diagnostics in Microbiology
2.	193MB1A6DE	Mycotoxicology
3.	193MB1A6DF	Marine Microbiology

GENERIC ELECTIVE COURSES (GE)

The following are the courses offered under Generic Elective Course

Semester III (GE-I)

S. No.	Course Code	Course Name
1	193MB1A3GA	Microbiology and Public Health

Semester IV (GE-II)

S. No.	Course Code	Course Name
1	193MB1A4GA	Food Microbiology

EXTRA CREDIT COURSES

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

S. No.	Course Code	Course Name
1	193MB1ASSA	Good Laboratory Practices
2	193MB1ASSB	Food Sanitation

CERTIFICATE PROGRAMMES

The following are the programme offered to earn extra credits:

S. No.	Programme Code and Name	Course Code	Course Name
1	3MB5A Microbial Quality Control & Testing	193MB5A1CA	Microbial Quality Control & Testing
3	3MB5B Microbial Fermentation	193MB5B1CA	Microbial Fermentation

MOOC (NPTEL/SWAYAM/ SPOKEN TUTORIAL)

The following are the online courses offered:

Please refer the following link to select the courses

www.swayam.org

www.nptel.ac.in

www.spoken-tutorial.org

REGULATION 2019-20

Effective from the academic year 2019-20 and applicable to the students admitted to the Degree of Bachelor of Science / Commerce/Arts.

1. NOMENCLATURE

1.1 Faculty: Refers to a group of programmes concerned with a major division of knowledge are. Eg. Faculty of Computer Science consists of disciplines like Departments of Computer Science, Information Technology, Computer Technology and Computer Applications.

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 2015–2018 refers to students belonging to a 3 year Degree programme admitted in 2015 and completing in 2018.

1.4 Course Refers to a component (a paper) 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 and learning needs and the credits may be assigned suitably.

a) **Core Courses**
A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

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**: DSE courses are the courses offered by the respective disciplinary/ interdisciplinary programme.

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

e) **Ability Enhancement Courses (AEC):** AECC courses are the courses based upon the content that leads to Knowledge enhancement. These are mandatory for all disciplines. Environmental Science, Human Rights, Women's Rights, General Awareness, IPR and Innovation, Entrepreneurship Development and Research Methodology.

All these courses should be taught according to Outcome based Education.

1.5 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.

1.6 Project work

Itis considered as a special 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.

Extra credits

Extra credits will be awarded to a student for achievements in co-curricular activities carried out outside the regular class hours. The guidelines for the award of extra credits are given in section- these credits are not mandatory for completing the programme.

Advanced Learner Course (ALC):

ALC is doing work of a higher standard than usual for students at that stage in their education. Research work carried out in University/ Research Institutions/ Industries of repute in India or abroad for a period of 15 to 30 days will be considered as Advanced Learners Course.

2. STRUCTURE OF PROGRAMME

2.1 PART – I: LANGUAGE

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

2.2 PART – II : ENGLISH

English will be offered during the first two / four semester.

2.3 PART – III :

- Core course
- Inter Departmental Course (IDC)
- Discipline Specific Elective (DSE)
- Skill Enhancement Course (SEC)
- Generic Elective (GE)
- Lab on Project (LoP)
- Industrial Training (IT)

2.4 PART IV

2.4.1 Ability Enhancement Compulsory Course

The ability enhancement courses such as i)Environmental Studies, ii) Human Rights, iii) Womens' Rights, iv) General Awareness, v) Research Methodology, vi) Intellectual Property Rights(IPR), Innovation and Entrepreneurship or IPR and Innovation from I to VI Semester.

a) Those who have not studied Tamil up to XII Std and taken a non-Tamil language under Part-I shall take Tamil comprising of two courses.

(OR)

b) Those who have studied Tamil up to XII std and taken a non-Tamil language under Part-I shall take Advanced Tamil comprising of two courses in the third and fourth semesters.

(OR)

c) Students who come under the above a+b categories are exempted from Women's Rights and General awareness during III and IV semester respectively.

2.5PART V: EXTENSION ACTIVITIES

The following co-curricular and extracurricular activities are offered under institutional / department Association/ club/ extension programmes for the students under extension activities from I to IV semester.

a) Institutional

- National Service Scheme (NSS)

  Participation in any one of the camps organized by NSS unit.

- Friends of Police(FoP)

  Active participation in traffic regulation and other extension activities

- Sports

  Active participation in any one of the sports activities

- Youth Red Cross (YRC)

  Active participation in YRC programmes

b) Department Association

Membership and active participation in the department association activities.

c) Clubs

Membership and active participation in any one club activities.

1. CREDIT ALLOTTMENT

The following is the credit allotment:

- **Lecture Hours (Theory)** **:** Max.1 credit per lecture hour per week,

  1 credit per tutorial 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

2. DURATION OF THE PROGRAMME

- A student is normally expected to complete the B.Sc. /B.com. /BA Programme in 6 semesters. However, in any case not more than 7 consecutive semesters. Failing which the concern BoS will identify suitable / equivalent course.

3. REQUIREMENTS FOR COMPLETION OF A SEMESTER

Candidate shall be permitted to appear for the End Semester examinations for any semester(practical/theory) if

i) He/she secures **not less than 75%** of attendance in the number of working days during the semester.

ii) He/she earns a progress certificate from the Head of the institution, of having satisfactorily completed the course of study prescribed in the scheme of examinations for that semester as required by these regulations, and

iii) His/her conduct / character is satisfactory.

- Provided that it shall be open to the Academic council, or any authority delegated with such powers by the Academic council, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions. (Refer the **Ordinance No.1 of 1990 of the Bharathiar University)**
- A candidate who earned 75% of attendance and more in the current semester are eligible to write the examination in current semester subjects.
- A candidate who has secured **less than 65% but 55%** and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the later semester.
- A candidate who has secured **less than 55%** of attendance in any semester shall not be permitted to appear for the regular examinations and to continue the study

in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%.

- A candidate who has secured **less than 65%** of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned Head of the department after rejoining the same course.

4. 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 (including the project work and Viva-Voce examination in the final Semester) shall be 100 with the following breakup.

(i) Theory Courses

Continuous Internal Assessment (CIA) : **25** Marks

End Semester Exams (ESE) : **75** Marks

(ii) For Practical/ Courses

Continuous Internal Assessment (CIA) : **40** Marks

End Semester Exams (ESE) : **60** Marks

a. The following are the distribution of marks for the **Continuous Internal Assessment** in **Practical, Project / Industrial Training Courses**.

Continuous Internal Assessment for Practical Courses:

S.No	For - UG practical courses	Distribution of Marks					
1	Minimum 10 experiments to be conducted/practical paper/semester	20	15	10	8	5	4
2	Tests : Two tests out of which one shall be during the mid semester and the other to be conducted as model test at the end of the semester.)	16	10	10	8	6	6
3	Observation Note Book	4	5	5	4	4	-
	TOTAL MARKS	**40**	**30**	**25**	**20**	**15**	**10**

Project viva-voce / Industrial Training

The following are the distribution of marks for the continuous Internal assessment in UG Project/Industrial Training courses.

S.no	For - UG Project courses//Industrial Training	Distribution of Marks	
1	Review-I	5	10
2	Review-II	5	10
3	Review-III	5	10
4	Document, Preparation and Implementation	10	10
	TOTAL MARKS	**25**	**40**

b. Following are the distribution of marks for the **External Examination** in UG Project /Industrial Training courses

S.no	For - UG Project //Industrial Training courses	Distribution of Marks	
1	Record Work and Presentation	35	40
2	Viva-Voce	15	20
	TOTAL MARKS	**50**	**60**

Part – IV

The courses offered under Part – IV shall have only End Semester Examinations (ESE) for a maximum of 50 Marks. However, Students who select "Tamil" under Part IV, will be assessed only by Continuous Internal Assessment (CIA). The marks shall be furnished to the COE by the concerned Course teacher through the Head of the Department.

6.1CONTINUOUS ASSESSMENT EXAMS

6.1 Theory courses

a)Continuous Internal Assessment test (CIA)

There will be a Minimum of two Continuous Assessment Exams, for each Theory course. The first and Second Assessment Exams will be conducted for a Maximum of 50 Marks and 75 marks respectively. The total marks secured in the Two Assessment Exams will be converted to 15 Marks.

b) Utilization of Library

Marks will be awarded to the student based on the hours spent in the library after the working hours and submission of report by the student.

Hours spent in Library	Marks	Type of Document submitted
2	1	Report/ Assignment/ Class presentation
4	2	
6	3	
8	4	
10	5	
12	6	

- During the Library hour, the student must spend time in reading the articles, books, journals of their subject of interest
- Each student should borrow minimum three books during the semester
- **Student is expected to submit one Report / Assignment/ Class Presentation per Course.**

c) Class Participation

Active participation in classroom discussion by the student will be evaluated based on Integration of knowledge, Interaction and Participation and demonstration of knowledge.

d)PAPERS / REPORTS/ ASSIGNMENTS/ CLASS PRESENTATION

The student will be evaluated based on his ability to do analysis of application of theory to real world problems or creative extension of class room learning and his/her ability to communicate the given topic effectively and clearly.

Continuous Assessment OBE Rubrics Score Sheet

Degree: _____ Branch: _____ Semester: _____

Course Code: _____ Course: _____

Max. Marks: Internal:_____ External: _____ Total: _____

S.No.	REG.NO	THEORY / PRACTICAL & LIBRARY CLASS PARTICIPATION (15) (Compulsory)				RUBRICS ASSESSMENT (SELECT ANY ONE)									Total Marks out of : 30	Total Marks out of : 16 /10 /08 /04
						PAPERS / REPORTS (15)			ASSIGNMENTS (15)			CLASS PRESENTATION (15)				
		Library	Integration of Knowledge	Interaction & Participation	Demonstration of Knowledge	Organization & Knowledge	Format & Spelling	Reference / Experiments	Demonstration of Knowledge	Format & Spelling	Reference	Content & Coherence	Creativity and Speaking Skills	Duration of Presentation		
		6	3	3	3	5	5	5	5	5	5	5	5	5		
1																

The following are the distribution of marks for the continuous internal assessment in UG practical courses

S.No	For - UG Practical Courses	Distribution of Marks					
1	Minimum 10 experiments to be conducted/practical paper/semester	20	15	10	8	5	4
2	Tests : Two tests out of which one shall be during the mid semester and the other to be conducted as model test at the end of the semester.)	16	10	10	8	6	6
3	Observation Note Book	4	5	5	4	4	-
	TOTAL MARKS	**40**	**30**	**25**	**20**	**15**	**10**

7.FOR PROGRAMME COMPLETION

Programme Completion (for students admitted in the A.Y.2019-20 and Onwards)

Student has to complete the following:

i) Part I,II,III,IV,V as mentioned in the scheme

ii) **Industrial/ Institutional training**

Students must undertake industrial / institutional training for a minimum of 15 days and not exceeding 30 days during the IV semester summer vacation. The students will submit the report for evaluation during V semester.

Based on the performance Grade will be awarded as follows:

Marks Scored	**Grade to be awarded**
75 and above	A
60-74	B
40-59	C
< 40	Re-Appearance

iii) Skill Enhancement Training

Student must undergo Skill Enhancement training on Communication skills (I and II Semester) and Quantitative aptitude (III and IV Semester) respectively each for 40h.

8. EXTRA CREDITS

- Earning extra credit is mandatory. However, it is not essential for programme completion
- Extra Credits will be awarded to a student for achievement in co-curricular/ extracurricular activities carried other than the regular class-hours.
- The detailed guidelines for the award of extra credits are as follows:
- A student is permitted to earn a maximum of **five** extra Credits during the programme duration of UG from I to V Semester.
- Candidate can claim a maximum of 1 credit under each category listed.

The following are the guidelines for the award of Extra credits:

8.1 Proficiency in foreign language

Qualification	Credit
A pass in any foreign language in the examination conducted by an authorized agency	1

8.2 Proficiency in Hindi

Qualification	Credit
A pass in the Hindi examination conducted by Dakshin Bharat Hindi PracharSabha	1

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

8.3 Self study Course

Qualification	Credit
A pass in the self study courses offered by the department	1

- The candidate shouldregister the self study course offered by the department only in the III semester

8.4 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.

Qualification	**Credit**
A pass in the type writing / short hand examination offered by TNDTE	1

8.5 Diploma/Certificate

Courses offered by any recognized University / NCVRT

Qualification	Credit
A pass in any Certificate course/ Diploma / PG Diploma	1

8.6 CA/ICSI/CMA

Qualification	Credit
Qualifying foundation / Inter level / Final in CA/ICSI/CMA / etc.,	1

8.7 Sports and Games

The Student can earn extra credit based on their Achievement in sports as given below:

Qualification	**Credits**
Achievement in University/ State / National/ International	1

8.8 Online Courses

Pass in any one of the online courses

Qualification	Credit
SWAYAM/NPTEL/Spoken Tutorial etc.,	1

8.9 Publications /Conference Presentations (Oral/Poster)/Awards

Qualification	Credit
Research Publications in Journals/ oral/poster presentation in Conference	1

8.10Innovation / Incubation / Patent / Sponsored Projects / Consultancy

Qualification	Credit
Development of model/ Products /Prototype /Process/App/Registration of Patents/ Copyrights/Trademarks/Sponsored Projects /Consultancy	1

8.11Representation

Qualification	Credit
State / National level celebrations such as Independence day, Republic day Parade,National Integration camp etc.,	1

Course Code	Course Name	Category	L	T	P	Credit
193MB1A1CA	**CORE :** GENERAL MICROBIOLOGY	**Core**	**4**	**1**	**-**	4

PREAMBLE

This course has been designed for students to learn and understand

- The history behind microbiology
- Microscopy, Sterilization methods and Culture media
- Microbial Diversity

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 Pioneers and their invaluable contributions in micro biology.Familiarize the history of microbiology	K1
CO2	Gives technical ideas about the handling of microscopes. Develop robust technology in micro scopical observation. Route map for bacteriological study.	K1,K2
CO3	Understand the aseptic techniques which are applicable in day today life. Familiarize various types of disinfecting agents and their mode of action and application on inanimate objects.	K2,K3
CO4	Describes the cultivation of various types of microbes and their handling	K3
CO5	Interpret the knowledge of fungi and algae for human welfare sting	K2, K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193MB1A1CA	CORE : GENERAL MICROBIOLOGY	SEMESTER I

Total Credits: 4

Total Instructions Hours: 60

Syllabus

Unit I History of Microbiology 13 h

History and Scope of Microbiology – Spontaneous generation theory and its disproval – Contribution of Leuwenhoek, Louis Pasteur, Robert Koch, Edward Jenner, Joseph Lister and John Tyndall.

Unit II Microscope and Staining 13 h

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

Unit III Methods of Sterilization 12 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.

Unit IV Culture Methods 12 h

Culture Media - Types of Media – Enriched, Selective, Differential and Special Purpose Media (one e.g. for each type) - Pure culture techniques - Maintenance and Preservation of microbial culture.

Unit V General characteristics of Fungi and Algae 10 h

Morphology, General Characteristics, Classification, and economic important of Fungi (Aspergillus, Saccharomyces) Algae (Anabena, Chlamydomonas, Volvox, Spirogyra).

Text Books

1 Joanne Wiley, Linda Sherwood, Christopher J Woolverton. 2016. Prescott's Microbiology, 10th Edition. McGraw Hill Company

2 Michel J. Pelczar, JR, Chan ECS, Noel R. Krieg. Microbiology, 5th Edition. McGraw Hill Company.

References

1 Salle A.J. 2014. Fundamental Principles of Bacteriology 7th edition, Tata Mc Hill Publishing Company Ltd.,

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

3 Atlas, R.M. 1997. Principles of Microbiology, Second edition. WCK. McGraw – Hill

4 Jeffrey C.Pommerville, Alcamo's Fundamentals of Microbiology, 10th edition. Blackwell Publications

5 Ketchum, Microbiology, John Willey & Sons, 1998

193MB1A1CP	CORE PRACTICAL: GENERAL MICROBIOLOGY	SEMESTER I

Total Credits: 3

Total Instructions Hours: 60

S.No	Contents
1	Laboratory precautions
2	Preparation of cleaning solutions - Chromic acid
3	Culture media preparation – Nutrient Broth
4	Nutrient Agar (Plate, Deep, Slant)
5	Differential medium
6	Selective medium
7	Sterility testing of Autoclave
8	Sterility testing of Hot air Oven
9	Decimal Dilution Technique
10	Pure culture techniques – Streak plate method, Pour plate method, Spread plate method
11	Isolation and Enumeration of bacteria from soil
12	Isolation of fungi from soil
13	Isolation of Actinomycetes from soil
14	Bacterial staining - Simple Staining & Gram Staining
15	Slide culture Technique (DBT Star Scheme)
16	Preservation of bacterial cultures – Mineral oil overlay method(DBT Star Scheme)

References

1. James.C.Cappuccino. 2017. Microbiology A laboratory manual. 11th edition, Pearson education publishers.
2. Kannan, N. 1996. Laboratory manual of General Microbiology, 2nd edition, Panima publishing house.
3. Aneja. K.R. 2012. Experiments in Microbiology, plant pathology and biotechnology, 4th Edition. New age publishers.
4. Kannan, N. 2003. Hand book of Laboratory culture media 1st edition, Panima publishing house.
5. https://microbeonline.com/gram-staining-principle-procedure-results/

Course Code	Course Name	Category	L	T	P	Credit
193CL1A1IA	IDC -BIOCHEMISTRY- I	**IDC**	4	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- Nature of biological macromolecules namely carbohydrate, lipids, proteins and nucleic acids
- The basic structure, classification and functions of various biomolecules
- Basic knowledge and key understanding of the role of Vitamins, Minerals and Hormones in the functioning of cell

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	K1,K2
CO2	Know the structure and properties of lipids	K1,K2
CO3	Understand the structural and functional aspects of aminoacids and proteins	K1,K2,K3
CO4	To be acquainted with the hardware, software and operating system and its operations	K1,K2, K3
CO5	Understand the types and significance of vitamins, minerals and hormones	K1,K2, K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193CL1A1IA	IDC -BIOCHEMISTRY- I	SEMESTER I

Total Credits: 3

Total Instructions Hours: 48

Syllabus

Unit I Carbohydrates 12h

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

Unit II Lipids 8 h

Lipids: Definition classification of lipids, physiochemical properties. Storage lipids – fatty acids – types. Structural lipids – phospholipids, glycolipids & sphingolipids. Structure & Biological role of cholesterol

Unit III Aminoacids & Proteins 10 h

Classification of amino acids, general properties, Non protein amino acids. Peptide bond – structure & conformation, Protein classification, Physiochemical properties of proteins. Organization of protein Structure – Primary, Secondary Tertiary, Quaternary structure

Unit IV Nucleic acids 8h

Structures of Purines, Pyrimidines, Nucleoside & Nucleotides. Properties of nucleic acids. DNA - Double helical structure – Isoform. RNA – Types structure & function

Unit V Micronutrients 10h

Minerals in biological system & their importance – Iron, Calcium, Phosphorous, Iodine, Copper, Zinc. Vitamins – Definition, classification: Fat soluble and Water Soluble vitamins - Sources, functions and deficiencies. Hormones involved in regulatory metabolism: Insulin, Glucagon and thyroid

Text Books

1 J.L.Jain. 2016. Fundamentals of Biochemistry, 7th edition. S. Chand and company Ltd

2 Sathyanarayana U.2013. Biochemistry, 4th Edition. Books and Allied (P) Ltd

References

1 Zubay, 1999. Biochemistry, 4th edition. William.C.Brain publishers

2 Voet, D and Voet J G, 2011, Biochemistry, 4th Edition, John Wiley and Sons, USA

3 Stryer L.2011. Biochemistry, 7th Edition. W. H. Freeman and Company, New york

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

193CL1A1IP	IDC PRACTICAL I - BIOCHEMISTRY	SEMESTER I

Total Credits: 2

Total Instructions Hours: 48

S.No	Contents
1	Analysis of Carbohydrates a. Monosaccharides – Pentose - Arabinose. Hexoses - Glucose, Fructose, b. Disaccharides - Sucrose, Maltose and Lactose c. Polysaccharide - Starch
2	Qualitative analysis of Amino acids: a. Histidine b. Tyrosine. c. Tryptophan d. Arginine
3	Analysis of lipids: a. Estimation of Acid Number b. Estimation of Iodine Number
4	Quantification technique: a. Quantification of Protein by Lowry et al method b. Quantification of Carbohydrate by DNSAmethod

References

1 Pattabiraman T. N and SitaramaAcharya U.(2015). Laboratory Manual in biochemistry, 4th Edition. All India Traveller Book Seller

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

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

Course Code	Course Name	Category	L	T	P	Credit
193MB1A1AA	**PART-IV:** AECC 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. To inculcate the knowledge on structure, function and energy flow in the Eco system.	K2
CO2	To impart knowledge on Natural resources and its conservation.	K3
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 ets.	K2,K3
CO5	To build awareness about sustainable development and Environmental protection	K2,K3

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	S	M	M	M	M
CO3	M	M	M	M	M
CO4	M	M	M	M	M
CO5	M	M	M	M	M

S Strong M Medium L Low

193MB1A1AA	PART-IV: VALUE EDUCATION- ENVIRONMENTAL STUDIES	SEMESTER I

Total Credits: 2

Total Instructions Hours: 24

Syllabus

Unit I **Introduction to Environmental studies** & Ecosystems 4 h

Multidisciplinary nature of environmental studies; components of environment – atmosphere, hydrosphere, lithosphere and biosphere. Scope and importance; Concept of sustainability and sustainable development. What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chain, food web and ecological succession. Case studies of the following ecosystems: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

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

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 over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state). Heating of earth and circulation of air; air mass formation and precipitation. Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

Unit III **Biodiversity and Conservation** 5 h

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. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

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

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; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; International agreements; Montreal and Kyoto protocols and conservation on Biological Diversity (CBD). The Chemical Weapons Convention (CWC). Nature reserves, tribal population and rights, and human, wildlife conflicts in Indian context.

