YENEPOYA

(DEEMED TO BE UNIVERSITY)
Recognized under Sec 3(A) of the UGC Act 1956
Accredited by NAAC with 'A' Grade

YENEPOYA (DEEMED TO BE UNIVERSITY)

Deralakatte, Mangaluru -575018

REGULATIONS AND CURRICULUM GOVERNING

UNDERGRADUATE PROGRAM

BACHELOR OF SCIENCE NEUROSCIENCE TECHNOLOGY

(CURRICULUM - EFFECTIVE FROM 2020-21)

Structure of the program clearly indicating courses, credits/Electives

Ref. Page No. 9, 10, 11, 12, 22-28

ATTESTED

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Ref: No. Y/REG/ACA/38-ACM/2020

14.05.2020

NOTIFICATION – 38-ACM/12 /2020 dtd. 14.05.2020

Sub: Revised curriculum of the existing B.Sc. (Tech) programmes and Starting of additional programmes under the Faculty of Allied and Healthcare Professions

Ref: Resolution of the Academic council at its 38th meeting held on 27.04.2020, vide agenda - 23

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The Academic Council at its 38th meeting held on 27.04.2020 and subsequently the Board of Management at its 49th meeting held on 30.04.2020 have resolved to approve the revised curricula and regulations of existing 08 B.Sc. Technology Programmes (Anaesthesia & O.T. Technology, Renal Dialysis Technology, Respiratory Care Technology, Medical Laboratory Technology, Medical Imaging Technology, Cardio Vascular Technology, Perfusion Technology, Optometry Technology) and starting of 04 new programmes under the Faculty of Allied & Healthcare Professions

1. B.Sc. in Physician Assistant
2. B.Sc. in Clinical Psychology
3. B.Sc. in Emergency Medicine Technology
4. B.Sc. in Neuro Science Technology

All these programmes shall follow Choice Based Credit System.

This notification will supersede all the earlier notifications issued on this subject.

REGISTRAR

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CC to:

1. Dean, Faculty of Allied and Healthcare Professions
2. Controller of Examinations
3. File copy

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YENEPOYA (Deemed to be) University

Regulations & curriculum for

B.Sc. Neuroscience Technology under Choice Based Credit System.

1. Preamble

Health care sector has become one of the largest employment generation sectors in India and abroad. Rapidly changing and expanding horizon of the health care sector demands formal training programs in all its allied areas. Advanced complex instrumentation & equipment require technologists not only to operate but also to care & maintain these instruments and equipment. These technologists should possess a strong scientific foundation to be able to perform these tasks at a much higher level than the traditionally trained technicians of the past used to perform. The students who are trained in the technological aspects of medical care with a good scientific foundation will be in a position to competently assist the Physician or Surgeon. Hence to prepare the students to meet the demands of the healthcare sector and in accordance with the Ministry of Human Resource Development (HRD), Govt. of India Education system, Choice based credit system is introduced from the academic year 2020-21onwards.

B.Sc. Neuroscience is undergraduate program in the field of health care concerned with use of technology and equipment in the scientific study of the nervous system. Neuroscience deals with the structure and function of the brain and nervous system.

The scope of neuroscience technology is continuously broadening and qualified professionals of the discipline can seek both medical and non-medical career opportunities.
Neurodiagnostic technologists or Neurodiagnostic technicians make use of science and technology to diagnose and treat neurological diseases and disorders. Neuroscientists or neuroscience technologists also work as researchers within medical institutions and hospitals. In research-specific jobs, neuroscientists design and carry out scientific experiments related to the nervous system and its function.

Choice based credit system is a flexible system of learning. The distinguishing features of CBCS are the following:

- It permits students to learn at their own pace.
- Choose electives from a wide range of elective courses offered by the other departments/ University
- Undergo additional courses and acquire more than the required number of credits.
- Adopt an inter-disciplinary and intra-disciplinary approach in learning.
- Make best use of the available expertise of the faculty across the departments or disciplines.
- Has an inbuilt evaluation system to assess the analytical and creativity skills of students in addition to the conventional domain knowledge assessment pattern.

2. Programme Outcome:

Upon successful completion of the undergraduate course, students will have developed a broad knowledge in the field of evaluation, diagnosis and management of different conditions of the nervous system.

In particular they will:

PO 1. Technically and clinically competent

PO 2. Aware of the importance of quality assurance

PO 3. Aware of the theoretical basis for evidence-based practice

PO 4. Effective members of the multidisciplinary team

PO 5. Prepared to participate in or initiate research into practice

PO 6. Practice as Neurotechnologist independently

PO 7. Have critical analysis & good reasoning skills to provide accurate data & analysis

Expected skill to be acquired by the end of the programme:

PO 7. Understand and learn how to use digital EEG including the appropriate use of montage reformatting. Learn to interpret adult inter-ictal EEGs. Know the clinical significance of inter-ictal EEG.

PO 8. In the neurophysiology lab, assist neurologists in Electromyography (EMG) procedures & Nerve conduction studies (NCV) – procedures to be performed independently and basic interpretation of the findings.

PO 9. Know the differential diagnosis of seizure disorders. Learn to diagnose & classify seizure disorders

PO 10. Develop a strong knowledge base in neuro anatomy, physiology and pathophysiology as well as pharmacology, fetal and neonatal brain development and neuro science.

PO 11. Improve ability to understand and accept diversity in cultures, lifestyles and coping strategies among their patients, and learn to communicate within the patient's mode of understanding, with a focus on improving overall quality of life for each patient.

PO 12. Theoretical, technical and basic knowledge of procedures like Visual Evoked Potential (VEP), Somatosensory Evoked Potential (SSEP), Brainstem Auditory Evoked Response (BAER).

PO 13. Conduct the various clinical and technical tests in the autonomic lab. Hands on training in sleep lab – patient instructions, clinical interpretations, sleep staging based of Epworth's scale and procedure skills in Polysomnography (PSG) to be acquired.

PO 14. They are taught to demonstrate knowledge and practice of basic patient care and to coordinate with other members of the team Protect and uphold the rights of the patient, Ethical and legal issues and responsibilities and to Maintain professional confidentiality.

3. Duration of the Programme:

The duration of the programme shall extend over 8 semesters (three academic years with one year internship). Each semester comprising minimum of 15 weeks with the minimum of 90 actual working days of instructions in each semester. The successful completion of the undergraduate program, along with internship as applicable will lead to Bachelor's degree in Neuroscience Technology (B.Sc. Neuroscience Technology).

4. Semester:

An academic year shall consist of two semesters;

Odd Semester 1st, 3rd, 5th & 7th	July/August to December/January
Even semester 2nd, 4th, 6th & 8th	January/February to June/July

5. Medium of Instructions:

The medium of instruction and examination shall be English.

6. Eligibility for admission:

To be eligible for admission in B.Sc. Neuroscience Technology, a candidate should have passed two-years Pre-University examination/ Pre-Degree examination/ two years after ten years of schooling or its equivalent as recognized by the Yenepoya (Deemed to be) University with Physics, Chemistry and Biology as principal courses of study.

Candidate needs to secure 40% or above marks in the qualifying examination to be eligible for admission. For SC/ST/OBC candidates minimum marks required in the qualifying exam is 35% marks.

7. Semester System and Choice Based Credit System:

The semester system accelerates the teaching-learning process. The credit-based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice-based credit system provides a cafeteria 'type approach in which the students can take courses of their choice, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning.

8. Definition of Key words:

8.1. Academic Year: Two consecutive (one odd + one even) semesters constitute one academic year.

8.2. Choice Based Credit System: The CBCS provides choice for students to select from the prescribed courses (core, Ability Enhancement, Skill Enhancement, self-learning, Discipline specific courses).

8.3. Course: Usually referred to, as 'papers" is a component of a programme. The courses shall define learning objectives and learning outcomes. A course shall comprise lectures/ tutorials/ laboratory work/ field work/ outreach activities/ project work/ vocational training/viva/ seminars/ term papers/assignments/ presentations/ self-study etc. or a combination of some of these.

8.4. Credits: Credit defines the quantum of contents/syllabus prescribed for a course and determines the number of hours of instruction required per week. Thus, normally in each of the courses, credits will be assigned on the basis of the number of lectures/tutorial laboratory work and other forms of learning required, to complete the course contents in a 15-20week schedule: One credit =1 hour of lecture per week/ two hours of Laboratory or practical/three hours of clinical rotation, field work/posting. All courses need not carry the same credits.

	Lecture- l	**Tutorial-T**	**Practical- P**	**Clinical Training/ Rotation CT/CR**
1 Credit	1 Hour	1 Hour	2 Hours	3-5 Hours

8.5. Programs: An educational program leading to award of a degree, diploma or certificate.

8.6. Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.

8.7. Credit Point: It is the product of grade point and number of credits for a course.

8.8. Cumulative Grade Point Average (CGPA): It is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

8.9. Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters: O, A+, A, B+, B, C, P, F, and AB.

8.10. Semester Grade Point Average (SGPA): It is a measure of performance of work done in a semester. It is ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.

8.11. Transcript or Grade Card or Certificate: Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the course details (code, title, number of credits, grade secured) along with SGPA of that semester.

8.12. Semester System and Choice Based Credit System: The semester system accelerates the teaching-learning process. The credit-based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice-based credit system provides a cafeteria ‘type approach in which the students can take courses of their choice, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning.

9. Types of Courses

Courses in a programme may be of three kinds:

- Core Course
- Ability Enhancement Compulsory Course (Foundation course)
- Elective Course

9.1 Core Course: A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course. This is the course which is to be compulsorily studied by a student as a core requirement to complete the program of study in a said discipline.

9.2 Ability Enhancement Compulsory Courses (AECC): Ability enhancement compulsory courses (AECC) are the courses based upon the content that leads to knowledge enhancement.

Example:

1. Environmental science
2. English/ MIL communication

These are mandatory for all disciplines.

9.3 Elective Course (EC):

9.3.1 Generic elective

9.3.2 Skill enhancement course

9.3.3 Self-learning courses (SWAYAM/MOOC)

9.3.4 Discipline Specific Elective courses

9.3.1 Generic elective: An Elective Course chosen from pool of courses which are unrelated from unrelated discipline/subject with intention to seek exposure beyond disciplines of choice. The purpose of this is to offer the students the option to explore disciplines of interest beyond the choices they make in core and discipline specific elective courses.

9.3.2 Skill enhancement course: SEC courses are value-based and/or skill- based and are aimed at providing hands-on-training, competencies and skills. These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge.

9.3.3: Self – learning course: with respect to- UGC (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2021. New Delhi, the 25th March, 2021. Vide No.F.1-100/2016 (MOOCs/e-content)

The List of MOOCS (Massive open online courses) and SWAYAM (Study webs of active learning for young aspiring minds) will be finalized by the faculty of allied health professions as per subject to time-to-time UGC notification and will be submitted to the academic council of the DU. Yenepoya (Deemed to be university) shall adopt the regulation of UGC governing MOOCS/ SWAYAM courses as amended from time to time.

The college/ department will designate course coordinator/facilitator to guide the students throughout the course to facilitate the completion of the chosen course.

9.3.3.1 Evaluation and Certification of MOOCs:

Evaluation will be based on predefined norms and parameters and announced in the overview of the Course at the time of offering the course. Formative continuous online assessments and end of course proctored exams shall be completed by the student.

The Yenepoya (Deemed to be) University incorporate the marks/grade obtained by the student, as communicated by the Host Institution through the PI of the SWAYAM course in the marks sheet of the student that counts for final award of the degree by the University.

9.3.3.2 Credit Mobility of MOOCs:

The Yenepoya (Deemed to be) University will give the equivalent credit weightage to the students for the credits earned through online learning courses through SWAYAM platform in the credit plan of the program.

In case a student fails to complete the MOOCS course He/ She may be allowed to complete the course requirements by registering for another course online in subsequent semester or opt for a course offered at this Yenepoya (Deemed to be) University.

10. Assigning Credit Hours per Course

While there is flexibility for the departments in allocation of credits to various courses offered, the general formula shall be:

- Every Core course shall be restricted to a maximum of 4 credits.
- The elective course offered by the Yenepoya (Deemed to be) University shall be restricted to a maximum of 2 credits.
- A candidate shall compulsorily complete total Twelve Credits of Elective courses

- These courses shall be selected either from the Generic Electives, Skill enhancement courses offered by Yenepoya (Deemed to be) university or from the SWAYAM/MOOC/NPTEL courses notified by the UGC time to time and enlisted by the faculty of Allied Health Care Professions. A Candidate shall have freedom to choose the courses of once own choice and at their own pace from the external online platform (SWAYAM/MOOC) or a mix of courses offered by Yenepoya (Deemed to be) University but, require to complete before appearing the Sixth semester end examination.
- A candidate who is desirous to add more credits shall be permitted to do so during the academic duration. Extra credits earned by a candidate shall be included in the marks card on submission of course completion certificate. However, it shall not be considered for awarding the Grade in the UG programme.

- The credits assigned to the course is indicated as L: T: P format. For example, for a 4-credit course format could be: 4:0:0 or 1:2:1 or 3:1:0 or 0:0:4etc.

11. Assigning Total Credits for a Program

The UGC, in its notification No.F.1-1/2015 (Sec.) dated 10/4/15 has provided a set of “Model curricula and syllabi for CBCS programs. In conformation with this notification, at Yenepoya (Deemed to be University), for the UG program with duration of 3years study period or 6 Semesters, the total credits shall be a maximum of 140 and for the UG programme with the duration of 4 years study period or 8 semesters, The total credits shall be maximum of 156 Credits.

12. CBCS Program Coding System

The coding system shall be in the consonance with the system followed by the office of the controller of examination. Presently the following coding pattern is followed.

12.1 First two letters describe the faculty name followed by level of programme (UG – 01; PG – 02) and two letters represent the programme.

