REGULATIONS 2019-20 for Under Graduate Programme

(Outcome Based Education model with Choice Based Credit System)

B.Sc. DEGREE

(For the students admitted during the academic year 2019-20 and onwards)

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

PROGRAMME: B.Sc. CLINICAL LAB TECHNOLOGY

ELIGIBILITY: A pass in Higher Secondary Examination with Physics, Chemistry and Biology as subjects, and as per the norms prescribed by the Government of Tamil Nadu or an Examination accepted as equivalent thereto by the Academic Council, subject to such conditions as may be prescribed there to are permitted to appear and qualify for the **Bachelor of Clinical Lab Technology Degree Examination** of this College after a course of study of three academic years.

PROGRAMME OBJECTIVES:

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

1. Attain careers as practicing laboratory technicians in fields such as clinical laboratories, hospitals, clinical research centers, biotechnology laboratories, equipment manufacturing industries.
2. To take up advanced studies in disciplines such as Microbiology, Medical Laboratory Technology, Biochemistry, Biotechnology, Hospital Administration, Hospital Records Management, etc.,
3. Acquire professional leadership roles

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

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

CURRICULUM
B.SC. CLINICAL LAB TECHNOLOGY

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
First Semester										
Part – I										
191TL1A1TA/ 191TL1A1HA/ 191TL1A1MA/ 191TL1A1FA	Language - I	Tamil-I/ Hindi-I/ Malayalam-I/ French-I	4	1	-	3	25	75	100	3
Part – II										
191EL1A1EA	Language - II	English – I	4	-	1	3	25	75	100	3
Part – III										
193CL1A1CA	Core	Human Anatomy and Physiology	4	1	-	3	25	75	100	4
193CL1A1CB	Core	General Biochemistry	4	1	-	3	25	75	100	4
193CL1A1CP	Core Practical	Biochemistry-I	-	-	4	3	40	60	100	2
194IT1A1IA	IDC	Basics of Information Technology -I	3	1	-	3	25	75	100	3
Part – IV										
193MB1A1AA	AECC	Environmental studies	2	-	-	-	-	50	50	2
Total			**21**	**4**	**5**	**-**	**-**	**-**	**650**	**21**

Second Semester										
Part – I										
191TL1A2TA/ 191TL1A2HA/ 191TL1A2MA/ 191TL1A2FA	Language -I	Tamil-II/ Hindi-II/ Malayalam II/ French –II	4	1	-	-	25	75	100	3
Part – II										
191EL1A2EA	Language - II	English – II	4	-	1	-	25	75	100	3
Part – III										
193CL1A2CA	Core	Analytical Techniques	4	-	-	3	25	75	100	4
193CL1A2CB	Core	Intermediary Metabolism and Metabolic Disorders	4	-	-	3	25	75	100	4
193CL1A2CP	Core Practical	Biochemistry-II	-	-	4	4	40	60	100	2
194IT1A2IA	IDC	Basics of Information Technology -II	3	-	-	3	25	75	100	3
194IT1A2IP	IDC : Practical	Digital Media Lab	-	-	3	3	40	60	100	2
Part – IV										
196BM1A2AA	AECC	Human Rights	2	-	-	-	-	50	50	2
		Total	**21**	**1**	**8**				**750**	**23**

Third Semester										
Part – III										
193CL1A3CA	Core	Clinical Pathology	4	-	-	3	25	75	100	4
193CL1A3CB	Core	Histopathology	4	-	-	3	25	75	100	4
193CL1A3CC	Core	Basics of Human Genetics and Fetal Medicine	4	-	-	3	25	75	100	4
193CL1A3CP	Core Practical	Pathology	-	-	4	4	40	60	100	2
193FN1A3IA	IDC	Clinical Nutrition	3	-	-	3	25	75	100	3
193FN1A3IP	IDC: Practical	Nutritional Biochemistry	-	-	4	3	40	60	100	2
193CL1A3SA	SEC	Laboratory Automation and Quality Control	3	-	-	3	25	75	100	3
	GE		2	-	-	2	-	50	50	2
	LoP	Lab on Project	-	-	-	-	-	-	-	-
Part – IV										
191TL1A3AA	AECC	Basic Tamil	2	-	-	-	-	50	50	2
191TL1A3AB		Advanced Tamil								
195CR1A3AA		Women's Rights								
		Total	**22**		**8**				**800**	**26**

Fourth Semester										
Part – III										
193CL1A4CA	Core	Molecular Biology	4	1	-	3	25	75	100	4
193CL1A4CB	Core	Clinical Biochemistry - Functional tests	4	1	-	3	25	75	100	4
193CL1A4CP	Core Practic	Clinical Biochemistry	-	-	6	6	40	60	100	3
193BT1A4IA	IDC	Nanotechnology in Health Care	4	1	-	3	25	75	100	3
193CL1A4SA	SEC	Diagnostic Molecular Techniques	4	1	-	3	25	75	100	3
	GE		2				-	50	50	2
	LoP	Lab on Project								-
Part – IV										
191TL1A4AA	AECC	Basic Tamil	2				-	50	50	2
191TL1A4AB		Advanced Tamil								
192PY1A4AA		General Awareness								
		Total	**20**	**4**	**6**				**600**	**21**
Fifth Semester										
Part – III										
193CL1A5CA	Core	Microbiology	4	-	-	3	25	75	100	4
193CL1A5CB	Core	Hematology	4	-	-	3	25	75	100	4
193CL1A5CP	Core Practical	Hematology	-	-	6	6	40	60	100	3
193CL1A5CQ	Core Practical	Microbiology-I	-	-	6	9	40	60	100	3
193CL1A5SA	SEC	Blood Banking and Blood Transfusion	3	-	-	3	25	75	100	3

193CL1A5DA	DSE	Clinical Lab Management	4	-	-	3	25	75	100	4
193CL1A5DB		Forensic Science and Toxicology								
193CL1A5DC		Bio-safety and Bio waste Management								
193CL1A5TA	IT	Industrial Training	**Grade A to C**							
193CL1A5LA	LoP	Lab on Project	-	1	-	-	50	-	50	1
Part – IV										
192MT1A5AA	AECC	Research Methodology	2	-	-	-	-	50	50	2
		Total	**17**	**1**	**12**				**700**	**24**
Sixth Semester										
Part – III										
193CL1A6CA	Core	Immunology	4	-	-	3	25	75	100	4
193CL1A6CB	Core	Cytology	4	-	-	3	25	75	100	4
193CL1A6CP	Core Practical	Microbiology-II	-	-	6	9	40	60	100	3
193CL1A6SV	SEC	Mini Project	-	-	6	3	40	60	100	3
193CL1A6DA	DSE	Endocrinology	4	-	-	3	25	75	100	4
193CL1A6DB		Separation Techniques and Pharmaceutical Chemistry								
193CL1A6DC		Genetic Engineering								

193CL1A6DD	DSE	Clinical Enzymology	4	-	-	3	25	75	100	4
193CL1A6DE		Stem Cell Technology								
193CL1A6DF		Tumor markers and Immunohistochemistry								
Part – IV										
193BC1A6AA	AECC	Innovation, IPR and Entrepreneurship	2	-	-	-	-	50	50	2
Part-V										
193CL1A6XA		Extension Activity	-	-	-	-	50	-	50	1
		Total	**18**	**-**	**12**				**700**	**25**
Grand Total									**4200**	**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.	193CL1A5DA	Clinical Lab Management
2.	193CL1A5DB	Forensic Science and Toxicology
3.	193CL1A5DC	Bio - Safety and Bio Waste Management

Semester VI (Elective II)
List of Elective Courses

S. No.	Course Code	Name of the Course
1.	193CL1A6DA	Endocrinology
2.	193CL1A6DB	Separation Techniques and Pharmaceutical Chemistry
3.	193CL1A6DC	Genetic Engineering

Semester VI (Elective III)
List of Elective Courses

S. No.	Course Code	Name of the Course
1.	193CL1A6DD	Clinical Enzymology
2.	193CL1A6DE	Stem Cell Technology
3.	193CL1A6DF	Tumor markers and Immunohistochemistry

Generic Elective Courses (GE)

The following are the courses offered under Generic Elective Course

Semester III (GE)

S. No.	Course Code	Course Name
1	193CL1A3GA	Anatomy, physiology and laboratory science

Semester IV (GE)

S. No.	Course Code	Course Name
1	193CL1A4GA	Concepts of health

EXTRA CREDIT COURSES

The following are the courses offered under Self Study to earn extra credits:

S. No.	Course Code	Course Name
1	193CL1ASSA	Disaster management
2	193CL1ASSB	Good clinical laboratory practices

DIPLOMA / CERTIFICATE PROGRAMMES

The following are the programme offered to earn extra credits:

CERTIFICATE PROGRAMMES

S. No.	Programme Code	Course Code	Course Name
1	3CL5A	193CL5A1CA	Certificate course on Lab Safety and First aid
2	3CL5B	193CL5B1CP	Certificate course on Basic Clinical Laboratory Tests

DIPLOMA PROGRAMMES

S. No.	Course Code	Course Name
1	193CL7AA	PG Diploma in Clinical Laboratory Techniques

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-totorial.org

REGULATION 2019-20

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

1.NOMENCLATURE

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

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

1.3 Batch: Refers to the starting and completion year of a programme of study. Eg. Batch of 2015–2018 refers to students belonging to a 3 year Degree programme admitted in 2015 and completing in 2018.

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

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

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

c) **Discipline Specific Elective (DSE) Course**: DSE courses are the courses offered by the respective disciplinary/ interdisciplinary programme.

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

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

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

1.5 Lab on Project (LoP)

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

1.6 Project work

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

Extra credits

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

Advanced Learner Course (ALC):

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

2.5PART V: EXTENSION ACTIVITIES

The following co-curricular and extra curricular 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.

6.1 CONTINUOUS 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 Marksand 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	
						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	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 PracharSabha	1

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

8.3 Self study Course

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

The candidate 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 1/ 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

PROGRAMME OUTCOMES

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

PO Number	PO Statement
PO 1	The students are familiarized with theoretical and practical aspects of life science education.
PO 2	Students are encouraged to recognize and appreciate life processes taking place in human body.
PO 3	Students are exposed to modern tools and techniques adopted in the medical field and are motivated to apply the contextual knowledge for analysis and interpretation of data.
PO 4	Students are kindled to realize the need for lifelong learning and need for sustainable development.
PO 5	Students are encouraged to understand and follow ethical principles and practices and function effectively as an individual or team thereby achieve employability/entrepreneurship skills.

Course Code	Course Name	Category	L	T	P	Credit
193CL1A1CA	HUMAN ANATOMY AND PHYSIOLOGY	CORE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- To understand the terminologies used in human anatomy
- To understand the structure of various organs of the human body
- To appreciate the various physiological functions of systems of the body

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the definition of anatomical terms, general anatomy and physiology of central nervous system.	K1,K2
CO2	Know the circulatory system and understand the principles of cardiac system and measurement of cardiac output	K1,K2, K3
CO3	Describe the anatomy and physiology of respiratory and digestive system	K1,K2, K3
CO4	Understands the structure and functions of excretory and reproductive system	K1,K2, K3
CO5	Know the anatomy and physiology of lymphatic and sensory systems and appreciate the anatomical techniques	K1,K2, K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193CL1A1CA	HUMAN ANATOMY AND PHYSIOLOGY	SEMESTER I

Total Credits: 4

Total Instruction Hours: 60

Syllabus

Unit I General Anatomy 14h

Introduction to anatomical terms and organization of the human body. Tissues – Definitions, Types, characteristics, classification, location, functions and formation. Blood – morphology, composition, functions. Central Nervous system: Spinal cord, Anatomy, Functions. Structure of neuron, nerve impulse, myelinated and non-myelinated nerve. Brief account of resting membrane potential, action potential and conduction of nerve impulse.

Unit II Cardiovascular System 12h

Circulatory system – Structure of the Heart, Structure of Blood Vessels – arterial and venous system. Definitions of cardiac output, stroke volume, principles of measurements of cardiac output. Normal values of blood pressure, heart rate and their regulation in brief.

Unit III Respiratory System 14h

Parts, Nasal cavity and Paranasal air sinuses, trachea, Gross and microscopic structure of lungs, Diaphragm and Pleura. Principles of respiration, respiratory muscles, lung volumes and capacities, collection and composition of inspired alveolar and expired airs. Transport of oxygen and carbondioxide.Digestive System: Parts, Structure of Tongue, Salivary glands, stomach, Intestines, Liver, Pancreas. functions of G.I secretions, principles of secretion and movements of GIT

Unit IV Excretory system 12h

Parts, structure of Kidney, Ureters, Urinary Bladder and Urethra, Structure of Nephron, measurement and regulation of GFR, mechanism of urine formation. Clearance tests- urea & creatinine. Reproductive System: Parts of the system. Gross structure of both male and female reproductive organs

Unit V Lymphatic System 8h

Gross and microscopic structure of lymphatic tissue. Special Senses: Structure of Skin, Eye, Nose, Tongue (Auditory and Olfactory apparatus). Anatomical Techniques: Embalming of human cadaver, Museum Techniques

Text Books

1. Khurana I and Khurana A 2014.Textbook of Anatomy and Physiology for Nurses and Allied Health Sciences, 1st Edition, CBS Publishers and Distributors, New Delhi
2. William F.Ganong, 'Review of Medical Physiology', 22nd edition, McGraw Hill, New Delhi, 2005

References

1. Sembulingam K and Sembulingam P, 2010, Essentials of Medical Physiology, 5th Edition, Jaypee Medical Pub, New Delhi
2. Arnould-Taylor W E 2001, A Textbook of Anatomy and Physiology, 3rd Edition, Stanley Thomas publishers, UK
3. https://www.khanacademy.org/science/health-and-medicine/human-anatomy-and-physiology

Course Code	Course Name	Category	L	T	P	Credit
193CL1A1CB	GENERAL BIOCHEMISTRY	CORE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The complex architecture and functioning of cells and its types
- To understand structure and functions of various biomolecules
- To appreciate various endocrine hormones and its significance

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Describe the distinguishing characteristics of prokaryotic and eukaryotic cells and to understand the structure and functions of cell organelles	K1,K2
CO2	Understand the types, properties and significance of major biomolecules	K1,K2, K3
CO3	Understand the structure and functions of nucleic acids and to recall the types, sources and functions of vitamins and minerals	K1,K2
CO4	Understand the classification, structure, mechanism of action and diagnostic importance of enzymes.	K1,K2
CO5	Understand the types and functions of various endocrine hormones and their disorders	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	S	M
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S Strong M Medium L Low

193CL1A1CB	GENERAL BIOCHEMISTRY	SEMESTER I

Total Credits: 4

Total Instructions Hours: 60

Syllabus

Unit I Cell structure and function 12h

An overview of cells and their molecular composition:- prokaryotic and eukaryotic cells and their comparison. Cell organelles and their functions: Cell membrane, Endoplasmic reticulum, Golgi apparatus, lysosomes, peroxisomes and glyoxysomes. Mitochondria, Cytoskeleton, Nucleus: Chromosomes; chromatin structure.

Unit II Biomolecules 14h

Carbohydrates: Classification, Properties, biological significance and functions of monosachharides, disachharides and polysaccharides. Amino acids: Definitions, classification of essential and non essential amino acids. Chemical reactions of amino acids. Classification, structure and properties of peptides and proteins, Examples: albumin, globulins. Protein denaturation. Lipids: Definition; classification, significance and functions of lipids-simple, compound and derived lipids. Steroids-functions.

Unit III Nucleic acids and Vitamins 14h

Structure of purines and pyrimidines; nucleotides and nucleosides, DNA. Double helical structure, A, B & Z forms of DNA; DNA denaturation and renaturation, functions. RNA: Types and functions. Vitamins: Definition, classification, Sources and physiological functions of water and fat soluble vitamins. Minerals: Mineral requirement, essential macro and micro minerals: - Sources and functions.

Unit IV Enzymes 12h

International classification of enzymes, six main classes of enzymes. Factors affecting enzyme activity. Active site & Mechanism of enzyme action- example-trypsin. Enzyme Inhibition: Competitive, Non-competitive and uncompetitive enzyme inhibition. Coenzymes. Diagnostic importance of enzymes.

Unit V Hormones 8h

Names of endocrine glands & their secretions, functions of various hormones- Pituitary, thyroid, parathyroid, pancreatic, adrenal, testosterone, progesterone and estrogen. Brief account of these hormonal disorders.