Unit V Human Communities and the Environment& Field Work 5 h

Human population and growth: Impacts on environment, human health and welfares. Carbon foot-print. Resettlement and rehabilitation of project affected persons; case studies. Disaster management: floods, earthquakes, cyclones and landslides. Environmental movements: Chipko, Silent valley, Bishnios of Rajasthan. Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi). Visit to an area to document environmental assets; river/forest/flora/fauna, etc. Visit to a local polluted site – Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds and basic principles of identification. Study of simple ecosystems-pond, river, Delhi Ridge, etc.

REFERENCES

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.
3. Gleeson,B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge.
4. Gleick, P.H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J. Gary K. Meffe, and Carl Ronald carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37.
7. McCully, P.1996. Rivers no more: the environmental effects of dams(pp. 29-64). Zed Books.
8. McNeil, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
9. Odum, E.P., Odum, h.T. & Andrews, J.1971. Fundamentals of Ecology. Philadelphia: Saunders.

REFERENCE BOOKS:

1. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
2. Rao, M.N. & Datta, A.K. 1987. Waste Water Treatement. Oxford and IBH Publishing Co. Pvt. Ltd.
3. Raven, P.H., Hassenzahl, D.M. & Berg, L. R. 2012. Environment. 8th edition. John Wiley & Sons.
4. Rosencranz, A., Divan, S., & Noble, M.L. 2001. Environmental law and policy in India. Tripathi 1992.

Course Code	Course Name	Category	L	T	P	Credit
191TLIA2TA	**தமிழ்த்தாள் - II**	Theory	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- மொழிப் பாடங்களின் வாயிலாக தமிழரின் பண்பாடு, பகுத்தறிவு ஆகியவற்றை அறியச் செய்தல்
- கலை மற்றும் மரபுகளை அறியச் செய்தல்
- மாணவர்களின் படைப்பாக்கத் திறன்களை 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)- **மாணவனின் செயலாக்கத்திறனை ஊக்குவித்தல்**	K1,K2,K3
CO2	**மதிப்புக்கல்வி** (Attitude and Value education)	K2,K4
CO3	**பாட இணைச் செயல்பாடுகள்** (Co-curricular activities)	K2,K3,K4
CO4	**சூழலியல் ஆக்கம்** (Ecology)	K4
CO5	**மொழி அறிவு** (Tamil knowledge)	K5, K6

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

191TLIA2TA	தமிழ்த்தாள் - II	SEMESTER II

Total Credits: 3
Total Instruction Hours: 60 h

Syllabus

Unit I அற இலக்கியம் **12 h**

1. திருக்குறள்

அ.அறன் வலியுறுத்தல் (அ. எண்: 04)

ஆ.நட்பாராய்தல் (அ. எண்: 80)

இ.சான்றாண்மை (அ. எண்: 99)

ஈ.குறிப்பறிதல் (அ. எண்: 110)

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

Unit II அற இலக்கியம் **10 h**

1. நாலடியார் - அறிவுடைமை
2. பழமொழி நானூறு - வீட்டு நெறி
3. கார்நாற்பது - தோழி பருவங்காட்டி தலைமகளை வற்புறுத்திய பாடல்கள் (1முதல் - 18பாடல்கள்)

Unit III உரைநடை **10 h**

1. பெற்றோர்ப் பேணல் - திரு.வி.க.
2. உள்ளம் குளிர்ந்தது - மு.வரதராசனார்
3. சங்கநெறிகள் - வ.சுப.மாணிக்கம்

Unit IV உரைநடை **13 h**

1. பெரியார் உணர்த்தும் சுயமரியாதையும் சமதர்மமும் - வே. ஆனைமுத்து
2. வீரவணக்கம் - கைலாசபதி
3. மொழியும்நிலமும் - எஸ். ராமகிருஷ்ணண்

Unit V இலக்கிய வரலாறு, இலக்கணம் மற்றும் பயிற்சிப்பகுதி **15 h**

அ.இலக்கிய வரலாறு

1. பதினெண் கீழ்க்கணக்கு நூல்கள்
2. தமிழ் உரைநடையின் தோற்றமும் வளர்ச்சியும்

ஆ. இலக்கணம்

1. வழு, வழுவமைதி, வழாநிலை

இ. பயிற்சிப்பகுதி

1. நூல் மதிப்பீடு மற்றும் திரைக்கதை திறனாய்வு
2. தன்விவரக் குறிப்பு எழுதுதல்

Text Books

1 தொகுப்பு: தமிழ்த்துறை, டாக்டர் என்.ஜி.பி. கலை மற்றும் அறிவியல் கல்லூரி (தன்னாட்சி) செய்யுள் மற்றும் உரைநடைத் திரட்டு. (முதல்பதிப்பு.) சென்னை: நியூ செஞ்சுரி புக்ஹவுஸ் (பி) லிட்.

References

1 பேராசிரியர் புலவர் இளவரசு, சோம. (ஜூலை2012). தமிழ் இலக்கிய வரலாறு. (எட்டாம் பதிப்பு) சென்னை: மணிவாசகர் பதிப்பகம்.

2 பேராசிரியர் முனைவர் பாக்கியமேரி (2013). இலக்கணம் இலக்கிய வரலாறு மொழித்திறன். (முதல் பதிப்பு) சென்னை பூவேந்தன் பதிப்பகம்.

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

Course Code	Course Name	Category	L	T	P	Credit
201TL1A2HA	HINDI-II	Theory	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- To develop the writing ability and develop reading skill.
- To learn various concepts and techniques for criticizing literature
- To learn 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	S	M	M	M	S
CO2	S	M	M	M	S
CO3	S	M	M	M	S
CO4	S	M	S	M	S
CO5	S	M	S	M	S

S Strong M Medium L Low

201TL1A2HA	HINDI-II	**SEMESTER II**

Total Credits: 3
Total Instruction Hours: 60 h

Syllabus

Unit I — 15 h

आधुनिकपद्य – शबरी(श्रीनरेशमेहता)

प्रकाशक: लोकभारतीप्रकाशन

पहलीमंजिल, दरबारीबिल्डिंग,

महात्मागाँधीमार्ग, इलाहाबाद-**211001**

Unit II — 15 h

उपन्यास: सेवासदन-प्रेमचन्द

प्रकाशक: सु मत्रप्रकाशन

204 लीलाअपार्ट्मेंट्स, **15** हेस्टिंग्सरोड'

अशोकनगरइलाहाबाद-**211001**

Unit III — 15 h

अनुवादअभ्यास-**III (**केवलहिन्दीसेअंग्रेजीमें**)**

(पाठ**1 to 10)**

प्रकाशक: द क्षणभारतप्रचारसभाचेनैई-**17**

Unit IV — 15 h

पत्रलेखन: (औपचारिकयाअनौपचारिक)

Course Code	Course Name	Category	L	T	P	Credit
201TL1A2FA	FRENCH- II	Theory	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- To Acquire Competence in General Communication Skills – Oral + Written – Comprehension & Expression
- To Introduce the Culture, life style and the civilization aspects of the French people as well as of France
- To help 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	To learn the adjectives and the classroom environment in France	K2
CO3	Learn the Plural, Articles and the Hobbies	K3
CO4	To learn the Cultural Activity in France	K3
CO5	To learn 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	S	M	M	M	S
CO2	S	M	M	M	S
CO3	S	M	S	M	S
CO4	S	M	S	M	S
CO5	S	M	S	M	S

S Strong **M Medium** **L Low**

201TL1A2FA	FRENCH- II	**SEMESTER II**

Total Credits: 3
Total Instruction Hours: 60 h

Syllabus

Unit I – Super! 13 h

•Compétenc e Culturelle

L'égalitéhomme/femme

Compétence De communication

INTERACTION:

Exprimer des sentiments, exprimer la joie, le plaisir, le bonheur

- RÉCEPTION ORALE:

Comprendre un jeuradiophonique

- RÉCEPTION ÉCRITE:

Comprendre des announces

- PRODUCTION ÉCRITE:

Écrire des cartespostales •

Compétencegrammaticale

Les noms de professions masculine/feminine

- Le verb finir et less

Verbes du groupe

en-ir

- Le present de l'impératif
- Savoir(present)
- Le participle passé:

Fini, aimé, arrive, dit,écrit

- Quel(s), quelle(s)..:

InterrogatifetExclamatif

- À + infinitive
- Les articles: n,une,des

Unit II Quoi? 13 h

Compétenc e Culturelle

Le 20 siécle:

Petitsprogrés Grand progrés

Compétence De communication

- INTERACTION:

Decrirequelque chose, unepersonne

- RECEPTION ORALE:

Comprendre un message publicitaire

- RÉCEPTION ÉCRITE:

Comprendre un déplianttouristique

- PRODUCTION

ÉCRITE: Écrire des petites announces

Compétence grammatical

- On
- Plus, moins
- Le verbealler:
- Present, impératif
- Aller + infinitife
- Le pluriel en –x

Unit III – Et aprés 12 h

Compétenc e Culturelle

Nouvelles du jour

Compétence De communication

INTERACTION:

Raconteur,situer un récitdans le temps

RÉCEPTION ORALE:

Comprendreune description

RÉCEPTION ÉCRITE:

Comprendre un test

PRODUCTION ÉCRITE:

écrire des cartespostales

Compétencegrammaticale

L'imparfait:: quel-Ques forms pour introduire le récit:Ilfaisait, il y avait, ilÉtait

Un peu, beaucoup, trop,Assez

Trés

e verbevenir:

Présent, impératif

En Suisse, auMaroc, aux Etats-Unis

Unit IV Maisoui! 12 h

Compétenc e Culturelle

La génération des20-30 ans

Compétence De communication

INTERACTION:

Donner son opinion,

Expliquerpourquoi

RÉCEPTION ORALE:

Comprendre des informations à la radio

RÉCEPTION ÉCRITE:

Comprendre un texteinformatif

PRODUCTION ÉCRITE:

éncrire un mél de protestation

Compétencegrammaticale

Répondre, prendre:

Présent, impératif, part Passé

Parcequepourquoi

Tout/tous, toute/s

Tous/toutes les…

(répétition action)

Unit V Maisnon! 10 h

•Compétenc e Culturelle

De la ville à la campagne

Compétence De communication

INTERACTION:

Débat:: exprimerl'accord, exprimer le Désaccord

RECEPTION ORALE:

Comprendre un message sur un répondeurtéléphonique

RÉCEPTION ÉCRITE:

Comprendre un témoignage

PRODUCTION ECRITE: Rediger des petites Announces immobilieres

Compétencegrammaticale

Le verbedevoir:Present et participe passé

Le verbe vivre, present

Aller + infinitive

Venir+ infinitive

Etre pour/contre

Text Books

1 Marcella Di Giura Jean-Claude Beacco, AlorsINew Delhi – 110007:Goyal Publishers Pvt Ltd86, University Block Jawahar Nagar (Kamla Nagar).

Course Code	Course Name	Category	L	T	P	Credit
201TL1A2MA	MALAYALAM-II PROSE: NON-FICTION	Theory	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- To develop the writing ability and develop reading skill.
- To learn various concepts and techniques for criticizing literature.
- To learn 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	S	M	M	M	S
CO2	S	M	M	M	S
CO3	S	M	S	M	S
CO4	S	M	S	M	S
CO5	S	M	S	M	S

S Strong M Medium L Low

201TL1A2MA	MALAYALAM-II PROSE: NON-FICTION	**SEMESTER II**

Total Credits: 3
Total Instruction Hours: 60 h

Syllabus

Unit I 12 h

Biography

Unit II 12 h

Biography

Unit III 12 h

Travelogue

Unit IV 12 h

Travelogue

Unit V 12 h

Travelogue

Text Books

1. Unit III, IV &V:Pottakkadu,S.K. KappirikaludeNattil. Kottayam: D.C. Books.
2. Bhatathirippadu,V.T.KannerumKinavum. Kottayam: D.C. Books.

References

1. Dr. George,K.M.(). Jeevacharitrasahithyam. (Edn.) Kottayam: N.B.S.
2. Dr. NaduvattomGopalakrishnan.JeevacharitrasahithyamMalayalathil. Trivandrum:Kerala BhashaInstitute.
3. Dr. VijayalamJayakumar. AthmakathasahithyamMalayalathil. (Kottayam:N.B.S.
4. Prof. Ramesh Chandran.SancharasahithyamMalayalathil. (10 Edn.) Trivandrum: Kerala Bhasha Institute.

Course Code	Course Name	Category	L	T	P	Credit
201EL1A2EA	ENGLISH - II	Language - II	4	0	1	3

PREAMBLE

This course has been designed for students to learn and understand

- To experience the effect of dialogue, the brilliance of imagery and the magnificence of varied genres
- To strengthen the student's English vocabulary and understanding of English sentence structure
- To communicate effectively and acquire knowledge on 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	Interpret skills in communication and to shape their attitude	K2
CO2	Develop oral and written language skills in a business context	K3
CO3	Analyze to gain key strategies and expressions for communicating with professionals	K4
CO4	Inspect the knowledge to the corporate needs	K4
CO5	Formulate Inter and Intrapersonal skills	K6

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

201EL1A2EA	ENGLISH - II	SEMESTER II

Total Credits: 3
Total Instructions Hours: 60

Syllabus

Unit I Technical English 10

Communication: Process- Methods- Channels- Barriers of Communications

Phonetics: Basics of phonetics - Consonants and Vowel sounds - Pronunciation Guidelines- Problem Sounds and Differences in Pronunciation

Reading Skills: Skimming and Scanning- Reading Different Kinds of Texts- Types- Developing a Good Reading Speed

Writing Skills: Note- Making and note taking, Summarizing and Paraphrasing- Paragraph Writing: Structure and principles

Unit II Business English 11

Structure and Planning of Letters: Elements of Structure- Forms of Layout- Style- Importance and Steps for Planning- Writing Business Letters

Quotation, Order and Tender: Inviting - Sending Quotation letter - Placing Orders- Inviting Tenders

E-mail Correspondence: Structure- Procedure- Style- Guidelines- Jargon and Acronyms- Security Precaution

Seminar and Meetings: Introduction- Organizing a Seminar- Sample Brochure- Conducting and Participating in a Meeting

Unit III Professional English 14

Report Writing: Importance- Process- Types- Structure

Memo: Importance- Structure

Notice, Agenda and Minutes: Meeting- Notice- Agenda- Minutes: Preparation- Structure- Delivery

Brochures: Purpose- Audience- Qualities

Unit IV Employment Communication 11

Resume Writing : Elements of Resume - difference between CV and Resume - Writing Job Application Art of Conversation: Small Talk- Body Language- Principles of Good Conversation Interview: Organizational role- Goals- Types- Interview Process

Group Discussion: Importance- Features- Strategies- Barriers

Unit V Soft Skills 14

Self - Discovery and Goal Setting: Self - Discovery - What Comprises It?- Goals and Types- Benefits, Areas and Clarity of Goal Setting - Critical thinking

Positive Thinking (PT) and Attitude: Benefits of PT and Attitude- Develop Positive Attitude and Thinking- Drive out Negative Thinking and Attitude

Etiquettes and Manners: Home, Table and Business- Time Management: Nature and Characteristics- Objectives and Significance

Developing Emotional Intelligence (EI): Salient Features- Components of EI- Intrapersonal Development

Text Books

1. Prabha, Dr. R. Vithya & S. Nithya Devi. 2019. Sparkle. (1st Edn.) McGraw - Hill Education. Chennai.
2. Rizvi, Ashraf. M. 2018. Effective Technical Communication. McGraw - Hill Education, Chennai.

References

1. Ghosh, B.N. Editor. 2017. Managing Soft Skills for Personality Development. McGraw - Hill Education, Chennai.
2. Adams, Katherine L. and Gloria I. Galanes. 2018. Communicating in Groups- Applications and Skills. McGraw - Hill Education, Chennai.
3. Koneru, Aruna. 2017. Professional Communication. McGraw - Hill Education, Chennai.
4. Koneru, Aruna. 2011. English Language Skills. McGraw - Hill Education, Chennai.
5. Sharma, R.C. and Krishna Mohan. 2016. Business Correspondence and Report Writing. 5th Edn. McGraw - Hill Education, Chennai.

Course Code	Course Name	Category	L	T	P	Credit
203MB1A2CA	CELL BIOLOGY AND MICROBIAL DIVERSITY	CORE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The complexity and harmony of cell structure and functions
- The mode of cell divisions and
- Mechanism of nutrient transportations inside the cell

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Describe the morphological details of prokaryote and their physiology. Explain the structure of internal organelles and their functions in organisms.	K2
CO2	Identify the reproduction methods or cell division strategies. Summarise the nutrient uptake mechanism and their transportation among cell to cell	K3
CO3	Provides knowledge in the primitive life form. Outline the characteristics of the life in the extreme environment. Summarize the environmental adaptation strategies via microbial life in extreme environment.	K3
CO4	Explain the taxonomy and nomenclature	K4
CO5	Describe the classification of Fungi and Algae	K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

203MB1A2CA	CELL BIOLOGY AND MICROBIAL DIVERSITY	SEMESTER II

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Prokaryotes & Eukaryotes 12 h

Structure of Prokaryotes – Cell wall – Nuclear material – Flagella – Pili – Endospore formation – Structure of Eukaryotes – Cell wall – Nucleus - organization of genetic material – Mitochondria – Endoplasmic reticulum – Ribosomes.

Unit II Cell Division 12 h

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

Unit III Archaebacteria 12 h

Introduction – Cell wall – Lipids and Membranes – Metabolism - Archaebacterial taxonomy – Methanogens - Archaebacterial sulfate reducers – Halophiles – Thermophiles - Thermoacidophiles.

Unit IV Microbial Taxonomy 12 h

Taxonomic ranks - Major characteristics used in taxonomy - morphology, physiology, ecology, genetic and molecular characteristics - Classification systems - Natural, Phenetic & Bergey's manual (9th Edition) - its importance, phylogenetic classification - Numerical taxonomy.

Unit V Fungi and Algae 12 h

Kingdoms of organisms - Whittaker's - Carl Woese - Fungi – Alexopolus classification –Algae - Fritsch classification of Algae - Molecular classification - phylogentic tree and importance.

Text Books

1 Joanne Wiley, Linda Sherwood, Christopher J Woolverton, 2017, Prescott's Microbiology, 10th edition, McGraw Hill Company, New Delhi, India.

2 Michael T. Madigan, 2017, "Brock Biology of Microorganisms", 15th edition, Pearson publishers, New Delhi, India.

References

1 Tortora, Funke and Case, 2018, "Microbiology", 13th edition, Pearson Education, New Delhi, India

2 Verma P S, 2004, "Cell biology, Genetics, Molecular Biology, Evolution and Ecology", 14th edition, S Chand Publishers, New Delhi.

3 Jeffrey C Pommerville, 2013, "Alcamo's Fundamentals of Microbiology", 10th edition, Jones and Bartlett Publishers, New Delhi, India.

4 Alexopoulos C J, Mims C W, and Blackwell M, 2007, Introductory Mycology, 4th edition, John Wiley Publishers, New Delhi.

5 https://www.ncbi.nlm.nih.gov/books/NBK8477/

6 https://www2.estrellamountain.edu/faculty/farabee/biobk/BioBookmito.html

7 https://www.biologydiscussion.com/bacteriology/bergeys-manual-of-systematic-bacteriology/54662

193MB1A2CP	CORE PRACTICAL - CELL BIOLOGY AND MICROBIAL DIVERSITY	**SEMESTER II**

Total Credits: 3
Total Instructions Hours: 72 h

S.No	Contents
1	Microscopic studies of cell organelles
2	Measurement of Microbial cell size by Micrometry
3	Acid Fast Staining
4	Capsular staining – Negative staining
5	Spore Staining
6	Motility test - Hanging drop and SIM agar
7	Screening of PHB production
8	Observation of permanent slide for stages of mitosis and meiosis
9	Fungal staining – Lacto phenol Cotton Blue Mount & Fungal Cell Observation by Stereo Microscope - Under DBT Star Scheme
10	Observation of permanent slides of Algae, Fungi and Protozoa
11	Isolation and Identification of algae from water sample by inverted microscope - Under DBT Star Scheme
12	Extraction of chlorophyll pigments
Note :	Out of 12 experiments 10 can be performed.

References

1. Rajan S. and Selvi Christy, 2018. Experimental Procedures in Life Sciences. CBS Publishers & Distributors Pvt Ltd, India.

2. James. C. Cappuccino. 2017. Microbiology A laboratory manual. 11th edition, Pearson education publishing house, New Delhi

3. Aneja. K.R. 2017. Experiments in Microbiology, Plant Pathology and Biotechnology, 5th edition. New age publishers, New Delhi

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

Course Code	Course Name	Category	L	T	P	Credit
192CE1A2IB	IDC - CHEMISTRY	IDC	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The basic concepts of chemical bonding in molecules.
- The essentials of organic chemistry and coordination chemistry. Enable to differentiate the organic molecule configurations.
- The fundamentals of solution concepts and to know the kinetics of chemical reactions.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Gain the knowledge about the basic theories in coordination chemistry and to name the inorganic compounds.	K2
CO2	Recall basics of chemistry which helps students to understand bonding in molecules, crystals structures and evaluate their bonding characteristics.	K2
CO3	Understand and apply concepts of bonding in organic molecules, and relate their displacement reactions with mechanism.	K2
CO4	Design a demonstration that enables the students to prepare laboratory solutions.	K2
CO5	To study the spontaneity of the reaction, the nature of catalyst and reaction pathway.	K2

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

192CE1A2IB	IDC - CHEMISTRY	**SEMESTER II**

Total Credits: 3
Total Instruction Hours: 36 h

Syllabus

Unit I Coordination Chemistry and Fertilizers 8 h

Coordination Chemistry

Nomenclature, Theories of Werner, Sidge-Wick, Pauling, Chelation examples - Haemoglobin, Chlorophyll. Application of EDTA in qualitative and quantitative analysis.