12.2 Course code shall have prefix denoting semester number followed by an alphabet of respective type of courses such as C = Core, AECC= Ability Enhancement Compulsory, GE=Generic Elective, SE= Skill Enhancement, SL = Self -Learning, P=Practical followed by numbers denoting number of courses taught-

1st SEM: 1C1, 1C2, 1C3, 1C4,1AECC1, 1AECC2, GE1/SE1/SL1 etc.
2nd SEM: 2C1, 2C2, 2C3,2AECC1, 2AECC2, 2AECC3,2AECC4, GE2/SE2/SL2, etc.
3rd SEM: 3C1, 3C2,3C3.3C4, 3AECC1, GE3/SE3/SL3, 3P1, etc.
4th SEM: 4C1, 4C2, 4C3, 4P1,4AECC1,4AECC2, GE4/SE4/SL4etc.
5th SEM: 5C1, 5C2,5C3, 5GE1/5SE1, 5P1, GE5/SE5/SL5etc.
6th SEM: 6C1, 6C2,6C3,6C4, GE6/SE6/SL6etc.
7th SEM: 7C1 (Internship)
8th SEM: 8C1 (Internship)

13. Attendance:

13.1 Each course (theory, practical, clinical etc.) shall be treated as an independent unit for the purpose of attendance. Candidates having minimum 80% attendance in each of the Courses can only qualify to appear for the Semester End Examination. The Candidates with less than 80% of attendance shall be required to repeat that Course by attending the semester.

13.2 There shall be no provision for condonation of shortage of attendance.

13.3 For SWAYAM/MOOC/NPTEL it shall be as per the regulations governing the courses of implementing authority.

13.4 The HOD/Course Coordinator through the Dean of Faculties shall announce the names of the candidates who will not be eligible to take the Semester End- Examinations (SEE) in the various courses and send a copy of the same to the Controller of Examinations (COE) Office. Registrations of such candidates for those courses shall be treated as cancelled.

14. Scheme of examination

14.1 Evaluation of a course shall be done based on continuous internal assessment (CIA) mode followed by semester end university examination (SEE) for each course.

14.2 The components of CIA (Continuous Internal Assessment) may include Two Internal Assessment tests, Assignment and Conduct/discipline.

14.3 The marks for CIA shall be 40% and SEE shall be 60%.

14.4 There shall be no minimum marks for CIA for a pass, but the minimum marks for pass per course shall be 50% CIA and SEE added together.

14.5 There shall be examinations at the end of each semester ordinarily during December/January for odd (1^{st} & 3^{rd}) semesters and during June/July for even (2^{nd} &4^{th}) semesters. The SEE for 5^{th} &6^{th} semesters will be held during December/January and June /July of each year.

14.6 The SEE duration shall be three hours.

14.7 The question paper pattern shall be decided by the Board of Studies (BOS) of the respective departments.

Internal assessment format per course (distribution of marks)

Internal Assessment Components	**Maximum Marks**
Two IA tests	20
Assignment	10
Conduct/discipline	10
Total Marks	**40**

First Internal assessment shall be held in the 6^{th} week of the semester and the second Internal Examination will be held one month before the semester end university examination.

Question Paper Pattern for Core course SEE

	SUBJECTS HAVING MAXIMUM MARKS = 60				Duration
Type of question	**Number of questions**	**To be Answered**	**Marks for each question**	**Total**	
LONG ESSAY TYPE	02	01	10	10	180 minutes
SHORT ESSAY TYPE	10	08	05	40	
SHORT ANSWERS	07	05	02	10	
			Total	**60**	

Question Paper Pattern for AECC SEE

	SUBJECTS HAVING MAXIMUM MARKS = 40				Duration
Type of question	**Number of questions**	**To be Answered**	**Marks for each question**	**Total**	
LONG ESSAY TYPE	02	01	10	10	90 minutes
SHORT ESSAY TYPE	05	03	05	15	
SHORT ANSWERS	07	05	03	15	
			Total	**40**	

Practical examination

SI.NO	Components	Marks
1	Spotters	20
2	Case scenario/Stations	20
3	Viva Voice	20
Total Marks		60

PARTICULARS OF PRACTICAL, VIVA-VOCE

- Practical examination will be aimed at examination of clinical skills and competence of the candidates for undertaking independent work as a specialist.
- Viva- Voce examination shall aim at assessing depth of knowledge, logical reasoning, confidence & oral communication skills.
- OSCE/OSPE- shall have minimum of 4 stations.

15. Evaluation of Answer Scripts

15.1 Each theory examination shall have single evaluation. There shall be provision for re-evaluation on a payment of a fee. An external examiner shall value the paper, if the difference is more than 15% of previous marks the answer script shall be sent for third evaluation. In such an event, the average of the best two out of the three scores will be taken as the final score.

15.1 Practical examination shall be jointly conducted and evaluated by one internal examiner and one external examiner.

16 Classification of Successful candidates:

The results of successful candidates at the end of each semester shall be declared in terms of Grade Point Average (GPA) and Alpha-Sign Grade. The results at the end of the sixth semester shall be classified on the basis of the Cumulative Grade Point Average (CGPA) obtained in all the six semesters and the corresponding overall alpha sign grade.

16.1 Letter Grades and Grade Points:

16.1.1 The Deemed to be University would be following the absolute grading system, where the marks are compounded to grades based on pre-determined class intervals.

16.1.2 The UGC recommended 10-point grading system with the following letter grades are given below:

Letter Grade	Grade Point
O (Outstanding)	10
A+ (Excellent)	9
A (Very Good)	8
B+ (Good)	7
B (Above Average)	6
C (Average)	5
P (Pass)	4
F (Fail)/ RA (Reappear)	0
Ab (Absent)	0
Not Eligible (NC) detained	0

16.1.3 A student obtaining Grade RA/ Ab shall be considered failed and will be required to reappear in the end semester examination.

16.2 The Semester Grade Point Average (SGPA)

The performance of a student in a semester is indicated by a number called 'Semester Grade Point Average' (SGPA). The SGPA is the weighted average of the grade points obtained in all the courses by the student during the semester.

For example, if a student takes five (Theory/Practical) in a semester with credits C1, C2, C3, C4 and C5 and the student's grade points in these courses are G1, G2, G3, G4 and G5, respectively, and then students' SGPA is equal to:

$$SGPA = \frac{C1G1 + C2G2 + C3G3 + C4G4 + C5G5}{C1 + C2 + C3 + C4 + C5}$$

The SGPA is calculated to two decimal points. It should be noted that, the SGPA for any semester shall take into consideration the F and ABS grade awarded in that semester. For example, if a student has a F or ABS grade in program 4, the SGPA shall then be computed as:

$$SGPA = \frac{C1G1 + C2G2 + C3G3 + C4 * ZERO + C5G5}{C1 + C2 + C3 + C4 + C5}$$

16.3 Cumulative Grade Point Average (CGPA)

The CGPA is calculated with the SGPA of all the VI semesters to two decimal points and is indicated in final grade report card/final transcript showing the grades of all VI semesters and their courses. The CGPA shall reflect the failed status in case of F grade(s), till the course(s) is/are passed. When the program(s) is/are passed by obtaining a pass grade on subsequent examination(s) the CGPA shall only reflect the new grade and not the fail grades earned earlier. The CGPA is calculated as:

$$CGPA = \frac{C1S1+C2S2+C3S3+C4S4+C5S5+C6S6}{C1+C2+C3+C4+C5+C6}$$

Where C1, C2, C3,…. is the total number of credits for semester I, II, III… and S1, S2, S3….is the SGPA of semester I, II, III,…..

Calculation of GPA & CGPA: An example (1st semester)

Program Code	Course	Credits(a)	Grade obtained	Credit Value (b)	Grade Points (axb)
	Course 1	4	B	8	32
	Course 2	4	B	8	32
	Course 3	4	O	10	40
	Course 4	2	C	7	14
	Course 5	2	A	9	18
	Total	16	-	-	136

1st Semester GPA = Total Grade Points / Total Credits = 136 / 16 = 8.5 2nd Semester GPA = 7 with respect to 18 Credits

Then 1st Year CGPA = (8.5 x 16) + (7 x 18) / 16 + 18 = 7.7

17. Declaration of Class

The class shall be awarded on the basis of Cumulative marks scored in all the Courses

First Class with Distinction= Aggregate Marks 75% and above

First Class = Aggregate Marks 60 to 74.9%

Second Class = Aggregate Marks 50 to 59.9%

17.1 Promotion Criteria

- The students are allowed to carry over any number of courses till sixth semester. But student is eligible to appear for the End semester exam of sixth semester if he/she has cleared all the Courses both Core and AECC of first, second, third & fourth semesters. If student has any pending course of first to fourth semesters, he/she is not eligible to appear for the end semester exam of the sixth semester. However, fifth semester courses are allowed to club with sixth semester end examination. But, all the Core courses and AECC Courses of first to fourth semester should be completed to be eligible for 6th end semester exam.

- Candidate should also complete 12 credits of elective course to be eligible for the 6th (in case of 3year program) end Semester Examination.

- Candidate should clear all Courses (Core, AECC & Elective courses) of all the semester, to be eligible to start the one year of mandatory internship.

- A fail in any one Course will mean the candidate has to reappear for the exam in that Course only.

- A candidate who passes the semester examinations in parts is eligible for only CGPA and letter grade but not for Class/ ranking/award/medal from the University.

18. Internship

A candidate has to mandatorily complete one year (2 semesters) of Internship. The total credits per semester is 18 and for two semesters it is 36.

The internship time period provides the Candidate the opportunity to develop confidence and increase skill in simulation and treatment delivery. Candidate will demonstrate competence in basic and intermediate procedures and will observe the advanced and specialized treatment procedures. The candidate will complete the clinical training by practicing all the skills learned in classroom and clinical instruction. The candidate is expected to work for minimum 8 hours per day and this may be more depending on the need and health care setting.

a. Eligibility

A candidate should have passed in all the coursers (Core, AECC and Electives) amounting to 130 number of credits before entering in to internship.

19.Eligibility for the award of Degree

A candidate shall have passed in all the Courses of all six semesters and should have successfully completed 1 year of mandatory internship (2 semesters) as required for the program.

20.Maximum Period for Completion of Programme:

A candidate shall complete six semesters (Three Years) programme within Six years from the date of admission. Hence the maximum period for completion of the programme is seven years.

21.Minimum for a pass:

21.1 A candidate shall be declared to have passed the UG program if he/she secures at least CGPA of 4.0 (Course Alpha-Sign Grade P) in the aggregate of both internal assessment and semester end examination marks.

21.2 The candidates who pass all the semester examinations in the first attempts in Three years are eligible for ranks provided they secure at least a CGPA of 8.0 (at least Alpha-Sign Grade A).

21.3 The results of the candidates who have passed the sixth semester examination but not passed the lower semester examinations shall be declared as NCL (Not Completed Lower semester examinations). Such candidates shall be eligible for the degree only after completion of all the lower semester examinations.

21.4 A candidate who passes the semester examinations in parts is eligible for only CGPA and Alpha-Sign Grade but not for ranking.

21.5 There shall be no minimum in respect of internal assessment and viva-voce marks.

22. Re-Entry after Break of the study:

21.1 Candidates admitted to a program abstaining for more than 3 months must seek readmission into the appropriate semester.

22.2 The candidate shall follow the syllabus in vogue (currently approved/is being followed) for the program.

22.3 All re-admissions of candidates are subject to the approval of the University.

23. Program Structure

Semester I

Sl. No	Category	Course Name	Max Marks		Total Marks	Hours Per week			Credits
			IA	SEE		L	T	P	
1	Core	Anatomy	40	60	100	4	-	-	4
2	Core	Physiology	40	60	100	4	-	-	4
3	Core	Biochemistry	40	60	100	4	-	-	4
5	AECC	English & Communication	10	40	50	2	-	-	2
6	AECC	Constitution of India	10	40	50	2	-	-	2
Total					400				16

Note: Of the total available 36 hours per week for teaching learning processes, 16 hours per week is dedicated to core and AECC courses. Remaining Hours are available for Electives /Value Added courses/Extracurricular activities.

Semester II

Sl. No	Category	Course Name	Max Marks		Total Marks	Hours Per week			Credits
			IA	SEE		L	T	P	
1	Core	General pathology	40	60	100	4	-	-	4
2	Core	Microbiology	40	60	100	4	-	-	4
4	AECC	Environmental studies	10	40	50	2	-	-	2
5	AECC	Healthcare	10	40	50	2			2
6	AECC	Medical Ethics	10	40	50	1			1
7	AECC	Sociology	10	40	50	1	-	-	1
Total					400				14

Note: Of the total available 36 hours per week for teaching learning processes, 14 hours per week is dedicated to core and AECC courses. Remaining Hours are available for Electives /Value Added courses/Extracurricular activities

Semester III

Sl. No	Category	Course Name	Max Marks		Total Marks	Hours Per week			Credits
			IA	SEE		L	T	P	
1	Core	Neurological Conditions& disorders I	40	60	100	4	-	-	4
2	Core	Electroencephalography	40	60	100	4	-	-	4
3	Core	Pharmacology	40	60	100	4	-	-	4
4	Core	Nerve conduction study	40	60	100	4	-	-	4
5	Core	Clinical NST I	40	60	100	-	-	8	4
7	AECC	Kannada	10	40	50	2	-	-	2
Total					600				22

Note: Of the total available 36 hours per week for teaching learning processes, 26 hours per week is dedicated to core and AECC courses. Remaining Hours are available for Electives /Value Added courses/Extracurricular activities.