Text Books

1. Jain J L, Jain S and Jain N, 2012, Biochemistry, 1st Edition, S. Chand and Company pvt Ltd, New Delhi
2. Deb, AC, 2001, Fundamentals of Biochemistry, 7th Edition New central Agency, Calcutta

References

1. Cooper, G M and Hausman R E, 2013, The cell: A Molecular Approach, 6th Edition, Sinauer Associates, Inc.Publishers, Sunderland, Massachusetts.
2. Voet, D and Voet J G, 2011, Biochemistry, 4th Edition, John Wiley and Sons, USA
3. Devlin T M (Ed.), 2010, Textbook of Biochemistry with Clinical Correlations (7th Edition), John Wiley and Sons, USA
4. Garrett, R H and Grisham, C M, 2013, Biochemistry (5th Edition), Brooks/Cole, USA
5. https://www.khanacademy.org/search?page_search_query=biochemistry

193CL1A1CP	CORE PRACTICAL: BIOCHEMISTRY- I	SEMESTER I

Total Credits: 2

Total Instructions Hours: 48

S.No	Contents
1	Qualitative analysis of carbohydrates: a. Monosaccharides – Pentose - Arabinose. Hexoses - Glucose, Fructose, b. Disaccharides - Sucrose, Maltose and Lactose c. Polysaccharide - Starch
2	Qualitative analysis of Amino acids: a. Histidine b. Tyrosine. c. Tryptophan d. Arginine
3	Analysis of lipids: a. Estimation of Acid Number b. Estimation of Iodine Number c. Estimation of Saponification Number

References

1. MSadasivam S and Manikam A 1996 Biochemical methods 2ndedition, New Age International publishers, New Delhi.
2. Plummer D T 2004 An Introduction to practical Biochemistry, 3rd Edition, Tata McGraw-Hill Education Pvt. Ltd, New Delhi.

Course Code	Course Name	Category	L	T	P	Credit
194IT1A1IA	BASICS OF INFORMATION TECHNOLOGY- I	IDC	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- To be aware about classification and components of computer
- To understand the hardware components of the computer
- To know about basics of Internet

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	To know about the types and generations of computers.	K1,K2
CO2	To understand the hardware components of the computer	K1,K2
CO3	To be aware of input and output devices of the computer	K1,K2
CO4	To be acquainted with the hardware, software and operating system and its operations	K1,K2, K3
CO5	To understand the basics of Internet and its operations	K1,K2, K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

194IT1A1IA	BASICS OF INFORMATION TECHNOLOGY- I	SEMESTER I

Total Credits: 3

Total Instructions Hours: 48

Syllabus

Unit I Computers 10h

Introduction: Computers - Characteristics - Classification - Micro, Mini, Mainframes and super computer. ALU - history of computer - Generation of computer hardware, software, human ware

Unit II Memory and types 8 h

Main Memory: ROM – RAM – EPROM – EPRAM - FLASH Memory - Auxiliary memory - magnetic tape. Hard disk - floppy disk - CD-ROM

Unit III Input Devices and Output Devices 8h

I/O Devices: Input Devices – Key board – Mouse – Track ball – Joystick – Scanner – MICR – OCR – OMR – Bar code reader – Light pen. Output Devices – VCD – Classification and Characteristics of Monitor – Printers – Plotters - Sound card - Speaker

Unit IV Operating system 10h

Introduction to computer software operating system - Classification and function of operating system, Programming language - Machine language - Assembly language- High level language. Types of High level language - Complier - Interpreters.

Unit V Internet and Electronic Mail 12h

Internet: Internet - basics, World Wide Web, web pages - web browser, searching the web - Internet Access. Electronic Mail: Introduction - Electric mail - basics - Advantage of creating mail ID, E-commerce - Introduction and application.
Interfacing of Laboratory equipments- Laboratory information system (LIS), hospital information system (HIS), Matching LIS to HIS, Merits of LIS, unidirectional and bidirectional interfacing.

Text Books

1. Alexis Leon, Mathews Leon,2009, Fundamentals of Information technology, Second Edition, Vikas Publication House Pvt Ltd
2. C.S.V Moorthi, Information Technology

References

1. R.Paramaswaran Computer applications in Business
2. Anoop Mathew, 2013, Fundamentals of Information Technology,Alpha Science Intl Ltd
3. https://www.docsity.com/en/study-notes/subjects/information-technology/

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

PREAMBLE

This course has been designed for students to learn and understand

- **மொழிப் பாடங்களின் வாயிலாக தமிழரின் பண்பாடு, பகுத்தறிவு ஆகியவற்றை அறியச் செய்தல்**
- **கலை மற்றும் மரபுகளை அறியச் செய்தல்**
- **மாணவர்களின் படைப்பாக்கத் திறன்களை ஊக்குவித்தல்**

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	**வாழ்க்கைத்திறன்கள்** (Life Skills)- **மாணவனின் செயலாக்கத்திறனை ஊக்குவித்தல்**	K1,K2,K3
CO2	**மதிப்புக்கல்வி** (Attitude and Value education)	K2,K4
CO3	**பாட இணைச் செயல்பாடுகள்** (Co-curricular activities)	K2,K3,K4
CO4	**சூழலியல் ஆக்கம்** (Ecology)	K4
CO5	**மொழி அறிவு** (Tamil knowledge)	K5, K6

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

191TLIA2TA	தமிழ்த்தாள் - II	SEMESTER II

Total Credits: 3
Total Instruction Hours: 60 h

Syllabus

Unit I அற இலக்கியம் **12 h**

1. திருக்குறள்

அ.அறன் வலியுறுத்தல் (அ. எண்: 04)

ஆ.நட்பாராய்தல் (அ. எண்: 80)

இ.சான்றாண்மை (அ. எண்: 99)

ஈ.குறிப்பறிதல் (அ. எண்: 110)

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

Unit II அற இலக்கியம் **10 h**

1. நாலடியார் - அறிவுடைமை

2.பழமொழி நானூறு - வீட்டு நெறி

3. கார்நாற்பது - தோழி பருவங்காட்டி தலைமகளை வற்புறுத்திய பாடல்கள் (1முதல் - 18பாடல்கள்)

Unit III உரைநடை **10 h**

1. பெற்றோர்ப் பேணல் - திரு.வி.க.

2. உள்ளம் குளிர்ந்தது - மு.வரதராசனார்

3. சங்கநெறிகள் - வ.சுப.மாணிக்கம்

Unit IV உரைநடை **13 h**

1.பெரியார் உணர்த்தும் சுயமரியாதையும் சமதர்மமும் - வே. ஆனைமுத்து

2. வீரவணக்கம் - கைலாசபதி

3.மொழியும்நிலமும் - எஸ். ராமகிருஷ்ணண்

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

அ.இலக்கிய வரலாறு

1. பதினெண் கீழ்க்கணக்கு நூல்கள்

2. தமிழ் உரைநடையின் தோற்றமும் வளர்ச்சியும்

ஆ. இலக்கணம்

1. வழு, வழுவமைதி, வழாநிலை

இ. பயிற்சிப்பகுதி

1. நூல் மதிப்பீடு மற்றும் திரைக்கதை திறனாய்வு

2. தன்விவரக் குறிப்பு எழுதுதல்

Text Books

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

References

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

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

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

Course Code	Course Name	Category	L	T	P	Credit
191TL1A2HA	HINDI-II	Theory	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

191TL1A2HA	HINDI-II	**SEMESTER II**

Total Credits: 3
Total Instruction Hours: 60 h

Syllabus

Unit I — 15 h

आधुनिकउपन्यास –

शबरी(श्रीनरशमेहता) प्रकाशक:

राजकमलप्रकाशन
नेहरूगोलम्बर, दरबारीबिल्डिंग,
महात्मागांधीमार्ग, इलाहाबाद-211001

Unit II — 15 h

उपन्यास: सेवासदन-

प्रेमचन्द प्रकाशक:

सरस्वतीप्रकाशन
204 बीरबलसाहनीमार्गमार्टस, 15 हार्डिंगरोड'
अशोकनगरइलाहाबाद-211001

Unit III — 15 h

अनुवादअभ्यास-III

(कवरहेन्दीसेअंग्रेजी)

(पाठ1 to 10)

प्रकाशक: दक्षिणभारतप्रचारसभाचेनैई-17

Unit IV — 15 h

नवरसखन: (औपचारिकयाअनौपचारिक)

Course Code	Course Name	Category	L	T	P	Credit
191TL1A2FA	FRENCH- II	Theory	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

191TL1A2FA	FRENCH- II	**SEMESTER II**

Total Credits: 3
Total Instruction Hours: 60 h

Syllabus

Unit I – Super! 13 h

•Compétenc e Culturelle

L'égalitéhomme/femme

Compétence De communication

INTERACTION:

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

- RÉCEPTION ORALE:

Comprendre un jeuradiophonique

- RÉCEPTION ÉCRITE:

Comprendre des announces

- PRODUCTION ÉCRITE:

Écrire des cartespostales •

Compétencegrammaticale

Les noms de professions masculine/feminine

- Le verb finir et less

Verbes du groupe

en-ir

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

Fini, aimé, arrive, dit,écrit

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

InterrogatifetExclamatif

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

Unit II Quoi? 13 h

Compétenc e Culturelle

•Le 20 siécle:

Petitsprogrés Grand progrés

Compétence De communication

- INTERACTION:

Decrirequelque chose, unepersonne

- RECEPTION ORALE:

Comprendre un message publicitaire

- RÉCEPTION ÉCRITE:

Comprendre un déplianttouristique

- PRODUCTION

ÉCRITE: Écrire des petites announces

Compétence grammatical

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

Unit III – Et aprés 12 h

Compétenc e Culturelle

Nouvelles du jour

Compétence De communication

INTERACTION:

Raconteur,situer un récitdans le temps

RÉCEPTION ORALE:

Comprendreune description

RÉCEPTION ÉCRITE:

Comprendre un test

PRODUCTION ÉCRITE:

écrire des cartespostales

Compétencegrammaticale

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

Un peu, beaucoup, trop,Assez

Trés

Le verbevenir:

Présent, impératif

En Suisse, auMaroc, aux Etats-Unis

Unit IV Maisoui! 12 h

Compétenc e Culturelle La

génération des20-30 ans

Compétence De communication

INTERACTION:

Donner son opinion,

Expliquerpourquoi

RÉCEPTION ORALE:

Comprendre des informations à la radio

RÉCEPTION ÉCRITE:

Comprendre un texteinformatif

PRODUCTION ÉCRITE:

éncrire un mél de protestation

Compétencegrammaticale

Répondre, prendre:

Présent, impératif, part Passé

Parcequepourquoi

Tout/tous, toute/s

Tous/toutes les…

(répétition action)

Unit V Maisnon! 10 h

•Compétenc e Culturelle De la

ville à la campagne Compétence

De communication

INTERACTION:

Débat:: exprimerl'accord, exprimer le Désaccord

RECEPTION ORALE:

Comprendre un message sur un répondeurtéléphonique

RÉCEPTION ÉCRITE:

Comprendre un témoignage

PRODUCTION ECRITE: Rediger des petites Announces immobilieres

Compétencegrammaticale

Le verbedevoir:Present et participe passé

Le verbe vivre, present

Aller + infinitive

Venir+ infinitive

Etre pour/contre

Text Books

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

Course Code	Course Name	Category	L	T	P	Credit
191TL1A2MA	MALAYALAM-II PROSE: NON-FICTION	Theory	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

191TL1A2MA	MALAYALAM-II PROSE: NON-FICTION	**SEMESTER II**

Total Credits: 3
Total Instruction Hours: 60 h

Syllabus

Unit I 12 h

Biography

Unit II 12 h

Biography

Unit III 12 h

Travelogue

Unit IV 12 h

Travelogue

Unit V 12 h

Travelogue

Text Books

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

References

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

Course Code	Course Name	Category	L	T	P	Credit
191EL1A2EA	ENGLISH - II	Language - II	4	0	1	3

PREAMBLE

This course has been designed for students to learn and understand

- To experience the effect of dialogue, the brilliance of imagery and the magnificence of varied genres
- To strengthen the student's English vocabulary and understanding of English sentence structure
- To communicate effectively and acquire knowledge on the transactional concept of English language

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Interpret skills in communication and to shape their attitude	K2
CO2	Develop oral and written language skills in a business context	K3
CO3	Analyze to gain key strategies and expressions for communicating with professionals	K4
CO4	Inspect the knowledge to the corporate needs	K4
CO5	Formulate Inter and Intrapersonal skills	K6

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

191EL1A2EA	ENGLISH - II	SEMESTER II

Total Credits: 3
Total Instructions Hours: 60

Syllabus

Unit I Technical English 10

Communication: Process- Methods- Channels- Barriers of Communications

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

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

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

Unit II Business English 11

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

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

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

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

Unit III Professional English 14

Report Writing: Importance- Process- Types- Structure

Memo: Importance- Structure

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

Brochures: Purpose- Audience- Qualities

Unit IV Employment Communication 11

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

Group Discussion: Importance- Features- Strategies- Barriers

Unit V Soft Skills 14

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

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

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

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

Text Books

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

2 Rizvi, Ashraf. M. 2018. Effective Technical Communication. McGraw - Hill Education, Chennai.

References

1 Ghosh, B.N. Editor. 2017. Managing Soft Skills for Personality Development. McGraw - Hill Education, Chennai.

2 Adams, Katherine L. and Gloria I. Galanes. 2018. Communicating in Groups- Applications and Skills. McGraw - Hill Education, Chennai.

3 Koneru, Aruna. 2017. Professional Communication. McGraw - Hill Education, Chennai.

4 Koneru, Aruna. 2011. English Language Skills. McGraw - Hill Education, Chennai.

5 Sharma, R.C. and Krishna Mohan. 2016. Business Correspondence and Report Writing. 5th Edn. McGraw - Hill Education, Chennai.

193CL1A2CA	ANALYTICAL TECHNIQUES	SEMESTER II

Total Credits: 4
Total Instruction Hours: 48 h

Syllabus

Unit I Buffers 08 h

pH meter-principle, instrumentation. pH scale, Henderson- Hasselbach equation, Buffer solutions, Buffer systems of blood-Hb, Protein and Phosphate buffer system. Various ways of expressing the solute and solvent concentrations - molality, molarity, normality, mole fraction - Definitions only.

Unit II Chromatographic Techniques 12 h

Paper chromatography-principle, materials, methods and applications. Thin Layer chromatography- principle, Technique and applications. Gas liquid chromatography- principle and applications. Adsorption chromatography- principle and applications. Ion-exchange chromatography, Affinity chromatography and Molecular sieve chromatography- Principle and applications. HPLC, FPLC and GC-MS (principles only).

Unit III Electrophoretic Techniques 12 h

Principles and applications of paper electrophoresis, Gel electrophoresis- Agar gel , and SDS-PAGE. Immuno electrophoresis- principle and technique, applications of Immuno electrophoresis. Isoelectric focusing. Principles and applications of Immunoassays- Radio immuno Assay, Enzyme Linked Immuno Sorbent Assay, fluoro immuno assay.

Unit IV Photometry 08 h

Colorimetry- Principle- Beer - Lambert's Law. Instrumentation and applications of colorimeter. Spectrophotometer-principle, Components of spectrophotometer and its applications. Spectrofluorimeter- components. Applications of spectrofluorimetry. Flame photometry- principle, basic components of flame photometry. Types- Emission flame photometry, Atomic absorption spectrophotometry.

Unit V Centrifuges 08 h

Principle of Centrifugation. Centrifuges - Bench top, high speed, Ultra centrifuge, analytical centrifuge - Principles and applications. Determination of Molecular weight by Sedimentation velocity method. Differential centrifugation - principle, Separation of Cell Organelles by differential centrifugation.

Text Books

1. Sabari Ghosal and Srivastava,A.K. (2010). Fundamentals of Bioanalytical Techniques and instrumentation. (5th Edn.) Eastern Economy Edition.
2. Asokan, P. (2001). Basics of Analytical Biochemistry. (IEdn.) Tamilnadu: Chinna Publications.

References

1. Plummer, D T. (2004). An introduction to Practical Biochemistry. (3 Edn.) New Delhi: Tata McGraw-Hill Education Pvt. Ltd.
2. Wilson.K., Walker J. (2000). Practical Biochemistry. (10 Edn.) Location: Cambridge University Press.
3. Katoch,R. (2011). Analytical Techniques in Biochemistry & Molecular Biology. (1 Edn.) UK: Springer.
4. Sawhney, S.K. (2005). Introductory practical Biochemistry. (10 Edn.) New Delhi: Narosa Publishers.