Fertilizers

Manufacture and uses of urea, ammonium sulphate, ammonium Nitrate, Potassium Nitrate, NPK fertilizer and triple superphosphate.

Unit II Chemical Bonding 5 h

Molecular Orbital Theory- bonding, anti-bonding and non-bonding orbitals. MO-configuration of H2, N2, O2, F2- bond order– diamagnetism and paramagnetism.

Ionic Bond: Nature of ionic bond, structure of NaCl and CsCl, factors influencing the formation of ionic bond.

Covalent Bond: Nature of covalent bond, structure of CH4, NH3, H2O, shapes of BeCl2, BF3, based on VSEPR theory and hybridization.

Unit III Basic Organic Chemistry 8 h

Electron displacement effect in organic compounds - Inductive effect – Electromeric effect - Resonance effect, hyperconjugation and steric effect.

Isomerism, Symmetry of elements (Plane, Centre and Axis of symmetry), Molecules with one chiral carbon and two adjacent chiral carbons –Optical isomerism of lactic acid and tartaric acid, Enantiomers, Diastereomers – Separation of racemic mixture, Geometrical isomerism (maleic and fumaric acid). R/S and E/Z configuration assignments for simple molecules.

Unit IV Solutions 8 h

Expression of concentration - normality, molarity, molality and mole fraction.
Primary and secondary standards – preparation of standard solutions.
Principle of Volumetric analysis. Indicators – Theory of indicators- Ostwald and quinonoid.
Strong and weak acids and bases - Ionic product of water- pH, pKa, pKb, Buffer solution, pH and pOH simple calculations.

Unit V Chemical Kinetics and Catalysis 7 h

Rate of reaction, rate law, order and molecularity. Zero, first, Pseudo first and second order reactions – definition with examples. Derivation of I and II order rate constant. Half life period of first order reaction.

Catalysis – homogenous, heterogeneous and enzyme catalysis (definition only), enzymes used in industry, characteristics of catalytic reactions.

Text Books

1. Madan,R. D. (2014). Modern Inorganic Chemistry. (4th Edn.) : S. Chand & Company.l.
2. Puri , Sharma, Pathania, (2017). Principles of Physical Chemistry. (47Edn.) : Vishal Publishing Company.

References

1. Jain M. K., Sharma S. C., (2007). Organic Chemistry. (3rd Edn.) : Shoban Lal Nayin Chand.
2. Gopalan,R (2007). Elements of Analytical Chemistry. (3rd Edn.): Sultan Chand & Sons.
3. Jayashree ghosh,. (2016). Fundamental concepts of applied chemistry. (1st Edn.) New Delhi: S. Chand & Company Pvt Ltd .

192CE1A2IP	IDC PRACTICAL : CHEMISTRY PRACTICAL	**SEMESTER II**

Total Credits: 4
Total Instructions Hours: 48 h

S.No	Contents
1	I. Volumetric analysis Estimation of Sodium Hydroxide using standard Sodium Carbonate.
2	Estimation of Hydrochloric acid using standard Oxalic acid.
3	Estimation of Oxalic acid using standard Sulphuric acid.
4	Estimation of Ferrous sulphate using standard Mohr salt solution.
5	Estimation of Oxalic acid using standard Ferrous sulphate solution.
6	Estimation of Ferrous ions using Mohr salt solution.
7	II. Organic analysis: a. To distinguish between aliphatic & aromatic. b. To distinguish between saturated & unsaturated. c. Detection of Elements (N, S, Halogens). d. Functional group tests for phenols, acids (mono & di), aromatic primary amine, monoamide, diamide, carbohydrate. Functional group characterized by Confirmatory test.

References

1. V. Venkateswaran, R. Veeraswamy & A. R. Kulandaivelu. 2004. Basic Principles of practical chemistry, Sultan Chand & Co, New Delhi.

Course Code	Course Name	Category	L	T	P	Credit
196BM1A2AA	AECC : HUMAN RIGHTS	AECC	2	-	-	2

PREAMBLE

This course has been designed for students to learn and understand

- To study how human values and personality traits help to develop the characteristics of each individual
- Understanding the moral values towards the enrichment of the society
- Identify the impact of ethics and values on the global development of the current scenario

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 human values, personality traits and character formation.	K2
CO2	Acquire the knowledge through value education towards national and global development.	K1
CO3	Introduce the basic concepts of conflict, emotions and adolescent emotions.	K1
CO4	Illustrate the techniques in therapeutic measures like yoga and meditation.	K2
CO5	Learn the concepts of human rights, rights for women and children and domestic violence.	K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong **M** Medium **L** Low

196BM1A2AA	AECC : HUMAN RIGHTS	**SEMESTER II**

Total Credits: 2
Total Instruction Hours: 24 h

Syllabus

Unit I Introduction to human values 05 h

Concept of Human Values - Value Education Towards Personal Development - Aim of education and value education - Evolution of value oriented education - Concept of Human values - Types of values - Components of value education - Personal Development: Self analysis and introspection - Sensitization towards gender equality - Physically challenged - Intellectually challenged - Respect to age - Experience - Maturity - Family members - Neighbours - Co-workers - Character Formation towards Positive Personality: Truthfulness - Constructivity - Sacrifice - Sincerity - Self Control - Altruism - Tolerance - Scientific Vision.

Unit II Value education and Social values 05 h

Value Education Towards National and Global Development National and International Values: Constitutional or national values - Democracy - Socialism - Secularism - Equality - Justice - Liberty - Freedom and fraternity -Social Values - Pity and probity - Self control - Universal brotherhood - Professional Values - Knowledge thirst - Sincerity in profession - Regularity - Punctuality and faith - Religious Values - Tolerance - Wisdom - Character - Aesthetic values - Love and appreciation of literature and fine arts and respect for the same - National Integration and international understanding.

Unit III Global Development on Ethics and Values 04 h

Impact of Global Development on Ethics and Values: Conflict of cross-cultural influences - Mass media - Cross-border education - Materialistic values - Professional challenges and compromise - Modern Challenges of Adolescent Emotions and behave or Sex and spirituality: Comparison and competition - Positive and negative thoughts - Adolescent Emotions - Arrogance - Anger - Sexual instability - Selfishness - defiance.

Unit IV Yoga and Meditation 05 h

Therapeutic Measures: Control of the mind through - Simplified physical exercise - Meditation – Objectives - Types - Effect on body - Mind - Soul - Yoga – Objectives - Types - Asanas - Activities: Moralisation of Desires -Neutralisation of Anger - Eradication of Worries - Benefits of Blessings.

Unit V Human Rights and Rights of Women and Children 05 h

Human Rights - Concept of Human Rights – Indian and International Perspectives Evolution of Human Rights - Definitions under Indian and International

documents - Broad classification of Human Rights and Relevant Constitutional Provisions - Right to Life - Liberty and Dignity - Right to Equality - Right against Exploitation - Cultural and Educational Rights - Economic Rights - Political Rights - Social Rights - Human Rights of Women and Children - Social Practice and Constitutional Safeguards - Female Foeticide and Infanticide - Physical assault and harassment - Domestic violence - Conditions of Working Women - Institutions for Implementation - Human Rights Commission - Judiciary - Violations and Redressel Violation by State - Violation by Individuals - Nuclear Weapons and Terrorism Safeguards.

References

1. Brain Trust Aliyar, 2008, Value Education for health, happiness and harmony. Vethathiri publications, Erode.
2. Grose. D. N, 2005, A text book of Value Education. Dominant Publishers and Distributors, New Delhi.
3. Yogesh Kumar Singh & Ruchika Nath, 2005, Value Education, P. H Publishing Corporation, New Delhi.
4. Venkataram & Sandhiya. N, 2001, Research in Value Education, APH Publishing Corporation, New Delhi.
5. Seetharam. R. (Ed), 1998, Becoming a better Teacher Madras Academic Staff College.
6. Brain Trust Aliyar, 2004, Value Education for Health, Happiness and Harmony. Vethathiri publications, Erode.
7. Swami Vivekananda, 2008, Personality Development. Advaita Ashrama, Kolkata.
8. Dey A. K, 2002, Environmental Chemistry. New Delhi – Vile Dasaus Ltd

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Third Semester										
Part – I										
191TL1A3TA	Language-I	Tamil - III	3	1	-	3	25	75	100	3
191TL1A3HA		Hindi - III								
191TL1A3MA		Malayalam - III								
201TL1A3FA		French - III								
Part – II										
191EL1A3EA	Language-II	English - III	3	-	1	3	25	75	100	3
Part – III										
193MB1A3CA	Core III	Microbial Physiology	4	1	-	3	25	75	100	4
193MB1A3CP	Core Practical - III	Microbial Physiology	-	-	6	6	40	60	100	3
194CS1A3IA	IDC – III	Biological Computing	3	-	-	3	25	75	100	3
193MB1A3SA	SEC-I	Culture Collection and Preservation Techniques	3	1	-	3	25	75	100	3
	GE - I		2	-	-	2	-	50	50	2
	LoP	Lab on Project	-	-	-	-	-	-	-	-
Part - IV										
191TL1A3AA	AECC - III	Basic Tamil	2	-	-	3	-	50	50	2
191TL1A3AB		Advanced Tamil								
195CR1A3AA		Women's Rights								
		Total	**20**	**3**	**7**					**23**

EXTRA CREDIT COURSES

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

S. No.	Course Code	Course Name
1	193MB1ASSA	Good Laboratory Practices
2	193MB1ASSB	Food Sanitation

ourse Code	Course Name	Category	L	T	P	Credit
191TLIA3TA	தமிழ்த் தாள்– III	மொழி-I	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- மொழிப்பாடங்களின் வாயிலாக தமிழரின் பண்பாடு , 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) – மாணவனின் செயலாக்கத்திறனை ஊக்குவித்தல்	K1,K2,K3
CO2	மதிப்புக்கல்வி (Attitude and Value education)	K2,K4
CO3	பாட இணைச்செயல்பாடுகள் (Co-curricular activities)	K2,K3,K4
CO4	சூழலியல் ஆக்கம் (Ecology)	K4
CO5	மொழி அறிவு(Tamil knowledge)	K5

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

191TLIA3TA	பகுதி – 1 : தமிழ் தாள் : 3	SEMESTER III

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I 10 h

1. காப்பியங்களின் தோற்றமும் வளர்ச்சியும்
2. சிலப்பதிகாரம் – மனையறம் படுத்த காதை
3. மணிமேகலை – வஞ்சிமாநகர் புக்க காதை

Unit II 10 h

1. கம்பராமாயணம் – கும்பகர்ணன் வதைப்படலம் (பா. எண் : 60 – 100)
2. பெரிய புராணம் – அதிபத்தநாயனார் புராணம்

Unit III 10 h

1.சிற்றிலக்கியங்களின் தோற்றமும் வளர்ச்சியும்

2.தமிழ்விடு தூது – தூதுப்பொருள்கள் மட்டும் 101 முதல் 112 வரை(12 கண்ணிகள்)

3.திருக்குற்றாலக்குறவஞ்சி – வசந்தவல்லி பந்தாடிய சிறப்பு (6: 4கண்ணிகள்)

4.கலிங்கத்துப்பரணி – களம் பாடியது (போர்க்களக் காட்சி –பா.எண்: 472–502)

Unit IV 10 h

1. நாடகங்களின் தோற்றமும் வளர்ச்சியும்
2. நாடகம் - ஔவை–ஆசிரியர் இன்குலாப்

Unit V 08 h

1. 'பா' வகைகள் : வெண்பா, ஆசிரியப்பா, கலிப்பா, வஞ்சிப்பா - பொது இலக்கணம் மட்டும்.
2. அணி: உவமையணி, உருவக அணி, இல்பொருள் உவமையணி விளக்கம், உதாரணம்.
3. பயிற்சிப்பகுதி

அ) அலுவலகம் சார்ந்த கடிதம்: விண்ணப்பங்கள், வேண்டுகோள், முறையீடு

ஆ) வாசகர் கடிதம்: நாளிதழ், வானொலி, செய்தி ஊடகங்களுக்கு

விமர்சனம் எழுதுதல்.

Text Books

1 மொழிப்பாடம் - 2020, தொகுப்பு : தமிழ்த்துறை , டாக்டர் என்.ஜி.பி. கலை அறிவியல் கல்லூரி.

2 இன்குலாப் – 2017. ஒளவை (நாடகம்), அன்னம் வெளியீடு, சென்னை.

References

1 புலவர் சோம. இளவரசு - 2014. இலக்கிய வரலாறு , மணிவாசகர் பதிப்பகம் , சென்னை – 108,

2 பேராசிரியர் முனைவர் பாக்யமேரி – முதற் பதிப்பு 2013 , இலக்கணம் இலக்கிய வரலாறு மொழித்திறன், பூவேந்தன் பதிப்பகம், சென்னை.

3 இணையதள முகவரி : www.tamilvirtual.com

Course Code	Course Name	Category	L	T	P	Credit
191TL1A3HA	HINDI-III	Language - I	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- To develop the writing ability and develop reading skill.
- To learn various concepts and techniques for criticizing literature, to learn 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	S	M	M	M	S
CO2	S	M	M	M	S
CO3	S	M	S	M	S
CO4	S	M	S	M	S
CO5	S	M	S	M	S

S Strong M Medium L Low

191TL1A3HA	HINDI-III	SEMESTER III

Total Credits: 03

Total Instruction Hours: 48 h

Syllabus

Unit I — 10 h

पद्य – काव्य पराशर (भोलानाथ)

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

प्रकाशक: जवाहर पुस्तकालय

सदर बाजार, मथुरा

उत्तर प्रदेश - 281001

Unit II — 10 h

हिन्दी साहित्य का इतिहास: (साधारण ज्ञान)

आचार्य रामचन्द्र शुक्ल

लोकभारती प्रकाशन इलाहाबाद

Unit III — 10 h

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

प्रकाशक: विनोद पुस्तक मंदिर

आगरा - 282002

Unit IV — 10 h

संवाद लेखन

पुस्तक: व्याकरण प्रदिप - रामदेव

प्रकाशक: हिन्दी भवन 36 इलाहाबाद - 211024

Unit V — 08 h

अनुवाद अभ्यास-III (केवल हिन्दी से अंग्रेजी में)

(पाठ 10 to 20)

प्रकाशक: दक्षिण भारत प्रचार सभा चेनैई -17

Course Code	Course Name	Category	L	T	P	Credit
191TL1A3MA	MALAYALAM - III	Language - I	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- To develop the writing ability and develop reading skill.
- To learn various concepts and techniques for criticizing literature, to learn 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	S	M	M	M	S
CO2	S	M	M	M	S
CO3	S	M	S	M	S
CO4	S	M	S	M	S
CO5	S	M	S	M	S

S Strong M Medium L Low

191TL1A3MA	MALAYALAM - III	SEMESTER III

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I 10 h

Kumaranasan

Unit II 10 h

Kumaranasan

Unit III 10 h

Kumaranasan

Unit IV 10 h

Kavyanchali Collection of Poems.

Unit V 08 h

Kavyanchali Collection of Poems.

Text Books

1 Chinthavishtayaya Sitha By Kumaranasan DC.Books Kottayam

2 Kavyanchali -Group of Authors DC.Books Kottayam

References

1 Kavitha Sahithya Charithram –Dr.M.Leelavathy Sahithya academy Thrissur.

Course Code	Course Name	Category	L	T	P	Credit
201TL1A3FA	FRENCH-III	Language - I	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- To Acquire Competence in General Communication Skills – Oral + Written – Comprehension & Expression.
- To Introduce the Culture, life style and the civilization aspects of the French people as well as of France.
- To help 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	To learn the adjectives and the classroom environment in France.	K2
CO3	Learn the Plural, Articles and the Hobbies.	K3
CO4	To learn the Cultural Activity in France.	K4
CO5	To learn 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	S	M	M	M	S
CO2	S	M	M	M	S
CO3	S	M	S	M	S
CO4	S	M	S	M	S
CO5	S	M	S	M	S

S Strong M Medium L Low

191TL1A3FA	FRENCH-III	SEMESTER III

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I Excuses et vœux 10 h

Compétence Culturelle : Convivialité - (lieux et société, - l'apéritif)

Compétence de Communication

- **INTERACTION ORALE:** Accueillir quelqu'un, s'excuser,remercier
- **RÉCEPTION ORALE**: Comprendre des announces enregistrées
- **RÉCEPTION ÉCRITE:** Compremdre une affiche
- **PRODUCTION ÉCRITE:** Écrire des cartes de vœux

Compétence Grammatical

Pronoms personnels toniques moi,je…;toi…tu - Pronoms personnels objets Me,te,le… - Lesverbsen-ercomme appeler,acheter - Lesadjectives possessives nos,vos,leurs

Unit II Bravo et merci 8 h

Communication et technologies (leportable, internet)

- **INTERACTION ORALE:** Interagir au téléphone , féliciter
- **RÉCEPTION ORALE:** Comperendre une emission à la radio
- **RÉCEPTION ORALE:** Comprendre une définition
- **PRODUCTION ECRITE:** Écrire des plaques commemoratives

Oui,que - Le passé composé - Le participe passé - J'ai eu,ella a été -

Longtemps,pendant …, de… à

Unit III Faire et dire 10 h

Jeunes : enquête

- **INTERACTION ORACE:** Demander de l'aide, donner des instructions
- **RÉCEPTION ORALE:** Comprendre un message enregistré
- **RÉCEPTION ÉCRITE :** Comprendre un article d'un magazine de consommateurs
- **PRODUCTION ÉCRITE :** Écrire un règlement

- du,de la (de l)',des,de

Unit IV Faire ci ou faire ça 10 h

acances des Français

- **INTERACTION ORALE :** Proposer quelque chose,accepter,refuser
- **RÉCEPTION ORALE :** Comprendre une émission de cuisine
- **RECEPTION ÉCRITE :** Comprendre une brochure d'informations
- **PRODUCTION ÉCRITE :** Ecrire un'texte de promotion touristique

S'il y a du soleil : L'hypothèse (supposition, Condition) la préposition S i + indicatif Sinon… ou + indicatif - Sortir,partir - Quelques, plusieurs - Le long de - Au milieu de… - Au sommet de…

Unit V Dialogue writing 10 h

1. Au Restaurant
2. A la poste
3. A L' Aeroport
4. A La Gare
5. Chez Le Medecin

Text Books

1 Marcella Di Giura Jean-Claude Beacco, Alors II. Goyal Publishers Pvt Ltd 86, University Block ,Jawahar Nagar (Kamla Nagar), New Delhi – 110007

Course Code	Course Name	Category	L	T	P	Credit
191EL1A3EA	ENGLISH - III	Language II	4	0	0	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	Learn English grammar and its specific usage	K2
CO2	Know the methods of improving reading skills	K3
CO3	Understand the importance of speaking skills and developing it through various practices	K3
CO4	Comprehend the basic steps of reading and its necessity	K3
CO5	Acquire the writing skills and mandatory similar practices	K4

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

191EL1A3EA	ENGLISH - III	SEMESTER III

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I Basics of English 10 h

Phrasal verb - Notions and Conventional Idiomatic Expressions - One-Word Substitution - Word Formation - Homophones - Spelling - Sentence Completion – Sentence Pattern

Unit II Listening 08 h

Listening and Hearing - Principles of listening - Types of listening - incidental listening - active and effective listening - discriminative listening - critical listening - listening vs practice - Barrier to Listening - Guidelines for Improving Listening

Unit III Speaking 10 h

Monologues - Dialogue - Role Play - JAM (Just A Minute talk) - Debate - Public Speaking - Group Discussion - Interview - Showing Directions - Accent and Neutralization

Unit IV Reading 10 h

Mechanics of Reading - Types of Reading - Summarization - Paraphrasing - Analysis and Interpretation - Reading Comprehension – Reading with purpose and making predictions - Cloze Passage

Unit V Writing 10 h

Paraphrase Writing - Techniques and Methods of Paraphrasing - Precis Writing - Difference between Paraphrase and Precis - review writing - Hints Developing - Editorial Writing - Tabloid - Column Writing

Text Books

1. Bhatnagar R. P. 2013. English for Competitive Examinations. Macmillan Publishers, Chennai.
2. KoneruAruna. 2011. English Language Skills. McGraw Hill Education, Chennai.

References

1. Radhakrishna Pillai G. 2000. English for Success. Emerald Publishers, Chennai.
2. Gauri Mishra, Ranjana Kaul. 2016. Language Through Literature. Primus Books, New Delhi.
3. Miles Craven. 2008. Cambridge English Skills Real Listening and Speaking. First Edition, Cambridge University Press, India.
4. Teaching Adult: A Literary Resource Book. 2012. New Readers Press, New York, United States.

