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. Biochemistry Degree

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

Programme: B.Sc. Biochemistry

Eligibility

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

Programme Educational Objectives

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

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

3. Provide students a detailed understanding on basic energy requirement of living cells, and how cells meet this prerequisite adequately through varied metabolic processes.
4. Capacitate students to grasp intricate influence of DNA and RNA structures in preserving and transferring information of cell function for generations.
5. Enable students to understand how multiple biological reactions with differing kinetics are performed in a small cell volume at a given time.
6. Entitle students to appreciate the prominence of Biochemistry in basic and applied research in varied branches of industry, medicine, agriculture, pharmacy, food technology, biotechnology, etc.

PROGRAMME OUTCOMES:

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

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

TOTAL CREDIT DISTRIBUTION

Part	Subjects	No. of Papers	Credit	Semester No.
I	Tamil / Hindi / French/Malayalam	4	4x 3 = 12	I, II ,III &IV
II	English	4	4x 3 = 12	I, II ,III &IV
III	Core (Credit 4)	10	10x4 =40	I to VI
	Core (Credits 3)	2	2x3=6	I to VI
	Core Practical (Credits 2)	6	6x2=12	I to VI
	Inter Departmental Course (IDC)	2	2x3=6	I to IV
	Inter Departmental Course (IDC)	1	1x2=2	I to IV
	Inter Departmental Course (IDC)	1	1x4=4	I to IV
	Inter Departmental Course Practical (IDC)	2	2x2=4	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 V
IV	Environmental Studies(AECC)	1	2	I
	Value Education (VE) (Human Rights, Womens' Rights) (AECC)	2	2 x 2 =4	II and III
	General Awareness(On-Line Exam) (AECC)	1	2	IV
	RM (AECC)	1	2	V
	Innovation and IPR (AECC)	1	2	VI
V	Extension Activity NSS / Sports / Department Activity	-	1	I to VI
TOTAL CREDITS			**140**	

CURRICULUM

B.Sc. BIOCHEMISTRY PROGRAMME

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
First Semester										
Part - I										
211TL1A1TA	Language-I	Tamil-I	4	1	-	3	25	75	100	3
201TL1A1HA		Hindi-I								
201TL1A1MA		Malayalaml								
201TL1A1FA		French – I								
Part - II										
211EL1A1EA	Language-II	Professional English I	4	-	1	3	25	75	100	3
Part - III										
193BC1A1CA	Core-I	Biomolecules	4	-	-	3	25	75	100	4
193BC1A1CB	Core-II	Cell biology	3			3	25	75	100	3
193BC1A1CP	Core Practical-I	Biomolecules and Cell Biology	-	-	4	3	40	60	100	2
192CE1A1IB	IDC-I	Chemistry for Biologists	3	-	-	3	25	75	100	3
192CE1A1IP	IDC Practical-I	Chemistry practical 1	-	-	4	3	40	60	100	2
Part - IV										
193MB1A1AA	AECC-I	Environmental studies	2	-	-	3	-	50	50	2
		Total	**20**	**1**	**9**				**750**	**22**

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

Dr.N.G.P. Arts and Science College
APPROVED
BoS- 11th 13/5/21 | AC - 11th 09/08/21 | GB - 15th 17/8/21

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

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Second Semester										
Part - I										
191TL1A2TA	Language-I	Tamil-II	4	1	-	3	25	75	100	3
201TL1A2HA		Hindi-II								
201TL1A2MA		Malayalam-II								
201TL1A2FA		French – II								
Part – II										
211EL1A2EA	Language-II	Professional English II	4	-	1	3	25	75	100	3
Part – III										
193BC1A2CA	Core-III	Analytical Biochemistry	4	1	-	3	25	75	100	4
193BC1A2CB	Core-IV	Enzymology	4	-	-	3	25	75	100	4
193BC1A2CP	Core Practical-II	Analytical Biochemistry and Enzymology	-	-	4	6	40	60	100	2
192PY1A2IC	IDC-II	Physics	3	-	2	3	25	75	100	4
Part - IV										
196BM1A2AA	AECC-II	Human Rights	2	-	-	3		50	50	2
		Total	**21**	**2**	**7**				**650**	**22**

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	4	-	-	3	25	75	100	3
Part – III										
193BC1A3CA	Core-V	Intermediary Metabolism	3	1	-	3	25	75	100	3
193BC1A3CP	Core Practical-III	Intermediary Metabolism	-	-	4	6	40	60	100	2
194IT1A3IA	IDC-III	Artificial Intelligence in Biology	3	-		3	25	75	100	2
194IT1A3IP	IDC Practical -II	Python Programming	-	-	4	3	40	60	100	2
193BC1A3SA	SEC-I	Basics of Bioinformatics	3	-	-	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**	**2**	**8**				**800**	**22**

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Fourth Semester										
Part - I										
191TL1A4TA	Language	Tamil-IV	3	1	-	3	25	75	100	3
191TL1A4HA		Hindi-IV								
191TL1A4MA		Malayalam-IV								
201TL1A4FA		French–IV								
Part – II										
191EL1A4EA	Language	English - IV	4	-	-	3	25	75	100	3
Part – III										
193BC1A4CA	Core-VI	Human physiology	4	1	-	3	25	75	100	4
193BC1A4CP	Core Practical-IV	Human physiology	-	-	4	6	40	60	100	2
192MT1A4IC	IDC-IV	Mathematics	3	-	-	3	25	75	100	3
193BC1A4SP	SEC-II	Bioinformatics practical		-	6	3	40	60	100	3
	GE-II		2	-	-	2		50	50	2
	LoP	Lab on Project	-	-	-	-	-	-	-	-
Part - IV										
191TL1A4AA	AECC -IV	Basic Tamil	2	-	-	3	-	50	50	2
191TL1A4AB		Advanced Tamil								
192PY1A4AA		General Awareness								
		Total	**18**	**2**	**10**				**700**	**22**

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Fifth Semester										
Part – III										
193BC1A5CA	Core-VII	Basic Genetics and Molecular Biology	4	1	-	3	25	75	100	4
193BC1A5CB	Core-VIII	Basics of Microbiology	4	-	-	3	25	75	100	4
193BC1A5CC	Core-IX	Clinical Biochemistry	4	-	-	3	25	75	100	4
193BC1A5CD	Core-X	Plant Biochemistry	4	-	-	3	25	75	100	4
193BC1A5CP	Core Practical-V	Genetics & Molecular biology, Microbiology, Plant and Clinical Biochemistry	-	-	4	6	40	60	100	2
193BC1A5SA	SEC-III	Genetic Engineering	3	-	-	3	25	75	100	3
193BC1A5DA	DSE-I	Developmental biology	4	-	-	3	25	75	100	4
193BC1A5DB		Principles of Biotechnology								
193BC1A5DC		Genetics of Clinical Disorders								
193BC1A5LA	LoP	Lab on Project	-	-	-	-	50	-	50	1
193BC1A5CT	IT	Industrial Training	Grade A to C							
Part - IV										
192MT1A5AA	AECC-V	Research Methodology	2	-	-	3	-	-	50	2
		Total	**25**	**1**	**4**				**800**	**28**

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Sixth Semester										
Part – III										
193BC1A6CA	Core- XI	Basic Immunology	5	-	-	3	25	75	100	4
193BC1A6CB	Core-XII	Nutritional Biochemistry	4	1	-	3	25	75	100	4
193BC1A6CP	Core Practical-VI	Immunology and Nutritional Biochemistry	-	-	4	6	40	60	100	2
193BC1A6SA	SEC-IV	Biostatistics	3	2	-	3	25	75	100	3
193BC1A6DA	DSE-II	Molecular diagnostics	4	1	-	3	25	75	100	4
193BC1A6DB		Concepts in Clinical Trials								
193BC1A6DC		Pharmaceutical Biochemistry								
193BC1A6DD	DSE-III	Bioentrepreneurship	4	-	-	3	25	75	100	4
193BC1A6DE		Environmental Biochemistry								
193BC1A6DF		Hormonal Biochemistry								
Part - IV										
195BI1A6AA	AECC-VI	Innovation and IPR	2	-	-	3	-	-	50	2
Part - V										
193BC1A6XA		Extension Activity				-	-	-	50	1
		Total	**22**	**4**	**4**				**700**	**24**
								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.	193BC1A5DA	Developmental biology
2.	193BC1A5DB	Principles of Biotechnology
3.	193BC1A5DC	Genetics of Clinical Disorders

Semester VI (Elective II)

List of Elective Courses

S. No.	Course Code	Name of the Course
1.	193BC1A6DA	Molecular diagnostics
2.	193BC1A6DB	Concepts in Clinical Trials
3.	193BC1A6DC	Pharmaceutical Biochemistry

Semester VI (Elective III)

List of Elective Courses

S. No.	Course Code	Name of the Course
1.	193BC1A6DD	Bioentrepreneurship
2.	193BC1A6DE	Environmental Biochemistry
3.	193BC1A6DF	Hormonal Biochemistry

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	193BC1A3GA	Biochemistry and Health

Semester IV (GE-II)

S. No.	Course Code	Course Name
1	193BC1A4GA	Organic farming: principles and practices

EXTRA CREDIT COURSES

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

S. No.	Course Code	Course Name
1	193BC1ASSA	Ecological Principles
2	193BC1ASSB	Herbal Technology

CERTIFICATE PROGRAMMES

The following are the programme offered to earn extra credits:

S. No.	Programme Code and Name	Course Code	Course Name
1	3BC5AA Certificate course on Bio-entrepreneurship	193BC5A1CA	Bio-entrepreneurship
2	3BC5AB Certificate course on Molecular Diagnostics	193BC5B1CA	Molecular Diagnostics

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

It is 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.

2.5 PART 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 40 h.

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 Prachar Sabha	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 should register 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

8.10 Innovation / Incubation / Patent / Sponsored Projects / Consultancy

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

8.11 Representation

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
211TLIA1TA	தமிழ்த் தாள் - I	மொழி- I	4	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 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

211TLIA1TA	தமிழ்த்தாள் - I	SEMESTER I

Total Credits: 03

Total Instruction Hours: 60 h

Syllabus

Unit I மறுமலர்ச்சிக் கவிதைகள் 12 h

1. உயிர் பெற்ற தமிழர் பாட்டு - பாரதியார்
2. படி - பாரதிதாசன்
3. போராடப் புறப்பட்டோம் - தமிழ் ஒளி
4. தமிழ்க் கொலை புரியாதீர் - புலவர் குழந்தை
5. திரைத்தமிழ்

அ) சும்மா கிடந்த நிலத்தை எனத்தொடங்கும் பாடல் - பட்டுக்கோட்டை கல்யாண சுந்தரனார்

ஆ) சமரசம் உலாவும் இடமும் எனத்தொடங்கும் பாடல் - மருதகாசி

இ) உன்னை அறிந்தால் எனத்தொடங்கும் பாடல் - கண்ணதாசன்

Unit II புதுக்கவிதைகள் 12 h

1. கடமையைச் செய் - மீரா
2. அம்மாவின் பொய்கள் - ஞானக்கூத்தன்
3. செருப்புடன் ஒரு பேட்டி - மு.மேத்தா
4. ஒரு சிங்கவால் குரங்கின் மரணம் - சிற்பி
5. கடல்கோள் 2004 - முத்தமிழ் விரும்பி
6. கரிக்கிறது தாய்ப்பால் - ஆரூர் தமிழ்நாடன்
7. ஐந்தாம் வகுப்பு 'அ' பிரிவு - நா. முத்துக்குமார்
8. ஹைகூ கவிதைகள் - 15 கவிதைகள்

Unit III பெண்ணியம் 08 h

1. ஒரு கதவும் கொஞ்சம் கள்ளிப்பாலும் - தாமரை
2. நீரில் அலையும் முகம் - அ. வெண்ணிலா
3. தொட்டிச் செடி - இளம்பிறை
4. ஏனிந்த வித்தியாசங்கள் - மல்லிகா

Unit IV சிறுகதைகள் 15 h

1. வேப்பமரம் - ந. பிச்சமூர்த்தி
2. அகல்யை - புதுமைப்பித்தன்
3. ஒருபிடி சோறு - ஜெயகாந்தன்
4. காய்ச்சமரம் - கி. ராஜநாராயணன்
5. நிராசை - பாமா
6. குதிரை மசால் தாத்தா - சு. வேணுகோபால்

Unit V இலக்கியவரலாறு, இலக்கணம் மற்றும் பயிற்சிப் பகுதி 13 h

அ. இலக்கிய வரலாறு

1. மறுமலர்ச்சிக் கவிஞர்களின் தமிழ்ப்பணிகள்
2. புதுக்கவிதையின் தோற்றமும் வளர்ச்சியும்
3. சிறுகதையின் தோற்றமும் வளர்ச்சியும்

ஆ. இலக்கணம்

1. வல்லினம் மிகும், மிகா இடங்கள் (ஒற்றுப்பிழை நீக்கி எழுதுதல்)
2. ர,ற ,ல, ழ, ள ,ண, ந,ன, வேறுபாடு (ஒலிப்பு நெறி, சொற்பொருள் வேறுபாடு அறிதல்)

இ. படைப்பாக்கப் பயிற்சி

1. கவிதை, சிறுகதை எழுதுதல்

Text Books

1 செய்யுள் மற்றும் உரைநடைத் திரட்டு . 2021. தொகுப்பு : தமிழ்த் துறை , டாக்டர் என். ஜி.பி. கலை மற்றும் அறிவியல் கல்லூரி. நியூ செஞ்சுரி புக் ஹவுஸ்(பி)லிட். சென்னை.

References

1 பேராசிரியர் முனைவர் பாக்கியமேரி. இலக்கணம் இலக்கிய வரலாறு மொழித்திறன். முதல் பதிப்பு 2013 . பூவேந்தன் பதிப்பகம். சென்னை

2 தமிழண்ணல் . புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு . பதினாறாம் பதிப்பு 2000 மீனாட்சி புத்தக நிலையம். மதுரை.

3 பேராசிரியர் புலவர் இளவரசு ,சோம. புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு. எட்டாம் பதிப்பு ஜூலை 2012.மணிவாசகர் பதிப்பகம்.சென்னை

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

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BoS- 11th | AC - 11th | GB - 18th
13/5/21 · 9/8/21 | 17/8/21

Course Code	Course Name	Category	L	T	P	Credit
201TL1A1HA	HINDI-I	Language 1	4	1	-	03

PREAMBLE

This course has been designed for students to learn and understand

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

  communicate Hindi

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

201TL1A1HA	HINDI-I	SEMESTER I

Total Credits: 03

Total Instruction Hours: 60 h

Syllabus

Unit I गद्य – नूतन गद्य संग्रह (जय प्रकाश) 12 h

पाठ 1- रजिया

पाठ 2- मक्रील

पाठ 3- बहता पानी निर्मला

पाठ 4- राष्ट्रपिता महात्मा गाँधी

Unit II कहानी कुंज- डॉ वी.पी. 'अमिताभ' 12 h

कहानी कुंज- डॉ वी.पी. 'अमिताभ' (पाठ 1-4)

Unit III व्याकरण 12 h

शब्द विचार (संज्ञा, सर्वनाम, कारक, विशेषण)

Unit IV अनुच्छेद लेखन 12 h

अनुच्छेद लेखन

Unit V अनुवाद 12 h

अभ्यास-III (केवल अंग्रेजी से हिन्दी में)

Text Books

1. प्रकाशक: सुमित्र प्रकाशन 204 लीला अपार्ट्मेंट्स, 15 हेस्टिंग्स रोड' अशोक नगर इलाहाबाद-211001 (Unit - I)
2. प्रकाशक: गोविन्द प्रकाशन सदर बाजार, मथुरा उत्तर प्रदेश – 281001 (Unit-II)
3. पुस्तक: व्याकरण प्रदिप – रामदेव प्रकाशक: हिन्दी भवन 36 टेगोर नगर इलाहाबाद – 211024 (Unit-III)
4. पुस्तक: व्याकरण प्रदिप – रामदेव प्रकाशक: हिन्दी भवन 36 इलाहाबाद-211024 (Unit-IV)
5. (पाठ 1 to 10) प्रकाशक: दक्षिण भारत प्रचार सभा चेनैई -17 (Unit – V)

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Course Code	Course Name	Category	L	T	P	Credit
201TL1A1MA	MALAYALAM	Language - I	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- develop the writing ability and develop reading skill.
- 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

201TL1A1MA	MALAYALAM - I	SEMESTER I

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I Novel — 12 h

1. Alahayude penmakkal

Unit II Novel — 12 h

1. Alahayude penmakkal

Unit III Short Story — 14 h

2. Nalinakanthi

Unit IV Short Story — 10 h

2. Nalinakanthi

Unit V — 12 h

Composition & Translation

Text Books

1 Alahayude penmakkal (NOVEL) By Sara Joseph Published by Current books Thrissur.

2 Nalinakanthi (Short story) By T.Padmanabhan Published by DC.Books Kottayam

3 Expansion of ideas,General Essay And Translation.

References

1 Malayala Novel Sahithyam

2 Malayala cherukatha Innale Innu.

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Course Code	Course Name	Category	L	T	P	Credit
201TL1A1FA	FRENCH- I	Language - I	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

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

201TL1A1FA	FRENCH- I	SEMESTER I

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I **Salut I Page 10** 12 h

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

Unit II **Enchanté I Page 20** 12 h

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

Unit III **J'adore I Page 30** 12 h

Objectifs de Communication	Tâche	Activités de réception et de production orale
• Exprimer ses gouts.	Dans un café, participer à une soirée de rencontres	• Dans une soirée de recontres rapid comprendre des personnes qui échangent sur elles et sur leurs goût • Comprendre une personne

	rapides et remplir de taches d'appréciation.	qui parler des goûts de quelqu'un d'autre.