Semester IV

Sl. No	Category	Course Name	Max Marks		Total Marks	Hours Per week			Credits
			IA	SEE		L	T	P	
1	Core	Neurological conditions& disorders II	40	60	100	4	-	-	4
2	Core	Advanced Electroencephalography I	40	60	100	4	-	-	4
3	Core	Advanced Nerve conduction study I	40	60	100	4	-	-	4
4	Core	Clinical Neuroscience II	40	60	100	-	-	8	4
5	AECC	Human Rights& Gender Equity	10	40	50	2	-	-	2
6	AECC	Biostatistics	10	40	50	2	-	-	2
Total					500				20

Note: Of the total available 36 hours per week for teaching learning processes, 24 hours per week is dedicated to core and AECC courses. Remaining Hours are available for Electives /Value Added courses/Extracurricular activities

Semester V

Sl. No	Category	Course Name	Max Marks		Total Marks	Hours Per week			Credits
			IA	SEE		L	T	P	
1	Core	Advanced EEG II	40	60	100	4	-	-	4
2	Core	Advanced Nerve conduction study II	40	60	100	4	-	-	4
4	Core	An introduction to Electromyography.	40	60	100	4	-	-	4
5	Core	Clinical NST III	40	60	100	-	-	8	4
Total					400				16

Note: Of the total available 36 hours per week for teaching learning processes, 20 hours per week is dedicated to core and AECC courses. Remaining Hours are available for Electives /Value Added courses/Extracurricular activities

Semester VI

Sl. No	Category	Course Name	Max Marks		Total Marks	Hours Per week			Credits
			IA	SEE		L	T	P	
1	Core	Nerve Conduction Study & IONM	40	60	100	4	-	-	4
2	Core	Evoked Potentials	40	60	100	4	-	-	4
3	Core	Polysomnography& Autonomic lab	40	60	100	4	-	-	4
4	Core	Advanced EMG	40	60	100	4	-	-	4
3	Core	Clinical NST IV	40	60	100	-	-	8	4
Total					500				20

Note: Of the total available 36 hours per week for teaching learning processes, 24 hours per week is dedicated to core and AECC courses. Remaining Hours are available for Electives /Value Added courses/Extracurricular activities

Semester VII

Sl. No	Category	Course Name	Max Marks		Total Marks	Hours Per week			Credits
			IA	SEE		L	T	P	
1	Core	Internship I	40	60	100	-	-	6	1
Total					100				18

Semester VIII

Sl. No	Category	Course Name	Max Marks		Total Marks	Hours Per week			Credits
			IA	SEE		L	T	P	
1	Core	Internship II	40	60	100	-	-	6	1
Total					100				18

Total credit		**108**
Elective		**12**
Internship		**36**
Total Credit of the program		**156**

SEMESTER I

ANATOMY

Course: Core

Credits: 04

Number of hours: 60 hours

Course objectives:

- Identify and locate each of the body systems to apply anatomical knowledge to perform minor technical procedural skills.
- Know the normal disposition of the structures in the body while clinically examining a patient and while conducting clinical procedures.
- Describe the functions of each body system
- Discuss the interrelationship of systems in maintaining homeostasis.
- Know the anatomical basis of disease and injury

COURSE CONTENT:

Unit I: Introduction: Human body as a whole 2 Hours

- Definition of anatomy and its divisions. Terms of location, positions and planes. Cell and its organelles.
- Epithelium: definition, classification, describe with examples, function. Glands: classification, describe serous & mucous glands with examples. Basic tissues: classification with examples
- Demonstration: Histology of types of epithelium. Histology of serous, mucous & mixed salivary gland.

Unit II: Locomotion and support 12 hours

- Bone: classification, names of bone cells, parts of long bone, microscopy of compact bone, names of all bones, vertebral column, inter-vertebral disc, fontanelles of fetal skull.
- Joints: classification of joints with examples, synovial joint (in detail for radiology).

Muscular system: classification of muscular tissue & histology, names of muscles of the body.

- Demonstration: Bones & joints. Histology of compact bone (TS & LS). Demonstration of all muscles of the body. Histology of skeletal, smooth &cardiac muscle (TS & LS). Histology of the 3 types of cartilage. Demo of all bones showing parts, radiographs of normal.

Unit III: Cardiovascular system 8 hours

- Heart: size, location, chambers, exterior & interior, blood supply of heart. Systemic &pulmonary circulation, branches of aorta, common carotid artery, subclavian artery, axillary artery, brachial artery, superficial palmar arch, femoral artery, internal iliac artery, peripheral pulse, inferior vena cava, portal vein, Porto-systemic anastomosis, great saphenous vein, Dural venous sinuses. Lymphatic system: cisterna chyli& thoracic duct, histology of lymphatic tissues, names of regional lymphatics, axillary and inguinal lymph nodes in brief
- Demonstration of heart and vessels in the body. Histology of large artery, medium sized artery & vein, large vein. Histology of lymph node, spleen, tonsil & thymus. Normal chest radiograph showing heart shadows. Normal angiograms

Unit IV: Gastro-intestinal system 8 hours

- Parts of GIT, oral cavity, lip, tongue (with histology), tonsil, dentition, pharynx, salivary glands, Waldeyer's ring, oesophagus, stomach, small and large intestine, liver, gall bladder, pancreas, radiographs of abdomen
- Demonstration of parts of gastro intestinal system. Normal radiographs of gastro intestinal system. Histology of gastro intestinal system.

Unit V: Respiratory system 4 hours

- Parts of RS, nose, nasal cavity, larynx, trachea, lungs, broncho-pulmonary segments, histology of trachea, lung and pleura, names of paranasal air sinuses.
- Demonstration of parts of respiratory System Normal radiographs of chest. -Histology of lung and trachea

Unit VI: Peritoneum 1 hour

- Description in brief. Demonstration of reflections.

Unit VII: Urinary system 2 hours

- Kidney, ureter, urinary bladder, male and female urethra. Histology of kidney, ureter and urinary bladder

- Demonstration of parts of urinary system. Histology of kidney, ureter, urinary bladder. Radiographs of abdomen-IVP, retrograde cystogram.

Unit VIII: Reproductive system 2 hours

- Parts of male reproductive system, testis, vas deferens, epididymis, prostate (gross & histology). Parts of female reproductive system, uterus, fallopian tubes, ovary (gross & histology). Mammary gland: gross
- Demonstration of section of male and female pelvis with organs in situ. Histology of testis, vas deferens, epididymis, prostate, uterus, fallopian tube, ovary. Radiographs of pelvis, hysterosalpingogram.

Unit IX: Endocrine glands 2 hours

- Endocrine glands: pituitary gland, thyroid gland, parathyroid gland, suprarenal glad (Gross & Histology).
- Demonstration of the glands. Histology of pituitary, thyroid, parathyroid, suprarenal glands.

Unit X: Nervous system 12 hours

- Neuron,classificationofnervoussystem,cerebrum,cerebellum,midbrain,pons,medullaoblongata,spinalcord with spinalnerve(gross&histology),meninges, ventricles & cerebrospinal fluid, names of basal nuclei, blood supply of brain, cranial nerves. Sympathetic trunk& names of parasympathetic ganglia
- Histology of peripheral nerve & optic nerve. Demonstration of all plexuses and nerves in the body. Demonstration of all parts of brain. Histology of cerebrum, cerebellum, spinal cord.

Unit XI: Sensory organs 3 hours

- Skin: histology, appendages of skin. Eye: parts of eye & lacrimal apparatus. Extra-ocular muscles & nerve supply. Parts of ear: external, middle and inner ear and contents.
- Histology of thin and thick skin. Demonstration and histology of eyeball. Histology of cornea & retina.

Unit XII: Embryology 4 hours

- Spermatogenesis & oogenesis. Ovulation, fertilization. Fetal circulation. Placenta, Demonstration of models.

Course Outcome:

- Demonstrate the structure of various organs in the human body and correlate the structure with the functions to know how both structure and function are modified by disease.
- Identify and locate all the structures of the body.
- Identify the microscopic structures of various tissues and organs in the human body and correlate the structure with the functions for understanding the altered state in various disease processes.
- Understand the basic principles of embryology including major variations, abnormalities and the congenital anomalies involved in development of the organs and systems.

Recommended Books

(1) Chaurasia BD. BD Chaurasia's Human Anatomy. CBS Publishers & Distributors PVt Ltd.; 2010.

(2) Sampath Madhyastha ,Manipal Manual of Anatomy for Allied Health Sciences, New Delhi: CBS publishers & distributors

(3) Waugh A, Grant A. Ross & Wilson Anatomy and physiology in health and illness E-book. Elsevier Health Sciences; 2014 Jun 25.

(4) Dilly PN. Essentials of Human Embryology. Postgraduate Medical Journal. 1984 Jun;60(704):447..

(5) Inderbir S. Textbook of human histology with color atlas. New Delhi: Jaypee Brithers Medical Publishers. 2006.

PHYSIOLOGY

Course : Core **No of Hours: 60 hours**

Credit: 4

Course objective:

- To broadly understand the physiological structure of each organ system and its physiological functions.
- To understand broadly the clinical abnormalities of organs and its clinical physiological implications

Course Content:

Unit I: General Physiology **2 hours**

- Introduction to physiology
- Homeostasis: Definition, Positive feedback, negative feedback.
- Body Fluid Compartments *Transport mechanisms (brief)*

Unit II: Blood **7 hours**

- Introduction: composition and function of blood.
- Blood Cells: types, Normal Count, Red blood cells: function. Erythropoiesis: Definition, Stages, Factors affecting, Hemoglobin: Function, concentration Physiological variation of RBC Count and Hb *Structure of Hb, methods of estimation*
- White blood cells: different types, functions, normal count, differential count *Immunity(brief)*
- Platelets: origin, normal count, functions *Morphology*
- Haemostasis: definition, steps, clotting factors, mechanism of clotting, disorders of clotting, Blood groups: ABO system, Rh system: Rh factor, Rh incompatibility. Blood grouping & typing, cross matching. Blood transfusion: indication, universal donor and recipient concept. Selection criteria of a blood donor, transfusion reactions.

Anticoagulants: classification, examples and uses

- Anemias: definition, Symptoms and signs (brief). Blood indices: color index, MCH, MCV, MCHC (def and Normal Values). ESR and PCV: normal values, definition, determination (methods).
- *Morphological and etiological classification of Anemia* Plasma proteins: types and concentration, functions of albumin, globulin, fibrinogen, prothrombin. Blood volume: normal value, determination of blood volume *Regulation of blood volume (brief), Functions of Lymph*

Unit III: Muscle Nerve physiology 5 hours

- Introduction, Classification and structure of muscle, sarcomere *contractile proteins*
- Neuromuscular junction, Transmission across neuromuscular junction. Excitation contraction coupling. Mechanism of muscle contraction, rigor mortis. *Fatigue*

Unit IV: Cardiovascular system 8 hours

- Heart: physiological anatomy, nerve supply. Properties of cardiac muscle Cardiac cycle: definition, systole, diastole, phases, JVP (brief) Cardiac output, stroke volume, EDV (only definitions). Heart sounds, normal heart sounds, mechanism and features, areas of auscultation.
- *Intra-ventricular pressure curves, Significance of Heart sounds*
- Blood pressure: definition, normal value, clinical measurement of blood pressure, hypotension, hypertension Heart rate: Physiological variations, regulation (brief), radial pulse, Electrocardiogram (ECG): Definition, Normal ECG, Causes of ECG waves, Uses of ECG. Cardiac shock: Definition, Types (brief), Triple response.

Unit V : Respiratory system 6 hours

- Introduction: Functions of respiratory system, physiological anatomy of respiratory system, respiratory tract Respiratory organs: lungs, alveoli, respiratory membrane Mechanism of breathing: Inspiration and Expiration, muscles involved, Mechanism.
- Surfactant: Composition, Function, *intra pulmonary pleural pressure, surface tension*
- Transport of oxygen: forms of transport, Oxygen Hemoglobin Curve. Lung volumes and capacities: Spirogram, Definitions and normal Volumes. Regulation

of respiration: Nervous and chemical regulation, respiratory Centre, Herring Breur reflexes. Hypoxia: Definition, Classification, Description (in brief). Cyanosis, Asphyxia, Dyspnea, Dysbarism, Artificial Respiration, Apnoea. (Definition Only)

Unit VI: Digestive System **5 hours**

- Introduction Physiological anatomy of gastro intestinal tract (All Structures in brief), functions of digestive system. Functions of Saliva Deglutition: definition, stages
- Stomach: functions Gastric secretion: composition, function, Phases of secretion Pancreas: Functions (exocrine), pancreatic juice: composition and regulation. Secretin and CCK-PZ
- Liver: Functions, Bile secretion, composition, function of bile; Bilirubin metabolism, types of bilirubin, Vandenberg reaction, Jaundice: types, significance. Gall bladder: Functions.
- Small intestine: functions, digestion and absorption, movements. (brief)Large intestine: functions, defecation reflex

Unit VII : Renal System **5 hours**

- Introduction: Functions of kidneys, composition of urine, nephron, cortical and juxtamedullary nephrons (comparison), Juxta Glomerular Apparatus: structure and function. *Vasa recta*
- Mechanism of urine formation GFR: Definition, Normal Values, factors effecting GFR, Measurement (Creatine, Inulin Clearance). Tubular reabsorption, TMG, Tubular secretion (brief).
- Mechanism of urine concentration: Counter-current mechanisms, Role of ADH *Diuresis, Diuretics*. Micturition, innervation of bladder, cystometrogram.

Unit VIII: Skin and Body temperature **1 hour**

- Structure and function of Skin *Sweat Glands* Body Temperature: physiological variation. Regulatory mechanisms: Mechanisms Activated by Heat/Cold Role of hypothalamus, and fever.
- *Body temperature measurement, hypothermia*

Unit IX : Endocrine System **5 hours**

- Introduction: Definition, classification of endocrine glands & their hormones.
- Hypothalamic- pituitary Axis Pituitary hormones: anterior and posterior pituitary hormones, Functions of Growth hormone,
- Thyroid gland: Thyroid Hormones: physiological function, regulation of secretion, disorders: hypo and hyper secretion of hormone. *Physiological anatomy of Thyroid*
- Adrenal cortex: functions of Cortisol and Aldosterone Adrenal medulla: functions of Adrenaline and Noradrenaline. *Physiological anatomy of Adrenal*
- Pancreas (Endocrine): Hormones of pancreas. Insulin: functions, regulation of blood glucose level, Diabetes mellitus *Abnormalities of pancreatic hormones(brief)* Regulation of Calcium Metabolism: Hormones involved, actions of PTH, Calcitonin, Vit D3*Tetany*

Unit X : Reproductive system 4 hours

- Introduction, Function of reproductive system, Changes during puberty.
- *Sex Differentiation*
- Male reproductive system: functions of testes Spermatogenesis: Definition, site, stages, factors influencing, Endocrine functions of testes *Sperm, semen*. Androgens: testosterone functions.
- Female reproductive system, Menstrual cycle: Definition, changes, ovulation Functions of progesterone and estrogen *Hormonal Regulation* Physiological changes during pregnancy, Lactation(brief), milk ejection reflex

Unit XI: Nervous system 8 hours

- Introduction: Parts of CNS and PNS, Functions of nervous system
- Neuron: definition, structure Nerve Fiber: classification, conduction of impulses continuous and saltatory. *Neuroglia*
- Synapse: Definition, structure, types, properties (brief). Receptors: definition, classification, properties (brief). Reflex: Definition, Reflex Arc, Examples.
- *Babinski's sign. Tone, Posture(definition),* Spinal cord nerve tracts: Diagram and Functions: Lateral Spino Thalamic Tract, Dorsal Column, Pyramidal Tract.*UMN and LMN lesion, Hemiplegia, Stroke (brief)*Functions of: Cerebral cortex, Cerebellum, Hypothalamus, Basal Ganglia *EEG, Parkinsonism*
- Cerebro Spinal Fluid (CSF): site of formation, circulation (brief), functions. *Lumbar puncture*. Autonomic Nervous System: Sympathetic and parasympathetic

distribution and functions (brief).