Course Code	Course Name	Category	L	T	P	Credit
193CL1A2CB	**INTERMEDIARY METABOLISM AND METABOLIC DISORDERS**	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Metabolic processes taking place in different types
- Basics of metabolic disorders
- Metabolic disorder symptoms and means of diagnosis

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Know the metabolism of carbohydrates and understand the individual pathway and its alternative pathway	K1,K2
CO2	Describes the lipid, protein metabolism and nucleotide metabolism.	K1,K2, K3
CO3	Know the Biological oxidation and Mitochondrial shuttle system.	K1,K2, K3
CO4	Understand disorders of carbohydrate and lipid metabolism	K1,K2, K3
CO5	Describes the diseases associated lipid storage and disorders of nucleotide metabolism.	K1,K2, K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193CL1A2CB	**INTERMEDIARY METABOLISM AND METABOLIC DISORDERS**	**SEMESTER II**

Total Credits: 4
Total Instruction Hours: 48 h

Syllabus

Unit I Carbohydrate metabolism 10 h

Introduction to metabolism: Types of metabolic reactions. Carbohydrate metabolism: Glycolysis, TCA cycle. Glycogenesis and Glycogenolysis, Alternative pathways: HMP pathway, gluconeogenesis (Structures not needed)

Unit II Lipid metabolism and Protein metabolism 10 h

Lipid metabolism: Fatty acid oxidation – α, β, ω oxidation. Biosynthesis of saturated and unsaturated fatty acids. Biosynthesis of cholesterol. Protein metabolism: Deamination, Transamination and Decarboxylation, Urea cycle. Nucleic acid metabolism: Biosynthesis and degradation of purine and pyrimidine nucleotides (Structures not needed)

Unit III Biological oxidation 08 h

Biological oxidation: Mitochondrial Electron Transport Chain (ETC): electron carriers, sites of ATP production, inhibitors of ETC, Oxidative phosphorylation, inhibitors of oxidative phosphorylation, Mitochondrial shuttle system.

Unit IV Disorders of carbohydrate and Lipid metabolism 10 h

Disorders of carbohydrate metabolism: Hypoglycemia - Definition and causes. Hyperglycemia - Definition and causes. Diabetes mellitus: Introduction, types of diabetes mellitus, clinical pathology and diagnosis. Galactosemia, and Glycogen storage diseases. Disorders of Lipid Metabolism: Hyperlipoproteinemia and Hypolipoproteinemia.

Unit V Lipid storage diseases and Disorders of purine metabolism 10 h

Lipid storage diseases: Artherosclerosis. Fatty liver and hyperlipidemia. Tay Sach's disease, Niemann - Pick disease. Disease of Aminoacid Metabolism: Phenylketonuria, Maple Syrup Disease, Alkaptonuria. Disorders of purine metabolism: Hyperuricemia and Gout; Hypouricemia - Xanthinuria. Disorders of Pyrimidine metabolism: Orotic aciduria.

Text Books

1. Murray et al, (2012). Harper's Biochemistry. (29th Edn.) : McGraw Hill Medical Publication.
2. Burtis, C.A. (2005). Tietz Textbook of Clinical Chemistry and Molecular Diagnosis. (5thEdn.) New Zealand: William Heinmann, Medical Books Ltd.

References

1. Voet, D. (2012). Fundamentals of Biochemistry. (4th Edn.) New Jercy: John Wiley and Sons.
2. Nelson, D.L. (2017). Lehninger Principles of Biochemistry. (7th Edn.) New York : W.H. Freeman & Co.
3. Deb, A.C. (2001). Fundamentals of Biochemistry. (7th Edn.) Calcutta: New central Agency.
4. Swaminathan, R. (2004). Handbook of Clinical Biochemistry. (1st Edn.) London. Oxford University Press.

193CL1A2CP II	CORE PRACTICAL II: BIOCHEMISTRY - II	SEMESTER

Total Credits: 2
Total Instructions Hours: 48 h

S.No	Contents
1	Preparation of buffers
2	Measurement and adjustment of pH
3	Quantitative analysis of urea in urine
4	Quantitative analysis of uric acid in urine.
5	Quantitative analysis of creatinine in urine.
6	Quantitative analysis of phosphorus in urine
7	Quantitative analysis of protein in urine
8	Quantitative analysis of sodium and potassium in urine
9	Separation of amino acids by paper chromatography
10	Separation of sugars by thin layer chromatography.
11	Separation of serum proteins by electrophoresis.
12	Strip test method for pregnancy- Demonstration.

Note: Any 8 out of 12 experiments are mandatory.

References

1. Wilson.K. Walker J. (2000). Practical Biochemistry. (10 Edn.) Location: Cambridge University Press.
2. Geetha Damodaran.K. (2016). Practical Biochemistry. J.PMedical Publishers Pvt. Ltd.
3. Sawhney S.K., (2005). Introductory practical Biochemistry. Narosa Publishers, New Delhi.
4. Rashmi A.Joshi and Manju Saraswat. (2002) A Text Book of Practical Biochemistry. I Ed. B.Jain Publishers Pvt. Ltd., New Delhi

Course Code	Course Name	Category	L	T	P	Credit
194IT1A2IA	BASICS OF INFORMATION TECHNOLOGY-II	IDC	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The overall view of Ms Office packages.
- The operations of word processor, spreadsheet, PowerPoint and access
- The operations of spreadsheet, PowerPoint and access

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Know about recent packages and their operations	K1,K2
CO2	Understand the functions of word processor.	K1,K2,K3
CO3	Understand the procedures and formulas to work in Excel sheet	K1,K2,K3
CO4	Know about operations of insert, delete and update in the database.	K1,K2,K3
CO5	Present a slideshow based upon the concepts using PowerPoint.	K1,K2,K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

194IT1A2IA	**BASICS OF INFORMATION TECHNOLOGY-II**	**SEMESTER** II

Total Credits: 3
Total Instruction Hours: 36 h

Syllabus

Unit I Office Automation 8 h

Introduction to office automation A. brief about latest packages - introduction to windows - creation of Icons - introduction to MS-Office - importance of word processor - spreadsheet - database - an presentation in office environment

Unit II MS Word 7 h

Word Basics - editing with word - copying and moving text - searching – replacing pictures in documents - printing documents - for making with work - for making photographs – sections dealing from letters – tables tool notes spell checking - grammar checking- sorting- fields, annotation book marks and cross reference.

Unit III Excel 7 h

Creating worksheet - entering and editing text, numbers, formulas - saving – Excel functions modifying worksheet range - selection copying and moving data - defining names - inserting of deleting rows of columns - moving around worksheet naming worksheet, copying inserting of deleting worksheet - formatting, auditing, heading - displaying value- changing of selecting fonts, protesting data using style so templates - reprinting worksheet creating charts - managing date - what if tables paste tables, macros, linking worksheets.

Unit IV Database and Data structure 7 h

Creating new database - modifying database structure- entering data relieving data running queries - changing screen displays - searching the databases- sorting - updating report generation - mailing levels working with numbers, dates and yes/no fields - working with multiple tables.

Unit V Powerpoint 7 h

Basics of power point - creating of editing slides - Formatting slides - masters slides- templates objects- transitions heading slides- using clip art gallery - chart creation managing files.

Text Books

1. Joyce, C (2000). Microsoft Office. (5th Edn.) Delhi: Galgotia Publications Pvt. Ltd.
2. Srivatsava S.S. (2008). MS- Office. (1stEdn.) New Delhi: Firewall Media.

References

1. Nellai Kannan .C (2002). MS Office. (1st Edn.) Tamilnadu: Nels Publications.
2. Stephanie, K. (2007). Advanced Microsoft Office Documents. (Edn.) U.S: Prentice Hall.
3. Michael, P. (2012). Office 2010. (Edn.) U.K: Tata McGraw-Hill.
4. Taxali, RK. (2000). PC Software for windows 98 made simple. (5th Edn.) New Delhi: Tata Mc Graw-Hill Publications.

194IT1A2IP	IDC PRACTICAL: DIGITAL MEDIA LAB	SEMESTER II

Total Credits: 2
Total Instructions Hours: 36 h

S.No	Contents
1	Create a paragraph of ten lines and perform the following using MS Word: i) Bold ii) Underline iii) Font Change iv) Sizing v) Color Background vi) Color Foreground vii) Spell Check viii) Line Spacing ix) Center Heading x) Page Numbering and Preview
2	Create a resume and format using Ms Word.
3	Prepare mail merge for parent meeting using MS WORD
4	Prepare Student mark sheet and chart for result analysis using MS EXCEL
5	Prepare a mark list for following conditions using data filter and data sort in MS EXCEL a) Prepare mark list in ascending order. b) Average is greater than or equal to 60. c) Average is between 50 and 60. d) Average is below 40
6	Create a presentation using various auto layouts, charts, table, bullets and clipart.
7	Create a power point presentation to advertise a product using Slide Transition and Custom animation
8	Create a database to student's Mark sheet using MS Access
9	Animate Plane flying in the Clouds using Photoshop
10	Create a banner for the department using Photoshop.
11	Create Plastic surgery for the eyes, nose and mouth using Photoshop
12	Design a certificate for an event using Photoshop.

Note: Any 8 out of 12 experiments are mandatory

References

1. Taxali. R.K (2000). PC Software for windows, Tata Mc Graw-Hill Publications

2. Nellai Kannan C. (2004). MS Office, Nels Publications

3. Niegel Chapman and Jenny Chapman (2007). Digital Media Tools, John Wiley and Sons, London.

4. Stephanie,K. (2007). Advanced Microsoft Office Documents. (10 Edn.) U.S: Prentice Hall

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	M	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.

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

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

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

References

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

CURRICULIM
B.SC.CLINICAL LAB TECHNOLOGY 2019-20

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Third Semester										
193CL1A3CA	Core	Clinical Pathology	4	-	-	3	25	75	100	4
193CL1A3CB	Core	Histopathology	4	-	-	3	25	75	100	4
193CL1A3CC	Core	Basics of Human Genetics And Fetal Medicine	4	-	-	3	25	75	100	4
193CL1A3CP	Core Practical	Pathology	-	-	4	4	40	60	100	2
193FN1A3IP	IDC Practical	Nutritional Biochemistry	-	-	4	3	40	60	100	2
193FN1A3IA	IDC	Clinical Nutrition	3	-	-	3	25	75	100	3
193CL1A3SA	SEC	Laboratory Automation and Quality Control	3	-	-	3	25	75	100	3
	GE		2	-	-	3	-	50	50	2
	LoP		-	-	-	-	-	-	-	-
Part - IV										
191TL1A3AA	AECC - III	Basic Tamil	2	-	-	3	-	50	50	2
191TL1A3AB		Advanced Tamil								
195CR1A3AA		Women's Rights								
		Total	22		8				800	26

EXTRA CREDIT COURSES

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

S. No.	Course Code	Course Name
1	193CL1ASSA	Disaster Management
2	193CL1ASSB	Good Clinical Laboratory Practices

Course Code	Course Name	Category	L	T	P	Credit
193CL1A3CA	CLINICAL PATHOLOGY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The organisation and functioning of Clinical Laboratory
- The collection procedure and analysis of various biological fluids
- The normal and abnormal components of body fluids and pathological conditions

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the overall organization, functioning and dynamics of a clinical laboratory, quality control in the laboratory	K1,K2, K3
CO2	Demonstrate a working understanding of the urine chemistry and its significance	K1,K2, K3
CO3	Demonstrate a working understanding of the stool chemistry and its significance	K1,K2, K3
CO4	Understand the various body fluids and will demonstrate the ability to interpret laboratory data	K1,K2, K3
CO5	Interpret and evaluate clinical laboratory examination of Seminal fluid	K1,K2, K3

MAPPING WITH PROGRAMME OUTCOMES

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

193CL1A3CA	CLINICAL PATHOLOGY	SEMESTER III

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Analytical Measures in clinical pathology 10 h

Importance of pre-analytical measures and post-analytical measures, generation of request, Instructions for sample collection, Rejection criteria and preservation, despatch of reports, records keeping, coding and indexing

Unit II Urine Analysis 10 h

Formation of urine, Macroscopic Examination –Volume, Colour, transparency, pH and Specific gravity. Normal and Abnormal constituents in urine. Microscopical examination – Cells (RBC, WBC, Epith), casts, crystals, Bacteria, Detection of microalbumin& 24 hours urine protein estimation

Unit III Stool Analysis 10 h

Examination and Microscopic examination of motion for colour, mucus, consistency, ova, ameba, cysts, parasites, pus cells, RBC (isomorphic and dismorphic) and crystals. Detection of occult blood in stool, concentration techniques

Unit IV Body Fluids 10 h

Examination of body fluids & cell counts: Examination of Ascitic fluid, pleural fluid examination and report, synovial fluid collection and examination, pericardial fluid collection and exaination, Cerebro Spinal Fluid and Amniotic fluid- collection, examination and pathological studies

Unit V Semen analysis 8 h

Macroscopic Examination and Microscopic examination of semen for time for liquefaction, volume, colour, pH, motility of sperm, sperm count and other findings. Staining, morphological study, pathophysiology and vitality of spermatozoa, semen fructose determination, antisperm antibodies

Text Books

1. Sood R, 1996.Laboratory technology (Methods and interpretations) 4th Ed. J.P. Bros, New Delhi
2. Mukherjee KL, 2010.Medical Laboratory Technology-A procedure manual for routine Diagnostic tests -Volumes I, II, III. Tata McGraw Hill Publishing Company ltd. New Delhi

References

1. Satish K. Gupta, 1991.Text book of medical laboratory for technicians, J.P. Bros, New Delhi.8th edition.
2. William F.Ganong. 2005. Review of Medical Physiology, 22nd edition, McGraw Hill, New Delhi.
3. Gupta, M.L, 2002. General Pathology Review, 2nd edition, C. B. S Publishers, New Delhi.
4. Talib V.H., 2014. Handbook of Medical Laboratory Technology, Vol. 1, 2nd Ed., CBS Publishers, New Delhi.

Course Code	Course Name	Category	L	T	P	Credit
193CL1A3CB	HISTOPATHOLOGY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The basics of histopathology
- The instrumentation and techniques used in pathology
- The record maintenance and ICDS classifications

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand basic concepts, techniques and methods in histopathology	K1,K2, K3
CO2	Description of instruments and its applications employed in histo techniques	K1,K2, K3
CO3	Learn about principle, working, instrumentation, types and applications of microscopes	K1,K2, K3
CO4	Understand principle, concepts, techniques of section making, staining and mounting process	K1,K2, K3
CO5	Know about record maintenance, microphotography, museum techniques and ICDS classifications	K1,K2, K3

MAPPING WITH PROGRAMME OUTCOMES

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

193CL1A3CB	HISTOPATHOLOGY	SEMESTER III

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to histopathology 8 h

Guidelines for receiving specimen in laboratory – specimen containers, Grossing and Preservation. Preservatives - Various fixatives – Mode of action, Indications, preparation, decalcification of calcified tissue before sectioning, Processing of tissues for routine paraffin sections and methods of embedding

Unit II Instrumentation 8 h

Tissue Processor- Manual tissue processor and Automated ,Types of microtome, Parts of Microtome- knives and Knife sharpener, Instruments for grossing Introduction on different types of stains- Automatic slide stainer

Unit III Microscopy 12 h

Tissue preparation, Fixatives and section cutting for different types of microscopy. Use of microscope – polarisers, Introduction to Electron Microscopy, Introduction to immunohistochemistry and technique of preparing slides – Types of glass slides and cover slips

Unit IV Frozen section technique 10 h

CO2 Freezing, cryostat and freezing microtome. Principles and techniques of sections cutting, staining - staining principles, preparation of reagents and techniques - routine staining and special staining (any five), Mounting techniques

Unit V Maintenance of records 10 h

Maintenance of records, filing and storage of specimen and slides, Microphotography – Photography and interfacing technique. Museum technology - preservation and organisation, Coding - ICDS – Introduction and importance

Text Books

1. Sood R, 2009. Laboratory technology (Methods and interpretations) 6th Edition, J.P.Bros, New Delhi

2. Mukherjee KL, 2010.Medical Laboratory Technology-A procedure manual for routine Diagnostic tests -Volumes I, II, III. Tata McGraw Hill Publishing Company ltd. New Delhi

References

1. Culling C F A, 1974. Histopathology Techniques.3rd Edition Butterworth - Heinemann Publication, London.

2. Matthew J Lynch, 1996. Lynch's medical laboratory Technology.3rd Edition, W.B Saunders Co Publications

3. Talib V.H., 2014. Handbook of Medical Laboratory Technology, Vol. 1, 2nd Ed., CBS Publishers, New Delhi.

4. Todd J C, Davidson I and Henry J B 2016.Clinical diagnosis by laboratory methods. 22nd Edition, Saunders Publications Pvt. Ltd, Pennsylvania

Course Code	Course Name	Category	L	T	P	Credit
193CL1A3CC	BASICS OF HUMAN GENETICS AND FETAL MEDICINE	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The basics of human genetics and fetal medicine
- The principle of recombination and gene mapping
- The multiple pregnancies and perinatal infectious diseases

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand basic concepts, techniques and methods in genetic analysis	K1,K2, K3
CO2	Describe of Laws of inheritance and chromosome theory	K1,K2, K3
CO3	Understand the principle of recombination and gene mapping, and sex inheritance	K1,K2, K3
CO4	Understand principle, concepts, techniques of embryology and fetal development	K1,K2, K3
CO5	Know about multiple pregnancies and perinatal infectious diseases	K1,K2, K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193CL1A3CC	BASICS OF HUMAN GENETICS AND FETAL MEDICINE	SEMESTER III

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Model Organisms in Genetic Analysis 8 h

Model systems in Genetic Analysis: Bacteriophage – Lytic and Lysogenic cycle, E. coli – Fission and Conjugation, Yeast, Maize, Drosophila, Rattus albicans, Homo sapiens - General outline of life cycle and importance in Genetic analysis.