Unit IV J'adore I Page 30 14 h

Objectifs de Communication	Tâche	Activités de réception et de production orale
• Présenter quelqu'un	Dans un café, participer à une soirée de rencontres rapides et remplir de taches d'appréciation	• Exprimer ses goûts. • Comprendre une demande laissée sur un répondeur téléphonique. • Parler de ses projets de week-end.
Autoévaluation du module I Page 40 – Préparation au DELF A1 page 42		

Unit V Tu veux bien? Page 46 10 h

Objectifs de Communication	Tâche	Activités de réception et de production orale
• Demander à quelqu'un de faire quelque chose. • Demander poliment. • Parler d'actions passes.	Organiser un programme d'activités pour accueillir une personne importante.	• Comprendre une personne demande un service à quelqu'un. • Demander à quelqu'un de faire quelque chose. • Imaginer et raconter au passé à partir de situations dessinées.

Text Books

1 Regine Merieux, Yves Loiseau, LATITUDES 1(Methode de Français), Goyal Publisher & Distributors Pvt.Ltd., 86 UB Jawahar Nagar (Kamala Nagar),Delhi-7 Les Editions Dider, Paris,2008- Imprime en Roumanie par Canale en Janvier 2012.

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BoS- 11th 13/5/21 | AC - 4th 4/8/21 | GB - 15th 17/8/21

Course Code	Course Name	Category	L	T	P	Credit
211EL1A1EA	PROFESSIONAL ENGLISH - I	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 genre
- 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	Extend interest in and appreciation of the works of eminent writers from various literatures	K2
CO2	Interpret the genres in literature through the master works of great visionaries	K3
CO3	Perceive the language gaps through a clear model of the grammatical structure	K5
CO4	Analyze the concepts of texts in the course of different lessons which are realistic and discursive in nature	K4
CO5	Value the integral concepts of English grammar necessarily required in their linguistic competence	K5

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

211EL1A1EA	PROFESSIONAL ENGLISH - I	SEMESTER I

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I Genre Studies - I 10 h

The Road Not Taken – Robert Frost
All the World's a Stage – William Shakespeare
Whitewashing the Fence – Mark Twain
The Face of Judas Iscariot - Bonnie Chamberlain
Soul Gone Home – Langston Hughes

Unit II Genre Studies - II 11 h

Ode on a Grecian Urn – John Keats
Mending Wall – Robert Frost
My Early Days – Dr. A.P.J. Abdul Kalam
Nightfall – Isaac Asimov
A Kind of Justice – Margret Atwood

Unit III Grammar - I 14 h

Parts of Speech
Articles and Prepositions
Subject Verb Agreement
Degrees of Comparison
Sequence of Tenses

Unit IV Genre Studies - III 11 h

On his Blindness - John Milton
Small - Scale Reflections on a Great House – A.K. Ramanujan
On Prayer – Khalil Gibran
The Garden Party – Katherine Mansfield
The Tell - Tale Heart – Edgar Allen Poe

Unit V Grammar - II 14 h

If Conditionals

Modal Auxiliary Verbs

Question Types/Tags

Voice

Direct and Indirect Speech

Text Books

1 Prabha, Vithya. R and S. Nithya Devi. 2019. Sparkle: English Textbook for First Year. McGraw Hill Education, Chennai.

2 Wren and Martin. 2006. High School English Grammar and Composition. S. Chand Publishing, New Delhi.

References

1 Bajwa and Kaushik. 2010. Springboard to Success- Workbook for Developing English and Employability Skills. Orient Black Swan, Chennai

2 Syamala. V. 2002. Effective English Communication for You. Emerald Publishers, Chennai.

3 Krishnaswamy. N, Lalitha Krishnaswamy & B.S. Valke. 2015. Eco English, Learning English through Environment Issues. An Integrated, Interactive Anthology. Bloomsbury Publications, New Delhi.

4 Krishnaswamy. N. 2000. Modern English: A Book of Grammar, Usage And Composition. Macmillan, New Delhi.

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APPROVED
BoS- 11th 13/5/21 | AC - 11th 9/8/21 | GB 15th 17/8/21

Course Code	Course Name	Category	L	T	P	Credit
193BC1A1CA	BIOMOLECULES	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The elements present in biomolecules and the different monomers and polymers
- About the link between structure and function of biomolecules at a chemical level within a biological context
- the physical and chemical properties of the biomolecules

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the chemical properties of water and how they influence biomolecular and cellular function	K1, K2
CO2	Describe the structure and conformational freedom of biomolecules.	K1, K2
CO3	Understand the structural principles that govern reactivity/physical properties of molecules.	K2
CO4	Understand and demonstrate the structure of biomolecules determines their properties and reactivity.	K1, K2,K3
CO5	Develop chemical reasoning, thinking, and are able to apply chemical rules and logics to biological problems.	K3

MAPPING WITH PROGRAMME OUTCOMES

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

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

193BC1A1CA	BIOMOLECULES	SEMESTER I

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Water and Introduction to Carbohydrates 10 h

Water: Structure, Physical properties of water. Weak interaction in aqueous solutions. pH - Introduction, buffers, Henderson-Hasselbalch equation, biological buffer system. Introduction to biological macromolecules- Carbohydrate classification structure, properties & chemical reactions of monosaccharides. Structure, Properties of disaccharides- Maltose, Lactose and Sucrose. Polysaccharides- structure & biological functions of Homo & Hetero polysaccharides

Unit II Lipids 9 h

Definition & classification of lipids, physico-chemical properties. Storage lipids- fatty acids- types. Structural lipids- phospholipids, glycolipids & sphingolipids. Structure and function of steroids- cholesterol and phytosterols

Unit III Amino acids & Proteins 10 h

Classification of amino acids, general properties, Chemical reactions of amino acids due to carbonyl groups and aminogroups. Peptide bond structure and properties. Protein classification, Physico-chemical properties of proteins. Organization of protein Structure- Primary (Insulin), Secondary (Keratin, Collagen), Tertiary (Myoglobin), Quaternary structure (Hemoglobin). Denaturation & Renaturation

Unit IV Nucleic Acids 9 h

Structures of Purines, Pyrimidines, Nucleosides and Nucleotides. Properties of nucleic acids. DNA double helical structure, A, B & Z forms. Denaturation &Renaturation of DNA. Types, structure and functions- RNA , microRNA, siRNA and other forms of RNA.

Unit V Minerals & Vitamins 10 h

Minerals in biological system and their importance- Iron, Calcium, Phosphorous, Iodine, Copper, Zinc. Vitamins- Definition, classification: Fat soluble (Vitamin A, D, E, K) and Water soluble vitamins (Vitamin-B Complex & -C) -Sources, functions and deficiencies.

Text Books

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

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

References

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

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

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

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

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BoS- 11th 13/5/21 | AC - 11th 9/8/21 | GB - 15th 17/8/21

Course Code	Course Name	Category	L	T	P	Credit
193BC1A1CB	CELL BIOLOGY	CORE	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the biology of cells, internal and external cellular organelles, cell division and renewal.
- the ultra-structural organization of cellular components.
- the importance of cellular function

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	List various cellular types based on origin and evolution. Differences of microbial, plant and animal cells.	K1, K2 & K3
CO2	Define the importance of pro- and eukaryotic cells. Classify various cellular organelles .	K1, K2 & K3
CO3	Demonstrate microfilament polymerization, assembly and intracellular organization of intermediate filament proteins.	K1, K2 & K3
CO4	Label cell membrane, cell wall and extracellular matrix in a cell.Outline various cell-matrix and cell-cell interactions.	K1, K2 & K3
CO5	Matching structure and functions of nucleus and chromosomes of eukaryotic cell and cell division.	K1, K2 & K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193BC1A1CB	CELL BIOLOGY	SEMESTER I

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Introduction to cell biology 7 h

An overview of cells: origin and evolution of cells and cell theory. Classification of cells: Prokaryotic (archaea and eubacteria) and eukaryotic cells (animal and plant cells). Comparison of cells: microbial, plant, and animal cells. Cells as experimental models: prokaryotic and eukaryotic cells.

Unit II Structure and Functions of different cell organelles 7 h

Structure and functions: Endoplasmic reticulum, Golgi apparatus, Ribosome's, Nuclear envelope, Nuclear-pore complex, Lysosomes, Glyoxysomes, Mitochondria, Chloroplast and Peroxisomes.

Unit III Cytoskeletal proteins 8 h

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

Unit IV Cell wall, extracellular matrix, cell membrane and transport 8 h

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

Unit V Nucleus, chromosome, cell cycle, cell death and cell renewal 7 h

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

Text Books

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

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

References

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

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

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

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BoS- 11th	AC - 11th	GB - 15th
13/5/21	9/8/21	17/8/21

193BC1A1CP	BIOMOLECULES AND CELL BIOLOGY	SEMESTER I

Total Credits: 2
Total Instructions Hours: 48 h

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

Note: Out of 12 - 10 Mandatory

References

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

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

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Course Code	Course Name	Category	L	T	P	Credit
192CE1A1IB	CHEMISTRY FOR BIOLOGISTS	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	Explain the basic theories of coordination chemistry and infer the names inorganic compounds.	K2
CO2	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	Demonstrate to prepare laboratory solutions.	K2
CO5	Relate the chemical kinetics and catalytic reactions	K2

MAPPING WITH PROGRAMME OUTCOMES

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

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

192CE1A1IB	CHEMISTRY FOR BIOLOGISTS	SEMESTER I

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Coordination Chemistry and Fertilizers 7 h

Coordination Chemistry:

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

Fertilizers:

Urea, ammonium sulphate, ammonium Nitrate, Potassium Nitrate, NPK fertilizer, Triple Superphosphate, Pollution of air, Water and Soil-sources, remedies.

Unit II Chemical Bonding 7 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.7

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 7 h

Normality, molarity, molality, mole fraction, mole concept.

Primary and secondary standards – preparation of standard solutions.

Principle of Volumetric analysis (with simple problems).

Indicators – Theory of indicators- Acid base 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, molecularity, first order rate law, half life period of first order equation, pseudo first order reaction, zero and second order reactions. Derivation of rate expression for I and II order kinetics.

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

Text Books

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

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

3 Bahl Arun and Bahl B S, 2016, "A Textbook of Organic Chemistry", 22nd Edition, S. Chand & Company.

References

1 Jain. M K, Sharma S C, 2019, Modern Organic Chemistry, Vishal publishing Co., New Delhi.

2 Lee J D, 2014, A New Concise Inorganic Chemistry, 5th Edition, Oxford University Press, London.

3 Puri B R, Sharma L R, Kalia K C, 2017, "Principles of Inorganic Chemistry", 33rd Edition, Vishal Publishing & Co. New Delhi.

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192CE1A1IP	IDC - CHEMISTRY PRACTICAL	SEMESTER I

Total Credits: 2
Total Instructions Hours: 48 h

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

Note: Out of 12 – 10 Mandatory

References

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

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

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BoS- 11th	AC - 11th	GB - 15th
13/5/21	9/8/21	17/8/21

Course Code	Course Name	Category	L	T	P	Credit
193MB1A1AA	VALUE EDUCATION- ENVIRONMENTAL STUDIES	AECC	2	-	-	2

PREAMBLE

This course has been designed for students to learn and understand

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	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	VALUE EDUCATION- ENVIRONMENTAL STUDIES	SEMESTER I

Total Credits: 2

Total Instruction Hours: 24 h

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 5 h

Land Resources and land use change; Land degradation, soil erosion and desertification. Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Water: Use and overexploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state). 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.

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.

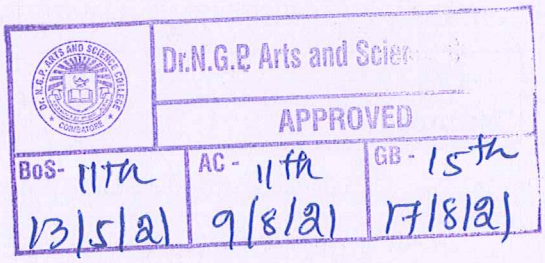
7 McCully, P.1996. Rivers no more: the environmental effects of dams(pp. 2964). Zed Books.

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.

References

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	பகுதி-1: தமிழ் - தாள்- II	மொழி	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- மொழிப் பாடங்களின் வாயிலாகத் 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

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	பகுதி-1: தமிழ் - தாள்- 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 பயிற்சிப் பகுதி** 15 h

அ.இலக்கிய வரலாறு

1. பதினெண் கீழ்க்கணக்கு நூல்கள்

2. தமிழ் உரைநடையின் தோற்றமும் வளர்ச்சியும்

ஆ. இலக்கணம்

1. வழு, வழுவமைதி, வழாநிலை

இ. பயிற்சிப் பகுதி

1. நூல் மதிப்பீடு மற்றும் திரைக்கதை திறனாய்வு

2. தன்விவரக் குறிப்பு எழுதுதல்

Note : பயிற்சிப் பகுதியில் வினாக்கள் அமைத்தல் கூடாது

Text Books

1 தொகுப்பு: தமிழ்த்துறை, டாக்டர் என்.ஜி.பி. கலை 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/>

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Course Code	Course Name	Category	L	T	P	Credit
201TL1A2HA	HINDI -II	LANGUAGE	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

201TL1A2HA	HINDI -II	SEMESTER II

Total Credits: 03

Total Instruction Hours: 60 h

Syllabus

Unit I — 12 h

आधुनिक पद्य – शबरी (श्री नरेश मेहता

प्रकाशक: लोकभारती प्रकाशन

पहली मंजिल, दरबारी बिल्डिंग,

महात्मा गाँधी मार्ग, इलाहाबाद-211001

Unit II — 12 h

उपन्यास: सेवासदन-प्रेमचन्द

प्रकाशक: सुमित्र प्रकाशन

204 लीला अपार्ट्मेंट्स, 15 हेस्टिंग्स रोड'

अशोक नगर इलाहाबाद-211001

Unit III — 12 h

कहानी-किरीट- डा उषा पाठक / डा अचला पाण्डेय

पाठ 1. उसने कहा था

पाठ 2. कफ़न,

पाठ 3. चीफ़ की दावत

प्रकाशक: राधाकृष्ण प्रकाशन दिल्ली

Unit IV — 12 h

पत्र लेखन: (औपचारिक या अनौपचारिक)

पुस्तक: व्याकरण प्रदिप – रामदेव

प्रकाशक: हिन्दी भवन 36 इलाहाबाद-211024

Unit V — 12 h

अनुवाद अभ्यास-III (केवल हिन्दी से अंग्रेजी में)

(पाठ 1 to 10)

प्रकाशक: दक्षिण भारत प्रचार सभा चेनैई -17

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BoS- 12th	AC - 12th	GB - 17th
30/12/21	23/3/22	28/3/22

Course Code	Course Name	Category	L	T	P	Credit
201TL1A2MA	MALAYALAM - II	LANGUAGE	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	SEMESTER II

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I 12 h

Travelogue

Unit II Novel 12 h

Travelogue

Unit III 14 h

Travelogue

Unit IV 10 h

Autobiography

Unit V 12 h

Autobiography

Text Books

1 Dubai Puzha (Travelogue) By K.Krishna Das, Published by Green books Thrissur.

2 Vazhithirivukal (Autobiography) By Dr.APJ Abdul Kalam Published by DC.Books Kottayam

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Course Code	Course Name	Category	L	T	P	Credit
201TL1A2FA	FRENCH -II	LANGUAGE	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

12 h

• Proposer, accepter, refuserune invitation. • Indiquer la date.	Organiser une soirée au cinéma avec des amis, par téléphone et par courriel.	• Comprendreunemessage d'invitationsurunrépondeurt éléphonique. • Inviter quelqu'un accepter ourefuserl'invitation.

Unit II

12 h

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

Unit III

12 h

• Exprimer son point de vuepositifetnégatif. • S'informersur le prix. • S'informersur la quantitité. • Exprimer la quantitité.	En groupes, choisir un cadeau pour un ami.	• Exprimer son point de vuesur des idées de cadeau. • Faire des achatsdans un magasin

Unit IV

12 h

• Demander etindiquerune direction. • Localiser (près de, en face de ….).	Suivre un itinéraire à l'aided'indications par telephone et d'un plan.	• Comprendre des indications de direction. • Comprendre des indications de lieu.