Unit XII : Special senses **4 hours**

- Vision: Functions of different parts(brief)Optic Pathway, Dark Adaptation, Color vision. *Structure of eye, Structure of retina*.
- Hearing: Function of Middle Ear, Functions of inner ear, mechanism of hearing (brief).
- Chemical Senses: Taste: types, receptor, Smell: physiology, receptors.

Course Outcome:

At the end of the study student will be able to,

- Understand the physiological structure of each organ system and its physiological functions.
- Understand broadly the clinical abnormalities of organs and its clinical physiological implications

Recommended Books

1) Guyton (Arthur): Text Book of Physiology. Latest Ed. Prism publishers.
2) Ganong WF. Review of m
3) Medical physiology. 18th ed. Stamford, CT: Appleton & Lange; 1997.
4) Chatterjee CC: Human Physiology Latest Ed. Vol-1, Medical AlliedAgency.Choudhary Sujith K: Concise Medical Physiology Latest Ed. New CentralBook.

BIOCHEMISTRY

Course: Core **Number of hours: 60 hours**

Credit:4

Course objective

- To classify various biomolecules like carbohydrates, lipids, proteins, nucleic acids vitamins and minerals
- To know about specimen collection and various other safety measures.
- To learn how to prepare various types of dilutions in the laboratory.
- To know about various terms used in quality control like specificity and sensitivity etc.
- A brief idea about acid base balance and biomedical waste management.

Course Contents

Unit I: Introduction and scope of Biochemistry **2 hours**

Unit II: Specimen collection: **4 hours**

- Pre-analytical variables. Collection of blood. Collection of CSF & other fluids. Urine collection.
- Use of preservatives. Anticoagulants.

Unit III: Safety measurements, Conventional and SI units **2 hours**

Unit IV: Dilutions **2 hours**

- Diluting solutions: e.g. preparation of 0.1 N NaCl from 1 N NaCl & from 2N NaCl etc., preparing working standard from stock standard, body fluid dilutions, reagent dilution techniques, calculating the dilution of a solution, body fluid reagent etc., saturated and supersaturated solutions

Unit V : Carbohydrate chemistry **4 hours**

- Classification, Isomerism, General reactions of carbohydrates

Unit VI: Lipids **4 hours**

- Chemistry of fatty acids, triglycerides, cholesterol, phospholipids, lipoproteins-
- Classification and functions.

Unit VII: Protein chemistry, structure **4 hours**

Unit VIII: Plasma Proteins **2 hours**

- Concentration, biochemical changes in disease, interpretation

Unit IX : Enzymes **6 hours**

- Definition, classification, coenzymes, cofactors, factors effecting enzyme activity, inhibitors, units of measurements, isoenzymes, biological interpretation

Unit X: Vitamins **6 hours**

- Definition, classification, sources, functions, deficiency disorder

Unit XI: Minerals **6 hours**

Na, K, Ca, P, Fe, Cu, selenium- sources, daily requirements, availability and properties

Unit XII: Nutrition **3 hours**

- Calorific value, nitrogen balance, respiratory quotient, basal metabolic rate, dietary fibers, nutritional importance of lipids, carbohydrates and proteins, vitamins. nutrition, nutritional support with special emphasis on parental nutrition.

Unit XIII: Quality control **2 hours**

- Accuracy, precision. Specificity, sensitivity, limits of error allowable in laboratory, percentage error. Normal values and Interpretations.

Unit XIV: Special Investigations **11 hours**

- Serum electrophoresis, immunoglobulins, drugs: digitoxin, theophylline's, regulation

of acid base status, Henderson Hasselbach equations, buffers of the fluid, pH regulation, disturbance in acid base balance, anion gap, metabolic acidosis, metabolic alkalosis, respiratory acidosis, respiratory alkalosis, basic principles and estimation of blood gases and pH, basic principles and estimation of electrolytes, water balance, sodium regulation, bicarbonate buffers,

Unit XV: Bio Medical waste management **2 hours**

Course outcome

At the end of the course students must demonstrate an understanding of

- Various biomolecules in our body and their classification
- Sample collection for various tests performed in laboratory
- Preparation of dilutions of chemicals and body fluids.
- Various terms used in quality control
- Biomedical wastes management
- Significance of various special investigations

Recommended book:

1. Varley H. Practical clinical biochemistry. Practical clinical biochemistry. 1954.
2. Naithani M, Singh P. Teitz textbook of clinical chemistry & molecular diagnostics. Medical Journal, Armed Forces India. 2006 Apr;62(2):204.
3. Kaplan LA, Pesce AJ, Kazmierczak SC. Clinical chemistry. Theory, analysis, correlation. 2003.
4. Ramakrishna(S) Prasanna(KG), Rajna ® Text book of Medical Biochemistry Latest Ed Orient Longman Bombay –1980
5. Vasudevan (DM) Sreekumari(S) Text book of Biochemistry for Medical students, Latest Ed
6. Das (Debajyothi) Biochemistry Latest ED Academic, Publishers, Calcutta – 1992
7. Rajagopal G & Ramakrishna - 1983 Practical Biochemistry for Medical Students Oriental Blackswan Pvt. Ltd.
8. Burtis CA and Ashwood ER, Tietz Fundamentals of Clinical chemistry, Harcort (India) Ltd, 7th Ed, 20154.

ENGLISH AND COMMUNICATION

Course: AECC

Credits: 2 **Number of Hours: 30 hours**

Course Objectives:

The course is designed to enable students to enhance their ability to speak and write English required for effective communication in their professional work. Students will practise their skills in verbal and written English during clinical and classroom experience.

Course Content:

UNIT – I: PHONETICS

4 Hours

- Brief introduction to the history of English Language & Phonetics
- Vowels, Diphthongs, Consonants
- Native pronunciation of English words

UNIT – II: Difference between American & British English

2 Hours

- Difference with regards to the Vocabulary, Accent, Grammar & Spellings.
- Syllables & Word Stress

UNIT – III: Grammatical Skills

10 hours

- Verb Tenses
- Appropriate Use of Prepositions

- Articles
- Subject Verb Agreement
- Appropriate usage of Punctuation and Capitalization
- Modals
- Transformation of Sentence structures
- Active Passive Voice
- Reporting skills
- Question Tags
- Homonyms & Homophones
- Degrees of Comparison
- One-word Substitution
- Linkers

UNIT – IV: Written Communication Skills

5 Hours

- Drafting of formal letters
- Email drafts – Do's and don'ts in professional emails.
- Article and Essay writing
- Notice writing
- Speech writing
- News Report writing
- Dialogue writing

UNIT – V : Oral Communication Skills

6 Hours

- Way of Communicating when we meet people.

  Face to Face Communication

  Tone of voice

  Body Language
- Small Talk
- Elevator Speech
- Etiquettes of Phone Conversation & Phone role play
- Basics of meeting online
- Video conference role play
- Group discussion
- First Impressions
- Interview Skills: Purpose of an Interview

  Do's & Don'ts of an Interview

UNIT-VI: Presentation Skills

3Hours

- Debating
- Speech Relay
- Presentations

Course Outcomes

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

- Apply the concepts and principles of English Language use in professional development such as pronunciation, vocabulary, grammar, paraphrasing, voice modulation, Spelling, pause and silence.
- Apply LSRW (Listening, Speaking, Reading and Writing) Skill in combination to learn, teach, educate and share information, ideas and results.

Recommended Books:

1. Raymond Murphy. English Grammar in Use. Cambridge University. 2012.
2. David Green. Contemporary English Grammar Structures and Composition. Macmillan Publishers. 2015.

CONSTITUTION OF INDIA

Course: Core

Credits: 02 **Number of hours: 30 hours**

Course Objectives: By the end of this course, a student will

- State and explain the constitution of India and its Constituent Assembly
- Explain fundamental rights and duties of citizen
- Identify union, state and federalism of India
- Knowledge of electoral process in India.
- State the basic concepts of Human Rights and its functions and authorities in society.

Course content

Unit I: Indian Constitution **5 hours**

- Meaning and Importance of Constitution
- The Constituent Assembly
- The Preamble
- Salient Features of Constitution

Unit II: Fundamental Rights and Directive Principles **3 hours**

- Meaning and Differences between Fundamental Rights and Directive Principles
- Fundamental Rights
- Rights Information Act Meaning, importance of RTI 2005

Unit III: Union Government **4 hours**

- President of India- Election, Powers and Position
- Prime Minister and council of Ministers
- Parliament – Lok Sabha, Rajya Sabha- Organizations and Powers

Unit IV: State Government **4 hours**

- The Governor
- Chief Minister and Council of Ministers
- State Legislature Vidhana Sabha, Vidhana Parishad – organization and Powers

Unit V: Federalism in India **2 hours**

- Meaning Federal and Unitary Features

Unit VI: The Judiciary **2 hours**

- The supreme Court – Organization, Jurisdiction and Role
- The High Court – Organization Jurisdiction and Role

Unit VII: Electoral Process In India **2 hours**

- Election Commission – Organization, Functions

Unit VIII: Local Governments **2 hours**

- Rural and Urban – Organization, Powers and Functions

Unit IX: Human Rights **3 hours**

- Human rights – Meaning
- Universal Declaration of Human Rights
- Remedies against Violation of Human Rights in India

Unit X: Special constitutional provisions **3 hours**

- Special Rights created in the constitution for: Dalits, Backwards, women and Children and the Religious and Linguistic Minorities.
- Constitution and Sustainable Development in India.
- Minority Commission in India

Course Outcome:

- This course is to keep the students abreast with the knowledge of the Constitution of India.
- To make the students understand the importance of human rights as citizens of India.

Recommended Books

1. Basu, D.D, Constitution of India, New Delhi Himalaya Publication; 2001
2 Dinesh Shelton, David P Stuart, International Human Rights in Nutshell. Thomas Burgenthel, West Nutshell Publisher; London; 2005.
3. ParvathyAppaiah, Constitution of India, Mangalore DivyaDeepa Publication; 2005
4. ParvathyAppaiah, Human Rights. DivyaDeepa Publication Mangalore; 201
5. RajRam. M, Constitution of India Himalaya Publication, New Delhi; 1999

SEMESTER II

GENERAL PATHOLOGY

Core: General Pathology **No of Hours: 60 Hours**

Credits: 4

Course Objectives:

- To be able to define the medical terms, define and classify disease and understand the concepts of the disease.
- Able to describe the causes and mechanism of common diseases that occur during the routine work and also changes seen in different individuals and various organs and fluids.
- Able to enumerate the laboratory tests e.g.: urine, blood, body fluids and its application on various diseases.

Course Content:

Unit I: Introduction **8 Hours**

Unit II: Cellular Responses to Stress and Injury **12 Hours**

- Types of cellular responses to injury
- Cellular adaptations
- In brief cell injury and types of cell injury, intracellular accumulation
- Necrosis and apoptosis (brief)
- Pathologic calcification, hyaline change, pigments

Unit III: Acute Inflammation **12 Hours**

- Definition, cardinal signs and sequence of events in acute inflammation

- List chemical mediators of inflammation, outcomes of acute inflammation, morphological types/patterns of acute inflammation and briefly systemic effects of inflammation
- In brief cutaneous wound healing (primary and secondary) Factors that influence wound healing, complications of wound healing
- Types of chronic inflammation, Granulomatous diseases, briefly about tuberculosis, leprosy and syphilis

Unit IV: Hemodynamic Disorders, Thromboembolism and Shock 6 Hours

- Edema and thrombosis
- Embolism, infarction and shock (in brief)

Unit V: Diseases of the Immune System 8 Hours

- Introduction to immune system
- Hypersensitivity reactions (brief)
- Autoimmune diseases and systemic lupus erythematosus (in brief)
- Acquired immunodeficiency syndrome

Unit VI: Neoplasia 8 Hours

- Nomenclature of neoplasms and characteristics of benign and malignant neoplasms
- Metastasis and spread of tumors
- Etiology of cancer (carcinogenic agents)
- Laboratory diagnosis of cancer, staging grading and prognosis

nit VII: Genetic Disorders 2 Hours

- Introduction of genetic disease and classification of genetic disorders

Unit VIII: Nutritional Disorders 4 Hours

- Common vitamin deficiencies -Fat-soluble vitamins
- Water-soluble vitamins—vitamin B complex

Course Outcome:

At the end of the course, the students will be able to

(1) understand how body reacts to cellular responses and injuries.

(2) Have a basic knowledge about various laboratory tests and its application on various disorders.

(3) define the medical terms, define and classify disease and understand the concepts of the disease.

Recommended Books

1. Nayak R, Rai S, Gupta A. Essentials in hematology and clinical pathology. New Delhi: Jaypee Brothers Medical Publishers; 2012.
2. Mohan H. Textbook of pathology. 8th ed. New Delhi, India: Jaypee Brothers Medical; 2018.

MICROBIOLOGY

Core 2: General Microbiology **No of Hours: 60 Hours**

Credits: 4

Course Objectives:

- To become familiar with the foundation concepts of history of Microbiology & General Bacteriology.
- To understand the key concepts in Immunology.
- To gain the knowledge of common bacterial infections.
- To understand and implement biomedical waste management and tackle infections.

Course Content:

Unit – I: General Bacteriology **8 hours**

Introduction & History of Microbiology, Classification & Morphology of Bacteria, Growth & Nutrition, Culture Media & Methods, Sterilization & Disinfection, Fundamental aspects of antibacterial agents and antimicrobial susceptibility testing.

Unit –II: Immunology **11 hours**

Infection, Immunity, Immunization schedule, applications of antigen antibody reactions, Hypersensitivity, Tumour & Transplantation Immunology.

