

PONDICHERRY UNIVERSITY

SALIENT FEATURES OF POSTGRADUATE MEDICAL EDUCATION (AMENDMENT) REGULATIONS, 2008

1. SHORT TITLE AND COMMENCEMENT:-

1. These regulations may be called "The Postgraduate Medical Education Regulations 2008".
2. They shall come into force from the current year.

2. GENERAL CONDITIONS TO BE OBSERVED BY POSTGRADUATE TEACHING INSTITUTIONS:

- i. Postgraduate Medical Education in broad specialities shall be of three years duration in the case of degree course and two years in the case of Diploma course after MBBS and in the case of super specialities the duration shall be of three years after MD/MS.
- ii. Postgraduate curriculum shall be competency based.
- iii. Learning in postgraduate programme shall be essentially autonomous and self directed.
- iv. A combination of both formative and summative assessment is vital for the successful completion of the PG programme.
- v. A modular approach to the course curriculum is essential for achieving a systematic exposure to the various areas concerned with the discipline.
- vi. The training of PG students shall involve learning experience 'derived from' or 'targeted to' the needs of the community. It shall, therefore, be necessary to expose the students to community based activities.

3. GOALS AND GENERAL OBJECTIVES OF POSTGRADUATE MEDICAL EDUCATION PROGRAMME TO BE OBSERVED BY POSTGRADUATE TEACHING INSTITUTION.

3.1 GOAL

The goal of postgraduate medical education shall be to produce competent specialists and/or Medical teachers.

- i. who shall recognize the health needs of the community, and carry out professional obligations ethically and in keeping with the objectives of the national health policy
- ii. who shall have mastered most of the competencies, pertaining to the speciality, that are required to be practiced at the secondary and the tertiary levels of the health care delivery system;
- iii. who shall be aware of the contemporary advance and developments in the discipline concerned;
- iv. who shall have acquired a spirit of scientific inquiry and is oriented to the principles of research methodology and epidemiology; and
- v. who shall have acquired the basic skills in teaching of the medical and paramedical professionals;

3.2 GENERAL OBJECTIVES OF POST-GRADUATE TRAINING EXPECTED FROM STUDENTS AT THE END OF POST-GRADUATE TRAINING

At the end of the postgraduate training in the discipline concerned the student shall be able to;

- i. Recognize the importance to the concerned speciality in the context of the health needs of the community and the national priorities in the health section.
- ii. Practice the speciality concerned ethically and in step with the principles of primary health care.
- iii. Demonstrate sufficient understanding of the basic sciences relevant to the concerned speciality.
- iv. Identify social, economic, environmental, biological and emotional determinants of health in a given case, and take them into account while planning therapeutic, rehabilitative, preventive and primitive measure/strategies.
- v. Diagnose and manage majority of the conditions in the speciality concerned on the basis of clinical assessment, and appropriately selected and conducted investigations.
- vi. Plan and advise measures for the prevention and rehabilitation of patients suffering from disease and disability related to the speciality.
- vii. Demonstrate skills in documentation of individual case details as well as morbidity and mortality rate relevant to the assigned situation.
- viii. Demonstrate empathy and humane approach towards patients and their families and exhibit interpersonal behaviour in accordance with the societal norms and expectations.
- ix. Play the assigned role in the implementation of national health programme, effectively and responsibly.
- x. Organize and supervise the chosen/assigned health care services demonstrating adequate managerial skills in the clinic/hospital or the field situation.
- xi. Develop skills as a self-directed learner, recognize continuing education needs; select and use appropriate learning resources.
- xii. Demonstrate competence in basic concepts of research methodology and epidemiology, and be able to critically analyze relevant published research literature.
- xiii. Develop skills in using educational methods and techniques as applicable to the teaching of medical/nursing students, general physicians and paramedical health workers.
- xiv. Function as an effective leader of a health team engaged in health care, research or training.

4. STATEMENT OF THE COMPETENCIES :

Keeping in view the general objectives of postgraduate training, each discipline shall aim at development of specific competencies which shall be defined and spelt out in clear terms. Each department shall produce a statement and bring it to the notice of the trainees in the beginning of the programme so that he or she can direct the efforts towards the attainment of these competencies.

5. COMPONENTS OF THE POSTGRADUATE CURRICULUM :

The major components of the Postgraduate curriculum shall be:

- Theoretical knowledge
- Practical and clinical skills
- Writing Thesis / Research articles
- Attitudes including communication skills.
- Training in Research Methodology, Medical Ethics and Medicolegal aspects.