Unit V

12 h

• Exprimerl'obligationl'interdit. • Conseiller.	Par courrierélectronique, donner des informations et des conseils à un ami qui veut voyager.	• Comprendreune chanson. • Comprendre de courts messages qui experiment l'obligationoul'interdiction • Donner des conseils à des personnesdans des situations données.

Text Books

1 LATITUDES 1 (Méthode de français) Pages from 56 to 101, Author : RÉGINE MÉRIEUX Publisher : GOYAL Publishers & Distributors Pvt

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AC - 15th 23/3/22
GB - 17th 28/3/22

Course Code	Course Name	Category	L	T	P	Credit
211EL1A2EA	PROFESSIONAL ENGLISH - II	LANGUAGE	4	-	1	3

PREAMBLE

This course has been designed for students to learn and understand

- The effect of dialogue, the brilliance of imagery and the magnificence of varied genres
- The vocabulary and to frame sentence structure
- The transactional concept of English language

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	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	K3
CO4	Inspect the knowledge to the corporate needs	K4
CO5	Formulate Inter and Intrapersonal skills	K5

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

211EL1A2EA	PROFESSIONAL ENGLISH - II	SEMESTER II

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I Technical English 12 h

Communication: Process- Methods- Channels- Barriers of Communications

Phonetics: Basics of phonetics - Consonants and Vowel sounds

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

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

Unit II Business English 12 h

Structure and Planning of Letters: Elements of Structure- Forms of Layout- Style- 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 12 h

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 12 h

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 12 h

Self - Discovery and Goal Setting: Self - Discovery - Goals and Types- Benefits, Areas and Clarity of Goal Setting

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

Text Books

1 Prabha, Dr. R. Vithya & S. Nithya Devi. 2019. Sparkle. (1st Edn.) McGraw - Hill Education. Chennai. [Unit I - V]

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.

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AC - 12th 23/3/22
GB - 17th 28/3/22

Course Code	Course Name	Category	L	T	P	Credit
193BC1A2CA	ANALYTICAL BIOCHEMISTRY	CORE	4	1		4

PREAMBLE

This course has been designed for students to learn and understand

- The basics and applications of the instruments that are routinely used for the characterization of biomolecules.
- The applicability and advantages of current analytical instruments.
- The basic laboratory skills in the conduct of any laboratory experiment.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the basics and applications of the chromatographic techniques.	K2
CO2	Choose appropriate centrifugation techniques for analysis of different biological sample types.	K3
CO3	Choose and apply the various electrophoretic techniques in biological research applications.	K3
CO4	Understand the basics spectroscopic techniques.	K2
CO5	Explain the methods and uses of radioiostopic techniques in biological research and applications	K2 & K 3

MAPPING WITH PROGRAMME OUTCOMES

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

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

193BC1A2CA	ANALYTICAL BIOCHEMISTRY	SEMESTER II

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Chromatography techniques 12 h

Basic Principles and applications of paper chromatography, Thin layer chromatography, Gas liquid chromatography, Ion-exchange chromatography, Affinity chromatography, Molecular sieve chromatography, High Performance Liquid Chromatography, Fast Protein Liquid Chromatography.

Unit II Electrophoresis techniques 12 h

Basic Principles, technique and applications of paper electrophoresis, gel electrophoresis - SDS-PAGE, Agarose gel electrophoresis, capillary electrophoresis, detection and identification (staining procedures) of proteins and nucleic acids, Isoelectric focusing of proteins, 2D Electrophoresis.

Unit III Centrifugation techniques 12 h

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

Unit IV Spectroscopic techniques 12 h

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

Unit V Radio isotopic techniques 12 h

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

Text Books

1. Sawhney and Singh, 2015, "Introductory Practical Biochemistry", 11th edition, Narosa Publishing house, New Delhi.
2. Srivastava S, 2012, "Molecular techniques in Biochemistry and Biotechnology", 1st edition, New Central Book Publishers, West Bengal.

References

1. Wilson and Walker, 2018, "Principles and techniques of Biochemistry and Molecular Biology", 8th edition, Cambridge University Press, UK.
2. Boyer R. F, 2012, "Biochemistry Laboratory – Modern theory and techniques", 2nd edition, Pearson Education Inc, London.
3. Sadasivam S and Manickam A, 2018, "Biochemical methods", 3rd edition, New Age International Publishers, New Delhi.
4. Sheehan D, 2013, "Physical Biochemistry – Principles and Applications", 2nd edition, Wiley Blackwell, New Jersey, USA.

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Course Code	Course Name	Category	L	T	P	Credit
193BC1A2CB	CORE IV : ENZYMOLOGY	CORE	4		-	4

PREAMBLE

This course has been designed for students to learn and understand

- Overview of the structure, functions and reactions mediated by enzymes in a cell.
- Gain basic knowledge of enzymes, features of enzyme catalysis and kinetics, mechanism of action of selected enzymes and co-enzymes
- Regulation of enzyme activity, inhibitors and applications of enzymes

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Classify enzymes, explain active site and specificity of enzymes, illustrate theories of enzyme catalysis	K1,K2
CO2	Describe the comparison of co-enzymes, regulatory enzymes, ribozymes and abzymes.	K1, K2
CO3	Illustrate factors that affect enzyme activity and construct MM plot,LB plot, Eadie-Hofstee and Hanes plot	K2,K3
CO4	Compare different types of enzyme inhibition and build models of bi-substrate reactions	K3
CO5	Explain industrial and diagnostic applications of enzymes	K4

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193BC1A2CB	CORE IV: ENZYMOLOGY	**SEMESTER II**

Total Credits: 4
Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to Enzymes 8 h

Introduction to enzymes, holoenzyme, apoenzyme, and prosthetic groups. General characteristics of enzymes. IUB Classification of enzymes, numbering and nomenclature (Class and subclass with one example). Units of enzyme activity – katal, International Unit (IU). Concept of active sites, enzyme specificity. Theories of enzyme catalysis- Lock and Key model and Induced fit model

Unit II Coenzymes and Regulatory enzymes 10 h

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

Unit III Enzyme Kinetics 10 h

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

Unit IV Enzyme Inhibition, Bi-substrate reactions and enzymatic catalysis 10 h

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

Unit V Enzyme Applications 10 h

Isolation of enzymes, criteria of purity. Immobilized Enzymes- methods & applications. Industrial uses of enzymes: production of glucose from starch, cellulose and dextrans, use of lactase in dairy industry, production of glucose and fructose syrup from sucrose, use of proteases in food, leather and detergent industry. Diagnostic (AST,ALT, creatine kinase, alkaline and acid phosphatases)

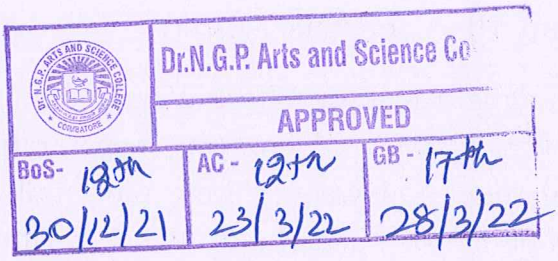
applications of enzymes

Text Books

1. Palmar, T (2001). Understanding enzymes. (1st Edn.) Horwood publishing house: Chichesper.
2. Bhatt, S.M. (2014). Enzymology and Enzyme technology. (15th Edn.) New Delhi: S. Chand publishers.

References

1. Palmer, T and Bonner, P.L. (2004). Enzymes: Biochemistry, Biotechnology, Clinical chemistry. (1st Edn.) New Delhi: Affiliated East West Press Private limited.
2. Asokan, P. (2006). Enzymes. (1st Edn.) Location: Chinnaa publications.
3. Choudhary N.L and Singh, A. (2012). Fundamentals of Enzymology. (1st Edn.) UK: Oxford Book Company.
4. Nelson, D.L and Cox, M.M. (2008). Lehninger Principles of Biochemistry. (5th Edn.) New York: W.H. Freeman and Company.



193BC1A2CP	CORE PRACTICAL: ANALYTICAL BIOCHEMISTRY AND ENZYMOLOGY	SEMESTER II

Total Credits: 2
Total Instructions Hours: 48 h

S.No	List of Experiments
1	Verification of Beer's law (Use KMnO4, K2CrO4 or similar coloured solution for this experiment)
2	Estimation of aminoacids by ninhydrin method
3	Estimation of proteins by Biuret method
4	Separation of carbohydrates by paper chromatography
5	Separation of amino acids by paper chromatography
6	Separation of lipids using thin layer chromatography (TLC)
7	Separation of amino acids using thin layer chromatography (TLC)
8	Separation of nucleic acid using agarose gel electrophoresis (Demonstration)
9	Effect of pH on the activity of any one of the following enzymes: a). Acid phosphatase b). Amylase c). Urease
10	Effect of temperature on the activity of any one of the following enzymes: a). Acid phosphatase b). Amylase c). Urease
11	Effect of substrate concentration on the activity of any one of the following enzymes: a). Acid phosphatase b). Amylase c). Urease
12	Separation of proteins by SDS PAGE. (Demonstration)

Note: Out of 12 - 10 Mandatory

References

1 Abhilasha Singh, 2007, "Enzyme Assays", 1st Edition, Regency Publications, New Delhi.

2 Sadasivam S and Manickam A, 2008, "Biochemical Methods", 3rd Edition, New Age International Publishers, New Delhi.

3 Singh SP, 2014, "Practical Manual of Biochemistry", 7th Edition, CBS Publishers & Distributors, New Delhi.

4 Sharma BK, 2003, "Instrumental Methods of Chemical Analysis", 24th Edition, Krishna Prakashan Media Private Ltd., Meerut, Uttar Pradesh.

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Course Code	Course Name	Category	L	T	P	Credit
192PY1A2IC	PHYSICS	IDC	3	-	2	4

PREAMBLE

This course has been designed for students to learn and understand

- Properties of materials and its determination
- Number systems and truth tables
- Concepts of smart materials and its applications

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES

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

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

192PY1A2IC	PHYSICS	SEMESTER II

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Properties of Matter 12 h

Young's modulus – Rigidity modulus – Bulk modulus – Poisson's ratio (definition)– Bending of beams – Expression for bending moment -Depression of Cantilever- Determination of Y by uniform and non- uniform bending methods - Determination of rigidity modulus by torsional pendulum.

Unit II Gravitation and Acoustics 12 h

Newton's law of Gravitation - Kepler's laws of planetary motion - Deduction of Newton's law of gravitation from Kepler's laws- Determination of 'G' by Boy's method- Acceleration due to gravity- Determination of 'g' by compound pendulum.

Doppler effect– Applications of Doppler effect – Determination of frequency of alternating current by Sonometer.

Unit III Digital Electronics 12 h

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

Unit IV Viscosity 12 h

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

Unit V Optics and Smart materials 12 h

Interference – conditions for interference maxima and minima – Air wedge – Determination of thickness of a thin wire by Air wedge method –Diffraction – Difference between diffraction and interference - Theory of transmission grating. Metallic glasses – Shape Memory Alloys – Biomaterials - Applications

Text Books

1 Murugeshan R and Kiruthiga Sivaprasath ER, 2014, "Modern Physics", 17th Edition, S Chand and Co, New Delhi.

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

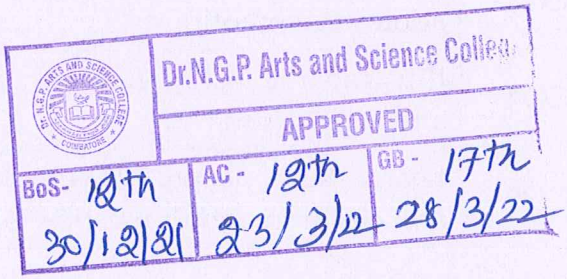
References

1 Millman J, Halkias C and Chetan Parikh, 2009, "Integrated Electronics", 10th Edition, Tata McGraw Hill Publishing Company Ltd, New York.

2 Robert Resnick, David Halliday and Kenneth S Krane, I.N., 2001, "Physics", 10th Edition, Wiley India, New Delhi.

3 Mehta R, 2010, "Principles of Electronics", 11th Edition, S Chand and Co, New Delhi.

4 Brij Lal and Subrahmanyam N, 2006, "A Text book of Optics", 10th Edition, S Chand and Co, New Delhi.



Course Code	Course Name	Category	L	T	P	Credit
196BM1A2AA	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	S	S	S

S Strong M Medium L Low

196BM1A2AA	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.

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

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APPROVED
BoS- 12th 30/12/21
AC - 12th 23/3/22
GB - 17th 28/3/22

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	4	-	-	3	25	75	100	3
Part – III										
193BC1A3CA	Core-V	Intermediary Metabolism	3	1	-	3	25	75	100	3
193BC1A3CP	Core Practical-III	Intermediary Metabolism	-	-	4	6	40	60	100	2
194IT1A3IA	IDC-III	Artificial Intelligence in Biology	3	-		3	25	75	100	2
194IT1A3IP	IDC Practical -II	Python Programming	-	-	4	3	40	60	100	2
193BC1A3SA	SEC-I	Basics of Bioinformatics	3	-	-	3	25	75	100	3
	GE-I		2			3	-	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**	**2**	**8**				**800**	**22**

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

அரசுஅலுவலகம் 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.

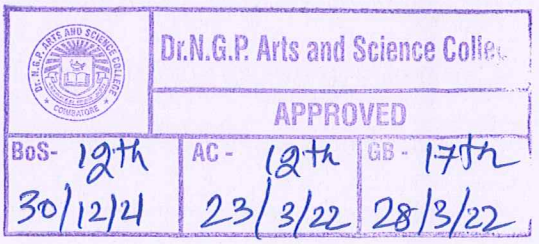
2 இன்குலாப் – 2017. ஔவை (நாடகம்), அன்னம் வெளியீடு, சென்னை.

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

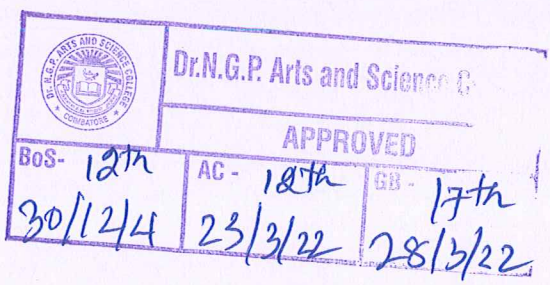
प्रकाशक: हिन्दी भवन 36 इलाहाबाद - 211024

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.

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APPROVED
BoS- 12th 30/12/21 | AC - 12th 23/3/22 | GB - 17th 28/3/22

Course Code	Course Name	Category	L	T	P	Credit
201TL1A3FA	FRENCH -III	LANGUAGE- 1	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

201TL1A3FA	FRENCH - III	SEMESTER III

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I

10 h

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

Unit II

8 h

° Raconter. ° Décrire les étapesd'une action.	Raconterune scene insoliteà l'oreal et à l'écrit.	Comprehendrele récitdún voyage. Raconterses actions quotidiennes.	Décrireunebiographie a partird'elémentsécrits.

Unit III

10 h

° EsprimerI'intensit éet la quantité. ° Interroger.	Raconterune scene insoliteà l'oreal et à l'écrit.	Comprehendrele récitdún voyage. Raconterses actions quotidiennes.	Décrireunebiographie a partird'elémentsécrits.

Unit IV

10 h

° Décrirequelqu'un. ° Comparer ° ExprimerPaccord ou le désaccord. ° Se situerdans le temps.	En milieu professional, recruiter quelqún et justifier sonchoix.	S'exprimersur les styles de vêtemantReconnaitre des personnes à partit de descriptions. Décrire des personnes. Comprendre des personnes qui experiment leur accord ouleurdésaccord.	Comprendre la description de personnesdans un extrait de roman. Comprendre des différences de points de vueexprimétesdans de message électronique. Raconter unsourvenir.

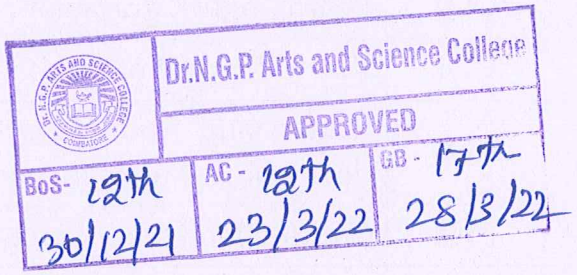
Unit V

10 h

° Parlerde Pavenir. ° Exprimer des souhaits. ° Décrirequelqu'un.	Discuter de l'organisation d'un voyage de groupepuispréparerune fiche projet et la templit.	Comprendreune chanson. Echangersursesprojets de vacancy Discuter du programme de la soire à venir. Addresser des souhaits à quelqu'un	Comprendre le message d'une carte d'anniversaire.