UNIT – III: Systematic Bacteriology **13 hours**

Common bacterial infections, Mycobacteria, Spirochaetes

UNIT – IV: Virology **10 hours**

Introduction to virology, viral hepatitis, poliomyelitis, Rabies, Human immunodeficiency virus.

UNIT – V: Mycology & Parasitology **12 hours**

Introduction to mycology, pathogenic yeasts & fungi, Introduction to parasitology, Amoebiasis, Malaria, Helminthic infections.

U**NIT – VII: Applied Microbiology** **6 hours**

Hospital acquired infections, Biomedical waste management.

Course Outcome:

At the end of the course, the students will be able to

- Understand how the bacteria grow and how sterilization & disinfection works.
- Have a basic knowledge about Immunization schedules and bacterial infections.
- Define terms in virology, mycology and parasitology.

Recommended Books

1. Baweja C. Textbook of microbiology. 1st ed. New Delhi: Arya Publications; 2005.

2. Textbook of Medical Laboratory technology, Ramnik Sood, 4th edition, Jaypee Publications.

3. Allied Health Sciences Laboratory Technology

ENVIRONMENTAL STUDIES

Course: AECC

Credit: 02 hours **Number of hours: 30 hours**

Course Objectives:

- Students will be able to learn about environment, factors affecting it, environmental ethics and its protection.
- Students will be able to Describe a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- Students will be able to Critically analyze technical subject matter (written or oral) for scientific merit apply learned environmental knowledge and understanding to solve technical /research problems in new contexts

COURSE CONTENT

Unit I: Multidisciplinary nature of Environmental Studies **1 hour**

- Multidisciplinary nature of Environmental Studies
- Concept of sustainability and sustainable development

Unit II: Ecosystems **4 hours**

- What is an ecosystem? Structure and function of an ecosystem; Energy flow in the ecosystem; Food chains, food webs and ecological succession. Case studies of the following ecosystems:

  a. Forest ecosystem
  b. Grassland ecosystem
  c. Desert ecosystem
  d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)
- History of ecosystem ecology
- Ecosystem services

Unit III: Natural Resources **5 hours**

Renewable and Non-renewable resources

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

Unit IV: Biodiversity and its conservation **6 hours**

- Levels of biological diversity: genetic, species and ecosystem diversity; Bio geographic zones of India; Biodiversity patterns and global biodiversity hotspots
- India as a mega-biodiversity nation; Endangered and endemic species of India
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
- Ecosystem and biodiversity services: ecological, economic, social, ethical, aesthetic and informational value.
- Nature Reserves, tribal populations and rights, Human wildlife conflicts in Indian context

Unit V: Environmental Pollution **6 hours**

Definition

- Cause, effects and control measures of: -

a. Air pollution
b. Water pollution
c. Soil pollution
d. Light pollution
e. Noise pollution

f. Thermal pollution

g. Nuclear hazards

- Climate change, Greenhouse effect, Global warming, Acid rain, Ozone layer depletion.
- Solid waste Management: control measures of urban and industrial wastes.
- Pollution case studies.

Unit VI: Environmental Policies & Practices **3 hours**

- Environmental Laws: Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- International Agreements: Montreal protocol, Kyoto protocol, Convention on Biological Diversity (CBD)
- Environmental Impact Assessment
- Carbon footprint
- Sustainable Development Goals

Unit VII: Human communities and the environment **3 hours**

- Human Population growth – impacts on environment
- Resettlement and rehabilitation of project affected persons: case studies
- Disaster management – floods, earthquake, cyclone and landslides
- Environmental movements: Chipko, Silent Valley, Bishnois of Rajasthan
- Environmental ethics
- Consumerism and Environment
- Environmental communication and public awareness, case studies.

Unit VIII: Field work **2 hours**

- Visit to a local area to document environmental assets river/ forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hill slopes, etc.

Course Outcomes:

- Students learn to knowledge on Echo systems, biodiversity and environmental policies and practices.

Recommended Books:

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
3. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
4. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
5. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
6. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
7. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
8. Heywood, V.H & Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.

HEALTHCARE

Course: AECC

Credit: 02 hours **Number of hours: 30 hours**

Course Objectives:

- To be able to describe the concepts of health, illness and national health policy various welfare programs in India.
- To be able to Explain the concepts of Nursing
- To be able to Explain the basic, special needs of the patient, bandaging and first aid for common emergencies.
- To be able to Explain infection control

Unit I: Introduction to Health: **3 Hours**

- Definition of Health, Determinants of Health, Health Indicators of India, Health Team Concept. National Health Policy.
- National Health Programmes (Briefly Objectives and scope) Population of India and Family welfare programme in India

Unit II: Introduction to Nursing: **3 Hours**

- What is Nursing? Nursing principles. Inter- Personnel relationships.

Unit III: Bandaging : **3 Hours**

- Basic turns; Bandaging extremities; Triangular Bandages and their application.
- Nursing Position, Bed making, prone, lateral, dorsal,dorsal re-cumbent, Fowler's positions, comfort measures, Aids and rest and sleep.

Unit IV: Nursing positions and bed making: **3 Hours**

- Positioning patient prone, lateral, dorsal, dorsal re-cumbent, Fowler's positions, comfort measures, Aids and rest and sleep.

Unit V: Lifting and Transporting Patients:

- Lifting patients up in the bed. Transferring from bed to wheel chair. Transferring from bed to stretcher. **3 Hours**

Unit VI: Bed Side Management: **3 Hours**

- Giving and taking Bed pan, Urinal: Observation of stools, urine. Observation of sputum, Understand use and care of catheters, enema giving.

Unit VII: Methods of Giving Nourishment: **3 Hours**

- Feeding, Tube feeding, drips, transfusion Care of Rubber Goods

Unit VIII: Vital Parameter Recording: **3 Hours**

- Recording of body temperature, respiration and pulse,

Unit IX: Asepsis : **3 Hours**

- Simple aseptic technique, sterlization and disinfection. Surgical Dressing: Observation of dressing procedures

Unit X: First Aid. **3 Hour**

Course Objectives:

At the end of the course student will be able to,

- Describe the concept of health, illness and national health policy various welfare programs in India.
- Explain the basic, special needs of the patient, bandaging and first aid for common emergencies.

Recommended Books:

1. Singh H. Essentials of management for healthcare professionals. 1st ed. Hari S, editor. Boca Raton : Taylor & Francis, a CRC title, part of the Taylor & Francis imprint, a member of the Taylor & Francis Group, the academic division of T&F Informa plc, 2018.: Productivity Press; 2017.

MEDICAL ETHICS

Course: AECC

Credit: 01 **Number of hours: 15 hours**

Course objectives:

- To understand the about the ethical importance in medicine
- Knowledge regarding ethical concepts and teaching/learning experience
- Understand the importance of informed consent and ethical issues in health care.

COURSE CONTENT

Introduction

Medical ethics is a systematic effort to work with in the ethos of medicine, which has traditionally been service to sick.

- **Objectives:** Identify underlying ethical issues and problem in medical practice

Unit I: Introduction to medical ethics **3 Hours**

What is ethics, what are values and norms, freedom and personal responsibility?

Unit II: Definition of medical ethics **2Hour**

Major principles of medic ethics.

Unit III: Perspective of medical ethics **4 Hours**

The Hippocratic oath, The Declaration of Helsinki, The WHO

Declaration of Geneva, International code of Medical Ethics (1993),

Medical Council of India Code of Ethics (2002).

Unit IV: Ethics of the individual **2 Hours**

Truth and confidentiality, the concept of disease, health and healing, the Rightto health.

Unit V: The ethics of human life **1 Hour**

Prenatal sex determination.

Unit VI: The family and society in medical ethics **1 Hour**

Euthanasia, cancer and terminal care.

Unit VII: Death and dying **1 Hour**

Use of life-support systems, the right to die with dignity, suicide–the Ethical outlook.

Unit VIII: Professional Ethics **1 Hour**

Contract and confidentiality, malpractice and negligence.

Course Outcomes:

- Increasing the awareness and knowledge of students of the value dimensions of interactions with the patients, colleagues, relations and public.
- Fostering the development of skills of analysis, decision making and judgment.
- Making the students aware of the need to respect the rights of the patient.
- Duties and responsibilities of the technologists.

Recommended Books:

1) Tsai DF. The WMA medical ethics manual. Journal of Medical Ethics. 2006 Mar 1;32(3):163.

SOCIOLOGY

Core: AECC

Credits: 2 **No of hours: 15 hours**

Course Objective

- To develop the abilities of students to analyse the sociological concepts and their
- Relationship with social work practice.
- To understand Indian social problems and its impact on social development.
- To develop skills for social analysis.
- To develop an understanding of emerging issues of social concern and their impact on society.
- To develop basic understanding of health perspectives and their practice in social work

Course Content:

Unit I: Introduction to Sociology **3 hours**

- Meaning, definitions and scope of sociology.
- Importance of its study with special reference to health care professionals.
- Methods of Sociological investigations - Case study, social survey, questionnaire, interview and opinion poll methods.

Unit II: Society, Family, Community and Socialization **4 hours**

- Concept of society: Definition and characteristics.
- The family: Meaning, definitions and functions of family.
- Role of family on individual's health and nutrition,
- Meaning, definitions and types of communities: Rural, Urban and Tribal community
- Socialization: Meaning and characteristics, Process of socialization, Agencies of socialization and their role –Family, School, peer group, religion, media.

Unit III: Social Problems, Social Change, Social Planning, Social Work and Social security measures **5 hours**

- Social Problems: Meaning, characteristics and their influence on health.
- Social Change**:** Meaning, definitions and characteristics.
- Social Planning: The role of social planning in the improvement of health and rehabilitation
- Social Work -Basic concepts of social work, definitions, objectives, values and basic methods. Role of social worker in health settings.
- Social Security: Social Security schemes for the disadvantaged sections in the society.

Unit IV: Socio-cultural factors in Health and Disease **3 hours**

- Health: Concept, definitions and dimensions
- Meaning of social factors and role of social factors in health and disease.
- Culture and its influence on health and disease.

Course Outcome

- Able to understand the meaning of sociology, it relationship with other disciplines and also to gain knowledge on the sociological methods of investigations
- Able to understand social factors and its role in health and disease
- Able to understand the meaning, importance and agencies of socialization
- Able to understand the concept and role of social groups in health, sickness and rehabilitation
- Able to understand the meaning of family and its role in health, nutrition and sickness among members
- Able to understand the meaning, features and health hazards of rural and urban communities
- Able to understand the concept of culture and health and their relationship
- Able to understand the meaning of social change, factors of social change, social change and stress, social change and health
- Able to understand the meaning of social problems and types of social problems in the society

- Gain knowledge on the social security and social legislation measures for the disabled
- Able to understand the meaning of social work and role of medical social worker

Recommended books

1. VidyaBhushan, D R Sachdeva.An Introduction to Sociology, Kitabmahal- Allahabad
2. Roshni Jain, 2012. An Introduction to Sociology, First editionAITBS publishers- New Delhi
3. Krishna Gowda, 2010. Sociology for Nurses, Sixth edition. CBS Publishers & DistributorsPvt Ltd- New Delhi
4. Ram Ahuja .Social problems in India, third edition, 2014. PremRawat for Rawat Publication.
5. Mohammed Akram, Sociology of Health, 2014. PremRawat for Rawat Publication-JaipurSociology of Health, Mohammed Akram, 2014. PremRawat for Rawat Publication-Jaipu

THIRD SEMESTER

NEUROLOGICAL CONDITIONS & DISORDERS I

Core: Neurological conditions & Disorders I **No of Hours:** 60 Hours

Credits: 4

Course Objectives:

- Knowledge on various neurological disorders
- To understand the Nerve and muscle related disorders.
- To understand the pathological process of brain and nervous system.

Course Content:

UNIT I- SYMPTOMS OF NEUROLOGICAL DISORDERS 15 Hours

- Neurological diseases – A basic approach
- clinical examination basics

- Delirium and Dementia Scott
- Aphasia, Apraxia, and Agnosia
- Syncope and Seizure
- Coma
- Diagnosis of Pain and Paresthesia's
- Dizziness and Hearing Loss
- Impaired Vision
- Headache
- Involuntary Movements
- Syndromes Caused by Weak Muscles
- Gait Disorders

UNIT II – Infections of the Nervous System **10 Hours**

- Bacterial Infections
- Viral Infections
- acquired immunodeficiency syndrome
- Neurosarcoidosis
- Reye's Syndrome
- Prion diseases

UNIT III- Vascular Diseases **11 Hours**

- Pathogenesis, Classification, and Epidemiology of Cerebrovascular Disease
- Examination of the Patient with Cerebrovascular Disease
- Transient Ischemic Attack
- Cerebral Infarction
- Cerebral and Cerebellar Hemorrhage
- Differential diagnosis of stroke
- Stroke in Children
- Treatment and Prevention of Stroke
- Subarachnoid Hemorrhage

UNIT IV – Trauma **12 Hours**

Chapter 1 - Head Injury

Chapter 2- Spinal Injury

Chapter 3- Intervertebral Discs and Radiculopathy

Chapter 4- Cervical Spondylotic Myelopathy

Chapter 5- Lumbar Spondylosis

Chapter 6- Peripheral and Cranial Nerve Lesions

Chapter 7-Neuropathic Pain and Posttraumatic Pain Syndromes

Chapter 8- Radiation Injury

Chapter 9- Electrical and Lightning Injury

Chapter 10- Decompression Sickness

UNIT V- Disorders of mitochondrial DNA **2 Hours**

Leber Hereditary Optic Neuropathy

UNIT VI- Peripheral Neuropathies **5 Hours**

- General Considerations
- Hereditary Neuropathies
- Acquired Neuropathies

UNIT VII- Disorders of the neuromuscular junction **5 Hours**

- Myasthenia Gravis
- Lambert-Eaton Syndrome
- Botulism

Course Outcome:

After the completion of the course the students will be able

- to Differentiate between neuropathies and myopathies.
- Understand the Management and treatment of different pathological conditions

REFERENCE BOOKS:

1. Houston Merritt H. Textbook of neurology. 9th ed. Philadelphia, PA: Lippincott Williams and Wilkins; 1995
2. Davis M.D. LE, Pirio Richardson M.D. Assistant P S. Fundamentals of neurologic disease. New York, NY: Springer New York; 2015.