Course Code	Course Name	Category	L	T	P	Credit
193MB1A3CA	MICROBIAL PHYSIOLOGY	CORE	4	1	-	4

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	Recognize the nutritional requirements, modes of nutrient uptake and classification of microorganisms.	K1, K4
CO2	Describe the impact of environmental factors on microbial growth, metabolism and physiology.	K2
CO3	Show the significance of different pathways of energy generation and Biosynthetic process.	K2, K3
CO4	Describe the concepts of anaerobic respiration, fermentation and nitrogen fixation process.	K2
CO5	Explain the concepts of biosynthesis of aminoacids. Differentiate cell wall synthesis	K1, K2

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong **M Medium** **L Low**

193MB1A3CA	MICROBIAL PHYSIOLOGY	SEMESTER III

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Basic Concepts of Microbial Physiology 12 h

Definition, Introduction, Terminologies and Basic concepts of Microbial physiology - Nutritional requirements and up take by vegetative and dormant stage of microbes - Factors influencing microbial growth – Growth curve.

Unit II Growth of Bacteria 12 h

Different phases of growth in Batch culture, Ccontinuous, Semi continuous, Synchronous and Biphasic growth - Calculation of generation time - Estimation of Microbial growth: Direct method - Microscopic count, Turbidometric assay and TVC - Indirect Method - CO2 liberation.

Unit III Respiration & Energy Production 12 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 12 h

Anaerobic respiration – Methanogens - Sulphur and Nitrogen metabolism - Nitrogen fixation in legumes by Rhizobium sp - Fermentation – Alcoholic, Propionic and Mixed acid fermentation - Oxygenic and anoxygenic photosynthesis in bacteria.

Unit V Microbial Metabolism 12 h

Biosynthesis of amino acids (Pyruvate family – Alanine, Leucine and Glutamic acid family) - Lipids (Phospholipids and Archeal lipids) -Biosynthesis of bacterial cell wall – Bioluminescence – Biotransformation in antibiotics production.

Text Books

1 Gerhard Gottschalk, 1986, "Bacterial Metabolism", 2nd Edition, Springer-Verlag, New York.

2 David White, George D Hageman, 1997, "Microbial Physiology and Biochemistry Laboratory - A Quantitative Approach", 4th Edition, Oxford University Press.

References

1 Doelle HW, 1975, "Bacterial Metabolism", 2nd edition, Academic Press, United States.

2 David L Nelson, Michael M Cox, 2008, "Lehninger Principles of Biochemistry", 5th edition, W. H. Freeman, United States.

3 Moat A G, Foster J W, 1988, "Microbial Physiology", 4th edition, John Wiley & Sons, New Jersey, United States.

4 Stanbury P T and Whitaker, 1984, "Principles of Fermentation Technology", 1st Edition, Adithya Books Pvt Ltd. New Delhi.

193MB1A3CP	CORE PRACTICAL : MICROBIAL PHYSIOLOGY	SEMESTER III

Total Credits: 3
Total Instructions Hours: 72 h

S.No	Contents
1	Measurement of Microbial growth – TVC - Haemocytometer - Turbidity method
2	Measurement of Growth Curve of Bacteria
3	Utilization of Amino Acid as Carbon source
4	Mixed acid Fermentation test
5	Acid end product test
6	Non-acid end product test
7	Carbohydrate fermentation test
8	Preferential sugar utilization and H2S production test – TSI
9	Starch hydrolysis, Casein hydrolysis test, Gelatin liquefaction
10	Catalase test, Oxidase test, Urease test
11	Nitrate Reduction Test
12	Microbial Degradation of textile dyes

Note: Out of 12 – 10 Mandatory

References

1. James.C.Cappuccino, 2013, Microbiology A laboratory manual, 1st edition, Pearson Education Publishers, New Delhi.
2. Kannan N, 1996, Laboratory manual of General Microbiology, 2nd edition, Panima Publishing House, New Delhi, India.
3. Aneja K R, 2012, Experiments in Microbiology, Plant pathology and Biotechnology, 4th Edition, New Age Publishers, New Delhi, India.
4. Kannan N, 2003. Hand book of Laboratory culture media, 1st edition, Panima Publishing House, New Delhi, India.

Course Code	Course Name	Category	L	T	P	Credit
194CS1A3IA	BIOLOGICAL COMPUTING	IDC	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The computational knowledge in the field of Computer Science and Biosciences
- How to create biological database that facilitate the information retrieval process
- How to apply the different types of software in research problems.

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 Computers and I/O devices	K1
CO2	Understand the principle of Operating System & Programming Paradigms	K2
CO3	Enrich the basic structure of Networks	K1
CO4	Emphasis is on the concepts of Internet Technologies	K2
CO5	Ability to gain knowledge in Biological Database	K1

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

194CS1A3IA	BIOLOGICAL COMPUTING	SEMESTER III

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Basic of Computer 8 h

Introduction – Digital and Analog Computers – History of Computer – Generations of Computers – Classification of Computer – The Computer System- Applications of Computers. Computer system Hardware: Central Processing Unit - Memory Unit.

Unit II Input and Output Devices 7 h

Input-Output Unit - Input Devices – Human Data Entry Devices – Source Data Entry Devices - Output Devices. User-Computer Interface: Interaction of User and Computer – Types of Software – System Software – Application Software.

Unit III Operating System & Computer Programming Fundamentals 7 h

Objective of Operating System – Types of OS - Functions of OS – File management – Device management – Protection and security – User Interface. Computer Programming Fundamental : Program Development Life Cycle – Algorithm – Control Structure – Flow Chart – Pseudo Code – Object Oriented Programming.

Unit IV Data Communication and Computer Network 7 h

Computer Network: Network Types – LAN Topologies – Network Devices – The Internet and Internet Services: History of Internet – The Internet Architecture - Connecting to the Internet – Internet Connections – Internet Address – Internet Services – Uses of Internet.

Unit V Introduction and Biological Databases 7 h

Biological Databases : Definition of Bioinformatics - Goal - Scope - Applications - Limitations - Database - Types of Databases - Biological Databases - Information Retrieval from Biological Databases- Pairwise Sequence Alignment - Database Similarity Searching - Multiple Sequence Alignment.

Text Books

1 Anita Goel, 2010, Computer Fundamentals, Pearson Edition, India.

2 Jin Xiong, 2012, Essential Bioinformatics, 1st Edition, Cambridge university press Cambridge, New York.

References

1 Leon A and Leon M, 2009. Fundamentals of Information technology, second edition, Vikas publishing House Pvt. Ltd. India.

2 Date C.J. 2006. Introduction to Database systems. 8th edition, Pearson publisher, India

3 Teresa K Attwood and David J. Parry Smith 1999. Introduction to Bioinformatics, Pearson Edition, India.

Course Code	Course Name	Category	L	T	P	Credit
193MB1A3SA	CULTURE COLLECTION AND PRESERVATION TECHNIQUES	SEC	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- Isolation, segregation and systemic arrangement of bacteria, fungi, and viruses.
- The different preservation techniques used in microbial culture collection centers.
- The idea on the laboratory safety and security measures taken and on the different National and International microbial culture collection centers.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Demonstrate the pure culture techniques for the isolation of bacterial and fungal strains.	K2
CO2	Describe the techniques for the isolation, cultivation and detection of viruses.	K2
CO3	Identify the organisms by comparing the molecular sequence of it in existing databases.	K1, K2
CO4	Demonstrate the different techniques for the Preservation of microbial culture.	K2
CO5	Classify and contrast the Microbial culture collection centre both Internationally and Nationally	K3, K4

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong **M** Medium **L** Low

193MB1A3SA	CULTURE COLLECTION AND PRESERVATION TECHNIQUES	SEMESTER III

Total Credits: 3
Total Instruction Hours: 48 h

Syllabus

Unit I Pure Culture Techniques & Identification of Bacteria and Fungi 10 h

Pure Culture Techniques – Definition, Principles and Methods of obtaining pure culture - Isolation of Bacteria and Fungi - Isolation, serial dilution, Pour, Spread and Streak plate - Cultivation of Anaerobic bacteria – Non culturable bacteria – Metagenomics - Identification of Bacteria & Fungi - Traditional methods – Biochemical and Microscopic methods, Molecular approaches – PCR, DNA sequencing, Pyrosequencing.

Unit II Isolation, cultivation, and identification of virus 10 h

Isolation, cultivation, and identification of virus – Experimental animals - Embryonated eggs - Tissue culture: Organ, Explants, Cell culture - Primary cell culture, Diploid cell culture and Continuous cell lines. Detection & Identification of Viruses – Cytopathic effect, Hemadsorption, Hheterologous interference, Transformation, Immunofluorescence, Molecular - RT-PCR, Sequencing using specific primers.

Unit III Taxonomical arrangements of Microbes 10 h

Taxonomical arrangement - Search Databases – European Molecular Biology Laboratory (EMBL), GenBank and DNA Databank of Japan (DDBJ), BLAST, PSI Blast, FASTA – Basics of Cladogram and its construction – Phylogenetic tree construction - Taxonomic placement of organism.

Unit IV Preservation of Collected Microbial Cultures 9 h

Preservation of Collected Microbial Cultures - Bacteria & Fungi - Methods – Short term – Agar slant culture, Refrigeration, Preservation by Drying. Long term – Mineral oil / liquid Paraffin method, Saline suspension, Cryo preservation, Lyophilisation, storage in sterile soil and silica gel. Preservation of Viruses – low temperature – Absence of water – Alternative environments etc. Culture Conservation – Importance and significance – preservation, characterization and exploitation

Unit V Biosafety and Security Aspects & Culture collection centers 9 h

Development of International Network Centers – Microbial Biological Resource Centers – Biosecurity & Biosafety (Code of Conduct to be implemented) - Quality Management System (ISO 20387). Culture Collection Centers in India – MCC, IMTECH, National fungal culture collection of India, National Collection of Industrial Microorganism. International Collection Centers – ATCC, JCM, CBS, NCIMB, BCRC.

Text Books

1 Joanne Wiley, Linda Sherwood, Christopher J Woolverton. 2016. "Prescott's Microbiology", 10th Edition. Mc Graw Hill Company, United states.

2 Michael Pelczar, 2001, "Microbiology", 5th Edition. Mc Graw Hill Book Company, United states.

References

1 Salle A.J, 2014, "Fundamental Principles of Bacteriology", 7th edition, Tata Mc Hill Publishing Company Ltd., New Delhi, India.,

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 David Mount, 2004, "Bioinformatics: Sequence and Genome Analysis", 2nd Revised Edition, Cold Spring harbor laboratory Press, US.

4 Reddy C, Beveridge T, Breznak J, Marzluf G, Schmidt T, Snyder L, 2007, "Methods for General and Molecular Microbiology", 3rd Edition. ASM Press, Washington, United States.

193MB1A3GA	GENERIC ELECTIVE: MICROBIOLOGY AND PUBLIC HEALTH	SEMESTER III

Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I Epidemiology 5 h

Definition and Aims – Epidemiological Approaches – Mortality – Morbidity – Epidemiological Methods: Descriptive – Analytical – Experimental. Uses of Epidemiology - Communicable Diseases: Introduction, Terminology, Modes of disease transmission, General measures for prevention & control of communicable diseases.

Unit II Disinfection & Sterilization 5 h

Effective disinfection by liquid chemical agents like Halogen, Potassium per magnate solution etc. Solid chemical agent – Bleaching powder, Lime.

Unit III Non-Communicable Diseases 4 h

Definition, types, Diagnosis & prevention - Cardiovascular Diseases, Cancer, Chronic lung disease, Diabetes, Chronic Neurologic disorder and Arthritis.

Unit IV Food borne infection 5 h

Salmonellosis, Shigellosis and Hemorrhagic colitis. Food intoxication – Staphylococcus aureus, Bacillus cereus and Mycotoxins.

Unit V Personal Hygiene 5 h

Factors influencing health & hygiene - Health habits & practices - Maintenance of normal circulation, respiration and digestion etc - Skin care cleanliness - Dental care. Care of hands, hand washing - Exercises - importance - Food values - Nutrition.

Text Books

1 Park K, 2013, "Preventive and Social Medicine", 22nd Edition, Banarsidas Bhanot Publishers, Madhya Pradesh, India.

2 Davidson H. Hamer, Jeffrey K. Griffiths, James H Maguire, 2010, "Public Health and Infectious Diseases", Elsevier Academic Press, United States.

References

1 Robert S Burlage, 2012, "Principles of Public Health Microbiology", Jones and Bartlett Publishers, United States.

2 Michael P Doyle and Robert L. Buchanan, 2013, "Food Microbiology: Fundamentals and Frontiers", 4th Edition, ASM Press, San Francisco.

3 Michael Pelczar, 2001, "Microbiology", 5th Edition, Mc Graw Hill Book Company, New York, United States.

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

193MB1ASSA	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.

193MB1ASSB	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 Jershey.
4. Frazier WC and Westhoff DC, 2008, "Food Microbiology", 4th Edition, McGraw Hill, New York.

191TLIA3AA	பகுதி – 4 : அடிப்படைத்தமிழ்தாள் : 1(Basic Tamil)	SEMESTER III

Total Credits: 2

Total Instruction Hours: 24 h

இளங்கலை 2019–20ஆம் கல்வியாண்டு முதல் சேர்வோர்க்குரியது (10 மற்றும் 12 – ஆம் வகுப்பு வரை தமிழ் மொழிப்பாடம் பயிலாதவர்களுக்கு) (பருவத் தேர்வு உண்டு)

அலகு : 1 தமிழ் மொழியின் அடிப்படைக் கூறுகள் 12 h

அ) எழுத்துகள் அறிமுகம் :

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

ஆ) சொற்களின் அறிமுகம்: பெயர்ச்சொல், வினைச்சொல் – விளக்கம் (எ.கா.)

அலகு : 2 குறிப்பு எழுதுதல் 12 h

1. பெயர், முகவரி, பாடப்பிரிவு , கல்லூரியின் முகவரி
2. தமிழ் மாதங்கள்(12), வாரநாட்கள்(7),
3. எண்கள் (ஒன்று முதல் பத்து வரை), வடிவங்கள், வண்ணங்கள்
4. ஊர்வன, பறப்பன, விலங்குகள், மனிதர்களின் உறவுப்பெயர்கள்
5. ஊர்களின்பெயர்கள் (எண்ணிக்கை 10)
6. பயிற்சிப் பகுதி (உரையாடும் இடங்கள்) : வகுப்பறை, பேருந்து நிலையம், சந்தை

வினாத்தாள் அமைப்பு முறை - மொத்த மதிப்பெண்கள் - 50

பகுதி –அ

சரியான விடையைத் தேர்வு செய்தல் 10x2=20

பகுதி –ஆ

அரைப்பக்க அளவில் விடையளிக்க 03x5=15

பகுதி-இ

இரண்டு பக்க அளவில் விடையளிக்க 01x15=15

குறிப்பு:

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

Text Books

1 அடிப்படைத் தமிழ். 2019. தொகுப்பு : தமிழ்த் துறை, டாக்டர் என். ஜி.பி. கலை மற்றும் அறிவியல் கல்லூரி, நியூ செஞ்சுரி புக் ஹவுஸ்(பி)லிட். சென்னை

References

1 ஒன்றாம் வகுப்பு பாடநூல் - தமிழ்நாடு அரசு பாடநூல் கழகம்

2 வலைதள முகவரி : http://tamilvu.org

191TLIA3AB	பகுதி – 4 : சிறப்புத் தமிழ் தாள் : 1 **(Advanced Tamil)**	**SEMESTER - III**

Total Credits: 2

Total Instruction Hours: 24 h

இளங்கலை 2019– 2020 ஆம் கல்வியாண்டு முதல் சேர்வோர்க்குரியது (10 மற்றும் 12 – ஆம் வகுப்புகளில் தமிழ் மொழிப்பாடம் பயின்றவர்களுக்கு உரியது)(பருவத் தேர்வு உண்டு)

அலகு – 1 மரபுக் கவிதைகள் 05 h

அ) பாரதியார் கவிதைகள்

- தமிழ்நாடு
- மனதில் உறுதி வேண்டும்
- வருகின்ற பாரதம் (பா.எண்.5-8)

ஆ) பாரதிதாசன் கவிதைகள்

- இன்பத்தமிழ்
- நீங்களே சொல்லுங்கள்
- வாளினை எடடா!

இ) தாராபாரதி கவிதைகள்

- வேலைகளல்ல வேள்விகள்

அலகு – 2 புதுக்கவிதைகள் 05 h

- கம்பன் கவியரங்கக் கவிதை - மு.மேத்தா
- தமிழா! நீ பேசுவது தமிழா! - காசியானந்தன்
- நட்புக் காலம் (10 கவிதைகள்) - அறிவுமதி கவிதைகள்

அலகு – 3 இலக்கணம் 04 h

- வல்லினம் மிகும் மற்றும் மிகா இடங்கள்
- ர, ற,- ல, ழ, ள - ந, ண, ன - ஒலிப்பு நெறி, பொருள் வேறுபாடு அறிதல்

அலகு – 4 கடிதங்கள் எழுதுதல் 05 h

- பாராட்டுக் கடிதம்
- நன்றிக் கடிதம்
- அழைப்புக் கடிதம்
- அலுவலக விண்ணப்பங்கள்

அலகு – 5 பாடம் தழுவிய வரலாறு 05 h

- பாரதியாரின் இலக்கியப் பணி
- பாரதிதாசனின் இலக்கியப்பணி
- மரபுக்கவிதை, புதுக்கவிதை - விளக்கம்

வினாத்தாள் அமைப்பு முறை - மொத்த மதிப்பெண்கள் - 50

பகுதி –அ	
சரியான விடையைத் தேர்வு செய்தல்	10x1=10
பகுதி –ஆ	
அரைப்பக்க அளவில் விடையளிக்க	05x3=15
பகுதி-இ	
இரண்டு பக்க அளவில் விடையளிக்க	05x5=25

குறிப்பு:

- பகுதி –அ அனைத்து அலகுகளில் இருந்தும் இரண்டு வினாக்கள் அமைதல் வேண்டும்
- பகுதி ஆ மற்றும் இ –க்கான வினாக்கள் இது அல்லது அது என்ற அடிப்படையில் அந்தந்த அலகுகளில் அமைதல் வேண்டும்

Text Books

1 சிறப்புத் தமிழ் . 2019. தொகுப்பு : தமிழ்த் துறை, டாக்டர் என். ஜி.பி. கலை மற்றும் அறிவியல் கல்லூரி, நியூ செஞ்சுரி புக் ஹவுஸ்(பி)லிட். சென்னை

References

1 புலவர் சோம. இளவரசு - 2014. இலக்கிய வரலாறு, மணிவாசகர் பதிப்பகம், சென்னை – 108

2 வலைதள முகவரி : http://tamilvu.org

195CR1A3AA	WOMEN'S RIGHTS	SEMESTER III

Total Credits: 2

Total Instruction Hours: 24h

Syllabus

Unit I **Rights to Infant & Child** 4 h

Issues for women in India- Law relating to Female infanticide-Rights to the survival of a child-Child Labour- Child trafficking –Child Marriage- Protection of Children against Sexual Offences Act 2012 (POCSO)

Unit II **Rights to women** 5 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

Unit III **Laws for Senior Citizen women** 5 h

Constitutional Rights –Personal Laws- The Tamil Nadu Maintenance and Welfare of Parents and Senior Citizens Rules in 2009- The National Council for Older person- Government Provisions for elderly persons

Unit IV **Civil and Political Rights of Women** 5 h

Right of inheritance-Right to live with decency and dignity-The Married women's Property Act 1874-Personl law 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

Unit V **International convention on Womens' Right** 5 h

Convention on the Elimination of All Forms of Discrimination against Women(CEDAW)-United Nations population Fund(UNFPA)-Protocol to the African Charter on the rights of women in Africa-Convention on the Nationality of Married women-Convention on the political rights of women- Inter-American convention on granting of civil and political rights for women-Universal declaration of Human rights

Text Books

1 Women & Law(2009)-Krishna Pal Malik-Allahabad Law University, Delhi

References

1 Women's Human Rights in India(2019)-Christian Foster and Jaya Sagade- Routledge India

2 Justice for Women: Concerns and Expressions (2008)-Anand AS –Universal Law Publishing Co.

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Fourth Semester										
Part - I										
191TL1A4TA 191TL1A4HA 191TL1A4MA 201TL1A4FA	Language - I	Tamil-IV/ Hindi-IV/ Malayalam- IV/ French – IV	3	1	-	3	25	75	100	3
Part - II										
191EL1A4EA	Language - II	English - IV	3	-	1	3	25	75	100	3
Part - III										
193MB1A4CA	Core	Immunology	3	1	-	3	25	75	100	3
193MB1A4CB	Core	Bioinstrumentation	3	-	-	3	25	75	100	3
193MB1A4CP	Core Practical	Immunology and Bioinstrumentation	-	-	5	9	40	60	100	2
192MT1A4IC	IDC	Mathematics	3	-	-	3	25	75	100	3
193MB1A4SA	SEC	Quality Assurance in Microbiology	3	-	-	3	25	75	100	3
	GE		2	-	-	3	-	50	50	2
	LoP	Lab on Project	-	-	-	-	-	-	-	-
Part - IV										
191TL1A4AA 191TL1A4AB 192PY1A4AA	AECC	Basic Tamil / Advanced Tamil/ General Awareness	2	-	-	3	-	50	50	2
Total			**22**	**2**	**6**				**800**	**24**

BoS Chairman/HoD 29/12/21,
Department of Microbiology
Dr. N. G. P. Arts and Science College
Coimbatore – 641 048

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

B.Sc. Microbiology (Students admitted during the AY 2020-21)

Course Code	Course Name	Category	L	T	P	Credit
191TL1A4TA	பகுதி-1: தமிழ் - தாள்- IV	மொழி	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- மொழிப்பாடங்களின் வாயிலாகத் தமிழரின் பண்பாடு , 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) – மாணவனின் செயலாக்கத்திறனை ஊக்குவித்தல்	K1,K2 & K3
CO2	மதிப்புக்கல்வி (Attitude and Value education)	K2,K4
CO3	பாட இணைச்செயல்பாடுகள் (Co-curricular activities)	K2,K3 & K4
CO4	சூழலியல் ஆக்கம் (Ecology)	K4
CO5	மொழி அறிவு (Tamil knowledge)	K5

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

191TLIA4TA	பகுதி-1: தமிழ் - தாள்- IV	SEMESTER IV

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I **எட்டுத்தொகை** 10 h

1. இலக்கிய வரலாறு - எட்டுத்தொகை நூல்கள்
2. 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 :9 – பெருங்கடுங்கோ

2. அகநானூறு – மருதத்திணை

I.பா.எண் : 86 – நல்லாவூர்கிழார்

குறிஞ்சித் திணை

I.பா.எண் :198 – பரணர்

2. 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. இலக்கிய வரலாறு - பத்துப்பாட்டு நூல்கள்

2. பட்டினப் பாலை – கடியலூர் உருத்திரங் கண்ணனார்

Unit IV **புதினம்** 10 h

1. புதினத்தின் தோற்றமும் வளர்ச்சியும்
2. புதினம்

1.புத்துமண் –- சுப்ரபாரதிமணியன்

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

I.இலக்கணம்

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

II.பயிற்சிப் பகுதி

புதினத் திறனாய்வு – கொங்கு வட்டாரப் புதினங்கள்

1. நாகம்மாள் – ஆர். சண்முகசுந்தரம்
2. மானாவாரி மனிதர்கள் – சூர்யகாந்தன்
3. ஈரம் கசிந்த நிலம் – சி. ஆர். ரவீந்திரன்
4. ஒண்டிக்காரன் பண்ணையம் – மா. நடராசன்

Note: பயிற்சிப் பகுதியில் வினாக்கள் அமைத்தல் கூடாது

Text Books

செய்யுள் திரட்டு - மொழிப் பாடம் - 2020- 21

1 தொகுப்பு: தமிழ்த்துறை, டாக்டர் என்.ஜி.பி. கலை அறிவியல் கல்லூரி, வெளியீடு : நியூ செஞ்சுரி புக் ஹவுஸ், சென்னை – 600 098.