Unit II Introduction to Genetics 10 h

Principle of Genetic Transmission – Gene, Mendel's Laws - Laws of inheritance, Concept of dominance, Law of segregation, Independent assortment, Chromosome theory of inheritance, Allelic and Non-allelic interactions: Concept of alleles, Types of dominance with example, Alleles types, Test of allelism- Compliment Test and Epistasis.

Unit III Linkage 10 h

Concepts of linkage, recombination, gene mapping in prokaryotes and eukaryotes, Sex-linked inheritance: Conceptual basis, sex influenced traits, mechanism of sex determination in Drosophila and Human. Quantitative inheritance – Concept, Genes and Environment - heritability, penetrance and expressivity

Unit IV Embryology and Foetal development 12 h

General embryology –Sperm and Ovum, Ovulation to implantation – Zygote formation, Development of amniotic sacs, Placenta and Membranes, Development of main organ systems, basic principles, Definition of congenital anomalies, mechanism of teratrogenesis, Types of teratrogens and its effects of possible teratogens

Unit V Multiple pregnancies and antenatal complications 8 h

Twins, Triplets and more, antenatal complications – IUGR, Chrioamnionitis, Premature rupture of membranes, IUF death. Perinatal infectious diseases – Toxoplasmosis, CMV, Herpes, HBV, HIV, HPV, Rubella, streptococcal infection and syphilis

Text Books

1. Robert Schley, (1993). Genetics and Molecular Biology; 2nd Edition The Johns Hopkins University Press ltd; London
2. Lodish, H et al, 2003. Molecular cell biology, 5th Edition, USA

References

1. Karp, G. John Wiley and Sons, 2007. Cell and Molecular Biology: Concepts and Experiments. 5th Edition. USA
2. Charles H.Rodeck and Martin J whittle. (2008). Fetal Medicine: Basic science and Clinical practice, 2nd Edition
3. Rastogi, S.C. 2012, Cell and Molecular Biology, 3rd Edition. New age International Publishers, India
4. Jorde, L.B. et al, 2016.Medical genetics:5th Edition, Elsevier Publishers, Philadelphia

193CL1A3CP	CORE PRACTICAL: PATHOLOGY	SEMESTER III

Total Credits: 2
Total Instructions Hours: 48h

S.No	CONTENTS
1	Physical Examination of urine
2	Chemical Examination of urine
3	Microscopic Examination of urine
4	Physical Examination of Stool
5	Chemical Examination of stool
6	Microscopic Examination of stool
7	Preparation of staining reagents
8	Preparation of various fixatives
9	Tissue processing
10	Tissue embedding and Section cutting
11	Staining and mounting of tissues
12	Body Fluids - CSF, Pleural, Peritoneal, Synovial, Semen Analysis- Demonstration

Note: Out of 12 - 10 Mandatory

References

1. Sood R, 1994 Medical Laboratory Technology, Jaypee Brothers, New Delhi
2. Mukherjee, KL 2010. Medical Laboratory Technology-A procedure manual for routine diagnostic Tests - Volume 1, 2 and 3, Tata McGraw Hill Publishing Company ltd, New Delhi
3. Chakraborty, P.2002. Practical Pathology, Reprint,New Central Book Agency, Kolkata

193FN1A3IP	IDC PRACTICAL: NUTRITIONAL BIOCHEMISTRY	SEMESTER III

Total Credits: 2
Total Instructions Hours: 48 h

S.No	Contents
1	Qualitative Analysis of Total protein
2	Qualitative Analysis of Minerals – Calcium and Iron
3	Estimation of moisture content in one food quantitatively
4	Estimation of fiber content in food
5	Estimation of ash content in food
6	Estimation of Ascorbic Acid content in Citrus fruit juice
7	Determination of carbohydrates by Anthrone method
8	Estimation of Iron content in food
9	Determination of Calcium content in milk
10	Determination of acid number of oils
11	Determination of saponification number
12	Determination of calorific value using of Bomb Colorimeter - Demonstration

Note: Out of 12 Practicals , 10 mandatory

References

1. Potter.N.N and Hotchkiss.J.H., 1996., "Food Science" CBS Publishers
2. Y. Sathe, 1999, "A First Course in Food Analysis" ,New Age Publications
3. Joshi Y. K. Basic Clinical Nutrition , 2003, Edition I, J. P. Brothers, New Delhi

Course Code	Course Name	Category	L	T	P	Credit
193FN1A3IA	CLINICAL NUTRITION	IDC	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The basic concepts of nutrition and health
- The nutritional requirements and nutritional disorders
- The role of diet in prevention and treatment of diseases

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand basic concepts of nutrition , health, essential nutrients, food habits and food groups	K1,K2,K3
CO2	Understand the physiological role and nutritional significance of carbohydrates, lipids and protein	K1,K2,K3
CO3	Know the energy content of foods, nutritional requirements and conditional nutritional disorders	K1,K2,K3
CO4	Interpret and identify primary nutritional diseases and Basic concept of high protein low caloric weight reduction diets	K1,K2,K3
CO5	Identify the role of diet and nutrition in prevention and treatment of diseases	K1,K2,K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193FN1A3IA	CLINICAL NUTRITION	SEMESTER III

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Introduction to nutrition 7 h

Function of foods and its relation to nutrition and health, essential nutrients, analysis of food composition, food habits and food groups. Role of water and fat soluble vitamins, minerals and antioxidants in health. Required dietary allowance for an average adult

Unit II Nutrition 7 h

Physiological role and nutritional significance of carbohydrates, lipids and protein. 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. Classification of amino acids – their role in growth and development

Unit III Energy content of foods 8 h

Measurement of energy expenditure, physical activity and energy utilization of cells. Energy requirements of men and women and factors affecting energy requirements. Role of dietary fibers in nutrition. Conditional nutritional disorders: Disorders of gastrointestinal tract, liver, biliary tract, pancreas, heart and Diabetes

Unit IV Primary nutritional diseases 7 h

Protein energy malnutrition (Marasmus and Kwashiorkar), Starvation, Protein metabolism in prolonged fasting. Protein sparing action. Basic concept of high protein low caloric weight reduction diets. Obesity, Vitamin deficiency disorders-Hypervitaminosis, vitamin A deficiency, vitamin D deficiency, vitamin B12 deficiency, vitamin K deficiency. Minerals –iron and types of anemia, calcium and iodine deficiency

Unit V Clinical Nutrition 7 h

Role of diet and nutrition in prevention and treatment of diseases: Dental Caries, Fluorosis, Atherosclerosis and Rheumatic disorders. Inherited metabolic disorders: Phenylketonuria, Maple Syrup disease, Homocystinuria & Alkaptonuria

Text Books

1. Gibney, Lanham-New, Cassidy and Vorster, 2013. Introduction to Human Nutrition, 2nd Edition, Wiley-Blackwell
2. Smolin and Grosvenor, 2016. Nutrition: Science and Applications, 4th Edition, Wiley

References

1. Swaminathan M. S, 1985. Essentials of food and Nutrition, 2nd Edition, Bangalore Press
2. Joshi Y K, 2010. Basic Clinical Nutrition, 2nd Edition, Jaypee Brothers, New Delhi
3. Trueman P, 2011. Nutritional Biochemistry, 5th Edition, MJP Publishers
4. Gibney, Margetts and Kearney, 2013. Public health Nutrition, The Nutrition Society, Blackwell Science

Course Code	Course Name	Category	L	T	P	Credit
193CL1A3SA	LABORATORY AUTOMATION AND QUALITY CONTROL	SEC	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The organization and basic needs of clinical laboratory
- The maintenance of common equipments and automation
- The internal , external quality control and Laboratory informatics

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the organization of clinical Laboratory and basic needs of clinical laboratory	K1,K2, K3
CO2	Know the maintenance and care of common laboratory glassware and common equipments	K1,K2, K3
CO3	Know Common terms used in Quality control, Internal and External Quality control	K1,K2, K3
CO4	Understand the auto analyzer and different types of analyzers and barcoding	K1,K2, K3
CO5	Perceive the Laboratory informatics, laboratory information management system	K1,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	M
CO5	S	S	S	M	M

S Strong M Medium L Low

193CL1A3SA	LABORATORY AUTOMATION AND QUALITY CONTROL	SEMESTER III

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Clinical Laboratory 8 h

Functional components of clinical laboratories, cleanliness, precautions to be taken with respect to patients, reports, analysis. Communication between physician, patients, and the medical laboratory professional, basic needs of clinical laboratory technician, awareness of soft skills

Unit II Laboratory glassware and equipments 7 h

Identification, use, maintenance and care of common laboratory glassware and equipments, handling of all glassware ,use, principle and use of centrifuge, colorimeter, oven, incubator, Laminar air flow chamber, microscope, Neubaur' s chamber, Autoclave, Makler chamber for Semen analysis

Unit III Quality Control in Clinical lab 7 h

Quality Assurance in clinical Laboratory - Introduction, Common terms used in Quality control ,Westgard rules L.J. Chart, External QC and Internal QC, Proficient testing and interlab comparison -Assessment, corrective action and preventive action, Total Quality management- water quality, electrical stability, equipment calibration, glassware and preventive measures

Unit IV Automation in Clinical Laboratory 7 h

Automation and Recent advances - Need for Automation, Advantages of Automation Types of Auto Analysers - Semi and Fully automated, Routine biochemistry analysers Ion selective electrode, Immuno-based analysers, Hematology analysers - Cell counters, Coagulometers, Bar coding and Total Laboratory Automation (TLA)

Unit V Laboratory informatics 7 h

Laboratory informatics- data acquisition, data processing, laboratory information management system(LIS), scientific data management and Hospital information management system (HIS) and autovalidation of reports and Artificial intelligence in lab

Text Books

1. Kanai L. Mukherjee, 2010, Medical laboratory technology Vol.1, 2nd Edition,Tata McGraw Hill (Updated)
2. Fischbach, 2015. Manual of lab and diagnostic tests, 9th Edition, Lippincott Williams Wilkins, New York.

References

1. Gradwohls, 2000. Clinical laboratory methods and diagnosis. (ed) Ales C. Sonnenwirth and leonardjarret, M.D.B.I., New Delhi
2. J Ochei and Kolhatkar, 2002. Medical laboratory science theory and practice, Tata McGraw- Hill, New Delhi
3. A Dasgupta and A Wahed, 2014. Clinical Chemistry, Immunology and Laboratory Quality Control, (1st edition) Elsevier
4. Kumar, Vijay, Gill, Kiran Dip, 2018. Basic Concepts in Clinical Biochemistry: A Practical Guide. Springer Singapore

193CL1A3GA	ANATOMY, PHYSIOLOGY AND LABORATORY SCIENCE	SEMESTER III

Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I General Anatomy 5 h

Definition of the terms Anatomy and Physiology- Organization of the body: Cells, Tissue, Organs, Membranes and glands. Muscular - Skeletal System: Bone types, structure and function

Unit II Cardiovascular System and Central Nervous System 5 h

Cardio Vascular System: Heart, Functions and Cardiac Cycle - Blood and its Composition, PNS and CNS-Nervous System: Structure and function of neuron,:

Unit III Digestive System Respiratory System and Urinary System 5 h

Structure and functions of digestive system (outline), Structure and function of lungs, Urinary System- Structure and functions of kidney and nephron.

Unit IV Endocrine System and Reproductive System 5 h

Pituitary gland- functions and pathophysiology in brief. Female reproductive system - Structure and functions of female reproductive organs, Reproduction. Male reproductive system -Structure and functions of organ

Unit V Laboratory Science 4 h

Clinical Laboratory set up, biological samples for diagnosis - blood, urine, and other biological specimens. Laboratory safety practices

Text Books

1 William F.Ganong, 2005. 'Review of Medical Physiology', 22nd edition, McGraw Hill, New Delhi.

2 Khurana I and Khurana A 2014.Textbook of Anatomy and Physiology for Nurses and Allied Health Sciences, 1st Edition, CBS Publishers and Distributors, New Delhi.

References

1 Arnould-Taylor W E 2001, A Textbook of Anatomy and Physiology, 3rd Edition, Stanley Thomas publishers,UK

2 A.K. Jain, 2005. Text book of Physiology, volume I and II, 3rd edition, Avichal Publishing company, New Delhi.

3 Elaine.N. Marieb, 2007. Essentials of Human Anatomy and Physiology, 8th edition, Pearson Education, New Delhi.,

4 Sembulingam K and Sembulingam P, 2010. Essentials of Medical Physiology, 5th Edition, Jaypee Medical Pub, NewDelhi.

193CL1ASSA	SELF STUDY: DISASTER MANAGEMENT	SEMESTER III

Total Credits: 1

Syllabus

Unit I Natural Disasters

Natural Disasters - Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, Volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion

Unit II Man Made Disasters

Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents

Unit III Disaster Preparedness

Disaster Preparedness: Concept & Nature, Disaster Preparedness Plan, Disaster Preparedness for People and Infrastructure

Unit IV Disaster Management

Disaster Management- Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements

Unit V Organizations in disaster management

Role of various organizations in disaster management- Role of NGOs, community – based organizations and media. Central, state, district and local administration; Armed forces in disaster response; Disaster response; Police and other organizations

Text Books

1. Together Towards a Safer India Part III, Central Board of Secondary Education, 2006
2. Natural Hazards and Disaster Management, Central Board of Secondary Education, 2006

References

1. Sharma, R.K. & Sharma, G. (2005) (ed) Natural Disaster, APH Publishing

193CL1ASSB	SELF STUDY: GOOD CLINICAL LABORATORY PRACTICES	SEMESTER III

Total Credits: 1

Syllabus

Unit I Scope and Levels of laboratories

Scope, Levels of laboratories, Infrastructure, Personnel, Training & development, Equipment, Reagents and materials, Standard operating procedure, Safety in laboratories, Ethical considerations

Unit II Laboratory facilities

Laboratory facilities- design and physical aspects of design. Laboratory equipment management:- Instrument selection, budgeting, installation, training and maintenance

Unit III Record and data management

Requisition form, Accession list, specimen collection, worksheet, reporting test results, specimen rejection record and data management

Unit IV Documentation practices

Good documentation practices, purpose of laboratory documentation, types of documentation and records, documentation process and errors, principles of good documentation practices and benefits

Unit V Quality assurance

Quality assurance, quality assurance programme, internal quality control, external quality assessment, internal audit, summary of QAP activities

Text Books

1 Good Clinical Laboratory Practices, Indian Council of Medical Research, 2008

2 Good Clinical Laboratory Practices, World Health Organisation, 2009

References

1 Understanding the principles of Good Clinical Laboratory Practices (GCLP), Global Health Laboratories, 2014

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

Total Credits: 2

Total Instruction Hours: 24 h

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

அலகு : 1 தமிழ் மொழியின் அடிப்படைக் கூறுகள் 12 h

அ) எழுத்துகள் அறிமுகம் :

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

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

அலகு : 2 குறிப்பு எழுதுதல் 12 h

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

வினாத்தாள் அமைப்பு முறை - மொத்த மதிப்பெண்கள் - 50

பகுதி –அ

சரியான விடையைத் தேர்வு செய்தல் 10x2=20

பகுதி –ஆ

அரைப்பக்க அளவில் விடையளிக்க 03x5=15

பகுதி-இ

இரண்டு பக்க அளவில் விடையளிக்க 01x15=15

குறிப்பு:

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

Text Books

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

References

1 ஒன்றாம் வகுப்பு பாடநூல் - தமிழ்நாடு அரசு பாடநூல் கழகம்

2 வலைதள முகவரி : http://tamilvu.org

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

Total Credits: 2

Total Instruction Hours: 24 h

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

அலகு – 1 மரபுக் கவிதைகள் 05 h

அ) பாரதியார் கவிதைகள்

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

ஆ) பாரதிதாசன் கவிதைகள்

- இன்பத்தமிழ்
- நீங்களே சொல்லுங்கள்
- வாளினை எடடா!