Text Books

1 LATITUDES 1 (Méthode de français) Pages from 102-151, Author : Regine Mérieux, Yves Loiseau



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

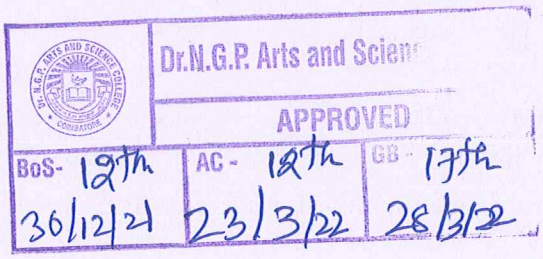
Paraphrase Writing - Techniques and Methods of Paraphrasing - Precis Writing - Difference between Paraphrase and Precis - review writing - Hints Developing - Editorial Writing - Tabloid - Column Writing

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
193BC1A3CA	INTERMEDIARY METABOLISM	CORE	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the fate of digestion and absorption of dietary food constituents such as macro and micronutrients.
- the role distinct metabolic pathways used by cells to harvest the energy.
- the combined activities of all the metabolic pathways that interconvert precursors, metabolites and products of Low Molecular Weight substances.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Illustrate the general design of metabolic pathways based on bioenergetics principle.	K2 & K3
CO2	Explain the events that make up the process of aerobic cellular respiration and Electron Transport Chain.	K2 & K3
CO3	Understand the chemical logic of lipid metabolic pathways.	K2
CO4	Explain nitrogenous Compound metabolism and the biochemical basis of some diseases arising in amino acid metabolism.	K3
CO5	Compare nucleic acid metabolic pathways and evaluate their interrelations of Carbohydrate, fat and protein.	K4

MAPPING WITH PROGRAMME OUTCOMES

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

S – Strong M – Medium L – Low

193BC1A3CA	INTERMEDIARY METABOLISM	SEMESTER III

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I Bioenergetics 6 h

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

Unit II Carbohydrate Metabolism 12 h

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

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

Unit III Lipid Metabolism 12 h

Blood lipids and fate of dietary lipids. Oxidation of fatty acids: - Carnitine cycle; beta oxidation. Alpha oxidation and omega oxidation. Biosynthesis of propionyl CoA. Biosynthesis of saturated fatty acids. Biosynthesis of unsaturated fatty acids: - Monounsaturated and polyunsaturated fatty acids. Biosynthesis and degradation:- Lecithin, cephalin, inositol, phosphatidyl serine, cholesterol. Case studies.

Unit IV Protein Metabolism 8 h

Fate of dietary proteins, metabolic nitrogen pool, Detoxification of Ammonia- Urea Cycle. Catabolism of amino acid: Oxidative deamination, non-oxidative deamination, transamination, amino acid decarboxylation, Metabolism ketogenic and glucogenic aminoacids. Metabolic disorders; Maple syrup Disease, Phenylketouria, tyrosinemia, homocystinuria.

Unit V Nucleic Acid Metabolism 10 h

Interrelation between carbohydrates, fat and protein metabolism.

Nucleic acid: Metabolism of purines: de-novo synthesis, salvage pathways; catabolism. Metabolism of pyramidines - de novo synthesis, salvage pathways; catabolism. Metabolism of micronutrients - Thiamine, Riboflavin, Niacin, Pantothenic Acid

Text Books

1 Bery J M Tymoezko and Stryer I, 2015 "Biochemistry", 8th edition, W.H.Freeman and Company, Newyork.

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

References

1 Mathews C K Vanholde K E, 2001, "Biochemistry", 3rd Edition, The Benjamin/ Cummings Publishing Company, Menlo park.

2 David L Nelson and Michael M Cox, 2017, "Lehninger Principles of Biochemistry",7th Edition, W.H.Freeman and company, Newyork.

3 Donald Voet Judith G Voet and Charlotte W Pratt, 2016, "Fundamentals of Biochemistry: Life at the Molecular Level", 5th Edition, Wiley Publishers,US.

4 West, E S, Todd, W R, Mason H S and Van Brugge T J, 2001, 4th Edition, "The text book of Biochemistry", Macmillan Company, London.

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193BC1A3CP	CORE PRACTICAL: INTERMEDIARY METABOLISM	SEMESTER III

Total Credits: 2
Total Instructions Hours: 48 h

S.No	List of Experiments
1	Urea by DAM TSC method
2	Uric acid by Phosphotungstate method
3	Creatinine by Picric acid method
4	Phosphorus by ANSA method
5	Glucose by O-Toluidine Method
6	Cholesterol by FerricChloride method
7	Hemoglobin by Cyanmethhemoglobin method
8	Calcium by permanganate method
9	Iron by Thiocyanate method
10	Protein by Biuret method
11	Qualitative analysis of glucose, albumin in urine.
12	Qualitative analysis of bilePigments, bile salts and ketone bodies in urine

Note: Out of 12 - 10 Mandatory

References

1. Gowenlock A H, 2002,"Varley's Practical Clinical Biochemistry", 6th Edition, CBS Publishers, New Delhi.
2. David T Plummer, 2006, "An introduction to Practical Biochemistry", 3rd Edition, Tata McGraw Hill Publishing Company Ltd., New Delhi.

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Course Code	Course Name	Category	L	T	P	Credit
194IT1A3IA	ARTIFICIAL INTELLIGENCE IN BIOLOGY	IDC	3	-	-	2

PREAMBLE

This course has been designed for students to learn and understand

- the Basic concepts of Artificial Intelligence
- the more advanced topics of AI such as learning, Artificial Neural Networks Self-Organizing Maps, Cellular Automata, robotics, expert systems, and Learning Classifiers.
- the Artificial Intelligence techniques for problem solving.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Demonstrate fundamental understanding of Artificial Intelligence and Artificial Neural Networks	K1,K2
CO2	Apply basic principles of AI with Self-Organizing Maps	K1,K2,K3
CO3	Predict the stability of small atomic clusters using Evolutionary Algorithms.	K4
CO4	Analyze the components of cellular automata and Expert Systems.	K2,K3
CO5	Understand basic knowledge of fuzzy sets and fuzzy logic and classification	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	M	M
CO4	S	S	S	S	M
CO5	S	S	S	S	S

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

194IT1A3IA	ARTIFICIAL INTELLIGENCE IN BIOLOGY	SEMESTER III

Total Credits: 2

Total Instruction Hours: 36 h

Syllabus

Unit I Artificial Intelligence and Artificial Neural Networks 7 h

Artificial Intelligence: What Is Artificial Intelligence? - Why Artificial Intelligence and What Can We Do with It - The Practical Use of Artificial Intelligence Methods. Artificial Neural Networks: Introduction - Human Learning - Computer Learning - The Components of an Artificial Neural Network – Training - Layered Networks.

Unit II Self-Organizing Maps 8 h

Self-Organizing Maps: Introduction - Using a Self-Organizing Map - Components in a Self -Organizing Map - Network Architecture - Drawbacks of the Self-Organizing Map - Applications.

Unit III Evolutionary Algorithms 7 h

Evolutionary Algorithms: Introduction - Components in a Genetic Algorithm - Operation of the Genetic Algorithm: Selection - Crossover - Mutation - Other Evolutionary Algorithms - Applications.

Unit IV Cellular Automata and Expert Systems 7 h

Cellular Automata: Introduction – Principles - Components of a Cellular Automata Model - Theoretical Applications. Expert Systems: Introduction - Applicability of Expert Systems - Goals of an Expert System - The Components of an Expert System.

Unit V Fuzzy Logic and Learning Classifier Systems 7 h

Fuzzy Logic: Introduction - Crisp Sets- Fuzzy Sets - Membership Functions - How Does a Fuzzy Logic System Work - Application of Fuzzy Rules. Learning Classifier Systems: A Basic Classifier System - How a Classifier System Works - applications.

Text Books

1. Hugh Cartwright, USING ARTIFICIAL INTELLIGENCE IN CHEMISTRY AND BIOLOGY A Practical Guide, CRC Press, Taylor & Francis Group,2008
2. Dario Floreano,Claudio Mattiussi,Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies (Intelligent Robotics and Autonomous Agents series), The MIT Press, 2008

References

1. https://epdf.pub/using-artificial-intelligence-in-chemistry-and-biology-a-practical-guide-chapman.html
2. Dr. K. Uma Rao, Artificial Intelligence and Neural Networks,Pearson Education, 2011
3. S. Rajasekara, Neural Networks, Fuzzy Systems and Evolutionary Algorithms: Synthesis and Applications,PHI Learning; 2nd Revised edition edition, 2017
4. Sebastian Raschka, Vahid Mirjalili ,Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, and TensorFlow 2, 3rd Edition Kindle Edition,2019

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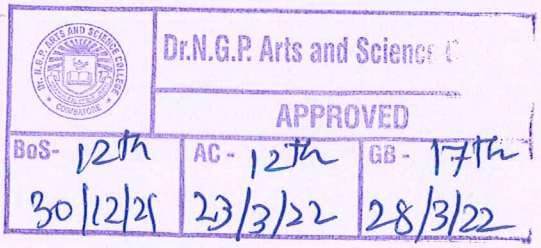
BoS- 18th	AC - 18th	GB - 17th
30/12/21	23/3/22	28/3/22

194IT1A3IP	IDC PRACTICAL: PYTHON PROGRAMMING	SEMESTER III

Total Credits: 2
Total Instructions Hours: 48 h

S.No	List of Experiments
1	Basic Operations.
2	Conditional Statements.
3	Control Statements.
4	Dictionary data structures.
5	Mathematical Functions.
6	Read the DNA sequence from the file and print it out along with its length
7	Manipulating Sequences.
8	Convert sequence object into protein.
9	Parsing data from FASTA GENBANK data files.
10	Create sequence record object and write a sequence file.
11	Load datasets and perform classification
12	Build a simple neural network.

Note: Out of 12 - 10 Mandatory



Course Code	Course Name	Category	L	T	P	Credit
193BC1A3SA	BASICS OF BIOINFORMATICS	SEC	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

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

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Develop elementary knowledge of Bioinformatics	K3
CO2	Identify Nucleotide and protein sequencing and their analysis	K2,K3
CO3	Construct global and local alignment search tool using BLAST and FASTA programs.	K3
CO4	Analyze protein structure prediction using laboratory-based approaches.	K4
CO5	Develop various approaches for target identification and validation in drug discovery.	K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193BC1A3SA	BASICS OF BIOINFORMATICS	SEMESTER III

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Introduction to Bioinformatics 7 h

Introduction to Computational Biology and Bioinformatics, Definition, history, emerging areas, scope and application of Bioinformatics, Human Genome Project-Science, applications and ELSI. Useful Bioinformatics sites on www. Data retrieval tool – Entrez, DBGET and SRS.

Unit II Databases 8 h

Biological databases, Importance of databases, Nucleic acid sequence databases-EMBL, GEN BANK, DDBJ, Protein databases- SWISS PROT, TrEMBL, PIR and Structure databases-PDB. Datamining of Biological databases.

Unit III Sequence Allignment 7 h

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

Unit IV Gene identification and prediction 7 h

Gene identification and prediction-pattern recognition, elements of gmo, non gmo and gene editing.

Protein primary structure analyses and prediction: identification and characterization.

Unit V Drug Discovery 7 h

Introduction to drug discovery, Structure based drug design- Pharmacophore identification and Mapping, methods to identify lead compounds, Molecular Docking. Classical SAR /QSAR and its applications.

Text Books

1. Rastogi S C, Mendiratla N D and Rastogi P,2013," Bioinformatics methods and applications- Genomics, Proteomics and Drug Discovery", 4th edition Prentice Hall India.
2. Lesk A M, 2019, "Introduction to Bioinformatics", 5th edition, Oxford University Press, New York.

References

1. Baxevanis A D and Francis Ouellette B F, 2020," Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins", 3rd Edition, Wiley and Sons, UK.
2. Sharma V, Munjal A and Shankar A, 2008, "A text book of Bioinformatics" first edition, Rastogi Publication, Meerut – India.
3. Polansski A and Kimmel M, 2010," Bioinformatics", first edition, Springer Pvt. Ltd., India.
4. David Mount W, 2013, "Bioinformatics sequence and genome analysis", 2nd edition , CBS Publishers, New Delhi.

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193BC1A3GA	GENERIC ELECTIVE : BIOCHEMISTRY AND HEALTH	SEMESTER III

Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I Carbohydrates 5 h

Carbohydrate – Sources of carbohydrates, Functions of carbohydrates in living organisms, Normal level of sugar in humans, Diabetes mellitus and its complications in human. Control and prevention of diabetes mellitus.

Unit II Lipids 5 h

Lipids- Sources of fats and Functions of fats and lipids in living organism. Normal levels of cholesterol, hypercholesterolemia and role of cholesterol in Blood pressure. Atherosclerosis and Heart attack. Obesity, Prevention and control of heart related diseases

Unit III Proteins 4 h

Proteins–Sources of proteins and amino acids. Functions of proteins in living organisms. Normal level of proteins in human. Protein Malnutrition - Kwashiorkor, Marasmus , Cachexia, -Prevention of Malnutrition.

Unit IV Vitamins 5 h

Vitamins–Sources of fat soluble(Vitamin A,D,E, K) and water-soluble vitamins (Vitamin-B Complex & -C). Functions of vitamins in humans and Deficiency disorders of Vitamins.

Unit V Minerals 5 h

Minerals– Sources ,Functions and deficiency disorders of calcium, magnesium, sodium, phosphorus, Iron, Iodine, Zinc in humans.

Text Books

1 Deb A C, 2001, "Fundamentals of Biochemistry", 9th edition, New Central Book Agency, Kolkatta.

2 Sathyanarayanan U, 2013, "Essentials of Biochemistry", 4th Edition, Elsevier, India

References

1 Ambika shanmugam, Ramadevi K, 2016, "Fundamentals of Biochemistry for Medical Students"for Medical Students, Lippincott Williams & Wilkins, US.

2 Jain, J.L., Jain, S. and Jain, N, 2016," Fundamentals of Biochemistry. Revised Edition, S. Chand and Company publication, Chennai

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

4 Donald Voet, Judith G. Voet , Charlotte W. Pratt," 2018, Voet's Principles of Biochemistry", 5th edition, John Wiley & Sons, New York.

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193BC1ASSA	SELF STUDY : ECOLOGICAL PRINCIPLES	SEMESTER III

Total Credits: 1

Syllabus

Unit I Introduction to Environment

The Environment: Physical environment; biotic environment; biotic and abiotic interactions. Habitat and Niche: Concept of habitat and niche;niche width and overlap; fundamental and realized niche; resource partitioning; character displacement.

Unit II Population Ecology

Population Ecology: Characteristics of a population; population growth curves; population regulation; life history strategies (r and K selection); concept of metapopulation - demes and dispersal, interdemic extinctions, age structured populations. Species Interactions: Types of interactions, interspecific competition, herbivory, carnivory, pollination, symbiosis.

Unit III Community Ecology and Ecological Succession

Community Ecology: Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones. Ecological Succession: Types; mechanisms; changes involved in succession; concept of climax.

Unit IV Ecosystem Ecology

Ecosystem Ecology: Ecosystem structure; ecosystem function; energy flow and mineral cycling (C,N,P); primary production and decomposition; structure and function of some Indian ecosystems: terrestrial (forest, grassland) and aquatic (fresh water, marine, eustarine). Biogeography: Major terrestrial biomes; theory of island biogeography; biogeographical zones of India.

Unit V Applied Ecology

Applied Ecology: Environmental pollution; global environmental change; biodiversity: status, monitoring and documentation; major drivers of biodiversity change; biodiversity management approaches. Conservation Biology: Principles of conservation, major approaches to management, Indian case studies on conservation/management strategy (Project Tiger,Biosphere reserves), legislations for conservation.

Text Books

1. Anubha Kaushik, Kaushik. C P 2013, "Basics of environment and ecology" 2nd edition, New Age International (P) Ltd., Publishers, India.
2. Anil Kumar De, Arnab Kumar De, 2010, "Environment and ecology", New Age International (P) Ltd., Publishers, India.

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1. Sharma P D,2018,"Ecology and Environment", 13th edition, RastogiPublications, Meerut, India..
2. Stiling Peter, 2006, "Ecology: Theories and Applications", 4th edition, Upper SaddleRiver, NJ: Prentice Hall, New Delhi, India.
3. Gaur R C, 2008,"Basic Environmental Engineering",New Age International (P) Ltd., Publishers, India..
4. Asthana, D K, Meera Asthana, 2015, "A Textbook of Environmental Studies", S.Chand Publishers, India..

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193BC1ASSB	SELF STUDY : HERBAL TECHNOLOGY	SEMESTER III

Total Credits: 1

Syllabus

Unit I Pharmacognosy

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

Unit II Medicinal plants

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

Unit III Medicinal Properties

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

Unit IV Herbal medicines for Human ailments

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

Unit V Herbal Biotechnology

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

Text Books

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

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

References

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

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

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

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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

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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

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BoS- 12th 30/12/21 | AC - 12th 23/3/22 | GB - 17th 28/3/22

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.