2 சுப்ரபாரதிமணியன், முதற் பதிப்பு -2019, புத்துமண் புதினம் – நியூ செஞ்சுரி புக் ஹவுஸ், சென்னை – 600 098. (Unit-IV)

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 தமிழ் இணையக் கல்விக்கழகம்.http://www.tamilvu.org/

Course Code	Course Name	Category	L	T	P	Credit
191TL1A4HA	Part- I : HINDI - Paper-IV	Language	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- To develop the writing ability and develop reading skill.
- To learn various concepts and techniques for criticizing literature, to learn 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	S	M	M	M	S
CO2	S	M	M	M	S
CO3	S	M	S	M	S
CO4	S	M	S	M	S
CO5	S	M	S	M	S

S Strong M Medium L Low

191TL1A4HA	Part- I : HINDI - Paper-IV	SEMESTER IV

Total Credits: 03

Total Instruction Hours: 48 h

Syllabus

Unit I — 10 h

नाटक – लडाई – सर्वेश्वरदयाल सक्सेना

प्रकाशक: वाणी प्रकाशन

21-A, दरियागंज

नई दिल्ली-110002

Unit II — 10 h

एकांकी: एकांकी पंचामृत – डॉ राम कुमार

(भोर और तारा छोड़कर)

प्रकाशक: जवाहर पुस्तकालय

सदर बाजार, मथुरा

उत्तर प्रदेश-281001

Unit III — 10 h

काव्य मंजरी- (डा मुन्ना तिवारी)

मैथिलीशरण गुप्त- मनुष्यता, जयशंकर प्रसाद- बीती विभावरी जागरी

सूर्यकान्त त्रिपाठी निराला- तोडती पत्थर और भिक्षुक

Unit IV — 10 h

सूचना लेखन

पुस्तक: व्याकरण प्रदिप – रामदेव

प्रकाशक: हिन्दी भवन 36 इलाहाबाद-211024

Unit V — 08 h

अनुवाद अभ्यास-III (केवल अंग्रेजी से हिन्दी में)

(पाठ 10 to 20)

प्रकाशक: दक्षिण भारत प्रचार सभा चेनैई -17

Course Code	Course Name	Category	L	T	P	Credit
191TL1A4MA	Part- I : MALAYALAM - Paper-IV	Language	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- To develop the writing ability and develop reading skill.
- To learn various concepts and techniques for criticizing literature, to learn 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	S	M	M	M	S
CO2	S	M	M	M	S
CO3	S	M	S	M	S
CO4	S	M	S	M	S
CO5	S	M	S	M	S

S Strong M Medium L Low

191TL1A4MA	Part- I : MALAYALAM - Paper-IV	SEMESTER IV

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I 10 h

Drama

Unit II 10 h

Drama

Unit III 10 h

Drama

Unit IV 10 h

Screen Play

Unit V 08 h

Screen Play

Text Books

1. Manju Poloru Penkutty, Screen Play By Kalavoor Ravikumar, Published by DC.Books, Kannur.
2. Lankalakshmi, Drama By C.N.Sreekandan Nair Published by D C.Books Kottayam

Course Code	Course Name	Category	L	T	P	Credit
201TL1A4FA	Part- I : **FRENCH-** Paper-IV	**Language**	**3**	**1**	**-**	**3**

PREAMBLE

This course has been designed for students to learn and understand

- To Acquire Competence in General Communication Skills – Oral + Written – Comprehension & Expression.
- To Introduce the Culture, life style and the civilization aspects of the French people as well as of France.

  To help 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	To learn the adjectives and the classroom environment in France	K2
CO3	Learn the Plural, Articles and the Hobbies.	K3
CO4	To learn the Cultural Activity in France	K3
CO5	To learn 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	S	M	M	M	S
CO2	S	M	M	M	S
CO3	S	M	S	M	S
CO4	S	M	S	M	S
CO5	S	M	S	M	S

S Strong M Medium L Low

201TL1A4FA	Part- I : FRENCH- Paper-IV	SEMESTER IV

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I **Cœur et santé** 10 h

• Author du Couple	• INTERACTION ORALE: Exprimer son intérêt pour quelqu'un, exprimer l'affection • RECEPTION ORALE: Comprendre une chanson • RECEPTION ÉCRITE: Lire un horoscope • PRODUCTION ÉCRITE: Écrire une letter au courrier du cœur	• J'étais…L'imparfait(1) • Aussi brilliant que… • Le plus beau, le moins cher • Le verbe connaître

Unit II **Problémes problems** 10 h

• Le bénvolat	• INTERACTION ORALE: Interroger sur la tristesse, I'abattement, exprimer sa sympathie, rassurer • RÉCEPTION ORALE: Comprendre une interview à la radio • RECEPTION ÉCRITE: Comprendre un test de magazine • PRODUCTION ÉCRITE: Écrire une letter a un(e) amie	• Les pronoms indfinis rien, quelque chose • Le verbe crier • Du pluriel: eau, eu, al • Se soigner, s'excuser, se renseigner, s'appeler • La phrase ngative: ne… plus, ne… jamais, ne… rien, ne… personne

Unit III C'est qui? C'est comment? 10 h

• Les classes socials	INTERACTION ORALE: Décrire quelqu'un RECEPTION ORALE: Comprendre un bulletin météo RECEPTION ÉCRITE: Comprendre une courte interview PRODUCTION ÉCRITE: Écrire des notices biographiques	• Les adjectifs qualificatifs: Formes au masculin et au féminin • ll fait beau, il neige, il pleut… • Le verbe décrier • Les verbs en –indre • Les adjectifs possessifs féminins mon, ton, son devant voyelle ou h

Unit IV Et après? Et après 10 h

• La mémoire et l'histoire	• INTERACTION ORALE: Raconter une anecdote, une histoire, attire l'attention • RÉCEPTION ORALE: Comprendre une interview à la radio • RÉCEPTION ÉCRITE: Comprendre des faits divers • PRODUCTION ÉCRITE: Écrire une bréve	• L'imparfait(2) • Les verbs en – oir • Les pronoms démonstratifs ça et cela • Prés de… Loin de… • La forme passive

Unit V Dialogue writing 08 h

a) Les Courses
b) A La Banque
c) Ecole
d) Professions
e) Bijoux

Text Books

1. *Marcella Di Giura Jean-Claude Beacco,* **Alors II. Pages 88 – 162,** Goyal Publishers Pvt Ltd 86, University Block ,Jawahar Nagar (Kamla Nagar), New Delhi – 110007.
2. *French Made Easy by Rashmi Varma, Goodwill Publishing House, New Delhi* – 110 008.

Course Code	Course Name	Category	L	T	P	Credit
191EL1A4EA	ENGLISH- IV	LANGUAGE	4	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The basics of English grammar and specific usages
- 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	Learn English grammar and its specific usage	K2
CO2	Know the ways of improving English language vocabulary	K3
CO3	Understand the importance of English language in competitive exams	K3
CO4	Acquire the basic needs of communication skills and methods	K3
CO5	Comprehend the composition writing and similar skills	K4

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

191EL1A4EA	ENGLISH- IV	SEMESTER IV

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I Grammar 10 h

The use of correlatives - The perfect tense - appended questions - the infinitive - negative verbs - redundant conjunctions - use of make and do - fairly and rather

Unit II Vocabulary 10 h

Words and contextual uses - Synonyms - Antonyms - Add one out - inflectional - infix- telescoping - loanwords - British and American words - Thesaurus

Unit III Language Use 08 h

Spotting Errors - Words often confused - Reconstructing a Passage - Clause - Idioms and colloquialism - Language aptitude - Clipping

Unit IV Communication 11 h

Different Types of Asking - Oral rehearsal - Describing person, Diagram, Data, Table - Vote of thanks - Small talk - Refusal and Apology

Unit V Composition 09 h

General Essay writing - Mind map - Reviews - Title expansion - Creative writing - Content writing - Translation - Abstracting - Flash Fiction

Text Books

1 Wood F.T. 2010. A Remedial Grammar for Foreign Students. Macmillan Publishers, India. [Unit I and II]

2 Bhatnagar R.P. 2013. English for Competitive Examinations. 3rd Edition. Trinity Press, New Delhi. [Unit III, IV and V]

References

1 Radhakrishna Pillai G. 2000. English for Success. Emerald Publishers, Chennai.

2 Krishnaswamy N. 2000. Modern English a Book of Grammar Usage and Composition. Macmillan Publishers, India.

3 Arulselvi Evangelin. 2012. Teaching of Special English. Saratha Pathippagam, Chennai.

4 Rawdon Wyatt. 2008. Check Your Vocabulary for TOFEL. Macmillan Publishers, India.

Course Code	Course Name	Category	L	T	P	Credit
193MB1A4CA	IMMUNOLOGY	CORE	3	1		3

PREAMBLE

This course has been designed for students to learn and understand

- About 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.Recognise the importance of cell and organs of the immune system.	K2
CO2	Define the cellular pathways of humoral/cell- mediated adaptive responses.	K3
CO3	Compare the four types of hypersensitivity for the Immunologic mechanism involved.	K3, K4
CO4	Detailed knowledge in diagnostic and therapeutic techniques and research.	K3
CO5	Understand the consequences of general types of immunodeficiency diseases and organ transplantation.	K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193MB1A4CA	IMMUNOLOGY	SEMESTER IV

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I History and Scope of Immunology: 9 h

History and Scope of Immunology. The basis of defense mechanisms. Cells and Organs involved in immune system.

Unit II Types of immunity: 9 h

Types of immunity, Antigen and Antibody types, Complement pathways - Classical, alternate and lectin pathway. 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: Double Immuno Diffusion. ELISA. Radio immune assay (RIA). Monoclonal antibodies and its applications.

Unit V Immuno hematology: 10 h

Immuno hematology - Blood transfusion - ABO grouping - Rh factor. Tissue transplantation - HLA typing - Mechanism of acceptance and rejection. Immunodeficiency disease: AIDS.

Text Books

1 Nandhini Shetti, 2009, "Immunology - an Introductory Text Book", 1st Edition, New Age International Ltd, New Delhi.

2 Tizard I R, 1998, "Immunology an Introduction", 4th Edition, Thomson publishers, Australia.

References

1 Roitt I M, 2011, "Immunology", 1st Edition, Mosboy Publishers, USA. .

2 Kuby J, 2002, "Immunology", 5th Edition, W.H.Freeman publishers, New York.

3 Rao C V, 2002, "An Introduction to Immunology", Narosa Publishing House, Chennai.

Course Code	Course Name	Category	L	T	P	Credit
193MB1A4CB	BIOINSTRUMENTATION	CORE	3			3

PREAMBLE

This course has been designed for students to learn and understand

- Concept of buffers, pH and biochemical calculations
- Instrumental aspects in microbiology
- 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	Describe the properties of Buffers. Calculate different concentration units of solutions. Understand the working principle of pH electrodes. Determine the pH of samples using pH meter.	K2
CO2	Demonstrate the use of instruments to maintain sterility and aseptic transfer of microbial cultures. Use of instruments to preserve microorganisms. Use of instruments to mix and blend substances.	K3
CO3	Understand the core principles of Centrifugation. Describe the features and components of major types of centrifuges. Illustrate how centrifugation methods are utilized for bioanalysis.	K2
CO4	Estimate the concentration of an unknown colored solution using colorimetry. Explain the basic principles of spectrophotometer. Demonstrate how to measure concentration by a UV Visible spectrophotometer.	K3, K4
CO5	Become familiar with fundamental concepts of chromatography and their role in achieving separations across different types of chromatography. Develop the core skills and identify the key factors influencing in Electrophoresis.	K2, K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193MB1A4CB	BIOINSTRUMENTATION	SEMESTER IV

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I pH Meter 8 h

Definitions –Solute, Solvent, Molarity, Molality, Normality. Buffers - Types of Buffers. Preparation of solutions - Molarity and Normality- Calculation methods. pH meter - Instrumentation - pH electrodes - calomel and glass electrode – Applications.

Unit II Instruments for sterilization 7 h

Principle, Instrumentation, and Applications of Autoclave, Hot air oven, Incubator, Laminar air flow, metabolic shaker, Lyophilizer. Biosafety cabinets – Introduction and types.

Unit III Centrifugation 7 h

Centrifugation: Principle- Types of Centrifuges –Low speed, High speed, Microfuge-Ultra centrifuge- Analytical and Differential Centrifuge- Applications. Types of rotors.

Unit IV Spectrophotometer 7 h

Colorimetry- Principle, Instrumentation and Applications- Spectrometry – UV & Visible Spectrophotometer. Spectrofluorimeter.

Unit V Chromatography 7 h

Chromatography– Paper, Thin layer, Column, Ion-exchange, Gas and HPLC. Electrophoresis –SDS – PAGE and Agarose gel electrophoresis.

Text Books

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

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

References

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

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

3 Swahney S K, Singh R, 2014, "Introductory Practical Biochemistry", 5th Edition, Narosa Publisher, India

4 Gedder , A. and L. E. Balser, 1989, "Principles of applied Biomedical instrumentation" John Wiley and Sons Publications, India

193MB1A4CP	CORE PRACTICAL IV: IMMUNOLOGY AND BIOINSTRUMENTATION	SEMESTER IV

Total Credits: 2
Total Instructions Hours: 60 h

S.No	List of Experiments
1	Slide agglutination -Blood grouping
2	Tube agglutination- WIDAL
3	Precipitation – Ouchterlony's Immunodiffusion
4	Flocculation – RPR
5	Preparation of Buffers-Acidic, neutral and alkaline range
6	Measurement of pH -pH meter
7	Extraction and quantification of Pigments from Plants
8	Density Gradient Centrifugation – Sucrose Gradient
9	Estimation of Protein-Lowry et al method
10	Estimation of sugars-DNSA method
11	Separation of amino acids-Paper Chromatography
12	Separation of amino acids-Thin Layer Chromatography

Note: Out of 12 Experiments 10 can be performed.

References

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

2 James C Cappuccino, 2013, "Microbiology A laboratory manual" 1st edition, Pearson education publishers.

3 Rajan S, and Selvi Christy, "Experimental Procedures in Life Sciences," Anjana book House.

4 Kannan N, 1997, "Laboratory Manual of General Microbiology", 2nd edition, Panima Publications.

Course Code	Course Name	Category	L	T	P	Credit
192MT1A4IC	MATHEMATICS	IDC	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- Concept of data collection and probability distribution
- Parametric and non-parametrictest
- Concepts of matrices

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Discuss the basics of data collection	K2
CO2	Explain the concept of probability distribution	K2
CO3	Apply the concept of chi square test and t-test	K3
CO4	Demonstrate the concept of Presentation of Biometric data	K3
CO5	Explain the concept of matrices	K2

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

192MT1A4IC	MATHEMATICS	SEMESTER IV

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Collection of data 7 h

Numerical Representation - Census and sampling methods of data collection - census method - Necessity of sampling - Types of sampling methods - Nonrandom or non-probability sampling.

Unit II Probability Distribution 7 h

Probability distribution - Observed and Theoretical distribution - Binomial distribution - Continuous probability distribution - Normal distribution - Kurtosis.

Unit III Student's t- test and Chi- Square test 7 h

Introduction - Parametric and non parametric test - student's t test - Assumption for t- test - degree of freedom - Types of t- test - t -test for single mean.

Chi-Square test: Introduction - Definition - Formula for determination of Chi square.

Unit IV Presentation of Biometric data 7 h

Presentation of data - Tabular presentation of data - Graphic presentation of data - Types of graph - Line Diagrams - Histograms - Frequency Polygon - Kite diagram - Stems and leafs display - Frequency curve or Ogive - Scatter or dot diagram.

Unit V Matrices 8 h

Kind of Matrices - Symmetric matrix - Skew Symmetric matrix - Hermitian Matrix - Skew Hermitian Matrix - Orthogonal Matrix - Unitary Matrix - Rank of a Matrix - Echelon form - Vectors - Linear dependence and linear independence of vectors.

Note: Theory 40% and problem 60%

Text Books

1 Veer Bala Rastogi., 2011, "Fundamental of Bio-Statistics", 2nd Edition, Ane Books Pvt. Ltd, New Delhi(Unit I to IV)

2 Duraipandian P and Udhayabaskaran S, 2014, "Allied Mathematics-Volume I", S. Chand and Company Pvt. Ltd., New Delhi(Unit-V)

References

1 Daniel W.W, 2013, "Biostatistics: A foundation for analysis in the health Sciences", 10th Edition., Jhon Wiley and sons Inc.ISBN-13: 978-1118302798

2 Parabhakara G.N., 2006, "BioStatistics", 1st Edition, Medical Publishers Pvt. Ltd., New Delhi.

3 Annadurai B., 2015, "A Text Book of Bio Statistics", 1st Edition, New Age International Pvt. Ltd., New Delhi

4 Manichavasagam Pillai T.K and Narayanan S., 2002, "Algebra", Viswanathan Publishers and Printers Pvt. Ltd

Course Code	Course Name	Category	L	T	P	Credit
193MB1A4SA	QUALITY ASSURANCE IN MICROBIOLOGY	SEC	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- To understand the quality assurance in microbiology laboratory.
- To inculcate the role of quality assessment in diagnostic procedures.
- To motivate the significance of quality management and standards.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Knows the definition of quality assurance, able to design microbiology laboratory and control of quality.	K2
CO2	Understands the quality assessment of laboratory environments and able to maintain records and reports.	K2
CO3	Importance of quality assessment in sterilization and disinfection, preservation and quality control of media and stains.	K2
CO4	Elucidates the quality assessment of disposal on decontaminated matters and gains knowledge o=n biological references and standards.	K2
CO5	Clearly able to categorize good laboratory practices with management.	K2

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193MB1A4SA	QUALITY ASSURANCE IN MICROBIOLOGY	SEMESTER IV

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Quality assurance and its applications 7 h

Quality assurance – Introduction and overview – Definition. Designing of microbiology laboratory – Control of quality – Applications.

Unit II Quality assessment and Quality management 7 h

Quality assessment of Equipments, chemicals, glass wares and laboratory environments – Variance – Quality control calculations – Quality management – Maintenance of records and reports.

Unit III Quality assurance in sterilization and Quality control 6 h

Quality assurance in sterilization and disinfection - Preservation of stock cultures, media and diagnostic kits – Quality control of media and stains.

Unit IV Quality assessment of disposal Quality management 8 h

Quality assessment of disposal – decontaminated matters and other biological effluents – Quality management in transportations of cultures. National control of biologicals – Biological references and standards.

Unit V Good laboratory practices and microbial standards 8 h

Good laboratory practices – Management of laboratory hazards and knowledge in First aid procedures. HACCP for Food Safety and Microbial Standards No. of Hours: 4 Hazard analysis of critical control point (HACCP) - Principles, flow diagrams, limitations Microbial Standards for Different Foods and Water – BIS standards for common foods and drinking water.

Text Books

1 Philip Kotler, R, 2014, "Quality assurance of pharmaceuticals: A compendium of guidelines and related materials" ,Volume 2. Prentice Hall, Delhi.

2 W.B.Hugo & A.D.Russel, 2007, "Pharmaceutical Microbiology", 4th Edition, Blackwell Scientific Publications, New Jersey.

References

1 Rajesh Bhatia and Rattan lalIchhpujani, 1995, "Quality assurance in Microbiology" Ist Edition, CBS Publishers & Distributors, India.

2 Baird RM, Hodges NA and Denyer SP, 2019, "Handbook of Microbiological Quality control in Pharmaceutical and Medical Devices", CRC Press, USA.