இ) தாராபாரதி கவிதைகள்

- வேலைகளல்ல வேள்விகள்

அலகு – 2 புதுக்கவிதைகள் 05 h

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

அலகு – 3 இலக்கணம் 04 h

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

அலகு – 4 கடிதங்கள் எழுதுதல் 05 h

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

அலகு – 5 பாடம் தழுவிய வரலாறு 05 h

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

வினாத்தாள் அமைப்பு முறை - மொத்த மதிப்பெண்கள் - 50

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

குறிப்பு:

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

Text Books

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

References

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

2 வலைதள முகவரி : http://tamilvu.org

195CR1A3AA	WOMEN'S RIGHTS	SEMESTER III

Total Credits: 2

Total Instruction Hours: 24h

Syllabus

Unit I Rights to Infant & Child 4 h

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

Unit II Rights to women 5 h

Matrimonial protection-Protection against dowry-Protection to pregnancy-Sexual offences-Law relating to work Place- Directive principles of Constitution (Article 39 a, d, e & Article 42, 43 & 46) - Trafficking of women

Unit III Laws for Senior Citizen women 5 h

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

Unit IV Civil and Political Rights of Women 5 h

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

Unit V International convention on Womens' Right 5 h

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

Text Books

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

References

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

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

Course Code	Course Name	Category	L	T	P	Credit
193CL1A4CA	MOLECULAR BIOLOGY	CORE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Fundamental knowledge in molecular biology
- Concepts of central dogma of life
- Mutation and repair mechanism

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concepts of molecular genetics and central dogma of life	K1,K2
CO2	Know the mechanism of DNA synthesis and regulation	K1,K2, K3
CO3	Know the mechanism and regulation of transcription	K1,K2, K3
CO4	Understand translation mechanism and regulation	K1,K2, K3
CO5	Understand the concept of mutation and repair mechanism	K1,K2, K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193CL1A4CA	MOLECULAR BIOLOGY	SEMESTER IV

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Genetic material 10 h

DNA- structure and types, DNA as a genetic material: - Griffith, Hershey –Chase experiment. Central dogma of life, Concepts of Gene and Genome. Genetic code- Codon and anticodon

Unit II Replication 10 h

DNA replication in Prokaryotes-Enzymes involved- Mechanism of replication- Theta type replication. DNA replication in Eukaryotes - Enzymes and mechanism of replication. Regulation of replication in prokaryotes and eukaryotes.

Unit III Transcription 15 h

Prokaryotic transcription mechanism- Enzymes and Transcription factors, transcription mechanism. Eukaryotic transcription- Enzymes and transcription factors, Mechanism of transcription. Post transcriptional modification-Capping, polyadenylation, splicing, RNA editing and gene silencing.

Unit IV Translation 10 h

Protein synthesis in prokaryotes and eukaryotes- activation, initiation, elongation and termination of protein synthesis. Inhibitors of protein synthesis, Post translational modification, Gene regulation- lac operons and trp operons.

Unit V Mutation 15 h

Definition, causes of mutation; mutagens and carcinogens; Types of mutation- missense, nonsense, insertion, deletion, duplication, frame shift mutation; Transposons, site directed mutagenesis. DNA repair mechanisms -Direct enzymatic repair, Base excision repair, Nucleotide excision repair, Mismatch repair, Recombinational repair mechanism.

Text Books

1. Robert Schleif, 1993, "Genetics and Molecular Biology", 2nd Edition, The Johns Hopkins University Press ltd, London.
2. Rastogi, S.C., 2012, "Cell and Molecular Biology", 3rd Edition, New age International Publishers, India

References

1. Lodish, H. et al, 2003, "Molecular Cell Biology", 5th Edition, USA.
2. Cooper, G.M., Hausman, R.E, 2009, "The cell: Molecular approach", 5th Edition , American Society of Microbiology press, USA
3. Karp, G., 2007, "Concepts and Experiments", 5th Edition, John Wiley and Sons, USA.
4. Freifelder ,D.and Malacinski,G.M ,1996, "Essential of Molecular Biology", 2nd Edition, Panima publishing Co., New Delhi.

Course Code	Course Name	Category	L	T	P	Credit
193CL1A4CB	CLINICAL BIOCHEMISTRY - FUNCTIONAL TESTS	CORE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The significance of organ function tests in diagnosis
- The function of human body and pathophysiological conditions
- Common diseases and the chemical and biochemical methods used to study

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Examine the functions and pathophysiology of Gastric secretions	K1, K2
CO2	Understand the functions and pathophysiology of Pancreas	K1, K2, K3
CO3	Understand the significance of Intestinal function	K1, K2, K3
CO4	Understand the functions and pathophysiology of Liver	K1, K2, K3
CO5	Understand the significance and pathophysiology of kidney	K1, K2, K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193CL1A4CB	CLINICAL BIOCHEMISTRY - FUNCTIONAL TESTS	SEMESTER IV

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Gastric function 10 h

Introduction, Tests for gastric function - The Insulin Stimulation test, determination of Gastrin in serum and Tubeless gastric analysis. Pancreatic function: Introduction, pancreatic function tests, serum amylase and lipase; direct stimulation test, indirect stimulation test.

Unit II Intestinal function 10 h

Introduction, Intestinal function ,Test used in the diagnosis of malabsorption, determination of total faecal fat (fat balance test), test of monosaccharide absorption (Xylose excretion test)

Unit III Liver function 15 h

Introduction, bilirubin metabolism and jaundice, Liver function tests: Estimation of conjugated Unconjugated and total bilirubin in serum (Diazo method), total protein- Albumin globulin ratio, detection of bilirubin and bile salts in urine (Fouchet's test and Hay's sulphur test), Prothrombin time.. Serum enzymes in liver disease – Alkaline Phosphatase, SGPT, SGOT, Gamma GT and Lactate dehydrogenase (LDH).

Unit IV Kidney Function 10 h

Introduction, physical examination of urine, elimination tests, Clearance tests - creatinine clearance and Urea clearance tests, Blood urea, serum creatinine and electrolytes – sodium ,potassium ,calcium and phosphorus,Micro albumin, protein creatinine ratio, renal blood flow and filtration fraction.

Unit V Hormone function 15 h

Endocrine function tests-T3, T4 andThyroid stimuting hormone (TSH), vitamin D, Pancreatic hormone – Insulin and its clinical significance. Follicle Stimulating hormone, Leutinizing hormone, Growth hormone, Adrenal hormones- cortisol, Gonadal hormone-Testosterone and estradiol- Clinical significance.

Text Books

1. Burtis CA, Ashwood ER and Bruns DE (eds), 2005, "Tietz Textbook of Clinical Chemistry and Molecular Diagnosis", 5th edition, William Heinmann, Medical Books Ltd, New Zealand.
2. Mayne PD, 1998, "Clinical Chemistry in Diagnosis and Treatment", 6th Edition, Hodder Arnold Publications, London.

References

1. Swaminathan R, 2004, "Handbook of Clinical Biochemistry", 1st Edition, Oxford University Press, London.
2. Devlin T M, 1997, "Textbook of Biochemistry with Clinical Correlations", 1st Edition, John Wiley & Sons, New York.
3. Khurana I and Khurana A, 2014, "Textbook of Anatomy and Physiology for Nurses and Allied Health Sciences", 1st Edition, CBS Publishers and Distributors, New Delhi.
4. Chatterjee, C C, 2005, "Human Physiology", 10th Edition, Medical Allied Agency, Kolkata.

193CL1A4CP	CORE PRACTICAL: CLINICAL BIOCHEMISTRY	SEMESTER IV

Total Credits: 3
Total Instructions Hours: 72 h

S.No	List of Experiments
1	Estimation of Urea
2	Estimation of Uric acid
3	Estimation of Creatinine
4	Estimation of Phosphorus
5	Estimation of Protein
6	Estimation of Glucose
7	Estimation of Cholesterol
8	Estimation of Sodium and potassium
9	Assay of Alkaline phosphatase
10	Assay of Alpha- Amylase
11	Assay of SGPT & SGOT
12	Assay of Gamma GT

Note: Out of 12, 10 experiments are mandatory

References

1. Wilson K and Walker J, 2000, "Practical Biochemistry" 5th Edition, Cambridge University Press, UK.
2. Plummer D T, 2004, "Practical Biochemistry", 3rd Edition, Tata McGraw Hill Publisher Pvt. Ltd, New Delhi.
3. Sadasivam,S. and Manickam,A 2008, "Biochemical methods" Revised second edition, New age International, New Delhi.
4. Devlin T M, 1997, "Textbook of Biochemistry with Clinical Correlations" 1st Edition, John Wiley & Sons, New York.

Course Code	Course Name	Category	L	T	P	Credit
193BT1A4IA	NANOTECHNOLOGY IN HEALTH CARE	IDC	4	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- To learn importance of nanoparticles
- To impart knowledge of nanoscience in healthcare dimensions.
- To gain information on characteristics of nanoparticles.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamental concepts in nanotechnology	K1
CO2	Know the basics of bionano-machinery	K1, K2
CO3	Comprehend the functional aspects of nanoparticles.	K2, K3
CO4	Learn about different characteristics of nanoparticles	K2, K3
CO5	Awareness on drug delivery and healthcare dimension of nanoparticles.	K2,K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193BT1A4IA	NANOTECHNOLOGY IN HEALTHCARE	SEMESTER IV

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I Features and Characteristics 9 h

History and scope of nanotechnology – Nanosize - comparison of particle behavior at nanosize to macrosize. Strategies for nanoarchitechure (to down and bottom up approaches).Nanoparticle synthesis in plants, bacteria and yeast.

Unit II Structural Nanobiotechnology 9 h

Overview of nanodevices.Strategies for construction of nanomachines. Carbon as raw material. Protein folding aspects: stable structure, globular proteins, lipid bilayer and DNA based nanostructures.Challenges faced by nanobiotechnology.

Unit III Functional Nanobiotechnology 8 h

Principles of functional nanobiotechnology. Biomaterials – filaments and fibrils. Minerals combined with biomaterials for medical applications. Biomolecular sensing taste and light sensors.Bacterial sensors. Muscle sarcomeres and nerves.

Unit IV Diagnostic Applications 8 h

Nanorobotics. Bionanoimaging -Principles, types and applications. anocrystals (nano cadmium and nano zinc).Magnetic nano particles, nanobiosensors, biochips, biorobotics. Synthesis of gold, titanium, nanopore technology, nanoarray. Role of nanomedine.

Unit V Therapeutic Applications 8 h

Medical applications of nanoparticles and nanosystems. Nano drug delivery. Conventional drug delivery & targeted drug delivery and its advantages. Delivery profile.Role of nanotechnology in drug delivery and cancer biology.

Text Books

1. Niemeyer CM and Mirkin CA, 2004, "Nanobiotechnology: Concepts, Applications and Perspectives", Wiley – VCH, USA.
2. Goodsel DS, 2004, "Bionanotechnology", John Wiley and Sons Inc., USA.

References

1. Shoseyov O & Levy I, 2007, "Nanobiotechnology: Bioinspired Devices and Materials of the Future", Humana Press, USA.
2. Frietas Jr RA, 2004, "Nanomedicine", 1st edition, Landes Bioscience, USA.
3. Kohler M & Fritzsche W, 2004, "Nanotechnology An Introduction to Nano-structuring Techniques", Wiley – VCH, USA.
4. Bhushan B, 2004, Springer Handbook of Nanotechnology, Springer-Verlag Berlin Heidelberg, USA.

Course Code	Course Name	Category	L	T	P	Credit
193CL1A4SA	DIAGNOSTIC MOLECULAR TECHNIQUES	SEC	4	1		3

PREAMBLE

This course has been designed for students to learn and understand

- The procedures used in a Molecular Diagnostic Laboratory.
- The fundamental principles and applications of molecular technique.
- Molecular analyses in disease diagnosis

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the types of disease and sample preparation	K1,K2
CO2	Understand the infectious disease diagnosis and molecular aspects	K1,K2, K3
CO3	Understand the molecular diagnosis of genetic diseases	K1,K2, K3
CO4	Basic molecular techniques and diagnostic applications	K1,K2, K3
CO5	Understand sequencing and nucleic acids hybridization techniques	K1,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

193CL1A4SA	DIAGNOSTIC MOLECULAR TECHNIQUES	SEMESTER IV

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I Diseases and sample preparation 10 h

Introduction: Diseases- infectious diseases, physiological and metabolic errors, genetic basis and inherited diseases. General approach to clinical specimens - Sample collection, transport and processing of samples for diagnosis.

Unit II Infectious disease diagnosis 15 h

Infectious disease diagnosis: Diagnosis of infection caused by Streptococcus, Salmonella, Vibrio and Mycobacterium sp., Diagnosis of fungal diseases: Candidiosis and Dermetophytoses. Diagnosis of RNA and DNA viruses - Pox viruses, Adenoviruses, Hepatitis Viruses and Retroviruses, Corona virus. Diagnosis of Protozoan diseases and helminthic disease: Amoebiosis, Malaria and Filariasis.

Unit III Inherited diseases and Diagnosis 10 h

Genetic disorders and sex linked disorders –Hemophilia, Sickle cell anemia, Retinoblastoma, Cystic Fibrosis, Duchenne muscular Dystrophy, Identification of inherited disorders, Cancer genetics - oncogenes and tumour suppressor genes.

Unit IV Molecular Diagnostic Tools 10 h

Nucleic acid amplification methods - PCR and its types- Reverse Transcription PCR (RT-PCR), Real time PCR, Inverse PCR. Proteins and Amino acids - Qualitative and quantitative techniques: Amino acid sequence analysis.

Unit V Hybridization techniques and DNA sequencing methods 15 h

Blotting Techniques- Southern, Northern, and Western blotting, In-situ hybridisation - FISH, DNA microarrays – types and applications, Automated DNA sequencing- Principle and application, Advances in DNA sequencing- New Generation sequencing Methods and Pyrosequencing.

Text Books

1. Boyer, Rodney F Benjamin and Cummins. 2001, "Modern Experimental Biochemistry", 2nd edition. Pearson Education.
2. Lodish, H. & Baltimore. D, 1994, "Molecular cell Biology". 2nd edition, American Scientific Books

References

1. Rakesh S. Sengar , Amit Kumar , Reshu Chaudhary , Ashu Singh , 2018, "Advances in Molecular Techniques", 1 edition, CRC Press.
2. Patrinos G, P. Patrinos G, Ansorge W, 2010, "Molecular Diagnostics", 2nd Ed, Academic Press.
3. Stefan Surzycki, 2000, "Basic techniques in molecular biology", Springer.
4. Walt Ream, Katharine G. Field, 1998, "Molecular Biology Techniques: An Intensive Laboratory", Academic Press.

193CL1A4GA	GE –II: CONCEPTS OF HEALTH	SEMESTER IV

Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I Health and Obesity 5 h

Health- Definition, Health and quality of life, Hygiene. Food factors for human beings and their requirements. Calorific value of food. Obesity: Definition and classification, Genetic and environmental factors leading to obesity, Obesity related diseases.

Unit II Diabetes 5 h

Diabetes: Normal level of Blood sugar, types of Diabetes mellitus, GTT ,HbA1c, Insulin and Glucagons, Etiology and pathogenicity, Diabetic insipidus, Management of diabetes.

Unit III Cardiac diseases 5 h

Cardiovascular diseases: Reference level of Lipid profile, Cholesterol and Lipoproteins, Types of Cardiac diseases- Myocardial infarction- Signs and Symptoms, Risk factors.

Unit IV Kidney stones and cancer 5 h

Kidney Stones – Types of kidney stones and factors causing kidney stones, Diet and Prevention. Cancer – Types, Food habits and its preventive measures.

Unit V Health Insurance 4 h

Health Insurance: Different types of health insurance policy, Individual, family mediclaim policy, domiciliary hospitalization, Group Mediclaim Policy, health insurance for senior citizens, Government and private policies.

Text Books

1 Heinmann W, 2012, "Chemistry and Molecular Diagnosis", 5th edition, Medical Books Ltd. New Zealand.

2 Varley H, 1985, "Practical clinical Biochemistry", 4th Edition, Heinemann Medical publishers, New Zealand.

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

Total Credits: 2

Total Instruction Hours: 24 h

இளங்கலை 2019–20ஆம் கல்வியாண்டு முதல் சேர்வோர்க்குரியது

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

(பருவத் தேர்வு உண்டு)

அலகு : 1 12 h

நீதி நூல்கள்

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

II.கொன்றைவேந்தன் - "அன்னையும் பிதாவும் முன்னறி தெய்வம்" முதல்

"எண்ணும் எழுத்தும் கண் எனத் தகும்" வரை -7 பாடல்கள்

III.திருக்குறள் - 6 பாடல்கள்

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

அலகு : 2 12 h

I. எளிய நீதிக்கதைகளும் வாழ்க்கை முறைகளும்

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

II. தமிழகப் பண்பாடுகள்

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

III . பயிற்சிப் பகுதி

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

Note: பயிற்சிப் பகுதியில் வினாக்கள் அமைத்தல் கூடாது

வினாத்தாள் அமைப்பு முறை - மொத்த மதிப்பெண்கள் - 100

பகுதி – அ

சரியான விடையைத் தேர்வு செய்தல் 10x2=20

பகுதி – ஆ

சரியா? தவறா? தேர்ந்தெடுத்து எழுதுக . 10x2=20

பகுதி - இ

ஒரு பக்க அளவில் விடையளிக்க 03x20=60

குறிப்பு:

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

Text Books

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

References

1 ஒன்றாம் வகுப்பு பாடநூல் - தமிழ்நாடு அரசு பாடநூல் கழகம்

2 வலைதள முகவரி : http://tamilvu.org

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

Total Credits: 2

Total Instruction Hours: 24 h

இளங்கலை 2019– 2020 ஆம் கல்வியாண்டு முதல் சேர்வோர்க்குரியது

(10 மற்றும் 12 – ஆம் வகுப்புகளில் தமிழ் மொழிப்பாடம் பயின்றவர்களுக்கு உரியது

(பருவத் தேர்வு உண்டு)

அலகு – 1 05 h

திருக்குறள்

I அறத்துப்பால்

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

II பொருட்பால்

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

III இன்பத்துப்பால்

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

அலகு – 2 05 h

கட்டுரைத் தொகுப்பு

I நல்வாழ்வு - டாக்டர் மு.வரதராசன்

1. நம்பிக்கை
2. புலனடக்கம்
3. பண்பாடு

II இளைஞர்களின் ஒளிமயமான எதிர்காலத்திற்கு - கு.வெ. பாலசுப்பிரமணியம்

1. காலக்கணக்கு
2. நற்பழக்கமே செல்வம்

அலகு – 3 05 h

I காப்பியங்கள் - குறிப்பு எழுதுதல்

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

II ஊடகம் - காட்சி ஊடகங்கள்

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

அலகு – 4 05 h

இலக்கணம் - வழக்கறிதல்

1. இயல்பு வழக்கு
2. தகுதி வழக்கு

அலகு – 5 04 h

I படைப்பாற்றல் பகுதி

கவிதை,கட்டுரை எழுதச்செய்தல் - பொதுத் தலைப்பு

II பயிற்சிப் பகுதி

தமிழில் தட்டச்சு செய்தல் - யூனிகோடு எழுத்துருவில்.