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AC - 12th 23/3/22
GB - 17th 28/3/22

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Fourth Semester										
Part-I										
191TL1A4TA	Language-I	Tamil-IV	3	1	-	3	25	75	100	3
191TL1A4HA		Hindi-IV								
191TL1A4MA		Malayalam-IV								
191TL1A4FA		French–IV								
Part-II										
191EL1A4EA	Language-II	English - IV	4	-	-	3	25	75	100	3
Part-III										
193BC1A4CA	Core-VI	Human Physiology	4	1	-	3	25	75	100	4
193BC1A4CP	Core Practical-IV	Human Physiology	-	-	4	6	40	60	100	2
192MT1A4IC	IDC-IV	Mathematics	3	-	-	3	25	75	100	3
193BC1A4SP	SEC-II	Bioinformatics practical		-	6	3	40	60	100	3
	GE-II		2	-	-	3		50	50	2
	LoP	Lab on Project	-	-	-	-	-	-	-	-
Part - IV										
191TL1A4AA	AECC - IV	Basic Tamil	2	-	-	3	-	50	50	2
191TL1A4AB		Advanced Tamil								
192PY1A4AA		General Awareness								
		Total	**18**	**2**	**10**				**700**	**22**

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/

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BoS- 12th AC - 12th GB - 17th
30/12/21 23/3/22 28/3/22

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

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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

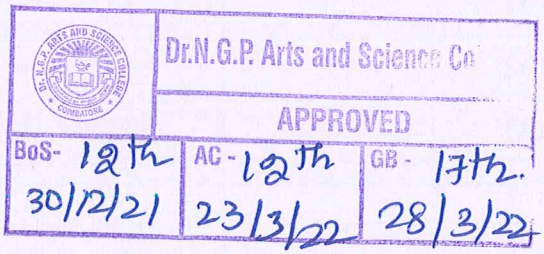
Unit V 08 h

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 • Il 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.

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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.

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BoS- 12th	AC - 12th	GB - 17th
30/12/21	23/3/22	28/3/22

Course Code	Course Name	Category	L	T	P	Credit
193BC1A4CA	HUMAN PHYSIOLOGY	CORE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- the functions of important physiological systems including the cardio-respiratory, renal, reproductive and metabolic systems
- integration and interrelationships of the organ systems of the human body
- the pathologic conditions altering normal physiology

COURSE OUTCOMES

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

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

193BC1A4CA	HUMAN PHYSIOLOGY	SEMESTER IV

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Body fluids and Respiratory system 12 h

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

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

Unit II Muscle and Nervous system 12 h

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

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

Unit III Cardiovascular system 12 h

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

Unit IV Gastrointestinal physiology 12 h

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

Composition and functions of saliva, gastric, pancreatic, intestinal juices and bile. Synthesis of Bile acids. Digestion and absorption of carbohydrates, proteins and fats

Unit V Excretory, Endocrine and Reproductive system 12 h

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

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

Reproduction system- overview, principles of contraception and IVF

Text Books

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

2 Pal G. K, 2015, "Textbook of Medical Physiology",3rd Edition, Ahuja Publishing House, New Delhi

References

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

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

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

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

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193BC1A4CP	CORE PRACTICAL: HUMAN PHYSIOLOGY	SEMESTER IV

Total Credits: 2
Total Instructions Hours: 48 h

S.No	List of Experiments
1	Separation of plasma proteins by electrophoresis (Group Experiment)
2	Estimation of Hemoglobin by Sahli's Method and CMG method
3	Determination of Hematocrit
4	Determination of Total RBC and WBC Count
5	Staining of Peripheral Blood Smear & Differential Leukocyte Count (DLC)
6	Determination of bleeding time and clotting time
7	Determination of blood types
8	Pulmonary function tests and spirometry (Demonstration)
9	Histology of connective tissue, liver, brain permanent slides (Demonstration)
10	Measurement heart rate and pulse rate and blood pressure
11	Renal clearance, GFR, ECG - Case studies
12	Determination of T3 and T4 level in serum by ELISA

Note: Out of 12 experiments, 10 are mandatory

References

1 Varshney V P, Bedi M, 2018, "Ghai's Testbook of practical physiology", 9th edition, Jaypee Brothers Medical Publishers, New Delhi

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

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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

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193BC1A4SP	SEC – II BIOINFORMATICS PRACTICAL	SEMESTER IV

Total Credits: 3
Total Instructions Hours: 72 h

S.No	List of Experiments
1	Working with MS-Office Packages One exercise each in Word, Excel, Power point and Access.
2	Working with HTML Tags and HTML Forms. Creating HTML Pages.
3	Biological Databanks Sequence Databases, Structure Databases, Specialized Databases.
4	Data retrieval tools and methods-ENTREZ and SRS.
5	Database file formats
6	Molecular visualization (RASMOL).
7	Gene structure and function prediction (using Gen Scan, GeneMark).
8	Sequence similarity searching (NCBI BLAST).
9	Protein sequence analysis (ExPASy proteomics tools).
10	Multiple sequence alignment (Clustal).
11	Molecular phylogeny (PHYLIP).
12	Sequence analysis using EMBOSS or GCG Wisconsin Package.
13	Homology Modeling using SPDBV

Note: Out of 13 experiments, 10 are mandatory

References

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

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

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

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193BC1A4GA	GENERIC ELECTIVE: ORGANIC FARMING: PRINCIPLES AND PRACTICES	SEMESTER IV

Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I Introduction to Organic Farming 4 h

Organic farming: definition, concept, principles. Difference between conventional and organic farming. Relevance of organic farming in global and Indian scenario, future prospects. SWOT analysis of Indian organic farming.

Unit II Land and Water management 5 h

Land use patterns, minimum tillage, shelter zones, pasture management, various agro-forestry systems, different cropping systems, crop rotation, organic livestock production.

Unit III Nutrient Management 5 h

Organic residues, organic manures, composting, vermicomposting, green manures and biofertilizers, Indigenous liquid organic manures.

Unit IV Plant Protection and Production 5 h

Indigenous liquid formulations for crop production and plant protection. Weed management, disease prevention and management, insect pest management practices.

Urban farming systems: concept and use of vertical farming, roof-top farming.

Unit V Marketing and economy of organic farming 5 h

Block chain technology. Marketing and export potential, inspection, certification, labeling and accreditation procedures for organic farming and organic produce. Socio-economic impacts of organic farming. Field visit.

Text Books

1. Shetty. P. K., Claude Alvares, Ashok Kumar Yadav, 2014, "Organic Farming and Sustainability", National Institute of Advanced Studies, IISc Campus, Bangalore, India.
2. Sharma, A, 2002, "A Hand Book of Organic Farming", Agrobios, India.

References

1. Palaniappan, S.P and Anandurai, K, 2010," Organic Farming - Theory and Practice", Scientific Publishers, India.
2. Rana SS, 2011, " Organic Farming", Department of Agronomy, College of Agriculture, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur, Himachal Pradesh, India.
3. Allen V. Barker, 2010, "Science and Technology of Organic Farming", CRC Press, Taylor & Francis Group, United States.
4. Harshita Joshi, 2019," Growing a Home Garden: A Simple Guide for Beginners", Agrihortico, India.

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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

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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

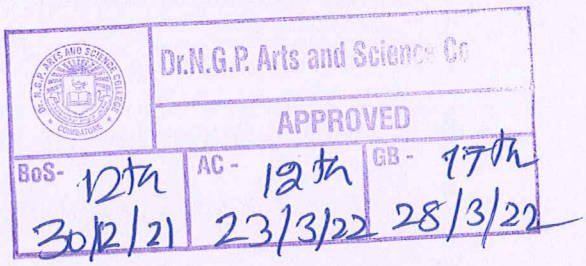
1 சிறப்புத்தமிழ் 20-21. தொகுப்பு : தமிழ்த் துறை , டாக்டர் என்.ஜி.பி. கலை அறிவியல் கல்லூரி, நியூ செஞ்சுரி புக் ஹவுஸ்(பி) லிட். சென்னை- 600 098

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.

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Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Fifth Semester										
Part – III										
193BC1A5CA	Core-VII	Basic Genetics and Molecular Biology	4	1	-	3	25	75	100	4
193BC1A5CB	Core-VIII	Basics of Microbiology	4	-	-	3	25	75	100	4
193BC1A5CC	Core-IX	Clinical Biochemistry	4	-	-	3	25	75	100	4
193BC1A5CD	Core-X	Plant Biochemistry	4	-	-	3	25	75	100	4
193BC1A5CP	Core Practical-V	Genetics & Molecular biology, Microbiology, Plant and Clinical Biochemistry	-	-	4	6	40	60	100	2
193BC1A5SA	SEC-III	Genetic Engineering	3	-	-	3	25	75	100	3
193BC1A5DA	DSE-I	Developmental biology	4	-	-	3	25	75	100	4
193BC1A5DB		Principles of Biotechnology								
193BC1A5DC		Genetics of Clinical Disorders								
193BC1A5LA	LoP	Lab on Project	-	-	-	-	50	-	50	1
193BC1A5TA	IT	Industrial Training	Grade A to C							
Part - IV										
192MT1A5AA	AECC-V	Research Methodology	2	-	-	3	-	-	50	2
		Total	**25**	**1**	**4**	**-**	**-**	**-**	**800**	**28**

Course Code	Course Name	Category	L	T	P	Credit
193BC1A5CA	BASIC GENETICS AND MOLECULAR BIOLOGY	CORE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	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

193BC1A5CA	BASIC GENETICS AND MOLECULAR BIOLOGY	SEMESTER V

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Genetics 16 h

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

Unit II Replication of DNA 10 h

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

Unit III Transcription and Reverse transcription 10 h

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

Unit IV Genetic Code and Translation 14 h

Genetic Code - definition, deciphering and salient features of genetic code, Wobble hypothesis. Prokaryotic protein biosynthesis - Translational activation of Amino acids, initiation, elongation and termination of protein synthesis. Inhibitors of protein biosynthesis. Comparison of protein biosynthesis in prokaryotes with eukaryotes. Post-translational modification of proteins. Role of signal peptide. Basic concept of one gene - one enzyme hypothesis.

Unit V Mutation, DNA Repair and Gene regulation 10 h

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

Text Books

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

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

References

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

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

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

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

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Course Code	Course Name	Category	L	T	P	Credit
193BC1A5CB	BASICS OF MICROBIOLOGY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

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

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Identify and Illustrate different types of microscopes.	K2 & K3
CO2	Plan and choose a suitable nutritional media required for microbial growth.	K2 & K3
CO3	Outline and apply the physical and chemical sterilization methods.	K3
CO4	Identify the mode of action of antibiotics.	K3
CO5	Compare and contrast the various pathogenic microbial diseases.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	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

193BC1A5CB	BASICS OF MICROBIOLOGY	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction 10 h

Definition, History and scope of Microbiology. Differentiation of Prokaryotes (Bacteria) and Eukaryotes (Fungi). Classification of microorganisms.

Microscopy: Principles of Microscope - Simple and compound microscope - Dark field, Phase contrast, Fluorescence and Electron microscopy. Microbiological staining techniques – Simple staining, Negative staining, Differential staining (Gram staining, Acid fast staining).

Unit II Microbial nutrition and growth 10 h

Carbon, nitrogen, hydrogen, oxygen, sulfur and phosphorous, nutritional classification of microorganisms. Nutritional uptake by cell - facilitated diffusion, active transport, group translocation. Media preparation - solid and liquid. Types of media – crude, semi synthetic, synthetic, enriched, enrichment, selective, differential and special purpose media (one example for each). Physical conditions required for microorganisms – temperature, atmosphere, pH, pressure. Microbial growth and measurement. Pure culture techniques – tube dilution, pour plate, spread and streak plate methods. Anaerobic culture methods – wright's tube, roll tube, McIntosh - Fildes anaerobic jar, Gaspak, Anaerobic chamber (glove box).

Unit III Sterilization and disinfection 9 h

Principles – methods of sterilization – dry heat, moist heat, filtration, radiation, tyndallization. Principle, classes, and applications of Biosafety cabinets.

Chemical sterilization - Chemical agents: mode of action (Alcohols, phenol, detergents, aldehydes, gaseous agents). Phenol coefficient test – Sterility testing.

Unit IV Antibiotics and mode of action 9 h

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

Unit V Microbes & Pathogenic diseases 10 h

Normal human micro flora, host - parasitic interaction, epidemics, exo and endotoxins. Air borne diseases: Aetiology, symptoms and prevention of Tuberculosis, Diphtheria, Poliomyelitis, Influenza, SARS, MERS and Covid-19. Food and Waterborne diseases: Aetiology, symptoms and pathogenesis of Typhoid, Cholera, Bacillary dysentery and Hepatitis. Direct contact disease: Aetiology and symptoms of Rabies. Fungal disease: Aetiology, symptoms and prevention of mucormycosis. Molecular Diagnosis of Viral diseases- RT-PCR.

Text Books

1 Pelczer, Chan and Krieg, 2014, "Microbiology", 5th Edition, McGraw Hill Education (India) Pvt Ltd, New Delhi, India.

2 Anantha Narayanan and Panicker, 2020, "Text Book of Microbiology", 11th Edition, Universities Press, Hyderabad, India

References

1 Willey, Sandman and Wood, 2020, "Prescott's Microbiology", 11th Edition, McGraw-Hill, New York, USA

2 Tortora, Funke, Case, Weber and Bair, 2021, "Microbiology – An Introduction", 13th Global Edition, Pearson Education Inc, London, UK

3 Arora and Arora, 2020, "Textbook of Microbiology", 6th Edition, CBS Publishers, New Delhi, India

4 Pommerville CJ, 2021, "Fundamentals of Microbiology", 12th Edition, Jones and Bartlett Publishers Inc, Massachusetts, USA

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Course Code	Course Name	Category	L	T	P	Credit
193BC1A5CC	CLINICAL BIOCHEMISTRY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- the disorders of carbohydrate and lipid metabolism
- the disorders of aminoacid, purine, pyrimidine and porphyrin metabolism
- the clinical principles underlying the application of clinical biochemistry investigations in human disease

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Describe bloodglucose regulation and its need. Illustrate about Diabetes mellitus, other carbohydrate related disorders and lipid disorders	K2 & K4
CO2	Explain the disorders of amino acid metabolism and disorders of purine, pyrimidine and porphyrin metabolism	K2 & K3
CO3	Compare normal and abnormal constituents of urine and blood. Demonstrate specimen collection and transport	K3 & K4
CO4	Demonstrate the gastric function tests, Renal function tests and Thyroid function tests	K3 & K4
CO5	Examine the Gastric function and illustrate the function tests. Analyze the enzymes in disease	K3 & K4

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193BC1A5CC	CLINICAL BIOCHEMISTRY	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Disorders of Carbohydrate metabolismand lipid metabolism 10 h

Disorders of Carbohydrate metabolism: Normal glucose level in blood, renal threshold and regulation of blood glucose concentration. Definition and causes- Hypo and Hyperglycemia; Diabetes mellitus; Introduction, aetiology, types of diabetes mellitus, Acute and chronic complications of Diabetes mellitus. and diagnosis- Urine testing, random blood sugar and GTT. Galactosemia and Glycogen storage diseases and Fructosuria

Disorders of lipid metabolism: Plasma lipoproteins-lipoproteinemias, lipid metabolism in liver and adipose tissue. Fatty liver-. Hypo and hypercholesterolemia. Atherosclerosis - aetiology, clinical features and complication.

Unit II Disorders of aminoacids, purine, pyrimidine and porphyrin metabolism 9 h

Disorders of aminoacids metabolism -Etiology and clinical manifestation of phenyl ketonuria, cystinuria, alkaptonuria, Fanconi's syndrome, albinism and tyrosinemia,Disorders of purine, pyrimidine and porphyrin metabolism- Hyperuricemia and gout. Lesch- Nyhan syndrome. Orotic aciduria, porphyrias.

Unit III Urine and blood analysis 10 h

Urine:Normal composition of urine– Volume,pH,colour,specific gravity. Normal Constituents and their variations in pathological conditions-urea, uric acid, creatinine, pigment. Abnormal constituents - glucose, albumin, ketone bodies. Blood: Normal constituents of blood and their variation in pathological conditions - urea, uric acid, creatinine, glucose, bilirubin, total protein, albumin/globulin ratio. A brief review of units and abbreviations used in expressing concentrations and standard solutions. Specimen collection (blood and urine), anti-coagulant and preservatives for blood and urine. Transport of biological samples.

Unit IV Liver Function tests, Renal function tests and Thyroid function tests 10 h

Liver Function tests-Metabolism of bilirubin, jaundice-types, clinical, features and test based on bile pigments, Serum enzymes, PT. differentiation of three types of jaundice.

Renal function tests-Clearance tests-urea, creatinine, PAH test, concentration and dilution tests.

Thyroid function tests- hypo-and hyper thyroidism ,Significanceand measurementof T3, T4 and TSH-values.