3 Dr Norman Hodges and Professor Geoffrey Hanlon (University of Brighton), 2013, "Industrial Pharmaceutical Microbiology,Vol & Vol II: standards & Controls", Wiley - Blackwell Publication, New Jersey.

4 Madigan M.T. 2017. "Brock Biology of Microorganisms", 14th Edition. Pearson-Prentice Hall, USA.

193MB1A4GA	GENERIC ELECTIVE : FOOD MICROBIOLOGY	SEMESTER IV

Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I Importance of microbes in food 5 h

Food and Microorganisms – Important microorganisms in food (Bacteria, Mold and yeasts); Factors affecting the growth of microorganisms in food – pH, moisture, oxidation – Reduction potential, Nutrient content and Inhibitory substances and biological structure.

Unit II Microbiology in Food Sanitation and waste treatment disposal 5 h

Microbiology in Food Sanitation – Bacteriology of Water – Sewage and waste treatment Disposal – Microbiology of Food Product – Good Manufacturing Practices – Hazard Analysis – Critical Control Points – Health of Employees.

Unit III Spoilage of food 4 h

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

Unit IV Fermented food and dairy products 4 h

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

Unit V Food borne diseases and outbreaks 6 h

Food borne diseases – Food poisoning - Bacterial and Non- Bacterial. Microbial quality and safety – Determining microorganisms in food culture, Microscopy and sampling methods – Chemical and immunological methods - Food borne infections –Bacterial and Mycotoxins- Investigation of food poisoning outbreaks.

Text Books

1. Frazier. W.C and Westhoff. D.C, 1978, "Food Microbiology", 3rd edition, Tata Macgraw Hill publishing Co., New Delhi.
2. Adams M.R. and Moss M. O., 2000, "Food Microbiology" 2nd Edition, Panima Publishers, New Delhi.

References

1. Roger Y Stainer, 2003, "Basic Food Microbiology", 2nd Edition, CBS Publishers, India.
2. Jay J M, 1991, "Modern Food Microbiology", 4th Edition,Van Nostra And Rainhokdd Co, USA.
3. Dubey R C, and Maheswari D K, 2013, "A Textbook of Microbiology", 1st Edition, S. Chand Publishing.New Delhi.

191TL1A4AA	பகுதி – 4 : அடிப்படைத்தமிழ் - தாள் : II (Basic Tamil)	SEMESTER IV

Total Credits: 2

Total Instruction Hours: 24 h

இளங்கலை 2019–20ஆம் கல்வியாண்டு முதல் சேர்வோர்க்குரியது

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

(பருவத் தேர்வு உண்டு)

அலகு : 1 12 h

நீதி நூல்கள்

I.ஆத்திசூடி - "அறம் செய விரும்பு" முதல் "ஔவியம் பேசேல்"வரை -12 பாடல்கள்

II.கொன்றைவேந்தன் - "அன்னையும் பிதாவும் முன்னறி தெய்வம்" முதல்

"எண்ணும் எழுத்தும் கண் எனத் தகும்" வரை -7 பாடல்கள்

III.திருக்குறள் - 6 பாடல்கள்

1. அகர முதல 1
2. மனத்துக் கண்.....34
3. இனிய உளவாக 100
4. தீயவை தீய பயத்தலான்.....202
5. கற்க கசடற 391
6. கண்ணொடு கண்ணினை.....1100

அலகு : 2 12 h

I. எளிய நீதிக்கதைகளும் வாழ்க்கை முறைகளும்

1. நீதிகாத்த மன்னன்
2. சிங்கமும் முயலும்
3. புத்திசாலி உழவனும் போக்கிரிப் பூதமும்
4. தேனீயும் புறாவும்
5. முயல் கூறிய தீர்ப்பு

II. தமிழகப் பண்பாடுகள்

1. தமிழர் விழாக்கள் - பொங்கல், ஆடிப்பெருக்கு
2. தமிழர் கலைகள் - தெருக்கூத்து, ஓவியம், சிற்பம்
3. தமிழர் விளையாட்டுகள்- ஏறுதழுவுதல், சடுகுடு

III . பயிற்சிப் பகுதி

1. படத்திற்கு ஏற்ற சொற்களை எழுதுதல்.
2. சொற்களைத் தொடராக்குதல்.
3. பொருத்துதல்,
4. உரையாடல் பகுதி

Note: பயிற்சிப் பகுதியில் வினாக்கள் அமைத்தல் கூடாது

வினாத்தாள் அமைப்பு முறை - மொத்த மதிப்பெண்கள் - 100

பகுதி – அ

சரியான விடையைத் தேர்வு செய்தல் 10x2=20

பகுதி – ஆ

சரியா? தவறா? தேர்ந்தெடுத்து எழுதுக . 10x2=20

பகுதி - இ

ஒரு பக்க அளவில் விடையளிக்க 03x20=60

குறிப்பு:

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

Text Books

1 அடிப்படைத்தமிழ் - 20-21. தொகுப்பு : தமிழ்த்துறை , டாக்டர் என்.ஜி.பி. கலை அறிவியல் கல்லூரி, நியூ செஞ்சுரி புக் ஹவுஸ்(பி)லிட். சென்னை-600 098

References

1 ஒன்றாம் வகுப்பு பாடநூல் - தமிழ்நாடு அரசு பாடநூல் கழகம்

2 வலைதள முகவரி : http://tamilvu.org

191TL1A4AB	பகுதி – 4 : சிறப்புத்தமிழ் - தாள் : II (Advanced Tamil)	SEMESTER - IV

Total Credits: 2

Total Instruction Hours: 24 h

இளங்கலை 2019– 2020 ஆம் கல்வியாண்டு முதல் சேர்வோர்க்குரியது

(10 மற்றும் 12 – ஆம் வகுப்புகளில் தமிழ் மொழிப்பாடம் பயின்றவர்களுக்கு உரியது

(பருவத் தேர்வு உண்டு)

அலகு – 1 05 h

திருக்குறள்

I அறத்துப்பால்

1. இனியவை கூறல் - அதிகார எண் : 10
2. அடக்கமுடைமை - அதிகார எண் : 13

II பொருட்பால்

1. கல்வி - அதிகார எண் : 40
2. உழவு - அதிகார எண் : 104

III இன்பத்துப்பால்

1. தகையணங்குறுத்தல் - அதிகார எண் :109
2. பிரிவாற்றாமை - அதிகார எண் : 116

அலகு – 2 05 h

கட்டுரைத் தொகுப்பு

I நல்வாழ்வு - டாக்டர் மு.வரதராசன்

1. நம்பிக்கை
2. புலனடக்கம்
3. பண்பாடு

II இளைஞர்களின் ஒளிமயமான எதிர்காலத்திற்கு - கு.வெ. பாலசுப்பிரமணியம்

1. காலக்கணக்கு
2. நற்பழக்கமே செல்வம்

அலகு – 3 05 h

I காப்பியங்கள் - குறிப்பு எழுதுதல்

1. சிலப்பதிகாரம்
2. மணிமேகலை
3. கம்பராமாயணம்
4. பெரியபுராணம்

II ஊடகம் - காட்சி ஊடகங்கள்

1. தொலைக்காட்சி
2. திரைப்படம்
3. இணையம்
4. முகநூல்
5. கீச்சகம்
6. கட்செவி அஞ்சல்

அலகு – 4 05 h

இலக்கணம் - வழக்கறிதல்

1. இயல்பு வழக்கு
2. தகுதி வழக்கு

அலகு – 5 04 h

I படைப்பாற்றல் பகுதி

கவிதை,கட்டுரை எழுதச்செய்தல் - பொதுத் தலைப்பு

II பயிற்சிப் பகுதி

தமிழில் தட்டச்சு செய்தல் - யூனிகோடு எழுத்துருவில்.

Note: பயிற்சிப் பகுதியில் வினாக்கள் அமைத்தல் கூடாது

வினாத்தாள் அமைப்பு முறை - மொத்த மதிப்பெண்கள் - 100

பகுதி –அ

சரியான விடையைத் தேர்வு செய்தல் 10x2=20

பகுதி –ஆ

கோடிட்ட இடங்களை நிரப்புக 10x2=20

பகுதி –இ

இரண்டு பக்க அளவில் விடையளிக்க 4x15=60

குறிப்பு :

- அனைத்து அலகுகளில் இருந்தும் இரண்டு வினாக்கள் அமைதல் வேண்டும்
- பகுதி இ –க்கான வினாக்கள் இது அல்லது அது என்ற வகையில் அந்தந்த அலகுகளிலிருந்து அமைதல் வேண்டும்.

Text Books

1 சிறப்புத்தமிழ் 20-21. தொகுப்பு : தமிழ்த் துறை , டாக்டர் என்.ஜி.பி. கலை அறிவியல் கல்லூரி, நியூ செஞ்சுரி புக் ஹவுஸ்(பி) லிட். 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 வலைதள முகவரி : http://tamilvu.org

192PY1A4AA	AECC : GENERAL AWARENESS	SEMESTER IV

Total Credits: 2
Total Instructions Hours: 24 h

S.No	Contents
1	Current Events
2	General Science
3	Geography of India
4	Tamil and Other Literature
5	Inventions and Discoveries
6	Numerical and Mental Aptitude
7	Verbal and Non Verbal Reasoning
8	Socio- Culture and Heritage of India
9	Indian Economy and Political System
10	History of India and Freedom Struggle

References

1. Majid Hussain, Arrora N D, 2019, "General Studies -TNPSC Group -I ", G.K.Publications (P) Ltd. New Delhi
2. Aggarwal R S, 2014, "Verbal and Non Verbal Reasoning" S Chand & Company, New Delhi
3. Competition Success Review, Competitive Success Publisher, New Delhi
4. Pratiyogita Darpan, Pratiyogita Darpan Publishers, Agra.

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Fifth Semester										
193MB1A5CA	Core	Medical Bacteriology	4	-	-	3	25	75	100	4
193MB1A5CB	Core	Medical Mycology	4	-	-	3	25	75	100	4
193MB1A5CC	Core	Virology	3	1	-	3	25	75	100	3
193MB1A5CD	Core	Food Microbiology	3	-	-	3	25	75	100	3
193MB1A5CP	Core Practical	Food & Medical Microbiology and Genetics	-	-	6	9	40	60	100	3
193MB1A5SA	SEC	Pharmaceutical Microbiology	3	-	-	3	25	75	100	3
193MB1A5DA	DSE	Microbial Genetics	4	-	-	3	25	75	100	4
193MB1A5DB		Algal Biotechnology	4	-	-	3	25	75	100	4
193MB1A5DC		Microbial Technology	4	-	-	3	25	75	100	4
193MB1A5TA	IT	Industrial Training	**Grade A to C**							
193MB1A5LA	LoP	Lab on Project	-	-	-	-	50	-	50	1
Part - IV										
192MT1A5AA	AECC	Research Methodology	2	-	-	2	50	-	50	2
		Total	**23**	**1**	**6**	**-**	**-**	**-**	**800**	**27**

EXTRA CREDIT COURSES

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

S. No.	Course Code	Course Name
1	193MB1ASSA	Good Laboratory Practices
2	193MB1ASSB	Food Sanitation

Course Code	Course Name	Category	L	T	P	Credit
193MB1A5CA	MEDICAL BACTERIOLOGY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The concept of infections, types and infectious disease process.
- The medically important Gram positive & negative organisms.
- The Bacterial characteristics of important pathogens.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Define the concept of infection, types and infectious disease process	K2
CO2	Classify the morphology, cultural characteristics, and pathogenesis of gram positive cocci.	K3
CO3	Identify and classify the gram positive and negative.	K3
CO4	Infer the morphology, cultural characteristics, and pathogenesis of gram negative rods.	K4
CO5	Demonstrate the importance of Mycobacterium, Spirochete and Leptospira.	K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193MB1A5CA	MEDICAL BACTERIOLOGY	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Infections - sources of infections 10 h

Infections- sources of infections- Types of infections- methods of infections - Definitions- Epidemic, Pandemic, Endemic diseases - Epidemiology of Infectious diseases, Infectious diseases cycle- Investigation of epidemics- control of epidemics. Nosocomial infections.

Unit II Medical Importance of Gram positive & negative coccus 10 h

Morphology, Pathogenicity and laboratory diagnosis- Gram positive & negative coccus - Staphylococcus aureus, Streptococcus pyogenes, Micrococcus, Enterococcus, Pneumococcus, Neisseria gonorrhea and Neisseria meningitidis, Hemophilus influenza, Helicobacter pylori. Legionella.

Unit III Bacterial characteristics of Gram positive organisms 8 h

Morphology, Pathogenicity and laboratory diagnosis- Gram positive organisms- Bacillus anthracis, Corynebacterium diptheriae, Clostridium botulinum, Clostridium tetani, Listeria monocytogenes.

Unit IV Bacterial characteristics of Gram negative bacillus 10 h

Morphology, Pathogenicity and laboratory diagnosis- Gram negative Organisms - Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella, Pseudomonas, Vibrio cholerae.

Unit V Bacterial characteristics of important pathogens 10 h

Morphology, pathogenicity and laboratory diagnosis - Mycobacterium tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira.

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
193MB1A5CB	MEDICAL MYCOLOGY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The concept of history and properties of fungi.
- Infectious disease process and transport.
- Processing and examination of cutaneous, subcutaneous, systemic and opportunistic mycoses.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the history and properties of fungi.	K2,K3
CO2	Understand the fungal culture media to growth pathogenic fungi.	K2, K3
CO3	Describe the morphology, cultural characteristics and pathogenesis of cutaneous and subcutaneous mycosis.	K4
CO4	Understand and describe the morphology, virulent factor and pathogenesis of systemic and opportunistic mycosis.	K3
CO5	Understand the pathogenicity of miscellaneous fungi and pseudo fungal infection and to appraise their laboratory diagnosis.	K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193MB1A5CB	MEDICAL MYCOLOGY	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I History and general properties of fungi 10 h

Unit – I: History and general properties of fungi

Historical overview of mycology. General properties of fungi – morphology, taxonomy, nomenclature and classification of fungi – virulence factors of fungi causing infection.

Unit II Culture media and Mycological techniques 10 h

Types of fungal culture media, fungal reagents and stains, conventional Mycological techniques, antifungal susceptibility testing, quality control, preservation and culture collection of fungi.

Unit III Cutaneous and Subcutaneous Mycoses 10 h

Collection, transport and processing of clinical specimens for detection of superficial cutaneous mycoses-Malasseziosis, Tinea nigra, Piedra and Dermatophytosis. Subcutaneous Mycoses-Mycetoma, Sporotrichosis, Chromoblastomycosis, Phaeohyphomycosis.

Unit IV Systemic and Opportunistic mycoses 10 h

Systemic mycoses – Histoplasmosis, Blastomycosis, Coccidiodomycosis and Paracoccidiodomycosis. Opportunistic mycoses – Candidiasis, Cryptococcosis, Aspergillosis, Pneumocystosis and Miscellaneous opportunistic mycose.

Unit V Miscellaneous Mycoses 8 h

Miscellaneous Mycoses – Oculomycosis, Otomycosis, Allergic fungal disease, mycotoxicoses and mycetismus and mycology laboratory contaminants. Pseudofungal infections – Protothecosis and Chlorellosis, Rhinosporidiosis.

Text Books

1. Jagadish Chander, 2018, "Text Book of Medical Mycology", 4th Edition, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi.
2. Reba Kanungo, 2017, "Ananthanarayan & Panicker's Text book of Microbiology", 10th Edition, Paperback, Orient Black Swan.

References

1. Reiss E. Shadomy H.J. and Lyon G.M, 2011, "Fundamental Medical Mycology", Wiley-Blackwell.
2. Alexopoulus CJ and C. W. Mims, 1996, "Introductory Mycology", 4th Edition, Wiley Eastern Ltd. New Delhi.
3. Reiss E. Shadomy H.J. and Lyon G.M, 2012, "Fundamental Medical Mycology", Wiley-Blackwell.
4. Brooks G., Carrol K.C., Butel J. and Morse S, 2012, "Jawetz Melnick and Adelberg Medical Microbiology", 26th Edition, Lange Medical Publications.

Course Code	Course Name	Category	L	T	P	Credit
193MB1A5CC	VIROLOGY	CORE	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The history and the concept of viral reproduction.
- The life cycle of Bacteriophages and Eukaryotic viruses.
- The infections types, infectious disease process, morphology, pathogenicity and laboratory diagnosis of medically important virus.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Recall the early development of Virology – Virus Morphology.	K2, K3
CO2	Compare the reproduction of DNA phages.	K2
CO3	Distinguish the Lysogeny and its induction of lysogens.	K2, K3
CO4	Discuss the Viruses of Eukaryotes and Categorize the reproduction of animal and plant viruses.	K2, K3
CO5	Understand the process of Human viral Infections.	K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193MB1A5CC	VIROLOGY	SEMESTER V

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I History of Virology: 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 - Cultivation of Viruses - Virus purification and assay.

Unit II Reproduction of DNA phages: 10 h

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

Unit III Lysogeny: 08 h

Temperate bacteriophages, lambda phage, Induction of lysogens, Generation of defective phages and their uses - Reproduction of RNA phages.

Unit IV Viruses of Eukaryotes: 10 h

Reproduction of animal and plant viruses (TMV, CaMV and BMV) - Viruses of Algae, fungi and viruses.

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) - Concepts of oncogenes and proto oncogenes.

Text Books

1. Stainier R.V., Ingraham, J.L., Wheelis, M.L. and Painter P.R, 1986, "The Microbial World", 1st Edition, Printice-Hall of India (Pvt.) Ltd., New Delhi.
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. Luria S.E. Darnel, J.E Jr. Baltimore. D and Campbell A, 1978, "General Virology", 3rd Edition, Wiley and sons.
4. Ananthanarayanan R and CK JayaramPanicker, 2005, "Introduction to Medical Microbiology", 2nd Edition, Orient Longman.

Course Code	Course Name	Category	L	T	P	Credit
193MB1A5CD	FOOD MICROBIOLOGY	CORE	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The types of microorganisms in food, The concept of fermentation and role of microbes in fermentation
- The concept of spoilage of various foods, Discuss on food borne illness and diseases,
- Principles of food preservation and methods of food preservation

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Discuss the list of microorganisms in food– categorize the factors affecting the microbes in food	K2, K3
CO2	Understand the principles and role of microbes in various food fermentation	K2
CO3	Discuss the spoilage of various food products	K2, K3
CO4	Categorize the Bacterial and non bacterial food borne illness and diseases	K4
CO5	Understand the principles of food preservation and various food preservation methods.	K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193MB1A5CD	FOOD MICROBIOLOGY	SEMESTER V

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Microbes in Food: 7 h

Important microbes in food – List of microbes of Bacteria, Molds and Yeats. Factors affecting the growth of Microbes in food –pH, Moisture requirement, Oxidation-Reduction potential, Nutrient contents, Inhibitory substances and Biological structure.

Unit II Fermented Food Products: 7 h

Principles of Fermentation, Fermented food products: Bread, Pickle, Fermented fish and meat products, Fermented dairy products: Yoghurt and cheese, Fermented Beverages: Wine and Beer.

Unit III Contamination and Spoilage: 8 h

Contamination and spoilage of Vegetables and fruits, Meat and meat products, Fish, and sea food, Poultry, Milk and Milk products, Egg, and Canned Foods. Analysis of food samples: Aerobic Plate count, Directed Microscopic Count, Determination of Anaerobic Spore formers and Milk quality test by dye reduction method.

Unit IV Food Borne Diseases: 7 h

Bacterial Food borne diseases: Food poisoning; Clostridium botulinum (Botulism), Staphylococcal aureus (Enterotoxin), Food borne illness: E. Coli, Salmonella, Shigella, Listeria, Campylobacter, Vibrio, Yersinia, Aeromonas and Bacillus. Non Bacterial Food borne diseases : Mycotoxins, Viruses and Parasites

Unit V Food Preservation: 7 h

Principles of food preservation, Methods of food preservation: Asepsis, Removal of Microbes, Under anaerobic Conditions, Use of High temperature (Including canning process), Use of low temperature, Drying, Chemical preservatives, and Radiation.

Text Books

1. Frazier. W.C and D.C Westhoff, 2017, "Food Microbiology", 5th Edition, Tata Macgraw Hill publishing Co., New Delhi.
2. Adams M.R. , Moss M. O., and Peter McClure, 2015, "Food Microbiology", 4th Edition, Royal Society of Chemistry Publishers.

References

1. Bibek Ray, Arunbhunia., 2013, "Fundamental Food Microbiology", 5th Edition, CRS Publishers.
2. James M. Jay, M.J. Listener, A. Golden., 2006, "Modern Food Microbiology", 7th Edition, Springer Publisher.

193MB1A5CP	CORE PRACTICAL V: FOOD, MEDICAL MICROBIOLOGY AND GENETICS	**SEMESTER** V

Total Credits: 3
Total Instructions Hours: 72 h

S.No	Contents
1	Isolation of Bacteria and Fungi from spoiled food
2	Milk quality test – MBRT
3	Bioenzyme production from food waste
4	Processing of clinical samples: Skin, Urine, Pus
5	Isolation and identification of Bacterial pathogens: Staphylococcus aureus, Streptococcus sp., E. Coli, Salmonella, Klebsiella , Pseudomonas, Proteus sp.,
6	Isolation and identification of clinically important fungi: Candida sp., and Aspergillus sp.,
7	Extraction and separation of chromosomal DNA from Bacteria
8	Extraction and separation of Plasmid from Bacteria
9	Isolation of drug resistant mutant – Gradient plate technique
10	Isolation and titration of Coliphages
11	Cultivation of Virus – Egg Inoculation method (Demonstration).
12	Sterility checking of pharmaceutical products - Direct Inoculation method.
13	Bioburden testing.
14	Disinfectant Qualification test.