Note: பயிற்சிப் பகுதியில் வினாக்கள் அமைத்தல் கூடாது

வினாத்தாள் அமைப்பு முறை - மொத்த மதிப்பெண்கள் - 100

பகுதி –அ

சரியான விடையைத் தேர்வு செய்தல் 10x2=20

பகுதி –ஆ

கோடிட்ட இடங்களை நிரப்புக 10x2=20

பகுதி –இ

இரண்டு பக்க அளவில் விடையளிக்க 4x15=60

குறிப்பு :

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

Text Books

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

References

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

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

3 வலைதள முகவரி : http://tamilvu.org

192PY1A4AA	AECC : GENERAL AWARENESS	SEMESTER IV

Total Credits: 2
Total Instructions Hours: 24 h

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

References

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

Course Code	Course Name	Category	L	T	P	Credit
193CL1A5CA	MICROBIOLOGY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The morphology of microorganisms
- The general characteristics of various microbes
- Laboratory diagnosis, control measures of each pathogenic microbe

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Compare and classify the organism	K1,K2, K3
CO2	Understand the characteristics of various organisms	K1,K2, K3
CO3	Recall the characters of important pathogenic fungi	K1,K2, K3
CO4	Understand the general characters of pathogenic viruses	K1,K2, K3
CO5	Know the general characters of various microbes	K1,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

193CL1A5CA	MICROBIOLOGY	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Microorganisms 10 h

Brief general characters including colony morphology, pathogenicity, laboratory diagnosis and prophylaxis of the following Gram Positive Cocci: Staphylococcus aureus, Streptococcus pyogenes. Gram Positive rod- Corynibacterium diphtheriae, Bacillus anthracis, Clostridium perfringens

Unit II Bacteriology 10 h

Brief general characters including colony morphology, pathogenicity, laboratory diagnosis and prophylaxis of the following Gram Negative rods: Escherichia coli, Salmonellae typhi, Pseudomonas aeruginosa, Non-fermenting gram negative bacilli including, Mycobacterium tuberculosis, Treponema pallidum, Mycoplasmas.

Unit III Mycology 8 h

Brief general characters including colony morphology, pathogenicity, laboratory diagnosis and prophylaxis of Candida albicans, Dermatophytes, Mycetoma and Dimorphic fungi

Unit IV Virology 10 h

[General characters of important pathogenic viruses including morphology, methods of replication, pathogenisis and laboratory diagnosis of Poliovirus, Influenza viruses, Rabies virus, Hepatitis BVirus, Retroviruses: HIV.

Unit V Parasitology 10 h

General characteristics of parasites including Morphology, Pathogenicity, life cycle and Lab diagnosis of Ascaris lumbricoids, Ancyclostoma deodenale, Enterobius vermicularis, Taenia saginata and Wuchereria bancrafti.

Text Books

1. Ananthanarayan R and Panicker C K J, 2005. Textbook of Microbiology, 3 Edition, Orient Longman Private Limited, Hyderabad.
2. Chakraborty P, 2013.Textbook of Microbiology, 3 rd Edition, New Central Agency (P) Ltd, London.

References

1. Atlas R M, 1993. Microbiology - Fundamentals and Applications, 3rd Editions, Macmillan Publishing Company, New York.
2. Pelczer M J, Chan, E C S and Krieg, N R, 1986. Microbiology ,Mc Graw Hill Publishers, New York, USA.
3. Prescott L M, Harley JH and Klein DA, 1993.Microbiology, 3rd edition, Brown Publishers, Iowa, USA.
4. Kannan N, 2002. Laboratory Manual in General Microbiology, 1st Edition, Published by Panima Book Distributors, New Delhi.

Course Code	Course Name	Category	L	T	P	Credit
193CL1A5CB	HEMATOLOGY	CORE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The basic hematological techniques
- Diagnosis of various diseases with reference to hematology
- Know the advancements in laboratory automation

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic tests in hematology laboratory	K1,K2, K3
CO2	Know the patho-physiology of anemia	K1,K2, K3
CO3	Know the mechanism of coagulation and diagnosis of hemorrhagic disorders.	K1,K2, K3
CO4	Understand fibrinolysis and tests used for its diagnosis	K1,K2
CO5	Understand lab automation in hematology.	K1,K2,K3

MAPPING WITH PROGRAMME OUTCOMES

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

193CL1A5CB	HEMATOLOGY	SEMESTER V

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Basic Hematological techniques 12 h

Blood, Blood collection, Anticoagulants used in Hematology, Normal values in Hematology, Basic Hematological tests: RBC Count, Hemoglobin estimation, Packed cell volume, WBC counts - Total and differential, Absolute eosinophil Count, Platelet count, Erythrocyte sedimentation rate , Reticulocyte count.

Unit II Preparation of blood films 12 h

Preparation of blood films, Stains used in Hematology, Morphology of red cells, Morphology of Leukocytes and platelets, Bone marrow - Techniques of aspiration, preparation and staining of films, Bone marrow biopsy, Preparation of buffy coat smears.

Unit III Investigation of anemia 12 h

B12 and folate assay, Serum iron and iron bonding capacity, Laboratory methods used in the investigation of hemolytic anemias : Osmotic fragility , Investigation of G-6 PD deficiency , Test for sickling , Estimation on of Hb-F,Hb-A2 , Hemoglobin electrophoresis , Test for auto immune hemolytic anemia, Measurements of abnormal Hb pigments.

Unit IV Investigation of Hemorrhagic disorders 12 h

Mechanism of coagulation, Bleeding time and clotting time, Other coagulation studies: PT, aPTT, Mean Prothrombin Time (MPT), Fibrinogen. Assay of clotting factors. Test for blood fibrinolytic activity and detection of D-dimers, Platelet function tests.

Unit V Automation in hematology] 12 h

Automated ESR, , Automated coagulometers , Diagnosis of hemoglobinopathies by HPLC, Cell counts (Automated hematology analysers) ,Organization and quality control in hematology laboratory

1 Mukherjee KL, 2010.Medical Laboratory Technology-A procedure manual for routine Diagnostic tests -Volumes I, II, III. Tata McGraw Hill Publishing Company ltd. New Delhi.

2 Sood R, 1996. Laboratory technology- Methods and interpretations 4thEd. Jaypee Brothers Medical Publishers (P) Ltd., New Delhi.

References

1 Talib V H, 2000. Handbook of Medical Laboratory Technology 2nd Edition, CBS Publishers and Distributors, New Delhi.

2 Gupte, S, 1998. A Short Text Book of Medical Laboratory for Technicians. Jaypee Brothers Medical Publishers (P) Ltd., New Delhi.

3 Bain B J, Bates I, Laffan M A and Lewis M, 2011.Dacie and Lewis Practical Hematology, 11th Edition, Churchill Livingstone, China.

4 Silberstein LE, Anastasi J, 2017. Hematology: Basic Principles and Practice. Elsevier Health Sciences.

193CL1A5CP	CORE PRACTICAL: HEMATOLOGY	SEMESTER – V

Total Credits: 3
Total Instructions Hours: 72 h

S.No	Contents
1	Hemoglobin estimation by Cyanmethemoglobin method.
2	Total R.B.C count and W.B.C count.
3	Differential W.B.C Count.
4	Platelet count.
5	Absolute Eosinophil and Reticulocyte count.
6	Bleeding time and clotting time.
7	Preparation of blood smears and staining with Leishmann's stain.
8	Preparation of Buffy coat smears.
9	Packed cell volume- Wintrobe's method.
10	Erythrocytes sedimentation rate- Westergren method.
11	Osmotic fragility test.
12	Sickling test

Note: Out of 12, 10 mandatory

References

1 Sood R, 1996. Laboratory technology- Methods and interpretations 4th Edition, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi.

2 Talib V H, 2000. Handbook of Medical Laboratory Technology 2nd Edition, CBS Publishers and Distributors, New Delhi.

3 Gupta, S,1998. A Short Text Book of Medical Laboratory for Technicians. Jaypee Brothers Medical Publishers (P) Ltd., New Delhi.

4 Bain B J, Bates I, Laffan M A and Lewis M, 2011. Dacie and Lewis Practical Hematology, 11th Edition, Churchill Livingstone, China.

193CL1A5CQ	CORE PRACTICAL: MICROBIOLOGY - I	SEMESTER V

Total Credits: 3
Total Instructions Hours: 72 h

S.No	Contents
1	Safety precautions in microbiology Laboratory
2	Handling, Use and Care of Instruments- Inoculation loop, Balance, Refrigerator, Hot air oven and Autoclave, Laminar Air flow, Incubator, Anaerobic Jar, Centrifuge and Metabolic shakers.
3	Staining technique – Simple staining
4	Staining technique –Gram staining
5	Staining technique – Motility-Hanging drop
6	Staining technique- SIM
7	Staining technique- Negative, Spore and AFB
8	Preparation and Inoculation of Culture media-Solid and Liquid
9	Morphological characterization of Bacteria
10	Tests for the identification of Bacteria-IMViC
11	Tests for the identification of Bacteria Sugar fermentation (Carbohydrate fermentation and TSI
12	Tests for the identification of Bacteria- Oxidase, Catalase, Urease, H2S production test

Note: Out of 12 - 10 Mandatory

References

1 SundaraRajan S, 2001. Practical Manual of Microbiology, Anmol Publications Pvt.Ltd, New Delhi.

2 Kannan N, 2002. Laboratory Manual in General Microbiology, 1st Edition, Published by Panima Book Distributors, New Delhi.

Course Code	Course Name	Category	L	T	P	Credit
193CL1A5SA	BLOOD BANKING AND BLOOD TRANSFUSION	SEC	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The basic concept of blood grouping and transfusion process.
- The hemolytic disorders and transfusion reactions
- The organization and functioning of blood bank

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concepts of blood grouping system	K1, K2
CO2	Apply screening methods of cross matching	K1,K2,K3
CO3	Know the criteria for donor selection and screening tests	K1,K2,K3
CO4	Understand blood transfusion reactions	K1,K2,K3
CO5	Understand the organization of blood bank	K1,K2,K3

MAPPING WITH PROGRAMME OUTCOMES

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

193CL1A5SA	BLOOD BANKING AND BLOOD TRANSFUSION	SEMESTER V

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Blood Grouping System 08 h

ABO Blood group system, Rh typing and weaker variants in Rh system, Subgroup and weaker variants of A and B and Bombay phenotype

Unit II Antibodies and Cross matching 06 h

Preparation and standardization of anti human globulin reagent, Auto and allo antibodies, Coomb's cross matching

Unit III Donors and blood donation 08 h

Donor selection – donor eligibility criteria, Importance of Donor consent. Phlebotomy- Blood collectionmethods, screening test on donor's blood sample. Autologous donation and specialized donation. Apheresis and plasmapheresis. Role of irradiation, Discarding of positive and expired blood

Unit IV Transfusion Reaction 08 h

Storage of whole blood, Preparation of blood components- Anticoagulants, Preservation and storage. Hemolytic disease of newborn, blood transfusion reaction-acute transfusion reactions and delayed transfusion reactions, Transfusion related complications- Transfusion-related acute lung injury (TRALI), Transfusion associated circulatory overload and investigation of transfusion reaction.

Unit V Organization of blood bank 06 h

Area for whole blood and components, staff requirement, equipment requirement for whole and component blood preparation, process of licensing. Discarding of blood bank wastes.

Text Books

1. Mukherjee KL, 2010. Medical Laboratory Technology-A procedure manual for routine Diagnostic tests -Volumes I, II, III. Tata McGraw Hill Publishing Company ltd. New Delhi.
2. Sood R, 1996. Laboratory technology (Methods and interpretations) 4th Ed. J.P. Bros, New Delhi.

References

1. Blaney K D and Howard P R, 2012. Basic & Applied Concepts of Blood Banking and Transfusion Practices, 3rd Ed, Elsiever Mosby publishers, Missouri.
2. Rudmann S V, 2005. Textbook of Blood Banking and Transfusion Medicine.2nd Ed. Elsiever Saunders publishers, Pennsylvania.
3. Satish Gupte, 2000. The Text book of Blood Bank and Transfusion Medicine, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi.
4. Roa, 2016. Handbook of Blood Banking & Transfusion Medicine. Jaypee Brothers Medical Publishers (P) Ltd., New Delhi.

Course Code	Course Name	Category	L	T	P	Credit
193CL1A5DA	CLINICAL LAB MANAGEMENT	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The managerial skills and responsibilities in clinical lab
- The knowledge of Medical ethics , Good practices and Quality management system
- The practices of audit in a Medical Laboratory

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the Administrative process in clinical laboratory.	K1,K2
CO2	Understand the Ethical Principles and Good Laboratory Practice.	K1,K2, K3
CO3	Understand the Sample analysis and Quality management system.	K1,K2, K3
CO4	Understand the Patient management.	K1,K2, K3
CO5	Understand the Audit in a Medical Laboratory.	K1,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

193CL1A5DA	CLINICAL LAB MANAGEMENT	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Principles of management 10 h

Introduction, managerial skills and responsibilities, levels in management team of the laboratory, Administrative process- planning of activities, organizing, directing and controlling.

Unit II Medical ethics and Good practices 10 h

Ethical principles and standards for a clinical laboratory professional duty to the patient, duty to colleagues and other professionals. Good Laboratory Practice (GLP) - Introduction to basics of GLP and Accreditation, Advantages of Accreditation, National and International Agencies for clinical laboratory accreditation.

Unit III Sample analysis and Quality management system 10 h

Sample analysis: Factors affecting sample analysis, reporting results, basic format of a test report, reported reference range, clinical alerts, abnormal results, results from referral laboratories, release of examination results, alteration in reports, Laboratory Information System (LIS). Quality Management system: Quality assurance, Quality control system, Internal and External quality control, quality control chart

Unit IV Patient management 08 h

Patient management for clinical sample collection, transportation and preservation, Sample accountability, Purpose of accountability, Methods of accountability.

Unit V Audit in a Medical Laboratory 10 h

Introduction and Importance of Audit, NABL & CAP. Responsibility, Planning, Horizontal, Vertical and Test audit, Frequency of audit, Documentation.

Text Books

1. Andrea RH, Carl and Nader R, 2017. "Tietz Textbook of Clinical Chemistry and Molecular Diagnostics", 6th Edition, Elsevier,USA.
2. Bishop ML, Fody EP and Schoeff LE, 2013. "Clinical Chemistry: Principles, Techniques, and Correlations", 7th Edition, Jones & Bartlett Learning, USA

References

1. McPherson and Pincus, 2013. "Henry's Clinical Diagnosis and Management by Laboratory Methods", 22nd Edition, Elsevier, USA.
2. Lynne SG and Paul B, 2013. "Clinical Laboratory Management", 2nd Edition, Wiley, USA.
3. Candis AK, 2011. "Laboratory Management Quality in Laboratory Diagnosis" Springer Publishing Company.
4. Jane Hudson, 2004. "Principles of Clinical Laboratory Management" Pearson Prentice Hall, USA.