ELECTROENCEPHALOGRAPHY

Core : Electroencephalography **No of Hours:** 60 Hours

Credits: 4

Course Objectives:

- To Differentiate between normal EEG and EEG with artifacts.
- To Differentiate between Epileptiform and normal EEG patterns.
- Understand the stimulating procedures in EEG

Course Content:

Unit I: Normal EEG rhythm in awake EEG 10 Hours

- Introduction
- Alpha Rhythm
- MU Rhythm
- Beta Rhythm
- Gamma Rhythm
- Theta Activity
- Delta Activity
- Lambda wave

Unit II: Abnormal EEG rhythm in awake EEG 10 Hours

- Abnormal Background activity
- Abnormal theta rhythm
- Spike, sharp and polyspike activity
- Paroxysmal activity.

Unit III : Sleep and EEG 6 Hours

- Introduction
- Normal sleep patterns in EEG
- Stages of sleep

Unit IV: Artifacts in EEG 5 Hours

- Introduction and characteristics of artifacts

- Types of artifacts
- Physiological and Non-Physiological artifacts

Unit V: Activation Procedures **9 Hours**

- Introduction
- Routinely performed activation procedures
- Eye opening and closure
- Mental alerting
- Hyperventilation
- Intermittent Photic stimulation
- Sleep

Unit VI: Benign Variants of EEG **10 Hours**

- and 6 Hz positive spikes
- Small sharp spikes
- Wicket spikes
- Rhythmic mid temporal theta of drowsiness
- Midline theta rhythm
- Subclinical rhythmic electrographic discharge in adults

Unit VII: EEG and Epilepsy **10 Hours**

- Paroxysmal discharge and seizure diagnosis
- Generalized epilepsies
- Focal epilepsies
- Undetermined epilepsies and epileptic syndromes
- Other EEG abnormalities associated with seizures
- Ictal discharges

Course Outcome:

After completion of this course the students will be able to

- Have a basic understanding on Epileptiform discharges and its recording parameters.
- Knowledge on different patterns seen during recording in EEG.

Recommended Books:

1. Chathurbhuj Rathore, Jagarlapudi M K Murthy, Kurupath Radhakrishnan, EEG in clinical practice, Manipal University Press,2018
2. .Misra UK, Kalita J. Clinical Electroencephalography. 2nd ed. New Delhi, India: Elsevier; 2018.

GENERAL PHARMACOLOGY

Course: Core

Credits: 04 **Number of hours: 60 hours**

Course objectives:

At the end of the program in Pharmacology the student is expected to:

- Know the basics of Pharmacology like, sources of drugs, routes of drug administration and general principles
- Describe the principles of pharmacokinetics and pharmacodynamics
- To appreciate various adverse drug reactions
- To have a basic knowledge of drugs affecting various body systems

COURSE CONTENT:

Unit I: General Pharmacology **8 Hours**

- Introduction to Pharmacology
- Routes of drug Administration
- Absorption & Distribution
- Metabolism
- Excretion
- Pharmacodynamics - Mechanism of drug action- receptors
- Factors modifying drug actions

- Adverse drug reactions

Unit II: Autonomic Nervous System drugs **6 Hours**

- Sympathomimetics
- Alpha blockers
- Beta-blockers
- Cholinomimetics
- Anticholinergics
- Skeletal muscle relaxants

Unit II: Central Nervous System **11 Hours**

- Opioid analgesics
- Non-opioid analgesics (Prostaglandins)
- NSAIDs
- Ethyl alcohol
- Sedative hypnotics
- Antiepileptic drugs
- Local anesthetics-1
- Local anesthetics-2
- General anesthetics- I
- G A – II (PAM)
- CNS stimulants

Unit IV: Cardio Vascular System Drugs **9 Hours**

- Diuretics
- Vasodilators (CCB's, Drugs acting on RAS)
- Antihypertensives
- Antianginal drugs
- Pharmacotherapy of shocks
- Cardiac glycosides
- Cardioplegic drugs
- Antiarrhythmic drugs
- Primary solutions

Unit V: Blood **6 Hours**

- Anemia, erythropoietin
- Anticoagulants
- Anti-platelet drugs
- Fibrinolytics,
- Lipid lowering drugs
- Vit.D and calcium, folic acid, phosphate binders

Unit VI: Endocrines **1 Hour**

- Corticosteroids

Unit VII: Chemotherapy **9 Hours**

- General Principles of Chemotherapy
- Sulfonamides
- Penicillin's
- Cephalosporins
- Broad spectrum antibiotics
- Macrolides
- Aminoglycosides
- Chemotherapy of UTI
- Drug Therapy of Tuberculosis

Unit VIII: Miscellaneous topics **10 Hours**

- Antihistamines
- Antiemetics
- Drugs used in bronchial asthma-1
- Drugs used in bronchial asthma-2
- Cough
- Inhalational gases and emergency drugs
- I V fluids
- Metabolic and electrolyte imbalance

- Immunosuppressants
- Antiseptics and disinfectant

Course Outcomes:

At the end of the course, the students will be able to

- Define and describe the principles of pharmacology and pharmacotherapeutics
- Define absorption, distribution, metabolism and excretion of drugs
- Define, identify and describe the adverse drug reactions
- Define and describe the pharmacological actions and therapeutic uses of drugs affecting systems- autonomic nervous system, cardiovascular system, blood, endocrine etc.
- To have a basic knowledge of drugs used in the treatment of various infections
- To have a basic knowledge on miscellaneous drugs

Recommended Books:

- Uday Kumar P. Textbook of Pharmacology for Dental and Allied Sciences. Jaypee Brothers Publishers; 2008.

NERVE CONDUCTION STUDY

Core: Nerve Conduction study **No of Hours:** 60 Hours

Credits: 4

Course Objectives:

- To learn the different recording techniques in nerve conduction tests.
- To understand the difference between various lesions affecting nervous system.
- To gain knowledge about the pathogenesis affecting the nervous system.

Course Content:

Unit I: Upper Extremity motor and sensory conduction studies 10 Hours

- Median Motor & Sensory conduction study
    - Anatomy
    - Nerve Conduction study of median nerve
    - Clinical conditions
- Ulnar Nerve
    - Anatomy
    - Nerve conduction study
    - Clinical conditions

Unit II: Lower extremity nerve conduction studies 10 Hours

- Peroneal nerve conduction study
    - Anatomy
    - Nerve conduction study
    - Clinical conditions
- Tibial nerve conduction study
    - Anatomy

Unit III: Median Nerve 6 Hours

- Anatomy
- Techniques

Median motor study

Median Palmar study

Median sensory study

- Normal Values
- Clinical Conditions

Unit IV: Ulnar Nerve **7 Hours**

- Anatomy
- Techniques

Ulnar motor study

Ulnar sensory study

Deep ulnar motor branch study (FDI)

Dorsal ulnar cutaneous nerve study

- Values
- Clinical Conditions

❖ Median versus ulnar digit 4 sensory study

❖ Median versus ulnar palmar mixed nerve study

Unit V: Radial Nerve **6 Hours**

- Anatomy
- Techniques

Radial motor study

Radial Palmar study

Radial sensory study

- Normal Values
- Clinical Conditions

Unit VI: Facial Nerve **4 Hours**

- Anatomy
- Techniques
- Values
- Clinical Conditions

Unit VII: Trigeminal Nerve **4 Hours**

- Anatomy
- Techniques
- Values
- Clinical Conditions

Unit VIII: Peroneal Nerve **4 Hours**

- Anatomy
- Techniques
- Values
- Clinical Conditions

Unit IX: Tibial Nerve **6 Hours**

- Anatomy
- Techniques
- Values
- Clinical Conditions
- Medial and lateral plantar nerve conduction

Unit X : Superficial Peroneal **4 Hours**

- Anatomy
- Techniques
- Values
- Clinical Conditions

Unit XI: Sural **4 Hours**

- Anatomy
- Techniques
- Values
- Clinical Conditions

Unit XII: Clinical- electrophysiological correlations: overview and common patterns 15 Hours

- Neuropathic lesions

Axonal loss and demyelination lesions

- Axonal loss lesions

Hyper acute

Acute

Subacute

Chronic

Subacute-chronic

- Demyelinating lesions

Single proximal lesion slowing and conduction block

Single distal lesion slowing and conduction block

Early reinnervation after severe reinnervation

Traumatic demyelination

Neuropraxia, Axonotmesis, Neurotmesis

Wallerian degeneration and regeneration

Course Outcome:

After completion of this course the student will be able to

- Understand the techniques used in stimulating various nerves.
- Understand the correlation between the pathological aspects with neuroelectrophysiology.

Reference Books:

1. Misra U, Kalita J. Clinical neurophysiology
2. Preston D, Shapiro B. Electromyography and neuromuscular disorders. Philadelphia: Elsevier; 2021.

KANNADA

Course: AECC

Credits: 02 **Number of hours: 30 hours**

Course Objectives

- Enable students to learn alphabet, words and simple sentences in Kannada.
- Enable students to enhance speaking and writing communicative skills in Kannada and learn technical words related to medical science

COURSE CONTENT:

Unit I: Kannada Letters (vowels, Consonant)

Unit II: Words, Phrases, formation of sentences, Letter Writing, Essay Writing. Treatment related Kannada words (from English to Kannada)

Unit III:

1) Possible communication in kannada between Patients and Doctors.
2) Advising sentences to the possible questions of patients.
3) Some important sentences which enable to communicate with doctors and colleagues.

Course Outcome

- Allied health science students will be able to attend health issues of native Kannada speaking patients more effectively.
- They can also act as a bridge between doctors and patients.

Recommended Books

- Kannada Vyakarana – (8th ,9th and 10th Karnataka government text books)
- HSK, Vyavarahika Kannada

CLINICAL NEUROSCIENCE TECHNOLOGY I

Course: Core

Credit: 04 **Number of hours: 120 hours**

Course Objectives:

- Up on completion of the course, the student should be able to gain basic practical skill in handling EEG and nerve conduction studies.

- The student will be introduced to EEG and nerve conduction studies and techniques used for treatment.

COURSE CONTENT:

Unit I: Distinguishing normal & abnormal EEG rhythms. **15 Hours**

Unit II : Activities during sleep in EEG **15 Hours**

Unit III: Artifacts arising in EEG & to differentiate between normal rhythms & artifacts **(15 Hours)**

Unit IV: Common activation procedures performed to increase the diagnostic yield of epilepsy. (**15 Hours)**

Unit V: Benign EEG patterns. **15 hours**

Unit VI: EEG activities seen in Epilepsy. **15 Hours**

Unit VII: Common upper extremity nerve conduction studies **15 Hours**

Unit VIII: Common lower extremity nerve conduction studies. **15 Hours**

Course Outcome:

- The student gain basic practical skill in handling the basic Neurodiagnostic procedures.

Recommended Books:

1. Misra UK, Kalita J. Clinical Electroencephalography. 2nd ed. New Delhi, India: Elsevier; 2018.
2. Chathurbhuj Rathore, Jagarlapudi M K Murthy, Kurupath Radhakrishnan, EEG in clinical practice, Manipal University Press,2018
3. Tatum WO, Husain A, Benbadis S, Kaplan PW. Handbook on EEG interpretation. New York, NY: Demos Medical Publishing; 2007

FOURTH SEMESTER

NEUROLOGICAL CONDITIONS& DISORDERS II

Core: Neurological conditions& disorders II **No of Hours:** 60 Hours

Credits: 4

Course Objectives:

- To understand the various autonomic disorders and associated nerves
- To understand the environmental neurology and associated lifestyle disorders.
- To understand the various myopathies and demyelinating diseses.

Course Outcome:

UNIT I -Myopathies **16 Hours**

- Identifying Disorders of the Motor Uni
- Progressive Muscular Dystrophies
- Polymyositis, Inclusion Body Myositis

- Congenital Disorders of Muscle
- Muscle Cramps and Stiffness
- Dermatomyositis

UNIT II-Demyelinating diseases **4 Hours**

- Multiple Sclerosis
- Neuromyelitis Optica

UNIT III-Autonomic disorders **5 Hours**

- Neurogenic Orthostatic Hypotension
- Parkinson's Disease
- Neurogenic causes of Bladder, Bowel and sexual dysfunction

UNIT IV-Paroxysmal Disorders **12 Hours**

- Migraine and Other Headaches
- Epilepsy
- Febrile Seizures
- Neonatal Seizures
- Transient Global Amnesia
- Meniere Syndrome
- sleep disorder

UNIT V- Systemic diseases and general medicine **15 hours**

- Endocrine diseases
- Hematologic and Related Diseases
- Hepatic Disease
- Cerebral Complications of Cardiac Surgery
- Bone Disease
- Renal Disease
- Respiratory Care: Diagnosis and Management
- Nutritional Disorders: Vitamin B12 Deficiency, Malabsorption, and Malnutrition
- Vasculitis Syndromes

- Neurologic Disease During Pregnancy

UNIT VI Environmental neurology **5 Hours**

- Alcoholism
- Complications of Cancer Chemotherapy
- Abuse of Children

UNIT VII - Ethical and legal guidelines **3 Hours**

- End-of-Life Issues in Neurology.

Course Outcome:

After the completion of the course the students will be able to

- Understand the various lifestyle disorders associated to neurology.
- Understand the various systemic diseases.