Note: Out of 14 experiments 12 can be performed.

References

1. Maniatis, T. Tritsch E F and Sambrook J, 2010, "Molecular Cloning. A Laboratory manual", Cold Spring Harbor Laboratory, New York.
2. Rajan S. and Selvi Christy, 2018, "Experimental Procedures in Life Sciences", 1st Edition. CBS Publishers
3. Aneja. K.R, 2012, "Experiments in Microbiology, Plant Pathology and Biotechnology", 2nd Edition, New age publishers.

Course Code	Course Name	Category	L	T	P	Credit
193MB1A5SA	PHARMACEUTICAL MICROBIOLOGY	SEC	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The concept, history and development of antibiotics.
- The antibiotic resistance, sterilization, preservation of pharmaceutical products
- The regulatory aspects of pharmaceuticals.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the history and concepts of antibiotics.	K2,K3
CO2	Understand the antibiotic resistance and mechanisms.	K2,K3
CO3	Describe the microbial contamination and hazards.	K3,K4
CO4	Understand and describe the principles and objectives of pharmaceutical products preservation as well as methods.	K3,K4
CO5	Understand pharmacopeia and regulatory process of pharmaceutical products.	K3,K4

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193MB1A5SA	PHARMACEUTICAL MICROBIOLOGY	SEMESTER V

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Introduction to chemotherapeutic agents 07 h

History and development of chemotherapeutic agent, Properties of antimicrobial agents, Types of chemotherapeutic agents – Synthetic, Semisynthetic, Natural. Antibiotics: Types of antibiotics with their mode of action; antibacterial, antifungal, antiviral, antiprotozoal.

Unit II Antibiotic resistance and development of new therapeutics 07 h

Development of antibiotic resistance, Mechanism of antibiotic resistance, Antimicrobial Peptides: History, properties, sources, mode of action and application. Phage therapy: introduction to phages, lytic cycle, types of phages involved in phage therapy. Plant based therapeutic agents.

Unit III Sterilization and Microbial spoilage of pharma products 07 h

Microbial contamination spoilage and hazard: Sources of contamination, factors affecting survival and growth, breakdown of active ingredient and general formulations. Principles of sterilizations with respect to pharmaceutical industries. Methods of sterilizations: Steam, dry heat, Radiation, Gaseous and Filtration.

Unit IV Preservation of Pharma Products 08 h

Principles and objectives of preservation. Antimicrobial preservatives and their properties: antimicrobial activity, factors affecting antimicrobial activity, preservative monographs. Preservative stability and efficacy. Methods of Preservative evaluation and testing- Preservative Efficasy test –In vitro & In vivo, Antibiotic Sensitivity test.

Unit V Regulatory aspects in pharmaceuticals 07 h

Introduction to pharmacopoeia; FDA regulation and IP, BP, USP; Reimbursement of drugs and biological; legislative perspectives; GMP in pharmaceuticals; Quality control through WHO; ICH process.

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.

Course Code	Course Name	Category	L	T	P	Credit
193MB1A5DA	MICROBIAL GENETICS	DSE	4	-	-	4

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
- Heritable transfer of genetic information
- Mutation of genes for the better understanding of genetic constitution.

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, K3
CO2	Describe the principle behind transcription, protein synthesis and genetic code.	K2
CO3	Categorize the mutational types, significance of mutation in recombinantion and repair mechanism.	K2
CO4	Familiar with microbial recombination.	K2, K3
CO5	Distinguish constitutive and inducible enzymes and their expression.	K5, K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193MB1A5DA	MICROBIAL GENETICS	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I DNA 08 h

DNA as genetic material - Structure of DNA and RNA - DNA Replication: Semiconservative, enzymology and mechanism.

Unit II Transcription 10 h

Transcription - Genetic Code: Organization of the code, Establishment of genetic code - Translation – Initiation, Elongation and Termination – Protein splicing.

Unit III Mutation 10 h

Mutation – definition, types – silent, missense, non – sense, insertion, deletion, substitution - spontaneous and induced. Repair – light – dark – SOS –Recombinant.

Unit IV Bacterial Genetics 10 h

Bacterial Genetics (Mutant phenotype, DNA mediated Transformation; Conjugation (Cointegrate Formation and Hfr Cells, Time–of–Entry Mapping, F' Plasmid); Transduction (Generalized transduction, Specialized Transduction) - gene mapping.

Unit V Gene Regulation 10 h

Molecular Mechanism of gene regulation in prokaryotes - Lac, Trp, Ara operons. Eukaryotic gene regulation – important differences in the genetic organization of Prokaryotes and Eukaryotes – Gene rearrangement. Yeast mating type.

Text Books

1 Joanne Willey, Kathleen Sandman, Dorothy Wood, 2019, "Prescott's Microbiology", 11th Edition, McGraw Hill Education.

2 Gardner, E. J, Simmons, M J& D P Snustard , 2006, "Principles of Genetics", 8th Edition, John Wiley & Sons, New York.

References

1 Freifelder .S. 1987. "Microbial Genetics", 1st Edition, Jones & Bartlett, Boston.

2 Larry Snyder, Joseph E. Peters, Tina M. Henkin, 2013, "Molecular Genetics of Bacteria", 4th Edition, Wendy Champness, ASM Press.

3 David Freofelder, 1996, "Essentials of Molecular Biology", 2nd Edition.

4 Jocelyn E. Krebs, Elliott S. Goldstein. Stephen T. Kilpatrick, 2014, "Lewin's Genes – X", 11th Edition, Jones & Bartlett Learning.

5 https://nptel.ac.in/content/storage2/courses/102103013/module1/lec1/10.html

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

Course Code	Course Name	Category	L	T	P	Credit
193MB1A5DB	ALGAL BIOTECHNOLOGY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The commercial application of algae.
- The cultivation methods of algae.
- The mechanism of Bio fertilizer and biopolymer production.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the resource potential of algae.	K3
CO2	Describe the principle behind algal growth and its cultivation.	K2
CO3	Categorize the types of bio fertilizer and its production mechanism.	K2
CO4	Familiar with advantages of Single Cell Protein.	K3
CO5	Describe the production of algal biopolymers and its application	K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193MB1A5DB	ALGAL BIOTECHNOLOGY	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to algal biotechnology 10 h

Resource potential of algae; commercial utility of algae - food and feed, pigments, fine chemicals, fuel and bio-fertilizers. Distribution of economically important algae in India.

Unit II Production of Algae 10 h

Strain selection; Algal growth curve; Culture media; indoor cultivation methods and scaling up. Measurement of algal growth. Large-scale cultivation of algae. Evaporation and uniform dispersal of nutrients; harvesting algae. Drying.

Unit III Algal Bio fertilizers 10 h

Blue Green Algae (BGA) as Bio fertilizer – Production of BGA inoculants – Field use of BGA inoculants –Crop response. Nostoc as Bio fertilizer – Morphology of Nostoc – Mass production – Utilization of Nostoc inoculants.

Unit IV Single Cell Proteins (SCPs) 9 h

Definitions – Advantages of SCPs –Algae as Single Cell Proteins & Mass Production– Spirulina – Chlorella - Scenedesmus - Dunaliella.

Unit V Algal Bio polymers 9 h

Production, Purification and Industrial applications of Algal Biopolymers - Starch – Cellulose – Chitin – Alginate – Polyhydroxyalcanoate.

Text Books

1. Kumaresan V, 2012, "Biotechnology", 6th Edition, Saras Publication, Tamilnadu.
2. Rema P L, 2007, "Applied Biotechnology", 1st Edition, MJP Publishers, Chennai.

References

1. Faizal Bux, 2016, "Algae Biotechnology Products and Processes",1st Edition, Cham Springer, Switzerland.
2. Muthu Arumugam, 2020, "Applied Algal Biotechnology", 1st Edition, Nova Science Publishers, Tamilnadu.
3. Barsanti L, 2005, "Algae-anatomy, biochemistry and biotechnology", 2nd Edition, Taylor & Francis, New york.
4. Trivedi, 2001, "Algal biotechnology", 2nd Edition, Pointer publishers, India.

Course Code	Course Name	Category	L	T	P	Credit
193MB1A5DC	MICROBIAL TECHNOLOGY	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.
- How 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	Knowledge about economic aspects of production using microbes.	K4, K3
CO2	Exemplify the ideas about the production and types of Bioethanol and Biofertilizer.	K3
CO3	Demonstrate the commercial production of Biopolymers using Microorganisms.	K3, K4
CO4	Understand the way cells and enzymes immobilization and its applications.	K4
CO5	Explore the production of vaccine and standardization.	K4

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193MB1A5DC	MICROBIAL TECHNOLOGY	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 (Ganoderma lucidum).

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 – Melanin. Adhesive Protein - Rubber - Polyhydroxyalkanoates - Hyaluronic acid.

Unit IV Immobilization of Cells & Enzymes 10 h

Cells – Surface attachment of cells – Entrapment within porous matrices: Hydrogel Entrapment method, Enzymes: Methods for Enzyme immobilization – Carrier binding method, Intermolecular cross linking – Applications of Immobilized cells

Unit V Microbial products with pharmaceutical importance 10 h

Vaccines – Preparation of Live (MMR, BCG, Oral Polio), killed (Covaxin, Rabies) vaccine and recombinant vaccine (Covishield) – Standardization of vaccine – Toxoid and uses –toxoid for Diptheria and tetanus.

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
192MT1A5AA	RESEARCH METHODOLOGY	AECC	2	-	-	2

PREAMBLE

This course has been designed for students to learn and understand

- the art of using different research methods and techniques
- planning and writing of researchproposals and dissertations, as well as a thesis
- the necessity for research ethics and guidelines to pursue research

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	learn thebasics of the research methods and techniques	K1
CO2	remember the hypothesis, laws related to research problem	K1
CO3	understand the limitations of experimentation in research	K2
CO4	illustrate the concept of interdisciplinary and multidisciplinary research	K3
CO5	analyze the ethics and responsibilities of research	K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

192MT1A5AA	RESEARCH METHODOLOGY	SEMESTER V

Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I Introductionto Research 4 h

Research: Introduction- Basic, Applied and Evaluation research – multidisciplinary and interdisciplinary Research – value of research skills – formulating a research problem – Research in relation to Teaching and Publishing

Unit II Hypotheses, Theories and Laws 6 h

Hypotheses – Theories – Laws. Scientific statements: their justification and acceptance: verification – Falsification – Acceptance – Peer review

Unit III Experimentationand research 5 h

The roles and limitations of experimentation – Experimentation and research – conducting experiments - validity and reliability in experimentation – Design of experiments

Unit IV Scientific method and Research Design 4 h

Introduction to Scientific method – Research Design - Components - research design and proposal -checklist in the preparation of proposals

Unit V Ethics and Responsibility in Scientific Research 5 h

Ethics – guidelines for Ethical practices in research - unethics to ethics in research - responsibility of Scientists and of Science as an Institution

Text Books

1 PerterPruzan, (2016), Research Methodology: The Aims, Practices and Ethics of Science. Springer, Switzerland

References

1 Thomas, C.G. (2015) Research Methodology and Scientific Writing.Ane Books Pvt. Ltd.: New Delhi.

2 Locharoenrat, K. (2017) Research Methodologies for Beginners.Pan Stanford Publishing: Singapore.

3 Ranjit Kumar, (2014) Research Methodology: A Step-by-Step Guide for Beginners. SAGE Publications Ltd.: Singapore.

4 Kothari, C.R. Garg, G. (2009) Research Methodology Methods and Techniques. New Age International Publishers, New Delhi..

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Sixth Semester										
Part - III										
193MB1A6CA	Core	Industrial Microbiology	3	-	-	3	25	75	100	3
193MB1A6CB	Core	Environmental and Agricultural Microbiology	3	1	-	3	25	75	100	3
193MB1A6CC	Core	Medical Parasitology	3	1	-	3	25	75	100	3
193MB1A6CP	Core Practical	Applied Microbiology and Recombinant DNA Technology	-	-	6	9	40	60	100	3
193MB1A6SA	SEC	Entrepreneurial Microbiology	3	-	-	3	25	75	100	3
193MB1A6DA/ 193MB1A6DB/ 193MB1A6DC	DSE		4	-	-	3	25	75	100	4
193MB1A6DD/ 193MB1A6DE/ 193MB1A6DF	DSE		4	-	-	3	25	75	100	4
Part - IV										
195BI1A6AA	**AECC**	Innovation and IPR	2	-	-	3	-	50	50	2
Part - V										
193MB1A6XA		Extension Activity				-	50	-	50	1
Total			**22**	**2**	**6**	**-**	**-**	**-**	**800**	**26**
Grand Total									**4400**	**140**

Course Code	Course Name	Category	L	T	P	Credit
193MB1A6CA	INDUSTRIAL MICROBIOLOGY	CORE	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- To comprehend the commercial value of fermented products
- To have an understanding on the types of fermentations, harvesting and purification process
- To analyze the application of economically important microorganisms for the large scale production

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Isolate and screen the industrially important microorganisms.	K1, K3
CO2	Understand the types of fermentation, describe the components and to give ideas about the operative mechanism of fermentor.	K1
CO3	Explore the large scale production process of fermented products.	K3
CO4	Understand the concept of SCP Production and Mushroom cultivation techniques.	K1, K3
CO5	Know the downstream process of Intracellular and Extracellular products.	K1, K2

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong **M** Medium **L** Low

193MB1A6CA	INDUSTRIAL MICROBIOLOGY	SEMESTER VI

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I Industrially important strains 10 h

Industrially important strains- Screening methods- Primary and Secondary screening. Strain development for improved yield- Mutation, Recombination and protoplasmic fusion.

Unit II Fermentation 10 h

Fermentation- Definition & Types - Submerged and Solid state. Batch fermentation – Continuous fermentation. Fermentors –Design of a fermentor- Components (Baffles, Agitator, Impellers and Antifoaming agents). Types of Fermentors - Tower, Cylindroconical, Airlift and Continuous Stirred Tank Fermentor (CSTF).

Unit III Industrial scale Production 8 h

Industrial scale Production of beverages – beer and wine. Vitamin - B12 and Riboflavin. Antibiotics - Penicillin and Streptomycin. Enzymes - Amylases and Proteases.

Unit IV Microbial Protein Production 10 h

Single cell protein- Baker's yeast, Spirulina. Mushroom Cultivation - Oyster (Pleurotus) and Button (Agaricus) mushroom. Cell and Enzyme immobilization methods and its applications.

Unit V Downstream process 10 h

Intracellular and extracellular – Filteration, Centrifugation, Breakage of cells - Physical and Chemical methods, Floatation, Solvent extraction, Precipitation, Chromatography, Drying and Crystallisation.

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/102/105/102105058/
https://nptel.ac.in/courses/102/103/102103015/

Course Code	Course Name	Category	L	T	P	Credit
193MB1A6CB	ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY	CORE	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The role and significance of microbes in ecological niche
- Microbial Solid and Liquid Waste Management
- Soil and Air Microbiology

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the nature of distribution and interactions among microorganisms.	K1,K2,K3
CO2	Comprehend about the microbial decomposition and conversion of solid organic wastes.	K1
CO3	Cognize the involvement of microbes in different geochemical cycles.	K2,K3
CO4	Understand microbiology of aquatic environment and its treatment.	K1,K3
CO5	Identify the factors influencing air quality. Demonstrate the methods of air quality analysis.	K1,K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong **M** Medium **L** Low

193MB1A6CB	ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY	SEMESTER VI

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I Microorganisms in nature 10 h

Distribution of microorganisms in Ecological niche – Microbial associations – Mutualism, Commensalism, Predation, Parasitism, Amensalism and Competition with suitable examples.

Unit II Microbial Degradation 10 h

Decomposition of Cellulose, Hemi cellulose and lignin - Microbial deterioration of agriculture products – Microbial degradation of pesticides – Microbes in textile deterioration.

Unit III Carbon, Nitrogen and Phosphorous cycle 10 h

Microorganisms in the decomposition of organic matter- carbon cycle – nitrogen Cycle- nitrogen fixing microorganisms, root nodule bacteria (symbiotic), Non symbiotic Nitrogen fixers – Phosphate cycle - phosphate solubilisers - Mycorrhizial association – Biofertilizers.

Unit IV Water Microbiology 8 h

Types of water - Types of aquatic environments - Water treatment- Primary, secondary and tertiary. Water Potability - MPN technique.

Unit V Air Microbiology 10 h

Distribution of Microbes in air - Outdoor and indoor aeromicrobiology - Air pollution - Air sampling devices and types - Impaction and Gravity sampling method - Bioaerosol control in laboratory.

Text Books

1 Atlas R. M and Bartha., 1998. Microbial Ecology. 1st edition. Pearson education.

2 Subbarao. 2005. Soil Microbiology Soil Microorganisms and Plant Growth. 1st edition. Oxford and IBH, 3. Mark S Coyne, Soil Microbiology: An Exploratory Approach, Delmar Publishers.

References

1 Black, J.G. 2013. Microbiology, 8th Edition. John Wiley and Sons.

2 N.S. Subba Rao 2014. Soil Microbiology (Fourth Edition of Soil Microorganisms and Plant Growth), Science Publishers.

3 Michael J.Pelczar 2001, Microbiology, Tata Mc Graw Hill Eduaction.

4 P.D Sharma, 2013. Microbiology. 3 rd edition, Rastogi publications, Meerut-New Delhi

Course Code	Course Name	Category	L	T	P	Credit
193MB1A6CC	MEDICAL PARASITOLOGY	CORE	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the types of host and the different types of parasites
- the life cycle of protozoans and helminthic infections
- the molecular aspects of certain infections and understand its diagnosis and control

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand protozoans and metazoans are and to understand their interactions with the host	K1, K2
CO2	Know the life cycle and pathogenicity of protozoans	K1, K2
CO3	Recognize the life cycle and pathogenicity of Platyhelminthes	K1, K2
CO4	Understand the life cycle and pathogenicity of Nematodes	K1, K2
CO5	Familiarize the various tools used in the identification of protozoans and to study about its control methods	K1, K2

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong **M** Medium **L** Low

193MB1A6CC	MEDICAL PARASITOLOGY	SEMESTER VI

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to Parasites 10 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 II Parasitic Protists 10 h

Study of Morphology, Life Cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of Entamoeba histolytica, Giardia intestinalis, Trypanosoma gambiense, Leishmania donovanii, Plasmodium vivax, Toxoplasma gonidii.

Unit III Parasitic Platyhelminthes 8 h

Study of Morphology, Life Cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of Fasciolopsis buski, Schistosoma haematobium, Taenia solium and Hymenolepis nana

Unit IV Parasitic Nematodes 10 h

Study of Morphology, Life Cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of Ascaris lumbricoides, Ancylostoma duodenale, Wuchereria bancrofti and Trichinella spiralis.

Unit V Sample Processing & Control of Parasitic Infections 10 h

Collection of specimen (parasitic infection) - Preservation and examination of stool- macroscopic and microscopic examination, concentration methods - floatation-sedimentation techniques, duodenal contents, anal swabs, blood- thin and thick smear- staining and cerebrospinal fluid. Methods of controlling parasitic infections – anti-parasitic drugs - preventive measures.

Text Books

1. Peter L Chiodini, Moody A H, Manser D W, 2001, Atlas of Medical Parasitology and Helminthology, 4th Edition, Churchill Livingstone, London
2. Subash Chandra Praja, 2013, Textbook of Medical Parasitology: Protozoology & Helminthology, 4th Edition, All India Publishers & Distributor, New Delhi, India.
3. [Richard A Harvey, 2019, Lippincott's Illustrated Reviews – Microbiology, 4th Edition, Lippincott Williams & Wilkins, United States.]

References

1. Arora D R, Brij Bala Arora, 2020, Medical Parasitology, 5th Edition, CBS Publishers, New Delhi, India
2. Chatterjee KD. Parasitology Protozoology And Helminthology 13Ed. 2019.
3. Kelkar S S, Rohini S Kelkar, A Text book of Parasitology, Bombay popular prakashan
4. Jagdish Chander, 2009, Textbook of Medical Mycology, 3rd Edition, Mehta publishers, New Delhi.
5. https://www.lshtm.ac.uk/files/dpl-handbook.pdf
https://faculty.ksu.edu.sa/sites/default/files/lec_1_1.pdf

193MB1A6CP	CORE PRACTICAL : APPLIED MICROBIOLOGY AND RECOMBINANT DNA TECHNOLOGY	SEMESTER VI

Total Credits: 3
Total Instructions Hours: 48 h

S.No	Contents
1	Separation of DNA by Agarose electrophoresis.
2	DOT ELISA technique
3	Separation of proteins by SDS – PAGE.
4	Alcohol production - wine
5	Immobilization using Sodium alginate
6	Microscopic observation of parasites – Entamoeba, Plasmodium, Ascaris, Taenia.
7	Water potability test-MPN Test
8	Isolation of free living nitrogen fixers –Azotobacter, Azospirillum
9	Isolation of Phosphate solubilizers
10	Isolation of symbiotic nitrogen fixers - Rhizobium from nodule.
11	Microbial degradation of synthetic dyes
12	Determination of Minimal Inhibitory Concentration

LABORATORY MANUALS:

1. Aneja. K.R.2nd edition, 2012. Experiments in Microbiology, Plant Pathology and Biotechnology, New age publishers.
2. Rajan S. and Selvi Christy. Experimental Procedures in Life Sciences. Anjana book House.

REFERENCE BOOKS:

1. James.C.Cappuccino. 2013. Microbiology A laboratory manual. 1st edition, Pearson education publishers.
2. Kannan N., 1997. Laboratory Manual of General Microbiology, 2nd edition, Panima Publishing House.