Unit V Gastric function tests and Clinical enzymology 9 h

Gastric function tests-Collection of gastric contents, fractional test meal, pentagastrinand insulin stimulation tests

Clinical enzymology-Definition of functional and non-functional plasma enzymes. Isozymes and diagnostic tests, enzyme patterns in acute pancreatitis, bone disorders and myocardial infarction.

Text Books

1 Burtis and Bruns, 2014, "Tietz fundamentals of Clinical Chemistry and Molecular Diagnostics", 7th edition, Saunders, US..

2 William J Marshal, Marta Lapsley, Andrew P Day and Ruth M Ayling, 2014, "Clinical Biochemistry: metabolic and Clinical aspects", 3rd edition, Churchill Livingstone, London

References

1 T.M. Delvin (editor), 2010, "Text book of biochemistry with clinical correlation", 7th edition, John wiley& Sons Inc. USA.

2 Larry jameson.J, Anthony S.Fauci, Dennis L Kasper, Stephen l Hauser, 2012, "Harrison's Internal Medicine", 20th Edition, MC Graw Hill Publishers, New York.

3 Phlip.D.Mayne, 2002, " Clinical Chemistry in diagnosis and treatment", 6th edition, Arnold Association Publication, New Delhi.

4 Nader Rifai, Andrea Rita Horvath, Carl T.Wittwer , 2019, "Tietz Textbook of Clinical Chemistry and Molecular Diagnostics" ,8th edition, , Saunders Publishers, US.

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Course Code	Course Name	Category	L	T	P	Credit
193BC1A5CD	PLANT BIOCHEMISTRY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

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

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Label plant cell organelles. Explain the stress physiology and biochemical events associated with water transport.	K1 & K2
CO2	Summarize the biochemistry of photosynthetic process and photorespiration.	K2
CO3	Explain nitrogen and other element cycle and relate the roles of macro and microelements in plant growth.	K1 & K2
CO4	Outline the biochemical processes of plant development. Experiment with plant hormones.	K2 & K3
CO5	Identify the toxic compounds in plants and understand the biochemistry of secondary metabolites in plant defense mechanism.	K2 & K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193BC1A5CD	PLANT BIOCHEMISTRY	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Plant Cell and Physiology of Plants 9 h

Plant cell – Structure and functions of subcellular organelles. Diffusion and Osmosis in plants and their significance. Mechanism of water absorption, Ascent of sap. Transpiration - types, mechanism of transpiration and factors affecting transpiration. Stress response in plants.

Unit II Photosynthesis and photorespiration 9 h

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

Unit III Cycles of elements and Plant Nutrition 10 h

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

Unit IV Plant growth regulators and Biochemistry of Plant development 10 h

Chemistry, biosynthesis, mode of action and physiological effects of auxins, gibberellins, cytokinins, abscicic acid and ethylene. Plant growth inhibitors and retardants. Biochemistry of seed dormancy, seed germination, fruit ripening and Senescence. Phytochrome, photoperiodism in flowering and vernalization.

Unit V Secondary metabolites and defense mechanism 10 h

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

Text Books

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

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

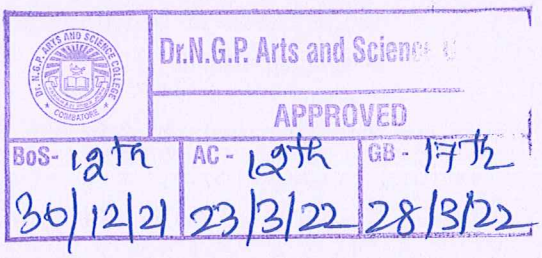
References

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

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

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

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



193BC1A5CP	CORE PRACTICAL: GENETICS &MOLECULAR BIOLOGY, MICROBIOLOGY,PLANT AND CLINICAL BIOCHEMISTRY	SEMESTER V

Total Credits: 2
Total Instructions Hours: 48 h

List of experiments

S.No	
1	Isolation of chromosomal DNA from E. coli cells , total RNA from yeast cells and Ultraviolet absorption spectrum of DNA and RNA
2	Transformation of E.coli cells with plasmid DNA
3	Designing of primers for any selected genes and Amplification of a DNA fragments by PCR
4	Demonstration of Western Blottingand Northern Blotting
5	Preparation and Inoculation of Culture media-Solid and Liquid
6	Staining techniques- Simple staining, Gram Staining, Negative and AFB
7	Antibiotic sensitivity of bacterial pure culture
8	Tests for identification of Bacteria- IMViC, Bacterial Sugar Fermentation, Oxidase, catalase, urease and H2SProduction
9	Isolation, Estimation of Chlorophyll, and separation by TLC
10	Qualitative Analysis of phytoconstituents.
11	Preparation of plant tissue culture Media, Sterilization and Initiation of Callus culture.
12	Induction of hydrolytic enzymes proteinases /amylases/lipase during germination.
13	Estimation of SGOT and SGPT in blood sample.
14	Estimation of alkaline phosphatase and acid phosphatase in blood sample.
15	Estimation of bilirubin (Direct and Indirect) in blood sample.

Note: Out of 15 - 12 experiments are mandatory.

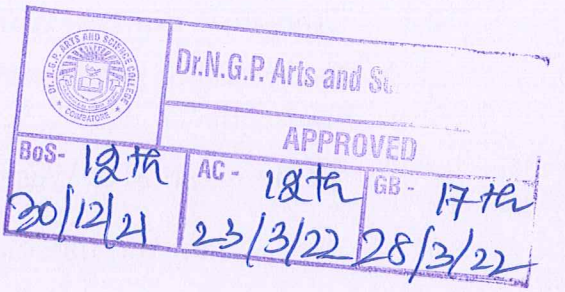
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1 David T.Plummer, 1998, "An Introduction to Practical Biochemistry", 3rd Edition, Tata McGraw Hill Publishing company ltd

2 Karp, G. 2010, "Cell and Molecular Biology: Concepts and Experiments" 6th Edition. John Wiley & Sons. Inc

3 Keith Wilson, John Walker, 2010, "Principle of Practical Biochemistry", 7th Edition, Cambridge University Press

4 Watson, J. D., Baker T.A., Bell, S. P., Gann, A., Levine, M., and Losick, R., 2008 "Molecular Biology of the Gene", 6th Edition. Cold Spring Harbour Lab. Press, Pearson Pub.



Course Code	Course Name	Category	L	T	P	Credit
193BC1A5SA	GENETIC ENGINEERING	SEC	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- Overview of biology of enzymes and vectors in genetic engineering.
- Basic knowledge and key understanding on basics of gene cloning.
- The applications of gene technology.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the basics of genetics, restriction enzymes and expression vectors.	K1,K2
CO2	Recall the basics of gene cloning, identify the expression vectors and examine the specific characteristics of vectors used in gene cloning.	K1, K3
CO3	Summarize the transformation, selection and identification of recombinants.	K2
CO4	Develop the concept of protein engineering and DNA sequencing methods.	K3
CO5	Explain the application of gene technology in production of recombinant products	K2

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193BC1A5SA	GENETIC ENGINEERING	SEMESTER V

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I MOLECULAR TOOLS FOR GENE CLONING 7 h

Genes within the cells, genetic elements that control gene expression, restriction and modification enzymes (Restriction enzymes, DNA ligases, Klenowfragment, T4DNA polymerase, Polynucleotide kinase, Alkaline phosphatase), safety guidelines of recombinant DNA research.

Unit II VECTORS AND GENE CLONING 7 h

Construction of genomic and cDNA libraries, design of linkers and adaptors. Characteristics of plasmid and phage vectors, prokaryotic and eukaryotic expression vectors, Cosmids, Phagemids, Insect, yeast and mammalian vectors.

Unit III ADVANCED TECHNIQUES IN MOLECULAR BIOLOGY 8 h

DNA sequencing (Maxam and Gilbert, Sangers, Pyro-sequencing, Shotgun sequencing method), Protein sequencing, RNA sequencing, Blotting Techniques: Southern, Western & Northern, In-situ hybridization, Site-directed mutagenesis, DNA labelling, DNA fingerprinting (RAPD, RFLP, AFLP).

Unit IV RECENT TRENDS IN MOLECULAR BIOLOGY RESEARCH 7 h

Isolation of DNA, mRNA and total RNA, polymerase chain reactions (PCR),RT-PCR and modified PCR, gene isolation, gene cloning, gene mapping, gene bank, screening and expression of cloned gene, transposons and gene targeting.

Unit V APPLICATIONS OF GENETIC ENGINEERING 7 h

Production of insulin, human growth factor, gene therapy, human genome project and its application, DNA microarray, Protein engineering, strategies for genome sequencing.

Text Books

1 Primrose S B and Twyman R M, 2014, "Principles of Gene Manipulation and Genomics", 7th Edition, Blackwell Publishers, USA and UK

2 Jane K and Setlow, 2016, "Genetic Engineering principles and Methods", Volume 27, 6th edition, Plenum Press, New York and London.

References

1 Ernst L Winnacker, 2003, "From Genes to Clones, Introduction to Gene Technology", Panima Publishing Corporation, New Delhi.

2 Brown TA, 2016, "Gene cloning and DNA Analysis an Introduction", 7th Edition, Blackwell Publishing, USA and UK.

3 Dubey RC, 2014, "Advanced Biotechnology", S.Chand & Company, New Delhi, India

4 Rajagopal K, 2012, "Recombinant DNA Technology and Genetic Engineering", McGraw Hill Education, India.

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Course Code	Course Name	Category	L	T	P	Credit
193BC1A5DA	DEVELOPMENTAL BIOLOGY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Conceptual overview of how developmental patterns arise
- different model systems and regulatory networks involved in
- molecular basis of developmental patterns

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the basic concepts and principles of development	K1 & K2
CO2	Summarize early embryonic development process in model organisms	K2
CO3	Explain late embryonic developmental processes in model organisms	K1 & K2
CO4	Outline the plant developmental processes	K2 & K3
CO5	Explain the programmed cell death and aging processes	K2 & K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193BC1A5DA	DEVELOPMENTAL BIOLOGY	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Basic concepts of development 10 h

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

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

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

Unit II Early Embryonic Development 10 h

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

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

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

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

Unit III Later Embryonic Development 10 h

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

Sex determination - environment dependent in reptiles, location dependent

Unit IV An overview of plant development 9 h

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

Unit V Programmed cell death, aging and senescence 9 h

Programmed cell death-mechanism and significance Genes and ageing, Insulin signalling cascade in c. elegans ,Environmental and epigenetic causes of ageing, Teratogenesis: Introduction, Principles and Teratogenic agents.

Text Books

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

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

References

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

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

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

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

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Course Code	Course Name	Category	L	T	P	Credit
193BC1A5DB	PRINCIPLES OF BIOTECHNOLOGY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Plant tissue culture and animal tissue culture.
- Various methods of genetic engineering of animal cells.
- Gene therapy and in vitro fertilization.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Illustrate the role of Media composition in plant tissue culture.	K1 & K3
CO2	Explain about the protoplast technique and gene transfer in plants.	K1 &K2
CO3	Understood the components of culture media and various tissue culture techniques.	K1, K2 & K3
CO4	Explain about the technique of genetic engineering in plants and animals.	K3, K4 & K5
CO5	Explain about the synthesis and applications of recombinant proteins from cell cultures.	K4 & K5

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193BC1A5DB	PRINCIPLES OF BIOTECHNOLOGY	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Plant Tissue Culture 9 h

Plant tissue culture: - Media composition, nutrients & growth regulators, MS medium & B5 medium. Callus & suspension culture. Initiation & differentiation of PTC. Micropropagation:- Methods, Production of haploid plants, phytochemicals from plant tissue culture

Unit II Protoplast Technology 10 h

Protoplast technology:- Isolation, fusion of protoplasts, Electroporation, Biolistics, Regeneration of plants from protoplasts. Gene Transfer in plants:-Ti plasmid vectors, mechanism of T- DNA transfer, Vir genes. Transgenic plants: - Herbicide, Virus, Pest resistance plants, Male infertility, Genetic engineering of plant oils.

Unit III Mammalian Cell Culture 10 h

Mammalian cell culture:- Establishment of cell in culture: Requirements for invitro growth; importance of serum. Cell-lines; cell transformation – properties of transformed cells, cell separation, Mass cultivation of cells: suspension culture; immobilized cultivation.

Unit IV Genetic Engineering of Animal Cells 9 h

Genetic Engineering of Animal cells: - Mammalian cell culture in protein production. Gene transfer into mammalian cells, Selectable markers pSV plasmids; retroviral vectors; Expression vectors; reporter genes.

Unit V Animal Biotechnology 10 h

Animal Biotechnology:- Artificial insemination and embryo transfer, Invitro fertilization (IVF):embryo cloning. Human embryo research, transgenic mice, Gene therapy; the Human Genome Project. Recombinant proteins from cell cultures: - Interferons, Viral vaccines, Bacterial vaccines, Hybridoma technology- Monoclonal antibodies- production and applications.

Text Books

1 Satheesh K.M, 2010, "Biotechnology", 2nd edition, New Age International LTD Publishers.

2 Dubey R.C, 2003, "A Text book of Biotechnology", 3rd edition, S. Chand and Company publications

References

1 Dr. Sathyanarayana U, 2010, "Biotechnology", Books and allied (P) Ltd, Kolkata

2 Adrian Slater, Nigel W.Scott ,2008, "Plant Biotechnology", 2nd edition, Oxford University press publication.

3 Walsh Gary and HeadonR.Denis, 1994, "Protein Biotechnology", John Wiley publishers. Australia

4 Ranga M.M,2003,"Animal Biotechnology", 2nd edition Dr.Updeshpurchit for agrobios (India)

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Course Code	Course Name	Category	L	T	P	Credit
193BC1A5DC	GENETICS OF CLINICAL DISORDERS	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Mutations and their characteristic features
- Epigenetics in gene expression
- Diseases and disorders due to gene manipulation

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Illustrate the role of mutations in genetic analysis, Understand variation in chromosome number and structure	K2 & K3
CO2	Demonstrate the patterns of single gene inheritance	K2 & K3
CO3	Analyze the genetic variation in health and diseases	K3 & K4
CO4	Understand the epigenetics in human diseases, Analyze the polymorphisms and disease	K2 & K3
CO5	Explain the chromosomal disorders,Analyze the inborn errors of metabolism	K3 & K4

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193BC1A5DC	GENETICS OF CLINICAL DISORDERS	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Mutation and its features 8 h

Mutation – Classification, mechanism, repair, role in genetic analysis and evolution-Changes in Chromosome number and structure: Polyploidy, aneuploidy, chromosomal rearrangements - deletion, duplication, inversion, and translocation. Meiotic consequences in structural heterozygotes, role in speciation and evolution

Unit II Patterns of Single Gene Inheritance 10 h

Autosomal recessive -Autosomal dominant -X-linked -Atypical patterns of inheritance -Hardy-Weinberg law -Calculation of carrier incidence -Concept of heterozygote advantage

Unit III Genetic Variation in Health and Diseases 10 h

Human genetic diversity-Methods of study- Biochemical/molecular genetic markers, some examples-Tracing human migrations with autosomal, Y-chromosomal and mitochondrial markers

Unit IV Epigenetics 10 h

Epigenetics in gene expression, human diseases, and X-inactivation-Telomeres, genome stability and aging-Polymorphisms and Disease-Polymorphisms and SNPs -Coronary Disease – Apo E-Alzheimer's Disease – Apo E-COPD – Antitrypsin alleles -HLA Antigens And Disease Association-Ankylosing spondilitis-Reiter's syndrome

Unit V Diseases and Disorder 10 h

Chromosomal disorders: Structural and numerical, Autosomal/sex chromosomal/sex reversal, Mechanisms-mitotic/meiotic non dysfunction/chromosomal rearrangement, some examples (syndromes/cancer/infertility), Inborn errors of metabolism-Hemoglobinopathies, multifactorial disorders-Introduction, Methods of study (Epidemiological, Twin/adoption and family studies), Etiology-genetic and non genetic determinants, common examples.

Text Books

1 Veer BalaRastogi, 2019, "Genetics", 4th Edition, Medtech Publishers, Delhi.

2 Primrose S.B and Twyman R.M, 2012, "Principles of Gene Manipulation and Genomics", 7th Edition, John Wiley and Sons, Inc, Canada

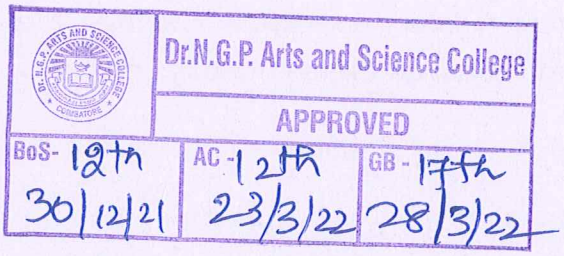
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1 Gardner, Simmons, Snustad, 2005, "Principles of Genetics", 8th Edition, John Wiley and Sons, Inc, Canada

2 Jack J. Pasternak, 2005, "An Introduction to Human Molecular Genetics: Mechanisms of Inherited Diseases",2nd Edition, John Wiley and Sons, Inc, Canada

3 P.S.Verma, V.K. Agarwal, 2014, "Genetics", 9th Revised Edition, S.ChandPublications,New Delhi

4 Speicher, Michael, Antonarakis, Stylianos E., Motulsky, Arno G., 2010, "Vogel and Motulsky's Human Genetics", 4th Edition, Springer-Verlag Berlin Heidelberg



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 research proposals 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 the basics 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	M
CO2	M	S	S	S	S
CO3	S	S	M	S	S
CO4	S	M	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 Perter Pruzan, (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..