REFERENCE BOOKS:

1. Houston Merritt H. Textbook of neurology. 9th ed. Philadelphia, PA: Lippincott Williams and Wilkins; 1995.

ADVANCED ELECTROENCEPHALOGRAPHY I

Core: Advanced Electroencephalography I **No of Hours:** 60 Hours

Credits: 4

Course Objectives:

- To understand the various epileptiform patterns associated to certain regions of brain.
- To understand various techniques used in EEG
- Gain knowledge on encephalopathic changes associated with EEG

Course Content:

Unit I: Focal epileptiform patterns in Adult Epilepsies

Introduction

Definition and classification of Inter ictal epileptiform discharge

Epileptiform discharges by location

- Temporal lobe epilepsy
- Frontal lobe epilepsy
- Parietal lobe epilepsy
- Occipital lobe epilepsy

Unit II: Non- Epileptiform EEG abnormalities

Introduction

Slow waves

Continuous polymorphic delta activity

Temporal lobe slow wave activity

Generalized synchronous slow wave activity

Generalized/regional bisynchronous slow waves

Amplitude abnormalities

Generalized increase in selected EEG features

Unit III: Techniques for long term EEG recording

- Video EEG
- Ambulatory EEG
- ICU recordings

Unit IV: Pathological changes in brain detected in EEG

- EEG in metabolic disease of cerebrum
- EEG in CNS infections
- EEG in head trauma, strokes, tumors
- EEG in Dementia and Degenerative diseases
- EEG in coma and brain death
- Role of EEG in presurgical of epilepsy

Unit V: Magnetoencephalography

- Magnetic field generation
- Neuroanatomy of detectable magnetic fields
- Sensors used in MEG
- Advantages and Applications

Course Outcome:

After completion of this course the students will be able to

- Gain knowledge on the recording of EEG in various settings
- Understand the patterns seen in EEG

Recommended Books:

4. Chathurbhuj Rathore, Jagarlapudi M K Murthy, Kurupath Radhakrishnan, EEG in clinical practice, Manipal University Press,2018
5. .Misra UK, Kalita J. Clinical Electroencephalography. 2nd ed. New Delhi, India: Elsevier; 2018

ADVANCED NERVE CONDCUTION STUDY I

Core: Advanced Nerve Conduction study I **No of Hours:** 60 Hours

Credits: 4

Course Objectives:

- To understand the proximal regions associated pathogenesis.
- To learn the conduction studies of the different nerve entrapment neuropathies.
- To understand the various radiculopathies associated to various regions of spinal cord.

Course Content

Unit I: Brachial Plexus **12 Hours**

Anatomy

Median

Ulnar

Radial

Axillary

Musculocutaneous

Etiology

Traumatic brachial plexopathy

Neoplasm and other mass lesions

Neuralgic amyotrophy

Post-operative brachial plexopathy

Delayed radiation injury

Thoracic outlet syndrome

Electrophysiological evaluation and nerve conduction studies

Unit II: Proximal neuropathies of shoulder and arm **6 Hours**

Suprascapular neuropathy

Axillary neuropathy

Musculocutaneous neuropathy

Long thoracic neuropathy

Spinal accessory neuropathy

Unit III: Median neuropathy at wrist (Carpal tunnel syndrome) 10 Hours

- Anatomy of median nerve
- Carpal tunnel syndrome
- Etiology
- Clinical symptoms and signs
- Differential diagnosis
- Electrophysiological evaluation
- Nerve conduction study
- Median-Versus-Ulnar Comparison Studies,
- Median- Versus-Ulnar Palm-to-Wrist Mixed Nerve Studies
- Proximal median neuropathies
- Anatomy of antecubital fossae
- Etiology
- Traumatic lesions
- Entrapment syndromes
- Ligament of Struthers entrapment
- Pronator syndrome
- Anterior interosseus syndrome
- Electrophysiological evaluations and nerve conduction studies

Unit IV: Ulnar neuropathy at elbow 8 Hours

- Anatomy and detailed anatomy of elbow
- Etiology, clinical and differential diagnosis
- Electrophysiological evaluations and nerve conduction studies

Unit V: Ulnar neuropathy at wrist 4 Hours

- Anatomy
- Etiology, clinical and differential diagnosis
- Electrophysiological evaluations and nerve conduction studies

Unit VI: Radial Nerve 10 Hours

- Anatomy
- Clinical
- Radial neuropathy at spiral groove
- Radial neuropathy in axilla
- Posterior interosseus neuropathy
- Superficial Radial sensory neuropathy
- Differential diagnosis
- Electrophysiological evaluation and nerve conduction study

Unit VII: Cervical radiculopathy **10 Hours**

- Radiculopathy- introduction
- Clinical, etiology and differential diagnosis.
- Electrophysiological evaluation
- Criteria of radiculopathy
- L5-S1 Radiculopathy
- Cervical
- Cervical spondylosis
- S1-S2
- Spinal cord Compression
- Lumbar disc prolapsed
- Spinal cord injury

Course Outcome:

After completion of the course the student will be able to

- Understand the difference between neuropathies and radiculopathies
- Gain knowledge on performing nerve conduction study on different entrapment syndromes.

Reference:

1. Misra U, Kalita J. Clinical neurophysiology
2. Preston D, Shapiro B. Electromyography and neuromuscular disorders. Philadelphia: Elsevier; 2021.

CLINICAL NEUROSCIENCE TECHNOLOGY II

Course: Core

Credit: 04 **Number of hours: 120 hours**

Course Objectives:

- Up on completion of the course, the student should be able to gain basic practical skill in handling the neurodiagnostic procedures.

- The student will be introduced to, equipment, and techniques used for treatment.

COURSE CONTENT:

Unit 1: EEG & Epilepsy- Patterns of EEG in adult Epilepsy. (5 hours)
Unit 2: Long term video EEG recording & monitoring (10 hour)
Unit 3: Encephalopathic conditions & patterns of EEG in encephalopathy (10 hours)
Unit 4: Magnetic electroencephalography (10 hours)
Unit 5: Advanced Nerve conduction studies (10 hours)

Course Outcome:

- The student gains basic practical skill in handling the advanced basic neurodiagnostic procedures.

Recommended Books:

1. Misra UK, Kalita J. Clinical Electroencephalography. 2nd ed. New Delhi, India: Elsevier; 2018.
2. Chathurbhuj Rathore, Jagarlapudi M K Murthy, Kurupath Radhakrishnan, EEG in clinical practice, Manipal University Press,2018
3. Tatum WO, Husain A, Benbadis S, Kaplan PW. Handbook on EEG interpretation. New York, NY: Demos Medical Publishing; 2007

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HUMAN RIGHTS AND GENDER EQUITY

Course: AECC **Number of Hours: 30 Hours**

Credits: 02

Course Objectives:

- To make the student understand the human rights as citizens of India.

COURSE CONTENT:

Unit I: Human Rights **5 Hours**

- Human Rights- Meaning
- Universal declaration of Human rights

Unit II: Human Rights Advocacy **5 Hours**

- Global Advocacy of human rights amnesty international and other organizations
- Peoples union for Civil Liberty (PUCL)
- Human Rights Commission in India
- Minority Commission in India
- Remedies against Violation of Human rights in India

Unit III : Gender Equity **5 Hours**

- Key Concepts- Gender and sex- Masculinity and Feminity, Partriarchy- Matriarchy, Gender roles and attributes, Gender division or labour, Gender Bias, Gender Stereotypes, Need for Gender Sensitization.

Unit IV: Woman Status in India **5 Hours**

- Important indicators- Six Ratio, Education, Health, Nutrition, Material and Infant Mortality, Work Participation rate, Political Participation.

Unit V: Contemporary Women's Issues **5 Hours**

- Discrimination against Girl child
- Violence against women
- Problems of health and nutrition
- Women's education gender bias in education

- Trafficking in Women
- Globalization and Impact on Women

Unit VI: State Initiatives on Gender Issues **5 Hours**

- Constitutional Rights of Women
- Laws Pertaining to Women
- The National Commission for Women

Course Outcome:

- Basic Knowledge of Human Rights and its function and authorities in society and industry women's status, issues and gender equity.

Recommended Books:

1. Parvathy Appaiah,Human Rights, Gender Equity and Environmental Studies, Shivam Books publishers, 2012.
2. Parvathy Appaiah,Human Rights, Gender Equity and Environmental Studies, Jai Bharath Prakashan publishers, 2016.
3. Parvathy Appaiah,Human Rights, Gender Equity and Environmental Studies, Jai Bharath Prakashan publishers, 2018-19.

BIOSTATISTICS

Course: AECC

Credit: 02 **Number of Hours: 30 Hours**

Course Objectives:

- Understands statistical terms.
- Possesses knowledge and skill in the use of basic statistical methods.

COURSE CONTENT:

Unit I: Introduction **3 hours**

- Meaning, definition of statistics.
- Importance of the study of statistics.
- Branches of statistics.
- Statistics and health science including nursing.
- Parameters and estimates.
- Descriptive and inferential statistics.
- Variables and their types.
- Measurement scales

Unit II : Tabulation of Data **3 hours**

- Raw data, the array, frequency distribution
- Basic principles of graphical representation
- Types of diagrams - histograms, frequency polygons, smooth frequency polygon, commulative frequency curve, ogive.
- Normal probability curve.

Unit III: Measure of Central Tendency **4 hours**

- Need for measures of central tendency

- Definition and calculation of mean - ungrouped and grouped
- Meaning, interpretation and calculation of median ungrouped and grouped
- Meaning and calculation of mode.
- Comparison of the mean, and mode.

Unit IV: Measure of Variability 6 hours

- Need for measure of dispersion. The range, the average deviation.
- The variance and standard deviation.
- Calculation of variance and standard deviation ungrouped and grouped.
- Properties and uses of variance

Unit V : Probability and Standard Distributions 6 hours

- Meaning of probability of standard distribution.
- The Binominal distribution.
- The normal distribution.
- Divergence from normality - skewness, kurtosis.

Unit VI: Sampling Techniques 5 hours

- Need for sampling - Criteria for good samples.
- Various sampling designs.
- Procedures of sampling and sampling designs errors.
- Sampling variation.
- Tests of significance.

Unit VII: Health Indicator 3 hours

- Importance of health Indicator.
- Indicators of population, morbidity, mortality, health services.
- Calculation of rates and rations of health.

Course Outcomes

- Gains Knowledge in application of statistics in medical field and research.
- Possesses knowledge and skill in the use of basic statistical methods.

Recommended Books.

1. Mahajan BK, Gupta MC. Textbook of preventive and social medicine. Jaypee Brothers; 1995.

FIFTH SEMESTER

ADVANCED ELECTROENCEPHALOGRAPHY II

Core: Advanced Electroencephalography II **No of Hours:** 60 Hours

Credits: 4

Course Objectives:

- To understand the various encephalopathies occurring during childhood
- To understand the interpretation of EEG during sleep and awake patients.
- To understand the EEG changes in infants to adolescents

Course Content

Unit I:EEG in obstetrics disorders **12 Hours**

- Effects of Pregnancy on Epilepsy
- Metabolic Changes
- Stress & anxiety
- Preclampsia &Eclampsia
- Stroke related to Pregnancy

- Status Epilepticus in pregnancy

Unit II: Interpretation of Neonatal EEG(Ontogeny) **12 Hours**

- Introduction
- Technical aspects of neonatal EEG recording
- Polygraphy
- Premature EEG and its maturation
- Behavioural states and sleep-wake cycles during maturation
- Common cerebral pathologies and abnormalities encountered in preterm EEG
- EEG in term neonates
- Continuous EEG monitoring in neonates.

Unit III: Normal EEG during wakefulness and sleep in infancy and childhood. **12 Hours**

- Introduction
- Maturation of EEG
- Patterns during wakefulness
- Patterns during sleep
- Clinical EEG in Seizures and Epilepsies in preterm and term neonates
- Clinical EEG in seizures and epilepsies in infants to adolescents

Unit IV: Focal Epileptiform patterns in childhood epilepsies **12 Hours**

- Introduction
- Idiopathic focal epilepsy syndrome
- Benign childhood epilepsy with Centro-temporal spikes
- Idiopathic childhood occipital epilepsy of gastaut
- Temporal lobe epilepsies
- Frontal lobe epilepsies
- Posterior cortex epilepsies
- Hemispheric and multilobar epilepsies

Unit V: EEG findings in epileptic encephalopathies **12 Hours**

- Neonatal/infantile onset epileptic encephalopathy syndromes
- Early myoclonic encephalopathy
- West syndrome
- Severe myoclonic epilepsy of infancy
- Childhood onset epileptic encephalopathy syndrome
- Lenox-Gastaut syndrome

Course Outcome:

After the completion of the course the students will be able to

- Interpret the EEG abnormalities during the record.
- Understand the EEG activities during pregnancy.
- Understand the various stages of the maturation of EEG.

Recommended Books:

1. Chathurbhuj Rathore, Jagarlapudi M K Murthy, Kurupath Radhakrishnan, EEG in clinical practice, Manipal University Press,2018
2. .Misra UK, Kalita J. Clinical Electroencephalography. 2nd ed. New Delhi, India: Elsevier; 2018.

ADVANCED NERVE CONDUCTION STUDY II

Core: Advanced nerve conduction study II **No of Hours:** 60 Hours

Credits: 4

Course Objectives:

- To understand the plexus and its associated nerves.
- Neuropathies associated to the plexus of nerves.
- Gain knowledge on the entrapment neuropathies.

Course Content:

Unit I: Lumbar Plexus **15 Hours**

- Anatomy- Lumbar plexus nerve
- Femoral
- Saphenous
- Obturator
- Iliohypogastric and Ilioinguinal Nerves
- Genitofemoral nerve
- Lateral femoral cutaneous nerve
- Anatomy-Lower lumbosacral plexus nerve
- Sciatic
- Posterior cutaneous nerve of thigh
- Common Peroneal
- superficial Peroneal
- Sural
- Tibial
- Common lumbosacral plexopathies
- Electrophysiological evaluations

Unit II: Tarsal tunnel syndrome **8 Hours**

- Anatomy

- Etiology, clinical and differential diagnosis
- Electrophysiological evaluations and nerve conduction study.

Unit III: Sciatic Neuropathy **8 Hours**

- Anatomy
- Clinical and etiology
- Electrophysiological evaluations and nerve conduction studies.

Unit IV: Blink Reflex **8 Hours**

- Anatomy
- Blink reflex procedure
- Patterns of abnormalities

Unit V : Facial and Trigeminal neuropathy **6 Hours**

- Anatomy
- Clinical conditions and differential diagnosis
- Electrophysiological evaluations and nerve conduction study.

Unit VI: Repetitive nerve stimulation. **15 Hours**

- Introduction
- NMJ Physiology
- Variables influencing NMJ transmission
- Technique of RNS
- Measurement
- Interpretation of RNS
- Physiological modelling of RNS
- Modelling slow and rapid RNS

- Exercise testing
- Clinical application of RNS Study
- Technical factors in RNS

Course Outcome:

After the completion of the course the students will be able to :

- Perform the Repetitive nerve stimulation study on patients.
- Understand the root lesions and its associated nerves

Recommended Books:

1. Misra U, Kalita J. Clinical neurophysiology
2. Preston D, Shapiro B. Electromyography and neuromuscular disorders. Philadelphia: Elsevier; 2021.