Course Code	Course Name	Category	L	T	P	Credit
193CL1A5DB	FORENSIC SCIENCE AND TOXICOLOGY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The basics of forensic pharmacology and metabolism and excretion of drug
- Forensic toxicology and radioisotopes effect in organs and tissues
- Forensic significance of DNA profiling and Certification and Accreditation

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Outline Forensic Pharmacology, metabolic pathways of drug function and excretion of drugs and poisons	K1,K2, K32
CO2	To know thescope of forensic toxicology and Fate of drug in body	K1,K2, K3
CO3	Outline the acute and chronic effect of radioisotopes.	K1,K2, K3
CO4	To understand the DNA Profiling in Forensic Science	K1,K2, K3
CO5	Understand theForensic Significance of DNA profiling.	K1,K2, K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193CL1A5DB	FORENSIC SCIENCE AND TOXICOLOGY	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Forensic Pharmacology 10 h

Pharmacology and its branches, Forensic Pharmacological studies, absorption, distribution, pharmokinetics, metabolic pathways of common drugs and poisons, Drug toxicity, excretion of drugs and poisons.

Unit II Forensic Toxicology 10 h

Introduction and scope of forensic toxicology. Types of poisons, Different routes of ingestion, toxicity of poisons. Fate of drug in body. Samples in fatal and non- fatal cases. Packing and preservations of viscera.

Unit III Radioactive isotopes and compounds 10 h

Radioisotopes, radioactive sources of exposure and contact, acute and chronic effect on the organs of the body, methods of detection and measurements, handling and disposal of body and tissues containing radioactive material.

Unit IV DNA Profiling 8 h

Introduction, DNA typing systems- RFLP analysis, PCR amplifications, Analysis of SNP, Y- STR. Mitochondrial DNA, Quality control, Certification and Accreditation.

Unit V Forensic Significance of DNA profiling 10 h

Applications in disputed paternity cases, child swapping, missing person's identity- civil immigration. The Combined DNA Index System (CODIS - legal standards for admissibility of DNA profiling, procedural and ethical concerns, technologies - DNA chips, SNPs and limitations of DNA profiling.

Text Books

1. Sharma, B. R., 2001. Forensic Science in Criminal Investigation and Trials, 3rd Ed, Universal Law Publishing Co. Ltd. New Delhi.
2. Jim Fraser and Robin Williams, 2009. Handbook of Forensic Science, Willan Publishing, New York.

References

1. James, S. H. and Nordby, 2003. Forensic Science - An Introduction to Scientific and Investigative Techniques, J. J. (Eds), CRC Press, London.
2. Tripathi K.D, 2018. Essentials of Medical Pharmacology, 8th edition, Jaypee Brothers Medical Publishers, India.
3. Saferstein, Richard, Criminalistics, 1998. An Introduction to Forensic Science, 6th Ed, Prentice-Hall, New Jersey.
4. Dr. K. S. Narayan Reddy and Dr. O. P. Murthy, 2017. The Essentials of Forensic Medicine and Toxicology, 33rd Edition, Jaypee Brothers Medical Publishers, India.

Course Code	Course Name	Category	L	T	P	Credit
193CL1A5DC	BIO-SAFETY AND BIO WASTE MANAGEMENT	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The basics of biosafety and biowaste management
- The safety practices, bioethics in biomedical laboratories
- The generation and disposal of biowastes, and biowastes management

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the safety guidelines and practices in clinical laboratory	K1,K2, K3
CO2	Realize the significance of bioethics and responsibilities of clinicians in laboratory	K1,K2, K3
CO3	Know the Indian regulations regarding biowastes segregation and disposal	K1,K2, K3
CO4	Identify the sources of biowastes, types and segregation	K1,K2, K3
CO5	Understand the need for biowaste management and the technologies applied for biowaste management	K1,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

193CL1A5DC	BIO-SAFETY AND BIO WASTE MANAGEMENT	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Biosafety 10 h

Biosafety in laboratory, Laboratory associated infections and other hazards; Code of good and safe laboratory practice for support staff and responsibilities of the workers regarding biosafety. Personal safety measures- Use of glove, mask and personal grooming. Set up of a laboratory on the basis of safety priority and Laboratory Biosafety Guidelines. Laboratory Biosafety Level Criteria (BSL-1-4).Chemical, electrical, fire and radiation safety. General Safety checklist, Hazardous properties of instruments and Laboratory chemicals.

Unit II Bioethics 10 h

Co-operation and working relationship with other health professionals, Confidentiality of patient information and test result- dignity and privacy of patient, Responsibility from acquisition of the specimen to the production of data, Accountability for quality and integrity of clinical laboratory services. Institutional ethical committee and its role, Health & Medical surveillance.

Unit III Biowaste regulations 8 h

Categories of Biowaste, Regulatory Requirements - State and Central regulation regarding biomedical waste disposal and management.

Unit IV Types of biowaste & segregation 10 h

[Sources of biomedical waste; Types and color coding for different biomedical wastes, Importance of segregate at source ,Types of health care waste: Infectious and non-infectious waste, hazardous waste, solid and liquid waste, biodegradable and non-biodegradable waste.

Unit V Biowaste management 10 h

Wastes management- life cycle of bio-medical wastes. Decontamination and disposal: Disinfection methods – Sterilization - steam sterilizing (Auto claving) - Non-burn treatment technology, Microwave, wet thermal treatment, dry thermal treatment, chemical based technologies. Disposal of hazardous wastes and radioactive wastes. Generation of Biogas from food wastes.

Text Books

1 Joshi RM, 2006. Biosafety and Bioethics. Gyan Books Pvt Ltd, India.

2 Singh A, Kaur S 2012.Biomedical waste disposal, Jaypee Publishers, India

References

1 Fleming DO, Hunt DL, 2006. Biological Safety: Principles and Practices, ASM Press, Washington DC.

2 Kishore J and Ingle GK, 2004. Biomedical waste management in India. Century Publications, New Delhi.

3 Singh, 2012. Biomedical Waste Disposal, Jaypee Brothers Medical Publishers, New Delhi..

4 NABH guidelines, WHO guidelines.

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..

Course Code	Course Name	Category	L	T	P	Credit
193CL1A6CA	IMMUNOLOGY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The immunological reactions and manifestation of immuno diseases
- The applications of advanced techniques in disease diagnosis and therapy
- The basic mechanism of transplantation and Vaccines

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Know the basics of immunity and organs of immune system	K1,K2
CO2	Understand the antigen and antibody reactions	K1,K2, K3
CO3	Appreciate the techniques involved in detection and quantification of immune components	K1,K2, K3
CO4	Gain knowledge on manifestation of various immune diseases	K1,K2, K3
CO5	Understand immuno therapy and vaccination.	K1,K2, K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193CL1A6CA	IMMUNOLOGY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Immune System and Lymphoid organs 10 h

Historical development of the science of the immunology. Innate and acquired immunity, Antibody mediated and cell mediated immunity. Primary and secondary lymphoid organs. Cells of immune system- T, B and NK cells. Receptors on the surface of lymphocytes. Structure and functions of neutrophils, Macrophages (phagocytosis and inflammation), eosinophils and basophils.

Unit II Antigen and Antibodies 10 h

Antigen: Properties, Specificity and Cross reactivity, antigenicity, immunogenicity, antigen determinants, Haptens, adjuvants, Self antigens (MHC) an outline only. Antibodies: Properties, classes and subclasses of immunoglobulin: Structure, specificity and distribution, Clonal selection theory of antibody formation. Cytokines and their functions. Complement components.

Unit III Antigen-Antibody interaction 8 h

Antigen-antibody interaction – Precipitation and agglutination. Precipitation in gel. Immuno diffusion and Immuno electrophoresis. Agglutination: Slide agglutination, Widal test. Principle and application of RIA, ELISA, Fluorescent antibody technique. Applications of immuno assay turbidometric, electro chemiluminescence assay. Monoclonal antibodies and their application.

Unit IV Hypersensitivity 10 h

Allergy and Hypersensitivity – Type I, II, III and IV and clinical manifestations. Immuno Disease: Rheumatoid arthritis, Myasthenia gravis and Muscular dystrophy. Immunity to bacteria and viruses. Skin Test: Montex and Penicillin test.

Unit V Transplantation 10 h

Transplantation: Tissue cross matching, HLA – class I & II. Allograft rejection: Graft Vs Host Diseases: Immuno suppressors: mechanism of graft rejection. Resistant to tumors: NK Cells: Tumor immuno therapy. Vaccination: Passive and active immunization, Recombinant vaccines: DNA vaccines and RNA Vaccine. Benefits and adverse effects of vaccination. AIDS - structure of HIV and clinical manifestation.

Text Books

1. Tizzard J R, 1995. Immunology – An introduction. Saunders College Pub., Philadelphia
2. Kindtt T J, Gosby R A, Osborne BA and Kuby J, 2016. Immunology, 6thedition, W.H. Freeman and Company, New York.

References

1. Roitt I, Brastoff J and Male D, 2012 . Immunology, Mosby – Elsiever, 8 th ed.
2. Ananthanarayan R and Panicker C K J, 2005. Textbook of Microbiology, 8rd edition, Orient Longman Private Limited, Hyderabad.
3. Janis Kuby, 1997. Immunology. 3rd edition, W H Freeman & Co (Sd).

Course Code	Course Name	Category	L	T	P	Credit
193CL1A6CB	CYTOLOGY	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The basic cell types and their functions and basic staining techniques
- Various types of cytological samples and morphological differences
- The principles of automation and immunohistochemistry

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the principles involved in collection, preparation, fixation and staining of samples	K1,K2
CO2	Understand the normal and malignant cytology of FNAC and non gynae cytology	K1,K2, K3
CO3	Understand the normal and malignant cytology of cervix, significance of cervical screening	K1,K2, K3
CO4	Understand the principle and procedure of flow cytometry	K1,K2, K3
CO5	Understand the principles involved in production and use of monoclonal antibodies and interpretation of immunohistochemical analysis	K1,K2, K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193CL1A6CB	CYTOLOGY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Cell structure and Staining 10 h

Normal cell structure and function, Normal Histology and cytology of epithelial and connective tissue, Collection and preparation of samples Fixation, fixatives, Staining - Principles, Preparations of reagents, techniques: a. Papanicolaou's stain, b. May – Grunwald Giemsa stain.

Unit II FNAC and non gynae cytology 10 h

Normal and malignant cytology in Gastrointestinal tract, Respiratory tract, Effusions, CSF and Urinary tract. FNAC of Breast, Lymph node, Thyroid and Salivary glands, liver, pancreas and biliary system.

Unit III Gynae cytology 10 h

Normal cervix, cervical neoplasia, Pathogenesis of cervical cancer, cervical screening, cervical cytopathology. Collecting cellular samples from the cervix: Conventional Pap smear, Liquid based cytology.

Unit IV Flow cytometry 10 h

Flow cytometry Principles, General components of a flow Cytometer: (a) Fluidics (b) Optics: Laser (argon) , Dichroic Filters and Mirrors, Photodiode, PMT (photo multiplier tubes) (c) Detectors (d) Electronics. Fluorochromes, Fluorochrome-conjugated Antibodies, Benchtop Flow Cytometers, Immunophenotyping, Data analysis and gating, procedure and evaluation. Image analysis Clinical applications and Research applications.

Unit V Immuno-cytochemistry 8 h

Introduction, Basic concepts of immunocytochemistry - Antigen, Antibody, Antigen - Antibody interaction , HLA B27, CD4, CD8, Monoclonal antibodies and their preparations, Polyclonal antibodies, Fluorescence reactions.

Text Books

1. Mukherjee KL, 2010. Medical Laboratory Technology-A procedure manual for routine diagnostic Tests - Volume 1, 2 and 3, Tata McGraw Hill Publishing Company Ltd, New Delhi.
2. Sood R, 1994. Medical Laboratory Technology, Jaypee Brothers, New Delhi.

References

1. Gupta S, 1998. A Short Text Book of Medical Laboratory for Technicians. Jaypee Brothers Medical Publishers (P) Ltd., New Delhi.
2. Bain B J, Bates I, Laffan M A and Lewis M, 2011. Dacie and Lewis Practical Haematology, 11th edition, Churchill Livingstone, China.
3. Todd J C, Davidson I and Henry J B, 2016.Clinical diagnosis by laboratory methods, 22nd Edition, Saunders Publications Pvt. Ltd, Pennsylvania.
4. NABH NIBL & NABL Guidelines, Clinical Laboratory manual, WHO Manual, CLSI Manual.

193CL1A6CP	CORE PRACTICAL : MICROBIOLOGY- II	SEMESTER VI

Total Credits: 3
Total Instructions Hours: 72h

S.No	Contents
1	Identification of Bacteria- Staphylococci sp, Streptococci sp. Corni bacterium diptheriae, E. coli, Klebsiella sp, Salmonella typhi, Shigella, sp., Pseudomonas sp.
2	Antibiotic susceptibility tests.
3	Culture characteristics of Aspergillus, Mucor, Rhizopus, Pencillium, Candida.
4	Slide culture technique for identification of fung.i
5	KOH preparation and LPCB staining for fungal identification.
6	Serological tests- Widal and Blood Grouping.
7	Latex Agglutination Tests -RF, ASO & CRP tests; ELISA test for HIV.
8	Demonstration of bacteriological analysis of Water-MPN Test.
9	Demonstration of bacteriological analysis of Milk-MBRT.
10	Demonstration of bacteriological analysis of Air and Soil.

Note: Any 8 out of 10 experiments are mandatory

References

1. SundaraRajan S, 2001. Practical Manual of Microbiology, Anmol Publications Pvt.Ltd, New Delhi.
2. Kannan N, 2002.Laboratory Manual in General Microbiology, 1stEdition, Published by Panima Book Distributors, New Delhi.

Course Code	Course Name	Category	L	T	P	Credit
193CL1A6DA	ENDOCRINOLOGY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The concept of hormone action and second messengers
- The structure and physiological roles of endocrine hormones
- The pathophysiology of endocrine hormones

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the classification and general mechanism of hormone action	K1, K2
CO2	Appreciate the physiological and pathophysiology of pituitary and hypothalamic hormones	K1,K2, K3
CO3	Know the structure, functions and dysfunction of thyroid, parathyroid hormones	K1,K2, K3
CO4	Realize the functions and disorders associated with the hormones of pancreas and adrenal gland	K1,K2, K3
CO5	Understand the sex hormones and endocrinology of pregnancy, parturition and lactation	K1,K2, K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193CL1A6DA	ENDOCRINOLOGY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Hormone- Introduction 8 h

Endocrine glands and its secretions. Hormones- Definition, Characteristic features. Hormones and homeostasis. Classification of hormones- steroid, peptide and amino acid derived hormones. General Mechanism of hormone action and regulation. Second messengers- cAMP and cGMP.

Unit II Hypothalamus and Pituitary gland 10 h

Hormones of hypothalamus. Pituitary hormones- Hormones of adenohypophysis and neurohypophysis. Functions and Disorders of Growth hormone, Thyroid stimulating hormone, Adrenocorticotropic hormone, Prolactin. Neurohypophysial hormones- Functions and disorders of Antidiuretic hormone and Oxytocin.

Unit III Thyroid and Parathyroid hormones 10 h

Thyroid Hormones- Biosynthesis of thyroid hormone, Biological functions of thyroid hormones. Thyroid Dysfunction: Hypothyroidism- Cretinism, Myxoedema. Hyperthyroidism - Thyrotoxicosis, Goitre. Thyroid function tests.

Parathyroid Hormones- Calcitonin and its biological action. Parathyroid Dysfunction - Hypoparathyroidism and Hyperparathyroidism.

Unit IV Pancreatic and adrenal hormones 10 h

Pancreatic hormones:- Insulin, glucagons, somatostatin. Pancreatic peptide – physiological roles and pathophysiology-Diabetes mellitus.

Adrenal hormones- gluco corticoids and mineralo corticoids- Functions. Disorders of adrenal gland- Addison's disease and Cushing's syndrome.

Unit V Reproductive Endocrinology 10 h

Hormones of male and female reproductive system-Androgens, testosterone, progesterone and estrogen- Physiological roles and pathophysiology. Endocrinology of pregnancy, parturition and lactation.

Text Books

1. Prakash S Lohar, 2005. Endocrinology: Hormones and Human Health, MJP Publishers, Chennai.
2. Larry Jameson J, 2002. Harrison's Endocrinology, 2nd edition, The McGraw Hill Companies, Inc. USA.

References

1. Mac E Handley, 1984. Endocrinology, 4th edition, Hadley, Prentice Hall.
2. Guyton, 2003. Textbook of medical physiology 10th edition –Hall, Saunders Publishing Co.
3. John E. Hall, Mario Vaz, Anura Kurpad, Tony Raj, 2016. Guyton & Hall Textbook of Medical Physiology, 2nd South Asian edition, Elsevier publications.
4. Shlomo Melmed et al., 2011. William's Textbook of Endocrinology, 12th edition, Philadelphia: Elsevier/Saunders.