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Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Sixth Semester										
Part-III										
193BC1A6CA	Core	Basic Immunology	5	-	-	3	25	75	100	4
193BC1A6CB	Core	Nutritional Biochemistry	4	1	-	3	25	75	100	4
193BC1A6CP	Core Practical	Immunology and Nutritional Biochemistry	-	-	4	6	40	60	100	2
193BC1A6SA	SEC	Biostatistics	3	2	-	3	25	75	100	3
193BC1A6DA	DSE-II	Molecular diagnostics	4	1	-	3	25	75	100	4
193BC1A6DB		Concepts in Clinical Trials								
193BC1A6DC		Pharmaceutical Biochemistry								
193BC1A6DD	DSE-III	Bioentrepreneurship	4	-	-	3	25	75	100	4
193BC1A6DE		Environmental Biochemistry								
193BC1A6DF		Hormonal Biochemistry								
Part - IV										
195BI1A6AA	AECC - VI	Innovation and IPR	2	-	-	3	-	-	50	2
Part-V										
193BC1A6XA		Extension Activity	-	-	-	-	50	-	50	1
Total									**700**	**24**
Grand Total									**4400**	**140**

Course Code	Course Name	Category	L	T	P	Credit
193BC1A6CA	CORE : BASIC IMMUNOLOGY	CORE	5	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

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

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the types of immune responses; Illustrate the Cells of the immune system.	K2
CO2	Distinguish the antigen and antibodies; Classify the complement pathway and cytokines.	K3
CO3	Analyze the antigen and antibodies interactions; Transform the interaction into different assays.	K3
CO4	Compare the types of hypersensitivity reactions; Explain the autoimmune diseases, Cancer immunology, and transplantation immunology.	K4
CO5	Describe AIDS; Influenza virus and corona virus, Explain the types of vaccines.	K5

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	M
CO2	S	S	S	M	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**

193BC1A6CA	CORE : BASIC IMMUNOLOGY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Cells of the Immune system 12 h

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

Unit II Antigen, Antibodies Complement and Cytokines 11 h

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

Unit III Assays based on Antigen and Antibodies interactions 12 h

Antigen and antibody interaction- precipitation reaction-Precipitation in gel: Immune diffusion -Oudin, Oahley-Fulthope procedure,radial immune-diffusion and Ouchterlony procedure, Immuno-electrophoresis and Electro immune-diffusion; Agglutination: Hemagglutination, Agglutination inhibition, Widal test;

Principle and application: RIA, ELISA, Flouresent antibody technique, chemiluminescence

Unit IV Hypersensitivity, Autoimmune disease, Cancer immunology and Transplantation Immunology 13 h

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

Transplantation- Allograft rejection, graft Vs Host reaction, Immuno-suppressors-mechanism of graft rejection.

Unit V AIDS, Influenza virus and Vaccines 12 h

Immunity to bacteria & Virus, Influenza virus and disease, corona virus, immune response to influenza and coronavirus. AIDS; Structure, destruction of T cells, immunity to HIV virus, AIDS vaccine.

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

Text Books

1. Richard A Goldsby, Thomas J.Kindt, Barbara A Osborne, 2018, "Kuby's Immunology", 5th Edition, W.H.Freeman and Company, England.
2. Ananthanarayanan R and YayaramanPanikar, 2013, "Text book of microbiology", 9th Edition, University Press Private Ltd., India

References

1. Jenni Punt, Sharon Stranford, Patricia Jones and Judy Owen, 2019, "Kuby Immunology", 8th edition, Macmillan Learning, US.
2. Tizard, Ian R., 2004, "Immunology (An Introduction)", 10th Edition, Thomson Publishers, Delhi.
3. Nandini Shetty, 2005, " Immunology", 2nd Edition, New Age International Publishers, Delhi.
4. Delves P.J., Martin S.J., Burton D.R. and Roitt I.M., 2016, "Roitt's Essential Immunology", 13th Edition, Wiley-Blackwell, USA.

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Course Code	Course Name	Category	L	T	P	Credit
193BC1A6CB	CORE : NUTRITIONAL BIOCHEMISTRY	CORE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Overview of human nutrition and nutritional disorders.
- The nutritional requirements of the human body and nutritional diseases.
- The relationship between principles of biochemistry and physiology to the science of nutrition.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the composition of food and how foods are grouped. Construct a dietary chart.	K1, K2
CO2	How to measure the energy content in food. Define and Relate the factors, which influence the BMR and SDA.	K1,K2
CO3	Outline the physiological and nutritive values of carbohydrates, lipids. Apply the nutritive values of macromolecules in a dietary chart.	K1,K3
CO4	Identify the various primary nutritional diseases and conditional nutritional disorders.	K3
CO5	Plan a diet for the prevention and treatment of diseases.	K2

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	M	S	S
CO4	S	S	M	M	M
CO5	S	S	S	S	S

S Strong M Medium L Low

193BC1A6CB	CORE : NUTRITIONAL BIOCHEMISTRY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Introduction to Food and Nutrition 10 h

Function of foods and its relation to nutrition and health, Essential nutrients, Analysis of food composition, Food habits and food groups. Antioxidants in Foods. Required dietary allowance (RDA) for different age groups. Carcinogens and Food additives, Fetal origin of Adulthood Diseases (FOAD). Microbiomes- Gut microbiota, Prebiotics, Probiotics, An overview on Genetically modified foods, Fermented foods, Alternative foods for animal Proteins and value added foods.

Unit II Energy Metabolism 12 h

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

Unit III Dietary Carbohydrates , Lipids and Health 12 h

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

Unit IV Dietary Proteins, Vitamins, Minerals and Health 13 h

Essential and non-essential amino acids – their role in growth and development. Protein energy malnutrition (Marasmus and Kwashiorkar), Starvation, Techniques for the study of starvation. Protein metabolism in prolonged fasting. Protein sparing treatments during fasting. Basic concept of high protein low caloric weight reduction diets.

Calcium, Phosphorus and Iron - Distribution in the body digestion, Absorption, Utilization, Transport, Excretion, Balance, Deficiency, Toxicity, Sources, RDA.

Calcium: Phosphorus ratio, Role of iron in prevention of anemia. Iodine and iodine cycle.

Unit V Clinical Nutrition 13 h

Role of diet and nutrition in prevention and treatment of diseases: Dental Caries, Lactose Intolerance, Fluorosis, Atherosclerosis and Rheumatic disorders. Obesity, Vitamin deficiency disorders, Hypervitaminosis, Nutritional anaemias.

Inherited metabolic disorders: Phenylketonuria, Maple Syrup disease, Homocystinuria & Alkaptonuria.

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

Harmful Effects of Fast foods

Text Books

1 Smolin and Grosvenor, 2016, "Nutrition: Science and Applications", 4th Edition, Wiley-Blackwell, United States.

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

References

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

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

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

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

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BoS- 12th 30/12/21 | AC - 12th 23/3/22 | GB - 17th 28/3/22

193BC1A6CP	CORE PRACTICAL : IMMUNOLOGY AND NUTRTIONAL BIOCHEMISTRY	SEMESTER VI

Total Credits: 2
Total Instructions Hours: 48 h

S.No	Contents
1	Single radial immunodiffusion
2	Double radial immunodiffusion
3	Immuno electrophoresis
4	Haemagglutination test
5	Lymphocyte separation
6	Cytokine assay
7	Recommended dietary allowances for different age group
8	BMI calculation
9	Detection of Adulteration in Milk
10	Estimation of lactose in milk
11	Estimation of ascorbic acid in fruit
12	Determination of Phosphorus in Food Sample

Note: Out of 12 experiments, 10 are mandatory

References

1. Frank C. Hay, Olwyn M R Wesstwood, 2008, "Practical Immunology", 4th Edition, Wiley-Blackwell, USA.
2. Sadasivam S and Manickam A, 2018, "Biochemical Methods" 3rd edition, New Age International Publishers, New Delhi.
3. Rama Sastri B V and ICMR, Gopalan C, 2016, "Nutritive Value of Indian Foods", Indian Council of Medical Research (ICMR), India.

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Course Code	Course Name	Category	L	T	P	Credit
193BC1A6SA	SEC : BIOSTATISTICS	SEC	3	2	-	3

PREAMBLE

This course has been designed for students to learn and understand

- Collection, organization and representation of the data
- About the basic statistical analysis
- The fundamental knowledge of the concepts of probability and its application

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Organize statistical survey and infer the methods for collecting and analyzing qualitative and quantitative data	K3,K4
CO2	Interpret data using measures of central tendency	K3
CO3	Interpret and analyze the data using measures of dispersion	K3
CO4	Define the basic concepts of probability and its theorems	K1
CO5	Summarize the various methods of studying correlation	K2

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193BC1A6SA	SEC : BIOSTATISTICS	SEMESTER VI

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I Collection, Organisation and Representation of Data 10 h

Planning and Execution of the Survey, Collection, classification, tabulation of statistical data. Organization of data - Individual series, discrete series, continuous series / class interval. Diagrammatic and Graphic representation of statistical data. Parametric and non parametric tests.

Unit II Measures of central tendency 13 h

Introduction, Characteristics of a good average, Arithmetic Mean-Simple and Weighed, Median, Mode (Individual, Discrete & Continuous data), Merits and demerits.

Unit III Measure of Dispersion 13 h

Introduction, definition, classification & properties. Quartiles, Deciles and Percentiles, Methods of measuring dispersion-Range, Quartile deviation, Mean deviation, Standard deviation, Variance, Coefficient of Variation.

Unit IV Probability 12 h

Definition of Probability, Terminology- Random Experiment, sample point, sample space, events, mutually exclusive and exhaustive events, Basics of Permutations and combinations, Types of probability, Probability measure, Theorems of Probability (Proofs not needed). Theoretical distributions: Binomial, Poisson and normal distribution.

Unit V Analysis of data 12 h

Introduction, Types of correlation - Positive and negative, linear and non linear, simple and multiple, partial and total correlation, Methods of studying correlation- Scatter Diagram method, Karl Pearson's Coefficient of Correlation, Ranking Correlation Coefficient. Regression analysis. Student's t-distribution, Chi-square test, Anova test.

Text Books

1 Gupta S P, 2014, "Statistical Methods", 43rd edition, Sultan Chand and Sons publications, New Delhi

2 Pillai R S N and Bagavathi, 2017," Statistical Theory and Practices", 8th edition, S. Chand and company Ltd, New Delhi

References

1 Ajai S Gaur and Sanjaya S. Gaur, 2009," Statistical methods for practice and Research: A guide to data analysis using SPSS". 2nd edition, Sage Publications Pvt. Ltd., New Delhi.

2 Gupta S C and Kapoor V K, 2017," Fundamentals of Mathematical statistics", Sultan Chand & Sons, New Delhi.

3 Wayne W. Daniel, Chad L. Cross 2018, "Biostatistics: A Foundation for Analysis in the Health Sciences", 11th Edition, Wiley, United States.

4 Jerrold H.Zar., 2010, "Biostatistical analysis", 5th Edition, Pearson Education, UK.

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Course Code	Course Name	Category	L	T	P	Credit
193BC1A6DA	ELECTIVE II : MOLECULAR DIAGNOSTICS	DSE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- the important parameters in the design of a quality system for molecular analysis
- techniques required in order to perform the molecular diagnostics protocols
- the significance of laboratory procedures to the appropriate disease process

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Summarize the types and classification of various types of diseases	K2
CO2	Describe the various tests used for predicting genetic disorders	K3
CO3	Illustrate the applications of PCR techniques diagnosis of disease	K3
CO4	Interpret the applications of gene sequencing and immune techniques in molecular diagnosis	K4
CO5	Explain the procedure and ethical issues in Prenatal and pre-implantation	K5

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	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

193BC1A6DA	ELECTIVE II : MOLECULAR DIAGNOSTICS	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Basics of Molecular Diagnostics 12 h

Introduction and history of diagnostics, Diseases-infectious, physiological and metabolic errors; genetic basis of diseases- inherited diseases; traditional methods for the diagnosis of metabolic errors.

Genetic disorders: Classification of genetic disorders, Single gene Disorders - Sickle cell anaemia, Duchenne muscular Dystrophy, Retinoblastoma, Cystic Fibrosis and Marfan's syndrome Multifactorial disorders - Diabetes, Atherosclerosis, Schizophrenia

Unit II Tests for genetic disorders 12 h

Disease identification and tests for following genetic disorders- Thalassemia, Fanconi anemia, Sickle Cell anemia, Fragile-X syndrome, Alzheimer's disease, Duchenne Muscular Dystrophy/Becker's Muscular Dystrophy, Huntington's disease

Allelic susceptibility test for multifactorial disorders (Neural Tube Defect, Cleft Lip and Palate, Cardio Vascular Disorder, Male infertility)

Unit III Applications of PCR in diagnosis 12 h

Applications of PCR- PCR based microbial typing: Eubacterial identification based on 16S rRNA sequences- Amplified Ribosomal DNA Restriction analysis (ARDRA)- Culture independent analysis of bacteria- DGGE and TRFLP. Molecular diagnosis of fungal pathogens based on 18S rRNA sequences- Detection of viral pathogens through PCR. RAPD for animal and plants. PCR in forensic science- AmpFLP, STR, Multiplex PCR- Determination of Paternity- Human identification and sex determination

Unit IV Immunodiagnostics 12 h

Immunodiagnostics - Introduction, antigen-antibody binding interactions and assays;. Immunohistochemistry assay - Detection of Breast cancer, colon cancer and detection of Hepatitis B infection.

Automated DNA sequencing- Principles, Methods and Instrumentation- Advances in DNA sequencing- New Generation sequencing Methods, Pyrosequencing · Microarrays- Personalized Medicine- Pharmacogenomics

Unit V Prenatal and pre-implantation diagnosis 12 h

Risk evaluation (Mendelian risk, empirical risk), Prenatal and pre-implantation diagnosis. Noninvasive: Triple test, Ultrsonography (USG), Invasive: Amniocentesis (AC), chorionic villi sampling (CVS), Fetal blood sampling (FBS), Population screening for genetic disorders, Treatment and management of genetic disorders

Genetic Counseling, Ethical and legal issues in genetic counseling

Text Books

1. David E. Bruns, Edward R. Ashwood, Carl A.Burtis, 2017, "Fundamentals of Molecular Diagnostics", 1st Edition, Saunders Group, United States
2. W.B. Coleman, 2006,"Molecular Diagnostics for the Clinical Laboratorian" 2nd Edition, Humana Press, United states.

References

1. William B. Coleman, Gregory J, Tsongalis, 2009, Molecular Pathology: The Molecular Basis of Human Disease; 1st edition, Academic Press, Unites States.
2. Lele Buckingham, Maribeth L, 2007, "Flaws Molecular Diagnostics: Fundamentals, Methods & Clinical applications", 3rd Edition, F.A. Davis Company, United States.
3. Richard J. Epstein, Human Molecular Biology, 2003, "An Introduction to the Molecular Basis of Health and Disease", Cambridge University Press, United Kingtom.
4. David H. Persing, Fred C. Tenover, James Versalovic, Yi-Wei Tang, Elizabeth R. Unger, David A, Relman, and Thomas J. White, 2003,"Molecular Microbiology: Diagnostic Principles and Practice", ASM Press, Washington DC.

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BoS- 18th 30/12/21
AC - 12th 23/3/22 17th 28/3/22

Course Code	Course Name	Category	L	T	P	Credit
193BC1A6DB	DSE: CONCEPTS IN CLINICAL TRIALS	DSE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The overview on basic concepts and processes in clinical trial practices.
- The importance of clinical trials.
- The advancements and ethics of clinical trials.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Describe various clinical trial types.	K2
CO2	Apply Indian clinical trial rules and regulations.	K3
CO3	Relate role of Indian pharmaceutical companies.	K3
CO4	Illustrate ICMR guidelines on clinical research in India.	K3
CO5	Contrast the ethics in clinical research	K4

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

193BC1A6DB	DSE: CONCEPTS IN CLINICAL TRIALS	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Introduction to Clinical Trails 12 h

Definition and need for clinical trials. Types, observational studies and patient-centered therapeutics. Overview of Phase I (Human/ Clinical Pharmacology), Phase II (Exploratory), Phase III (Confirmatory), and Phase IV Clinical Trials. Adverse drug reactions (events) and therapeutic drug monitoring. Draft Guidelines for Industry on Reporting Serious Adverse Events Occurring in Clinical Trials (CDSCO, Government of India)

Unit II Clinical Research 12 h

Clinical Research in India: Clinical Research Organizational Chart (keyfunctions of Data Management, Pharmacovigilance, Regulatory affairs, Biostatistics and SAS), Contract Research Organizations (CROs).