Course Code	Course Name	Category	L	T	P	Credit
193MB1A6SA	ENTREPRENEURIAL MICROBIOLOGY	SEC	3		-	3

PREAMBLE

This course has been designed for students to learn and understand

- To impart knowledge on the Concept of Entrepreneurship
- The different areas of Entrepreneurship in Microbiology
- Learn the various microbial product preparations in microbiology field.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the Concept and processing of funds in setting up an industry	K2
CO2	Know the areas of Entrepreneurship in Microbiology	K3
CO3	Gain knowledge on mushroom production techniques	K3
CO4	Acquire the knowledge of various biofertilizer production	K4
CO5	Know the Large scale production of breweries	K5

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193MB1A6SA	ENTREPRENEURIAL MICROBIOLOGY	SEMESTER VI

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to entrepreneurship 10 h

Concept of Entrepreneurship – Definition – Role and reasons. Entrepreneurial scenario in India – Establishment of Small scale Industries– Generation of project – Project identification – Preparation of Project report - Government, NGOs, venture capitals, angel funding, crowd funding and Incubation facilities to start spin-off's

Unit II Areas of Entrepreneurship in Microbiology 8 h

Agriculture- biofertilizer, composting, biopesticides, bioinseticides, biocontrol agents - Food - fermented food products, packed and canned foods- Dairy - Yoghurt, cheese - Pharmaceuticals - antibiotics, vaccines, amino acids- Diagnostics - rapid kits - Enzyme production- SCP- Mushroom

Unit III Mushroom production 10 h

Mushroom cultivation and Composting- Cultivation of Agaricus campestris, Agaricus bisporus, and Volvariella volvaciae; Preparation of compost, filling tray beds, spawning, maintaining optimal temperature, casing, watering, harvesting, storage.

Unit IV Biofertilizer production 9 h

Biofertilizers - Historical background, Chemical fertilizers versus biofertilizers, organic farming. Rhizobium sp, Azospirillum sp, Azotobacter sp, Azolla, PGPR as Biofertilizers.

Unit V Large scale production of breweries 11 h

Brewing- Media components, preparation of medium, Microorganisms involved, maturation, carbonation, packaging, keeping quality, contamination, Aging, by products. Production of Industrial alcohol. Pre and pro biotic definition, role, large scale production and side effects.

Text Books

1. Dimitris Charalampopoulos, Robert A. Rastall, 2009 Prebiotics and Probiotics Science and Technology, Volume 1, Springer Science & Business Media, pp - 1262

2. Koen Venema and Ana Paula do Carmo -Editors, 2015. Probiotics and Prebiotics: Current Research and Future Trends.

References

1. Handbook of Probiotics and Prebiotics, 2009, Second Edition, Edited by YUAN KUN LEE and SEPPO SALMINEN , published by John Wiley & Sons.

2. Nduka Okafor, 2007, Modern Industrial Microbiology, Published by Science Publishers, Enfield, NH, USA.

3. Arvind H. Patel, 2015, Industrial Microbiology, 2nd Edition, Laxmi Publication, and ISBN 10:9385750259.

4. Lester Earl Casida, 2016. Industrial Microbiology, Published by New Age International (P) Ltd., ISBN 10: 8122438024 / ISBN 13: 9788122438024.

Course Code	Course Name	Category	L	T	P	Credit
193MB1A6DA	RECOMBINANT DNA TECHNOLOGY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The basic aspect of different gene cloning enzymes and its applications
- The development of recombinant genetic material.
- The amplification and sequencing 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 working of different enzymes involved in gene cloning	K2, K3
CO2	Outline the principle and procedure of Isolation and Purification of DNA and RNA.	K2, K3
CO3	Appraise the knowledge about different types of Vectors.	K2, K3
CO4	Understand the theoretical principles behind Gene transfer techniques.	K2, K3
CO5	Understand the principles behind DNA amplification and sequencing procedures.	K2, K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong **M** Medium **L** Low

193MB1A6DA	RECOMBINANT DNA TECHNOLOGY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Gene Cloning 10 h

Gene manipulation – Restriction Enzymes – Discovery, types and mode of action, DNA Polymerases I,II & III, Taq polymerase, klenov fragment - Ligases - Methylases - Reverse transcriptase. Applications of Gene cloning.

Unit II Gene purification 10 h

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

Unit III Vectors 10 h

Vectors – Plasmid based Vectors - Natural vectors – pSC101, pSF2124 and pMB1. Artificial vectors - pBR322 & pUC. Phage based Vectors- ʎ phage, P1 phage and M13 based Vectors. Hybrid Vectors - Phagemid, Phasmid and Cosmid, BAC and YAC.

Unit IV Gene Transfer Techniques 10 h

Gene Transfer Techniques –Biochemical methods - calcium phosphate, DEAE dextran mediated, Lipofection. Physical methods - Electroporation, Microinjection, Partical bombardment, Ultrafection. Biological - Viral mediated transduction. Screening and Selection of recombinants - Direct Method - Selection by Complementation, Marker inactivation Methods. Indirect Methods - Immunological and Genetic Methods

Unit V Gene Amplification and Sequencing 8 h

PCR -Probe desigining, components, thermocycler. DNA Sequencing - Maxam - Gilbert sequencing, pyro sequencing, Sanger's sequencing and Next generation sequencing. Blotting - Southern and Northern Techniques.

Text Book

1. Brown TA. (2010). Gene Cloning and DNA Analysis. 6th edition. Blackwell Publishing, Oxford, U.K.
2. Primrose SB and Twyman RM. (2006). Principles of Gene Manipulation and Genomics, 7th edition. Blackwell Publishing, Oxford, U.K
3. Sambrook J and Russell D. (2001). Molecular Cloning-A Laboratory Manual. 3rd edition. Cold Spring Harbor Laboratory Press

References

1. Winnecker, E.D, 1987. From Gene to Clones, Introduction to Gene Technology, 1 st edition. Panima educational book agency.
2. Glick B. R and Pasternak J. J. 1994. Molecular Biotechnology. Principles and Application of recombinant DNA, 2 nd edition. ASM Press, Washington.
3. Wiley JM, Sherwood LM and Woolverton CJ. (2008). Prescott, Harley and Klein's Microbiology. McGraw Hill Higher Education
4. Primrose SB and Twyman RM. (2008). Genomics: Applications in human biology. Blackwell Publishing, Oxford, U.K.

Course Code	Course Name	Category	L	T	P	Credit
193MB1A6DB	Extremophiles	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- the principle features of extremophilic microbial life and its habitats
- the adaptability of microbes in extreme environments.
- the application and relevance of extremophiles in routine life.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the extreme habitats	K2
CO2	Demonstrate the characteristics of thermophiles and psychrophiles.	K3
CO3	Elaborate the survival mechanisms of halophiles and acidophiles and its applications.	K3
CO4	Develop the knowledge on barophiles.	K4
CO5	Illustrate about hyperextremophiles.	K5

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong **M** Medium **L** Low

193MB1A6DB	EXTREMOPHILES	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Extreme habitats 10 h

Life at hyper-extremities: Extreme habitats, extreme communities in following econiches: desserts (Atacama, Mojave), ore deposits/ mining areas (Fe, Mn, Cu), animal systems, deep biosphere (terrestrial and marine), hydrothermal vents. - Gene expression in hyperthermophilic bacteria and archaea.

Unit II Thermophiles and Psychrophiles 10 h

Thermophiles: Definition, habitats and ecological aspects. Extremely Thermophilic Archaebacteria, Commercial aspects of thermophiles. Applications of thermozymes. Psychrophiles and psychrotrophs: Survival Strategy of Psychrophiles.

Unit III Halophiles and acidophiles 08 h

Halophiles: Definition, Classification, Genomic, Proteomic adaptations and its applications. Acidophiles: Definition, survival at low pH, acidotolerence and its applications.

Unit IV Barophiles 10 h

Barophiles: Definition, Factors responsible for barostability. Genomic and proteomic adaptations – Purple membrane, compatible solutes. High pressure adaptation of extremophiles and biotechnological applications.

Unit V Hyperextremophiles 10 h

Hyper-extremophiles: Life detection methods - Evidence of metabolism - ATP production - Phosphate uptake and Sulphur uptake, novel metabolic machinery and biomolecules.

Text Books

1. Campbell, R. 2009. Microbial Ecology, 2nd edition, Blackwell Scientifc Publication.
2. Brock, T. D. 2012. Thermophilic microorganisms and life at high temperatures, Springer, New York.

References

1. Horikoshi, K., Grant, W. D., 1998. Extremophiles-microbial life in extreme environments, Wiley, New York.
2. Milton Keynes. Microbiology of Extreme Environments and its potential for Biotechnology. Edited by Da Costa, M.S., Duarate, J.C., Williams, R.A. D. Elsiever Applied Science, Low Extreme Environment. Mechanism of Microbial Adaptation. Edited by Milton R. Heinrich, Academic Press.
3. Kushner, D. J. 1978. Microbial Life in Extreme Environments, Academic Press.
4. Johri, B.N. 2000. Extremophiles, 1st edition, Springer Verlag. , New York

Course Code	Course Name	Category	L	T	P	Credit
193MB1A6DC	PHAGE BIOLOGY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- History and Classification of phages
- Life cycle and characterization of phages
- Importance and applications of phages in diagnostic and theraphy.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the history and cultivation of phages.	K2
CO2	Know the phage abundance and diversity.	K3
CO3	Understand the lytic and lysogenic life cycle of phages.	K3
CO4	Know the advancement of molecular characterization of phages.	K3
CO5	Describe the importance of phages on various fields.	K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193MB1A6DC	PHAGE BIOLOGY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction 10 h

Definition, Brief history of bacteriophage discovery - Classification - Cultivation - Enumeration and Assay of phages.

Unit II Phage abundance and Diversity 10 h

Biochemistry and Physiology of phages - Ecology and Evolution of phages - Virulent phages and its diversity. Therapeutic and diagnostic applications of phages.

Unit III Life cycle of phages 10 h

Distribution, Life cycle of Phages - Lytic - One step growth curve experiment - Temperate Vs Lytic - Adsorption, Penetration, Synthesis, Maturation, Assembly and Release. Lysogenic - Prophage and its Induction.

Unit IV Characterization of Phages 9 h

Molecular techniques - PCR, 16srRNA, docking, RFLP, RAPD, CRISPR-Cas, Heterologous interference, Immunofluorescence

Unit V Importance and Applications of Phages 9 h

Phage therapy - Antimicrobials - Phage display - Vaccines - Detection of Pathogens.

Text Books

1. Dimmock, 1998, "Introduction to Modern Virology", 5th Edition, Blackwell scientific publications.
2. Luria S.E. Darnel, J.E Jr. Baltimore. D and Campbell A, 1978, "General Virology", 3rd Edition, Wiley and sons.

References

1. Stainier R.V., Ingraham, J.L., Wheelis, M.L. and Painter P.R, 1986, "The Microbial World", 1st Edition, Printice-Hall of India (Pvt.) Ltd., New Delhi.
2. Pelczar M., Chan E.C.S. and Krieg, N.R, 1993, "Microbiology", 6th Edition, Tata Mc Grew Hill Publishing Co. Ltd., New Delhi..
3. Ananthanarayanan R and CK JayaramPanicker, 2005, "Introduction to Medical Microbiology", 2nd Edition, Orient Longman.
4. Rogger Hull, 2001, "Mathews Plant Virology', 4th Edition, Academic press.

Course Code	Course Name	Category	L	T	P	Credit
193MB1A6DD	MOLECULAR DIAGNOSTICS IN MICROBIOLOGY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Learn the Importance to molecular diagnosis
- Methods involved in the in molecular diagnostic methods
- Genome sequencing and its methods

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basics of molecular diagnostic methods.	K2
CO2	Know the molecular diagnosis using different types of immunoglobulins	K3
CO3	Cognize the amplification and fingerprinting methods in disease diagnosis	K3
CO4	Gain knowledge on genome sequencing methods for diagnosis	K2
CO5	Learn and understand the different blotting and hybridization techniques.	K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong **M** Medium **L** Low

193MB1A6DD	MOLECULAR DIAGNOSTICS IN MICROBIOLOGY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction 10 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 Molecular Diagnosis using Immunoglobins 10 h

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

Unit III Amplification and DNA fingerprinting methods 10 h

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

Unit IV Genome Sequencing for Diagnosis 10 h

Direct Sequencing: Whole Genome Sequencing and Target Sequencing. New Generation sequencing Methods (Influenza A), Metagenomics (Bacteria), Microarrays (Salmonella sp.).

Unit V Blotting and Hybridization Techniques 8 h

Protein and Nucleic acid extraction and analysis (PAGE & AGE); Southern (Aspergillus sp.), northern (Herpes virus), Western blot (HIV) dot blot (Salmonella typhi) ; nucleic acid probe preparation.

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. Lele Buckingham and Maribeth L. Flaws, 2019, "Molecular Diagnostics: Fundamentals, Methods & Clinical applications", 3rd Edition, F. A. Davis Company, Philadelphia.
4. Keith Willson and John Walker, 2010, " Principles and Techniques of Biochemistry and Molecular Biology", 7th Edition, Cambridge University Press, US.

Course Code	Course Name	Category	L	T	P	Credit
193MB1A6DE	MYCOTOXICOLOGY	DSE	4		-	4

PREAMBLE

This course has been designed for students to learn and understand

- the concept of mycotoxicology
- the types, mycotoxicoses, determination and quantitative techniques
- the analyze the mycotoxin and its prophylaxis.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Learn the mycotoxins and its importance	K2
CO2	To classify the mycotoxin types and its mechanism of action.	K3
CO3	To inspect the characteristic of mycotoxins	K3
CO4	To quantify the mycotoxin by various methods.	K4
CO5	To analyze the prophylactic measures against mycotoxicoses	K5

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong **M** Medium **L** Low

193MB1A6DE	MYCOTOXICOLOGY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction 10 h

Historical Perspectives of mycotoxins, mold growth and mycotoxin formation, Occurrence, effects, safe levels of mycotoxins, Economic losses by mycotoxins, major groups of field Mycotoxins, camouflaged mycotoxins, fungal infections and Mycotoxicoses.

Unit II Characteristic of mycotoxins 10 h

Mycotoxicological properties, risk assessment and safety evaluation of mycotoxins, regulations and limits for Mycotoxins, factors affecting mycotoxin production, Mycotoxins produced by Aspergillus, Penicillium and Alternaria. Chemical, physical and biological control of mycotoxigenic fungi.

Unit III Determination of mycotoxin 10 h

Design of sampling plans for determination of Mycotoxins in foods and feeds, determination of human exposure to aflatoxins, mechanistic interactions of Mycotoxins: theoretical considerations. Chemistry and biosynthesis of mycotoxin - ochratoxins.

Unit IV Quantitative analysis of mycotoxin 8 h

Assessing the mycotoxicological risk from consumption of foods, methods of sample extraction and quantitation of mycotoxin by thin layer chromatography, Gas chromatography, HPLC and LC-MS/MS.

Unit V Prophylaxis against mycotoxin 10 h

Management of mycotoxin contamination: Recent Advances in preharvest and post harvest procedures - Prevention of Mycotoxin. Contamination and detoxification and food safety- Procedures in management of mycotoxin Hazards.

Text Books

1 Mahendra Rai and Paul Dennis Bridge (2009) Applied mycology, First Edition, Published by Library of Congress Cataloging-in-Publication Data, ISBN-13: 978 1 84593 534 4.

2 Tulasi Satyanarayana, Sunil K. Deshmukh , B. N. Johri (2017) Developments in Fungal Biology and Applied Mycology, Springer Nature Singapore Pvt Ltd. ISBN 978-981-10-4768-8 (eBook) https://doi.org/10.1007/978-981-10-4768-8.

References

1 Rivka Barkai-Golan and Nachman Paster (2008) Mycotoxins in Fruits and Vegetables, First Editiion, Elsevier Publications, ISBN: 978-0-12-374126-4.

2 Kevin Kavanagh (2018) Fungi - Biology and Applications, 3rd Edition, Published by John Wiley & Sons, Inc. ISBN 9781119374169 (ePDF).

3 JohnWebster and Roland Weber (2007) Introduction to Fungi, 3rd Edition, Published in the United States of America by Cambridge University Press, New York. ISBN - 13 978-0-511-27783-2 eBook (EBL).

4 Sinha, K. K. (1998) Mycotoxins in Agriculture and Food Safety, Published by CRC Press. ISBN: 0-8247-0192-5.

Course Code	Course Name	Category	L	T	P	Credit
193MB1A6DF	MARINE MICROBIOLOGY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Marine microbial habitat and diversity
- The ecological diversity and role of microorganisms in marine environment
- Seafood microbiological quality and standard

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand physical and chemical factors of marine environment.	K2
CO2	Understand the role of microorganisms in biogeochemical cycle in marine environment.	K3
CO3	Gain knowledge on survival mechanisms of marine extremophilic organisms.	K3
CO4	Acquire idea on pathogenic organisms, and quality standards for seafood.	K2
CO5	Learn the marine microbial products and its commercial value.	K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193MB1A6DF	MARINE MICROBIOLOGY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Marine Microbial Habitats and Diversity 10 h

Marine environments - Physical and chemical factors of marine environment - Ecology of coastal, shallow and deep sea microorganisms - significance of marine micro flora. Diversity of microorganisms - Achaea bacteria, actinobacteria, cyanobacteria, algae, fungi, viruses and protozoa in the marine environment.

Unit II Ecological diversity and role of marine microorganisms 10 h

Sample collection – isolation and identification, cultural, morphological, physiological, biochemical and molecular characteristics. Role of microorganisms on carbon, nitrogen, phosphorous and sulphur cycles in the sea.

Unit III Marine extremophiles 10 h

Survival at extreme environments – starvation – adaptive mechanisms in thermophilic, alkalophilic, osmophilic and barophilic, psychrophilic microorganisms – hyper thermophiles, halophiles and their importance.

Unit IV Seafood Microbiology 10 h

Pathogenic microorganisms, distribution, indicator organisms. Quality standards - International and National standards. Microbiology of processed finfish and shellfish products. Rapid diagnosis of contamination in sea foods and aquaculture products.

Unit V Marine microbial products 8 h

Marine microbial products – Carrageenan, agar-agar, sea weed fertilizers – Astaxanthin, β carotene – enzyme – antibiotics – antitumor agents- polysaccharide – Biosurfactants and Pigments.

Text Books

1. Belkin S and Colwell RR. Ocean and health: Pathogens in the Marine Environment, Springer. 2005.
2. Prescott LM, Harley JP. Klein Microbiology, WCB, Mc Grow Hill Publications.1999.
3. Bhakuni DS and Rawat DS. Bioactive marine natural products. Anamaya Publishers, New Delhi. 2005.

References

1. Meller CB and Wheeler PA. Biological Oceanography, Wiley-Blackwell Publishers. 2012.
2. Raina M. Maier, Ian L. Pepper, Charles, P. Gerba Environmental Microbiology, Academic press. 2006.
3. Shimshon Belkin and Rita R Colwell Ocean and Health: Pathogens in the marine environment. Springer. 2005.
4. Mitchell R and Kirchman DL. Microbial Ecology of the Oceans, Wiley Blackwell Publishers. 1982.
5. Marine Microbes | Smithsonian Ocean (si.edu)
6. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiEqbvi3571AhVYTGwGHbfOA0UQFnoECCEQAQ&url=https%3A%2F%2Fwww.frontiersin.org%2Fresearch topics%2F7535%2Fnatural-products-from-marine microorganisms &usg=AOvVaw1GODqIGJ8YQEUUQO1F7vo3

Course Code	Course Name	Category	L	T	P	Credit
195BI1A6AA	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 an 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	S	M	M	M	M
CO2	S	M	M	M	M
CO3	S	M	M	M	M
CO4	S	M	M	M	M
CO5	S	M	M	M	M

S Strong M Medium L Low

195BI1A6AA	INNOVATION AND IPR	SEMESTER VI

Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I Introduction 05 h

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

Unit II Patents 05 h

Introduction and origin of Patent System in India- Conceptual Principles of Patent Law in India - Process for obtaining patent - Rights granted to a Patentee - Infringement of Patent.
Case Study: When Google was sued for Patent Infringement.

Unit III Trademarks 05 h

Origin of Trade Marks System - Types - Functions - Distinctiveness and Trademarks - Meaning of Good Trademark - Rights granted by Registration of Trademarks - Infringement of trademark.
Case Study: Trademark mismanagement by Cadbury's.

Unit IV Copyright 05 h

Introduction and Evolution of Copyright - Objectives and fundamentals of Copyright Law - Requirements for Copyrights - Works protectable under Copyrights - Authorship and Ownership - Rights of Authors and Copyright owners - Infringement of Copyright.
Case Study: Copyright Case of Napster and Grokster.

Unit V Geographical Indications 04 h

Introduction and Concept of Geographical Indications - History - Administrative Mechanism - Benefits of Geographical Indications - Infringement of registered Geographical Indication.
Case Study: The story of the Tirupati Laddu.

Note: Case studies related to the above topics to be discussed (Examined internal only)

Text Book

1 Nithyananda, K V. 2019, "Intellectual Property Rights" Protection and Management. India, IN: Cengage Learning India Private Limited.

References

1 Ahuja, V K. 2017, "Law relating to Intellectual Property Rights" India, IN: Lexis Nexis.

2 Neeraj, P., &Khusdeep, D. 2014, "Intellectual Property Rights" India, IN: PHI learning Private Limited.

3 http://www.bdu.ac.in/cells/ipr/docs/ipr-eng-ebook.pdf.

4 https://knowledgentia.com/knowledgeate

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