Course Code	Course Name	Category	L	T	P	Credit
193CL1A6DB	SEPARATION TECHNIQUES AND PHARMACEUTICAL CHEMISTRY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The separation Techniques
- The principle and applications of Gas Chromatography and High Performance liquid Chromatography
- The principle and applications of Planar Chromatography

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand various separation techniques	K1,K2
CO2	Realize the gas chromatography	K1,K2,K3
CO3	Understand the high performance liquid chromatography	K1,K2,K3
CO4	Know the principles and application of planar chromatography	K1,K2,K3
CO5	Understand the principles of Biochromatography	K1,K2,K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193CL1A6DB	SEPARATION TECHNIQUES AND PHARMACEUTICAL CHEMISTRY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Separation Techniques 10 h

Need for learning separation techniques, Chromatography - general Principles and Classification, normal and reversed phase, column chromatography, counter current chromatography, droplet chromatography, Ion exchange chromatography. Separation techniques in natural product research and drug discovery, extraction techniques.

Unit II Gas Chromatography 8 h

Gas Chromatography: General principles, split-splitless injector, head space sampling, columns packed and capillary column, detectors, quantification. Applications in pharmaceutical analysis.

Unit III High Performance liquid Chromatography 10 h

High Performance liquid Chromatography: Principle, instrumentation, pumps, injector, detectors, columns, column problems, gradient HPLC, HPLC solvents, trouble shooting, sample preparation. HPLC in Pharmaceutical analysis.

Unit IV Planar Chromatography 10 h

Planar Chromatography - TLC/HPTLC/OPLC: Basic principles, sample preparation and application, development of plates, visualization of plates, 2D TLC, densitometry, Over pressure layer chromatography.

Unit V Biochromatography 10 h

Ion exchange chromatography, ion pair chromatography, Size exclusion chromatography, affinity chromatography general principles, stationary phases and mobile phases. Hyphenated Techniques: Introduction to GC-MS and LC-MS techniques and their applications in pharmaceutical analysis.

Text Books

1. Sabari Ghosal, Srivastava,A.K., 2010. Fundamentals of Bioanalytical Techniques and instrumentation, 5th Edn, Eastern Economy Edition.
2. Asokan, P. 2001. Basics of Analytical Biochemistry, I Edn, Chinna Publications, Tamilnadu.

References

1. Katoch, R. 2011. Analytical Techniques in Biochemistry & Molecular Biology, 1 Edn, Springer, UK.
2. Garratt, D.C. 2001. The Quantitative Analysis of Drugs, 3rd Edn. CBS Publishers & Distributors, New Delhi.
3. Ashutosh, K. 2001. Pharmaceutical Drug Analysis, Minerva Press, New Delhi.
4. Keller, R. A. 2007. Separation Techniques in Chemistry and Biochemistry Marcel Dekker Inc.

Course Code	Course Name	Category	L	T	P	Credit
193CL1A6DC	GENETIC ENGINEERING	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The basics of genetic engineering and methodology of gene cloning
- The gene transfer and identification of recombinant gene
- The significance of gene technology and fermentation technology

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the gene cloning methods and basics of vectors	K1, K2
CO2	Understand the gene transfer and identification of recombinant gene	K1,K2, K3
CO3	Understand the applications of sequencing methods	K1,K2, K3
CO4	Appreciate the production and significance of recombinant proteins	K1,K2, K3
CO5	Understand the basic concepts and applications of fermentation	K1,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	M	M	M
CO5	S	S	M	M	S

S Strong M Medium L Low

193CL1A6DC	GENETIC ENGINEERING	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Basics of gene cloning 8 h

Gene cloning operations. Restriction endonucleases – Types and Features; Ligations- Linkers and Adaptors. Vectors of gene cloning: - Plasmid Vectors – Basic feature, pBR332. Bacteriophage vectors; Cosmids. Cloning hosts. Preparation of Plasmid DNA from bacteria.

Unit II Transformation 10 h

Introduction of DNA into bacterial cells: Transformation of E. coli, selection of transformed cells, Identification of recombinants. Introduction of phage DNA into bacterial cell, Identification of recombinant phage. Genomic library and cDNA library.

Unit III Sequencing Methods 10 h

DNA sequencing: Maxam Gilbert's method, Outline of Sanger's method – Applications, Computers for sequencing and analysis of DNA sequences. Genetic Finger Printing – Oligonucleotide directed mutagenesis; Protein engineering. PCR – Technique and Applications.

Unit IV Gene Expression 10 h

Expression vectors for E. coli - Constituents; Examples of promoters – Expression cassettes – Problems caused in expression of eukaryotic genes: Fusion proteins: - Applications of gene technology: Recombinant insulin; Cloning HBV surface antigen in yeast. Safety aspects and hazards of genetic engineering.

Unit V Bioprocess technology Fermentation 10 h

Design of a commercial fermenter; Solid substrate fermentation: Media for industrial fermentations; Batch culture and fed – batch culture. Down – stream processing. Production of amino acids; Single cell protein; Penicillin and alcohol.

Text Books

1 T.A. Brown, 1995. Gene cloning- An introduction, Chapman and Hall.

2 Balasubramaniam, D, C.F.A., Bryce, K. Dharmalingam, J. Green, Kunthala Jayaraman, 1996. Concepts in Biotechnology, COSTED – IBN university press.

References

1 R.W. Old & S.B. Primrose, 1994. Principles of Gene manipulation, Black well scientific publications.

2 Glick.R, Bernard and Pasternak.J, Jack, 1994. Molecular Biotechnology, ASM press, Washington D.C.

3 Glazier. N. Alexander, Hiroshnikaido, 1995. Microbial Biotechnology, W.H. Freeman & co., New york.

4 Priti Patel & Khushbu Panchal, 2020. Bioprocess Technology: Fundamentals of Microbial Process, Scholars' Press, Mauritius.

Course Code	Course Name	Category	L	T	P	Credit
193CL1A6DD	CLINICAL ENZYMOLOGY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Basics of Enzymes and its measurements
- The industrial and therapeutic applications of enzymes
- The significance of diagnostic enzymes in various diseases

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the classification and characteristics of enzymes	K1, K2
CO2	Understand various coenzymes and its importance	K1,K2, K3
CO3	Know industrial applications of enzymes in food industries	K1,K2, K3
CO4	Appreciate the production and significance of Therapeutic Enzymes	K1,K2, K3
CO5	Understand the diagnostic significance of enzymes in various diseases	K1,K2, K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193CL1A6DD	CLINICAL ENZYMOLOGY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Enzymes 8 h

Introduction to enzymes: nomenclature, classification and characteristics of enzymes, enzyme specificity, activators, inhibitors, active site, metalloenzymes, isozymes and multienzyme complexes, units of enzyme activity, factors affecting enzyme activity, measurement of enzyme activity.

Unit II Coenzymes 10 h

Coenzymes - prosthetic group, classification - vitamin and nonvitamin coenzymes, thiamine pyrophosphate, FMN and FAD - flavoprotein enzymes, NAD and NADP role in enzyme catalysis, PALP and PAMP, coenzyme A, biotin, folate coenzymes, coenzyme vitamin Bl2, Cofactors and prosthetic group.

Unit III Industrial uses of Enzymes 10 h

Enzymes as analytical reagents, immobilized enzymes, applications of enzymes, industrial uses of enzymes - sources of industrial enzymes, thermophilic enzymes, amylases, glucose isomerases, cellulose degrading enzymes, lipases, proteolytic enzymes in meat and leather industry, detergents and cheese production.

Unit IV Therapeutic uses of Enzymes 10 h

Therapeutic use of asparginase, streptokinase. Diagnostic enzymes. Immobilization of enzymes and their applications. Therapeutic uses of Abzymes and Isoenzymes. Isolation and purification of enzymes from liver and blood.

Unit V Diagnostic Enzymology 10 h

Factors affecting enzyme levels in blood. Serum enzymes in Heart diseases: CK, LDH, Aspartate aminotransferase, Alanine aminotransferase, γ-glutamyltransferase, Histaminase, Cholinesterase, Serum enzymes in Liver diseases: SGOT, SGPT, Serum Alkaline phosphatase and other enzymes. Serum enzymes in GI Tract diseases: Amylase, Lipase, Serum enzymes in Muscles diseases : Aldolase, CPK, Serum enzymes in Bone diseases and Enzymes in Malignancy.

Text Books

1. Buchholz, Klaus, Volker Kasche, and Uwe Theo Bornscheuer, 2012. Biocatalysts and Enzyme Technology, John Wiley & sons.
2. Copeland, Robert, 2004. Enzymes: A practical introduction to structure, mechanism, and data analysis, John Wiley & sons.

References

1. Palmer T, 2001. Enzymes: Biochemistry, Biotechnology and Clinical Chemistry, Horwood publishing, Cichester, UK.
2. Price NC and Stevens I, 1999. Fundamentals of Enzymology, 3rd edition, oxford University press inc., New York.
3. William J. Marshall, 2000, Clinical Chemistry, 4th edition, illustrated, reprint, Mosby.

Course Code	Course Name	Category	L	T	P	Credit
193CL1A6DE	STEM CELL TECHNOLOGY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The basics of stem cell technology
- The Stem Cell Concept in Animals
- Therapeutic applications of stem cells

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic stem cell technology	K1,K2
CO2	Know the types of stem cells	K1,K2, K3
CO3	Understand the Stem Cell Concept in Animals.	K1,K2, K3
CO4	Understand the Haemopoietic Stem Cell.	K1,K2, K3
CO5	Know the Therapeutic applications of stem cells.	K1,K2, K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193CL1A6DE	STEM CELL TECHNOLOGY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to stem cells 10 h

Definition and history of stem cells, Source of stem cells, Properties – concepts of stem cells – differentiation, maturation, proliferation. Stem cell categories, Medical applications of stem cells.

Unit II Types of stem cells 8 h

Stem Cell biology and therapy, types- embryonic stem cell, Adult stem cell, induced pluripotent stem cells, mesenchymal stem cells, culture and the potential benefits of stem cell technology.

Unit III Stem Cell Concept in Animals 10 h

Skeletal muscle stem cell – Mammary stem cells – intestinal stem cells – keratinocyte stem cells of cornea-Umbilical card stem cells – skin and hair follicles – Tumour stem cells, Embryonic stem cell biology - factors influencing proliferation and differentiation of stem cells – hormone role in differentiation.

Unit IV Haemopoietic Stem Cell 10 h

Biology – growth factors and the regulation of haemopoietic stem cells. Hematopoietic stem cell niche, Embryonic stem cell-derived Hematopoietic stem cells. Cord blood hematopoietic stem cells- Cord blood transplantation Characteristics of cord blood stem cells Genomics and proteomics of cord blood stem cells.

Unit V Therapeutic applications of stem cells 10 h

Cellular therapies – vaccines – Gene therapy – immunotherapy – tissue engineering – blood and bone marrow – Fc cells. Stem cells for the treatment of muscular dystrophy and Neurological disorder - Cellular environment of a dystrophic muscle, Myogenic stem cells from embryonic stem cells and inducible pluripotent stem cells. Ethical consideration of stem cell technology.

Text Books

1. Hossein Baharvand, 2016. Trends In Stem Cell Biology And Technology, Springer Science & Business Media, Humana Press.
2. Robert Paul Lanza, 2006. Essentials of stem cell biology, 2nd edition, Academic Press.

References

1. Song Li, Nicolas L'Heureux, Jennifer Elisseeff. 2011. Stem Cell and Tissue Engineering, 1st edition, World Scientific Publishers.
2. Robert Lanza, John Gearhart, Brigid Hogan. 2006. Essentials of Stem Cell Biology, 2nd edition, Macmillan Publishing Solutions.
3. CS Potten , 1997. Stem cells. Elsevier.

Course Code	Course Name	Category	L	T	P	Credit
193CL1A6DF	TUMOR MARKERS AND IMMUNOHISTOCHEMISTRY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The concept of tumor and tumor markers
- The structure and roles of various biological tumor markers
- The immune techniques for diagnosis of cancer

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the morphological and biochemical characteristics of normal and tumor cells	K1, K2
CO2	Understand the concept of tumour markers and significance	K1,K2, K3
CO3	Know the significance of carbohydrates as tumour markers in screening and diagnosis	K1,K2, K3
CO4	Realize the significance of different proteins as tumour markers	K1,K2, K3
CO5	Understand the Immunological techniques and monoclonal antibodies	K1,K2, K3

MAPPING WITH PROGRAMME OUTCOMES

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

S Strong M Medium L Low

193CL1A6DF	TUMOR MARKERS AND IMMUNOHISTOCHEMISTRY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Carcinogens and Oncogenes 8 h

Introduction to cancer. Carcinogens - definition. Oncogene – definition. General mechanism of Oncogenes. Characteristics of growing tumor cells- general and morphological changes, biochemical changes.

Unit II Tumor Markers 10 h

Tumor Markers- Introduction, Clinical applications of tumor markers. Enzymes as tumor markers, Alkaline Phosphatase (ALP), Creatine kinase (CK), Lactate dehydrogenase (LDH), Prostate specific antigens (PSA).

Unit III Hormone tumor markers 10 h

Hormones as tumor markers- Structure and mechanism. Oncofetal antigens. Alpha feto protein (AFP), Beta Human Chorionic Antigen (β HCG), Carcino embryonic antigen (CEA) Squamous cell carcinoma (SCC) antigen. Carbohydrate markers - CA 15-3, CA 125.

Unit IV Bladder cancer markers 10 h

Blood group antigen (brief introduction of each type) CA 19-9, CA 50, CA 72-4, CA 242. Bladder cancer markers (introduction in brief) - Bladder tumor antigen (BTA) Fibrin, Fibrinogen degradation product (FDP). Nuclear matrix protein (NMP22). TRAP assay, hyaluronic acid and Hyaluronidase.

Unit V Immunological techniques 10 h

Immunological techniques - immunofixation, Antigen retrieval, immunochemistry, turbimetry Immunohistochemistry – Polyclonal and monoclonal antibodies, Direct and Indirect immunohistochemistry, labels, detection, tissue preparation, antigen retrieval, blocking, rinsing, controls. Tumour markers – AFP, B2M, Beta hCG.

Text Books

1. Gerhard Seifert, 2012. Morphological Tumor Markers: General Aspects and Diagnostic Relevance, illustrated, Springer Science & Business Media.
2. Manjul Tiwari, 2012. Tumor Marker and Carcinogenesis, River Publishers.

References

1. Carl A. Burtis, David E. Bruns, 2014. Tietz Fundamentals of Clinical Chemistry and Molecular Diagnostics, 7th edition, Elsevier Health Sciences.
2. William J. Marshall, 2000. Clinical Chemistry, 4th edition, illustrated, reprint, Mosby.
3. Eleftherios P. Diamandis, 2002. Tumor Markers: Physiology, Pathobiology, Technology, and Clinical Applications, Amer. Assoc. for Clinical Chemistry.
4. Hebermann and Mercer, 1990. Immunodiagnosis of Cancer, 2nd edition, illustrated, revised, CRC Press.

Course Code	Course Name	Category	L	T	P	Credit
193BC1A6AA	INNOVATION, IPR AND ENTREPRENEURSHIP	AECC	2	-	-	2

PREAMBLE

This course has been designed for students to learn and understand

- The role of Entrepreneurship in Economic Development and basics of Intellectual Property Rights, Copy Right Laws, Trade Marks and Patents
- Ethical and professional aspects related to intellectual property law context
- Intellectual Property(IP) as 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 innovation, IPR, entrepreneurship and its role in economic development	K2
CO2	Know the value , purpose and process of Patent	K2
CO3	Understand the basics of trademarks and industrial designs	K2
CO4	Acquire knowledge about copyright and copyright law	K2
CO5	Identify Geographical Indications	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	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

193BC1A6AA	INNOVATION, IPR AND ENTREPRENEURSHIP	SEMESTER VI

Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I Introduction to Innovation, IPR and Entrepreneurship 05 h

Meaning of Creativity, Invention and innovation - Types of Innovation - Introduction and the need for Intellectual Property Right (IPR) - Kinds of IPR – National IPR Policy. Entrepreneurs-Concept, characteristics, Functions, need and types, Entrepreneurial decision process. Role of Entrepreneurship in Economic Development.

Case Study: Jayabharati Viswanath: A case of Ladel to Leather.

Unit II Patents 05 h

Introduction and origin of Patent System in India- Conceptual Principles of Patent Law in India - Process for obtaining patent - Rights granted to a Patentee - Infringement of Patent.
Case Study: When Google was used 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", Cengage Learning India Private Limited, New Delhi, India.

2 Dr. S. S. Khanka, 2020,"Entrepreneurial Development", S Chand and Company Limited, New Delhi, India.

References

1 Ahuja, V K. 2017, "Law relating to Intellectual Property Rights", 3rd Edition, Lexis Nexis, Gurgaon, India.

2 Neeraj, P., & Khusdeep, D., 2014, "Intellectual Property Rights", 1st Edition, PHI Learning Private Limited, New Delhi, India.

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

4 https://knowledgentia.com/knowledgeate.

29/12/21

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