AN INTRODUCTION TO ELECTROMYOGRAPHY

Core: An introduction to electromyography **No of Hours:** 60 Hours

Credits: 4

Course Objectives:

- To understand the principles of EMG.
- To understand the various recording techniques used in EMG.
- To understand the electrodes used in EMG.

Course Content:

Unit I: Introduction to Electromyography **8 Hours**

- Anatomy of muscle
- Types of EMG needle electrodes
- Recording techniques

Unit II: Technique of Electromyography: Muscles of Upper Limb **14 Hours**

- Muscles of Hands
- Muscles of forearm
- Muscle of arm
- Muscles of shoulder girdle and trunk

Unit III: Techniques of Electromyography: Muscles of Lower limb **13 Hours**

- Muscle of the foot
- Muscles of leg
- Muscles of thigh
- Muscles of pelvic girdle
- Muscles of face, Head and neck

Unit IV: Principles of Electromyography **25 Hours**

- Recording techniques
- Insertional & spontaneous activity
- Motor units
- Polyphasic
- Jitter and blocking
- SEMG
- QEMG
- Fasciculations and fibrillations
- Macro EMG
- Qualitative Electromyography
- Motor Unit action potential
- Interference Pattern
- Normal and abnormal patterns
- Endplate potentials
- MUP
- Localization techniques
- Neurogenic and myopathic patterns

Course Outcome:

After the completion of the course the students will be able to

- Perform the techniques used for recording the EMG.
- Understand the various myopathic changes during recording of the EMG clinically.

Reference:

1. Preston D, Shapiro B. Electromyography and neuromuscular disorders. Philadelphia: Elsevier; 2021.
2. Misra U, Kalita J. Clinical neurophysiology

CLINICAL NEUROSCIENCE TECHNOLOGY III

Course: Core

Credit: 04 **Number of hours: 120 hours**

Course Objectives:

- Up on completion of the course, the student should be able to gain basic practical skill in handling the neurodiagnostic procedures.

- The student will be introduced to, equipment, and techniques used for treatment

Course Content:

Unit I: EEG activities during pregnancy 15 Hours

Unit II: Neonatal EEG monitoring 15 Hours

Unit III: EEG changes in Epilepsy in neonates 15 Hours

Unit IV: EEG changes in encephalopathy in neonates 15 Hours

Unit V: Upper & Lower extremity nerve conduction studies 15 Hours

Unit VI: Repetitive nerve stimulation 15 Hours

Unit VII: Facial and trigeminal nerve conduction studies & Blink reflex. 15 Hours

Unit VIII: Principles, Technique & Electrodes in Electromyography. 15 Hours

Course Outcome:

- The student gains basic practical skill in handling the advanced basic neurodiagnostic procedures.

Recommended Books:

4. Misra UK, Kalita J. Clinical Electroencephalography. 2nd ed. New Delhi, India: Elsevier; 2018.
5. Chathurbhuj Rathore, Jagarlapudi M K Murthy, Kurupath Radhakrishnan, EEG in clinical practice, Manipal University Press,2018
6. Tatum WO, Husain A, Benbadis S, Kaplan PW. Handbook on EEG interpretation. New York, NY: Demos Medical Publishing; 2007

SIXTH SEMESTER

NERVE CONDUCTION STUDY & IONM

Core: Nerve conduction study & IONM

No of Hours: 60 Hours

Credits: 4

Course Objectives:

- To be able to discuss in detail about special techniques in nerve conduction study including autonomic function testes.
- To be able to assist neurosurgeons in Intra operative neuro monitoring procedures.
- To be able to perform IONM procedures by eliminating artifacts and obtaining a proper recording.

Course Content:

Intra Operative Neuro Monitoring

Unit I: Introduction to the operating room **12 Hours**

- Aseptic technique
- Sterilization methods
- Operating room attire
- Preparation
- Safety
- Personal protective equipment
- Etiquette and protocol
- Documentation

Unit II: Basic neurophysiologic intraoperative monitoring **12 Hours**

- Free running EMG and motor nerve studies

- Anatomy and physiology
- Characterization and interpretation
- Motor nerve conduction studies

Unit III: Remote Monitoring **12 Hours**

- Background
- Remote connection issues
- Remote NIOM review resolutions

Unit IV: Anesthetic considerations **12 Hours**

- Principles of anesthesia
- Non pharmacological factors
- Effects of specific anasthetic agents
- Anesthetic technique

Unit V: Clinical methods **12 Hours**

- Vertebral column surgery
- Spinal cord surgery
- Lumbosacral surgery
- Peripheral nerve surgery
- Cerebellopontine angle surgery
- Thoracic aortic surgery
- Carotid surgery
- Epilepsy surgery
- Instrumentation for intraoperative monitoring (IONM)
- Precautions to be taken during IONM
- Electrode placement, Stimulation parameters for the recording, brachial plexus, dorsal column, cranial nerves, peripheral nerves and brain stem nuclei
- Somatosensory evoked potentials for aneurysm surgery, spinal cord surgery

Course Outcome:

After the completion of the course the students will be able to

- Understand the concepts of various Intraoperative techniques in patients.
- Understand the surgical outcomes while performing various surgeries in the regions of spinal cord.

Recommended Books:

1. Preston D, Shapiro B. Electromyography and neuromuscular disorders. Philadelphia: Elsevier; 2021.
2. A Practical Approach to Neurophysiologic Intraoperative Monitoring Edited by Aatif M. Husain, MD Department of Medicine (Neurology) Duke University Medical Cent

EVOKED POTENTIALS

Core: Evoked Potentials **No of Hours:** 60 Hours

Credits: 4

Course Objectives:

- To understand the various types of Evoked potentials tests performed in laboratory.
- To understand the instrumentation parameters while recording of Evoked potentials.

Course Content:

Unit I: Evoked potentials 5 Hours

- Definition
- Principles of averaging/recording techniques
- Instrumentation
- Signal to noise ratio
- Frequency response
- Internal noise

Unit II: Brainstem Auditory Evoked Potentials 8 Hours

- Introduction
- Patient preparation
- Factors affecting

- Auditory pathway
- Normal values and waveform limitations
- Clinical conditions

Unit III: Brainstem auditory evoked potential in pediatric 5 Hours

- Practice
- Methodological considerations
- Maturation of BAEP
- Clinical application of BAEP in Pediatrics

Unit IV: Visual Evoked Potential 6 Hours

- Introduction
- Patient preparation
- Factors affecting
- Visual pathway
- Normal values and waveform limitations
- Clinical conditions

Unit V: Visual Evoked Potential in pediatric practice 5 Hours

- Methodology
- Maturation of VEP
- Measurement of VEP
- Clinical Applications

Unit VII: Somato Sensory Evoked potentials 10 Hours

- Anatomical and Physiological Basis of SSEP
- Median SSEP
- Tibial SSEP
- Reproducibility of SEP
- Patient Related Factors
- Clinical Applications of SSEP
- Surgical Monitoring

Unit VII: Somatosensory evoked potential in pediatric 5 Hours

- Practice
- Methodological considerations
- Maturational Changes
- Clinical Applications

Unit VIII: Motor Evoked Potential 10 Hours

- Anatomy & Physiology of Corticospinal tract
- Physiological basis of Motor Evoked Potential
- Methods of Motor Evoked Potentials
- Comparison of electrical and magnetic stimulation
- Clinical Applications

Unit IX: Cognitive Evoked Potential 6 Hours

- P3
- Waveform identification & Measurement
- Variables affecting P3
- Generators of P3
- Clinical applications

Course Outcome:

After the completion of the course the students will be able to

- Perform various Evoked potential l tests in neuro electrophysiology lab.
- Gain knowledge on the instrumentation parameters used while recording the Evoked potentials.

Recommended Books:

1. Misra U, Kalita J. Clinical neurophysiology
2. Preston D, Shapiro B. Electromyography and neuromuscular disorders. Philadelphia: Elsevier; 2021

POLYSOMNOGRAPHY & AUTONOMIC LAB

Core: Polysomnography & Autonomic lab **No of Hours:** 60 Hours

Credits: 4

Course Objectives:

- To understand the different sleep related disorders.
- To gain knowledge on the various sleep patterns and the stages associated to it.
- To understand the various sleep changes associated in children.

Course Content:

Unit I: Sleep medicine and polysomnography 15 Hours

- Anatomy of sleep
- Medical disorders of sleep
- Insomnia
- Obstructive sleep apnea
- Central sleep apnea
- Mixed apnea
- Hypopnea
- sleep disorders in elderly
- Narcolepsy and related disorders
- REM sleep disorders
- RERA
- AHI
- CPAP
- BiPAP

Unit II: Stages of sleep & sleep Patterns 10 Hours

- Stages of Sleep
- Waveforms

- K complex
- POST
- Sleep spindles
- VST

Unit III: Polysomnography **10 Hours**

- Introduction
- Normal adult PSG
- Sleep center environment
- Recording parameters
- Audio and video recording
- Biocaliberations

- ❖ Multiple sleep latency test
- ❖ PLMS & RLS

Unit IV: Paediatric PSG **15 Hours**

- Introduction
- Diseases
- Apnea
- OSA
- Gastroeasophageal reflex
- Nocturnal Seizures
- PLMD (Periodic Limb movement disorders)
- SIDS
- Sleep center environment
- Recording parameters
- Capnography
- Audio and video recording
- Paediatric montages
- Biocaliberations.

Unit V: Autonomic Nervous system Testing **10 Hours**

- Anatomical & Functional Basis
- Autonomic Function Tests
- Sympathetic skin response
- R – R analysis
- Valsalva maneuver
- Tilt table
- Heart rate variability

Course Outcome:

After the completion of the course the students will be able to

- Interpret the EEG changes associated during sleep.
- To perform the Polysomnography on patients with sleep or respiratory related problems.

Recommended Books:

1. Chathurbhuj Rathore, Jagarlapudi M K Murthy, Kurupath Radhakrishnan, EEG in clinical practice, Manipal University Press,2018

2. Misra UK, Kalita J. Clinical Electroencephalography. 2nd ed. New Delhi, India: Elsevier; 2018.

ADVANCED ELECTROMYOGRAPHY

Core: Advanced Electromyography **No of Hours:** 60 Hours

Credits: 4

Course Objectives:

- To gain knowledge on the disorders affecting the neuromuscular junctions.
- To understand the Electromyography in paediatrics.
- To gain knowledge on Electromyography performed in ICU settings.

Course Content:

Unit I: Single Fiber Electromyography

- Introduction
- Methods of SFEMG
- SFEMG in Neurologic disease
- Neuromuscular **Transmission** Disorders
- SFEMG in Neurogenic Disorders
- SFEMG in Myopathies
- Macro- EMG

Unit II: Disorders affecting NMJ junction

- ALS
- Myopathy
- Myotonia
- Dystonia
- Muscular dystrophies
- DMD
- Polymyositis
- Anterior Poliomyelitis
- Willson disease
- Deep tendon reflex

Unit III: Myopathy

- Introduction
- Clinical
- Electrophysiological evaluations- Electromyographic approach
- Clinical and electrophysiological patterns in selected myopathies
- Myotonic muscle disorders and periodic paralysis syndromes
- Muscle cooling
- Dystrophic myotonic muscle disorders
- Nondystrophic myotonic muscle disorders and periodic paralysis syndromes
- Other conditions associated with myotonia

Unit IV: Electromyography in special clinical discharges

- Approach to Electrodiagnostic studies in ICU
- Introduction
- Differential diagnosis of neurological weakness in ICU
- Electrodiagnostic patterns in ICU
- Nerve conduction and electromyographic protocol in ICU setting.

Unit V: Approach to paediatric electromyography

- Neuromuscular diagnosis in children
- Maturation issues
- Technical issues
- Patient safety in EMG

Course Outcome:

After the completion of the course the students will be able to

- Perform Electromyography studies in ICU settings.
- Interpret the instrumentational settings used while performing EMG.

Recommended Books:

1. Preston D, Shapiro B. Electromyography and neuromuscular disorders. Philadelphia: Elsevier; 2021.
2. Misra U, Kalita J. Clinical neurophysiology

CLINICAL NEUROSCIENCE TECHNOLOGY IV

Course: Core

Credit: 04 **Number of hours: 120 hours**

Course Objectives:

- Up on completion of the course, the student should be able to gain basic practical skill in handling the neurodiagnostic procedures.
- The student will be introduced to, equipment, and techniques used for treatment

Course Content:

Unit I: Special Techniques in Nerve conduction study including Autonomic Function tests.. (15 Hours)

Unit II: Conducting Intra operative neuro monitoring procedures by eliminating artifacts and obtaining a proper recording. (15 Hours)

Unit III: Evoked Potentials & its Instrumentation and procedure. (15 Hours)

Unit IV: Polysomnographic studies (15 Hours)

Unit V: Sleep activities during polysomnographic studies (15 Hours)

Unit VI: Polysomnographic studies In Children. (15 Hours)

Unit VII: Electromyography in Children (15 Hours)

Unit VIII: Electromyography in ICU setting. (15 Hours)

Course Outcome:

- The student gains basic practical skill in handling the advanced basic neurodiagnostic procedures.

Recommended Books:

7. Misra UK, Kalita J. Clinical Electroencephalography. 2nd ed. New Delhi, India: Elsevier; 2018.
8. Chathurbhuj Rathore, Jagarlapudi M K Murthy, Kurupath Radhakrishnan, EEG in clinical practice, Manipal University Press,2018
9. Tatum WO, Husain A, Benbadis S, Kaplan PW. Handbook on EEG interpretation. New York, NY: Demos Medical Publishing; 2007

INTERNSHIP (SEMESTER VII &VIII)

The internship time period provides the students the opportunity to continue to develop confidence and increased skill in diagnosis and management. Students will demonstrate competence in beginning, intermediate, and advanced procedures in above areas. Students will participate in advanced and specialized treatment procedures. The student will complete the clinical training by practicing all the skills learned in classroom and clinical instruction. The students are expected to work for minimum 6 hours per day and this may be more depending on the need and the healthcare setting.