Unit III Clinical Trials in India 12 h

Basic philosophies of animal ethics: (3 R's). The role of MNCs and Indian Pharma companies in Clinical Trials in India. Concepts of cGMP, IPR and Patenting

Unit IV Guidelines for Clinical Trails 12 h

ICMR Ethical Guidelines for Biomedical Research on Human Participants, Chapter I (General Principles), Chapter II (Basic Responsibilities, Composition, Review Procedures only of Institutional Ethics Committee), Chapter III (Informed Consent Process, Compensation, Conflict of Interest, Special Groups, Post-Trial Access, International Collaboration), Chapter IV (Drug Trials only). Also, Definitions, and Declaration of Helsinki from Guidelines of the CDSCO on Good Clinical Practice.

Unit V Bioethics in Clinical Research 12 h

Introduction to bioethics, ethical issues in preclinical (animal) studies, & clinical studies-Ethical principles, Institutional Review Board, Special issues in research.

Ethical Guidelines-ICMR, Institutional Ethics Committees, Institutional Review Board, Ethics-SOPs Ethical issues based on methodology of clinical Research.

Text Books

1 Gupta SK, 2007, "Basic Principles of Clinical Research and Methodology", First edition, Jaypee Brothers Medical Publishers (P) Ltd, New Delhi..

2 Dr. Roli Mathur, 2017, "National ethical guidelines for biomedical and health research involving human participants", Indian Council of Medical Research, New Delhi

References

1 Lawrence M. Friedman,Curt D. Furberg,David L. DeMets David M. Reboussin, Christopher B. Granger, 2015, "Fundamentals of Clinical Trials", Fifth Edition, Springer International Publishing, Switzerland.

2 Standards and Operational Guidance for Ethics Review of Health-Related Research with Human Participants, 2011, World Health Organization, Switzerland

3 Josef Kolman, Paul Meng, Graeme Scott, 2002, "Good Clinical Practice: Standard Operating Procedures for Clinical Researchers", John Wiley & Sons, Inc.

4 JoAnn Pfeiffer, Cris Wells, 2020, "A Practical Guide to Managing Clinical Trials", First Edition, CRC Press.

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Course Code	Course Name	Category	L	T	P	Credit
193BC1A6DC	PHARMACEUTICAL BIOCHEMISTRY	DSE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Physico-chemical properties and pharmaceutical uses of agents belonging to the therapeutic class.
- The action of drugs on living systems.
- The needs to obtain experience in pharmaceutical research.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the ADME properties of drugs.	K2
CO2	Summarize the ligand receptor interaction concept.	K2
CO3	Illustrate the drug metabolism and adverse effects.	K3
CO4	Identify the structural activity relationship of different class of drugs.	K3
CO5	Categorize and demonstrate depth and breadth of knowledge in pharmaceutical science.	K4

MAPPING WITH PROGRAMME OUTCOMES

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

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

193BC1A6DC	DSE-II : PHARMACEUTICAL BIOCHEMISTRY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Introduction, Pharmacodynamics and Kinetics 10 h

Introduction and History of Drugs, Classification of drugs, routes of drug administration, passage of drugs across biological membrane, binding of drugs to plasma proteins. Absorption, Metabolism, Distribution and Elimination (ADME) of drugs, factors influencing drug absorption and elimination of drugs. Toxicity assessment: acute, sub chronic, chronic exposure.

Unit II Receptor concept 12 h

Definition of Receptor, Agonist and Antagonist, Drug receptor interaction. Receptor types - G-protein coupled receptor, Receptors with intrinsic ion channel, Enzymatic receptors, receptors regulating gene expression. Receptor theories, isolation of receptors, consequences of drug receptor interaction, binding forces in drug receptor interaction.

Unit III Drug Metabolism and Elimination 9 h

Phase I and Phase II reactions. Metabolism via hydroxylation, N-Oxidation, azo and nitro reduction, Oxidative deamination, purine oxidation, dehalogenation, hydrolysis, action of choline esterase. Physiological importance of xenobiotic metabolism. Elimination of drugs from the body with reference to renal system.

Unit IV Chemotherapy and Plant derived drugs 15 h

Chemotherapy: Mode of action of sulfonamides, anti-metabolites of folate, purines and pyrimidines. Mode of action of Antibacterial - ampicillin, tetracycline and erythromycin; Antifungal agents - undecylenic acid and amphotericin; Antiviral - Acyclovir, Zidovudine, Interferon; Antimalarial - Chloroquine and Amodiaquine; Anti-tubercular drugs - Streptomycin and rifampicin. Cancer chemotherapy-cytotoxic drugs. Immunosuppressive drug therapy. Natural products: Alkaloids - cocaine, nicotine, quinine, atropine; Terpenoids - terpenoid, menthol, diterpene; Flavonoids – anthocyanin. Concept of Personalized medicine.

Unit V Drugs acting on CNS, Cardiovascular, GI tract and ADR 14 h

CNS – mode of action of barbiturates, salicylates, MAO inhibitors and drugs for Parkinson's disease with an example. Cardio-vascular disease - mode of action of diuretics, ACE inhibitors, β blockers, aldosterone antagonists, heparin, cardiac glycosides with an example. GI tract - mode of action of antacids, drugs for peptic ulcer, diarrhea, and constipation with an example. Adverse responses and side effects of drugs: Allergy, drug intolerance, drug addiction, drug abuses and their biological effects.

Text Books

1 Satoskar, R.S., Nirmala N. Rege, Bhandarkar, S.D., 2015, " Pharmacology and Pharmacotherapeutics", 24th Edition, Popular Prakashnan Pvt. Ltd., Mumbai.

2 Tripathi, K.D., 2019, "Essentials of Medical Pharmacology", 7th edition, Jaypee Brothers, Medical Publishers, New Delhi.

References

1 David A Williams, and Thomas L Lemke, 2017, "Foye's Principles of Medicinal Chemistry", 7th Edition, Lippincott Williams & Wilkins, United States.

2 Palmer, M., Chan, A., Diekmann T., Honek, J., 2012, "Biochemical Pharmacology", 1st edition, Wiley, United states.

3 Patrick L. Graham, 2013, "An introduction to medicinal chemistry", 5th edition, Oxford University Press, United Kingdom.

4 Brunton, L. Knollmann, B. and Hilal-Dandan, R. 2022, "Goodman and Gilman's the Pharmacological Basis of Therapeutics", 13th edition, McGraw Hill Education, New York.

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Course Code	Course Name	Category	L	T	P	Credit
193BC1A6DD	DSE : BIOENTREPRENEURSHIP	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The concept and scope of innovation
- The concept and features of entrepreneurship
- The ways of successful bio-entrepreneurship

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the concept of innovation and its need	K1, K2
CO2	Label the characteristics and need of a successful entrepreneur	K1
CO3	Illustrate the opportunities and challenges in agri-preneurship	K3
CO4	Analyze the scope of bio-entrepreneurship	K4
CO5	Explain the types of bio-entrepreneurship	K2

MAPPING WITH PROGRAMME OUTCOMES

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

193BC1A6DD	DSE : BIOENTREPRENEURSHIP	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Innovation 10 h

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

Unit II Entrepreneur 10 h

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

Unit III Entrepreneurship and Agri-preneurship 10 h

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

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

Unit IV Bioentrepreneurship 8 h

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

Unit V Bioentrepreneurship Process 10 h

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

Text Books

1 Dr.Khanka.S.S, 2012,"Entreprenerial Development", fourth edition, S Chand and Company Limited, New Delhi

2 Dr.Gupta.O.P,2015, "Fundamentals of Entrepreneurship", SBPD Publishing House, Agra

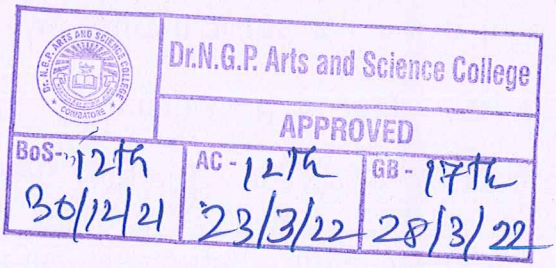
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1 Jayshree Suresh, 2011, "Entrepreneurial Development", Fifth Edition, Margham Publications, Chennai.

2 Holger Patzelt, Thomas Brenner, 2008,"Handbook of Bioentrepreneurship", Springer Science and Business Media LLC, New York.

3 Howard Frederick, Allan O Connor, Donald F. Kuratko, 2016, "Entrepreneurship: Theory, Process, Practice", Fourth Edition, Cengage Learning Australia Pty Limited, South Melbourne.

4 Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, 2017, "Entrepreneurship", Tenth Edition, McGraw-Hill Education, New York



Course Code	Course Name	Category	L	T	P	Credit
193BC1A6DE	ENVIRONMENTAL BIOCHEMISTRY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- An overview and concepts of environmental biochemistry
- Basic knowledge on fundamental of ecology
- Global environmental issues and International laws

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Recall the Environmental components and Hydrological cycle	K1
CO2	Illustrate the concept of ecosystems and Hydrocarbons	K2
CO3	Apply the Classification of biomes, major biotic elements of each biome and their characteristics	K2 & K3
CO4	Develop knowledge of the Global environmental issues and International laws	K3
CO5	Outline the consequences of Phytoremediation and Chemical toxicology.	K2

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	M	S	S
CO4	S	S	M	M	S
CO5	S	S	M	M	S

S Strong M Medium L Low

193BC1A6DE	ENVIRONMENTAL BIOCHEMISTRY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Environmental features 10 h

Environmental components: Atmosphere, structure and chemical composition of atmosphere, Internal structure of the Earth, rocks and their classification, minerals and their classification, Hydrological cycle. Classification of trace elements, mobility of trace elements, biogeochemical cycles and soil formation, soil profile, soil classification, soils of India. Global Water Balance

Unit II Ecology 8 h

Fundamentals of Ecology: Definition, subdivisions. Ecosystems: concept of ecosystems, aquatic ecosystem, terrestrial ecosystem, energy flow in ecosystems, nutritional flux. Food chains, Food web, ecotone, edge effects, ecological habitat & niche, ecological pyramids and ecosystem stability. Hydrocarbons, substituted hydrocarbons, oil pollution surfactants, Environmental policy

Unit III Biomes and Biodiversity 10 h

Biomes: Classification of biomes, major biotic elements of each biome and their characteristics. Population growth curves, life history strategies (r & k selection); concept of meta population. Biodiversity: Types of diversity; Genetic diversity, Species diversity and Ecosystem diversity. Gene banks; Cryopreservation. National Biodiversity Strategies and Action Plans (NBSAPs)

Unit IV Environmental laws & Pollution 10 h

Global environmental issues and International laws: Ozone depletion, Green house effect and acid rain Global warming, hazardous waste, CITES, Important environmental treaties signed by India. Earth's carbon cycle, carbon sequestration, sustainable development. Water quality parameters- pH, Dissolved Oxygen (DO), Chemical Oxygen demand (COD); Biological Oxygen demand (BOD); Environmental Sample Collection and Processing; Environmental pollution,

Sampling of air, soil and water pollutants. Carbon foot Print- ecology & Conservation, Carbon Credits

Unit V Bioremediation and Technology 10 h

Bioremediation: Introduction and types of bioremediation, bioremediation of surface soil and sludge, bioremediation of subsurface material, Phytoremediation. In situ and Ex-situ technologies. Chemical toxicology: Biochemical effects of heavy metals (Pb, As, Hg, Cd), pesticides, insecticides, herbicides, weedicides, larvicides, Biocontrol of plant pathogens; Integrated pest management-practical implementation, Role of biotechnology in management of resources; Uses of Technology; Microbes in Human Welfare

Text Books

1. Eugene Odum., Gary W. Barrett., 2008, "Fundamentals of Ecology", 2nd edition, Oxford & IBH publishing Co.pvt.ltd, New Delhi.
2. Dr.S.S Dara and Dr.D.D Mishra., 2014, "Textbook of environmental chemistry and pollution control", revised edition, S.Chand & company Pvt Ltd, New Delhi

References

1. Anil Kumar DE., Arnab Kumar DE., 2010, "Environment and ecology", 2nd edition, New Age International Pvt, Publishers, New Delhi
2. DR.P.S.VERMA & DR.V.K.AGARWAL,S., 2004, "Environmental Biology (Principles of Ecology)", 13th edition, S.Chand Publishing & Company Ltd New Delhi.
3. Arnab kumar DE (AKDE)., 2017, "Environmental Chemistry", 8th edition, New age International Pvt (Ltd), Publishers, New Delhi.
4. Majid Husain., 2013, "Environment and Ecology: Biodiversity, Climate Change and Disaster Management", 3rd edition, Access Publishing India Pvt (Ltd), New Delhi.

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Course Code	Course Name	Category	L	T	P	Credit
193BC1A6DF	ELECTIVE III : HORMONAL BIOCHEMISTRY	DSE	4		-	4

PREAMBLE

This course has been designed for students to learn and understand

- the diverse group of hormones and their specific mechanism of action
- regulatory functions & their interrelationship in the endocrine disorders
- management of endocrine disorders

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Summarize classification and mechanism of action of various hormones	K1,K2
CO2	Describe biochemical actions &endocrine disorders of hypothalamic hormones and pituitary hormones	K1,K2
CO3	Illustrate the biosynthesis, physiological actions & patho physiology of thyroid and parathyroid hormone	K2,K3
CO4	Interpret the biochemical actions and pathophysiology of pancreatic and GI tract hormones	K3
CO5	Summarize the biochemical effects of adrenal and reproductive hormones	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	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

193BC1A6DF	ELECTIVE III : HORMONAL BIOCHEMISTRY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to endocrine system 9 h

Hormones- definition, classification, biosynthesis, circulation in blood, modification and degradation. Mechanism of hormone action, class I and Class II hormone receptors- Structural features and regulation. Role of second messengers in hormone action. Feedback regulation of hormones

Unit II Hypothalamus and pituitary hormones 10 h

Hypothalamic releasing factors, Biosynthesis, secretion, transport, regulation and biological effects of pituitary hormones. Hyper and hypo activity of pituitary and hypothalamus- Acromegaly, Dwarfism, Diabetes Insipidus and hypopituitarism

Unit III Thyroid hormones 10 h

Biosynthesis, secretion, transport, regulation and biological effects of thyroid hormones. Hypo and hyperthyroidism. Anti thyroid agents.

Role of parathyroid hormones, Calcitonin and Calcitriol in maintaining calcium and phosphorus homeostasis. Hypo and hyper parathyroidism.

Unit IV Hormones of pancreas 9 h

Pancreas -Islets of Langerhans- cell types, biosynthesis, mechanism of action and biological effects of Insulin and Glucagon. Disorders of hypo and Hyper secretion of pancreas.

Gastro intestinal hormones. Adipocyte hormones: Adiponectin and leptin; Appetite and satiety control. Happy Hormones: Biological effects

Unit V Adrenal hormones and Reproductive hormones 10 h

Biosynthesis, secretion, transport, biological effects, mechanism of action and excretion of adrenal cortical and medullary hormones. Pathophysiology of adrenal gland secretions-Hypo and hyper state conditions

Male and female sex hormones. Interplay of hormones during ovarian and uterine phases of menstrual cycle; Placental hormones; role of hormones during parturition and lactation. Hormone based contraception. Reproductive hormone disorders- Menorrhea, Menorrhagia, Premenstrual syndrome, Polycystic Ovary Syndrome, Menopause

Text Books

1 Nelson, D L ., Cox M M., 2013,"Lehninger Principles of Biochemistry"6th ed, W.H. Freeman & Company ,NewYork.

2 Widmaier, E.P., Raff, H. and Strang, K.T. 2008, Vander's Human Physiology, 11th ed., McGraw Hill International Publications, New York

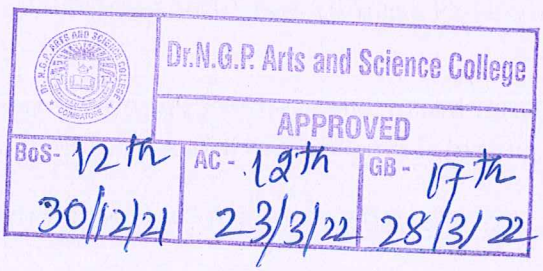
References

1 Hadley, M.C., and Levine, J.E. 2007, Endocrinology, 6th ed, Pearson Education ,New Delhi

2 Melmed S., Polonsky K S., P,Larsen P R., Kronenberg H M. 2015, "Williams Textbook of Endocrinology", 12th edition, Elsevier Health publishers, Netherland

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

4 Murray R., Granner D., Mayes P., Rodwell V., 2006 "Harper's Illustrated Biochemistry". 27th Edition, McGraw-Hill Education, New York



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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