6. STARTING OF POSTGRADUATE MEDICAL COURSES AND THEIR RECOGNITION.

(1) An institution intending to start a Postgraduate Medical Education course or to increase the admission capacity shall obtain permission of the Central Government under Section 10A of the Act.

(2) The institution shall apply for recognition of the Postgraduate medical qualification to the Central Government through the affiliating university.

7. NOMENCLATURE OF POSTGRADUATE COURSES.

The nomenclature of postgraduate medical courses shall be as provided in the Schedule annexed to these Regulation :

Provided that in the case of postgraduate medical degree and diploma courses instituted prior to the commencement of these Regulations with the approval of the Medical Council of India and which have not been included in these regulations, the institutions concerned shall continue such course till the students admitted complete the said courses.

8. GENERAL

(1) The institutions recognised by the Medical Council of India for running Postgraduate courses prior to the commencement of the Indian Medical Council (Amendment) Act, 1993 and those medical colleges recognised for running Bachelor of Medicine and Bachelor of Surgery (MBBS) course or institutions established by the Central Government for the purpose of imparting postgraduate medical education shall be eligible for starting any postgraduate degree or diploma and higher specialty course.

(1A) The Central Government shall exempt any such existing/proposed non-teaching institutions or specialist institution or autonomous body owned and managed by the Central Government/State Government from fulfilling the prescribed provision of having an undergraduate teaching facility, and allow starting Postgraduate medical course.

(2) The maximum number of students for a postgraduate medical course, who can be registered in any recognised department, for training for the award of postgraduate degree or diploma by the affiliating university, shall be determined by the facilities available in the department in terms of infrastructure, teaching staff and clinical teaching material.

(3) Every student, selected for admission to a Post Graduate medical course in any of the medical institutions on acquiring MBBS Degree or an equivalent qualification thereto shall have obtained permanent registration with the Medical Council of India, or any of the State Medical Council(s) or should obtain the same within a period of one month from the date of his / her admission, failing which his / her admission shall stand cancelled;

Provided that in the case of a foreign national, the Medical Council of India may, on payment of the prescribed fee for registration, grant temporary Registration for the duration of the postgraduate course limited to the Medical College / Institution to which he / she is admitted for the time being exclusively for pursuing the Post Graduate studies; Provided further that temporary registration to such foreign national shall be subject to the condition that such person is duly registered with appropriate registering authority in his own

country wherefrom he has obtained his Basic Medical qualification and is duly recognized by the corresponding Medical Council or concerned authority.

(4) The students undergoing postgraduate courses shall be exposed to the following:-

- a. Basics of statistics to understand and critically evaluate published research paper.
- b. Exposure to Human Behavior studies.

9. SELECTION OF POSTGRADUATE STUDENTS.

1. Students for Postgraduate medical courses shall be selected strictly on the basis of their academic merit.
2. For determining the academic merit, the university/institution may adopt any one of the following procedures both for degree and diploma courses :-
 - i. On the basis of merit as determined by the competitive test conducted by the State Government or by the competent authority appointed by the State Government or by the university/group of universities in the same state; or
 - ii. On the basis of merit as determined by a centralized competitive test held at the national level; or
 - iii. On the basis of the individual cumulative performance at the first, second and their MBBS examination, if such examination have been passed from the same university; or
 - iv. Combination of (i) and (iii):

Provided that wherever entrance test for Postgraduate admission is held by the State Government or a university or any other authorized examining body, the minimum percentage of marks for eligibility for admission to postgraduate medical courses shall be fifty per cent for general category candidates and 40 per cent for the candidate belonging to Scheduled Castes, Scheduled Tribes and Other Backward classes.

Provided further that in non-Governmental institutions fifty percent of the total seats shall be filled by the competent authority and the remaining fifty per cent by the management of the institution on the basis of merit.

10. PERIOD OF TRAINING

The period of training for the award of various postgraduate degrees or diplomas shall be as follows:

(1) Doctor of Medicine (M.D.) / Master of Surgery (M.S.)

The period of training for obtaining these degrees shall be three completed years including the period of examination.

Provided that in the case of students possessing a recognised two year postgraduate diploma course in the same subject, the period of training, including the period of examination, shall be two years.

(2) Doctor of Medicine (D.M.) / Master Chirurgiae (M.Ch.)

The period of training for obtaining these Degrees shall be three completed year including the examination period.

Provided that where an institution on the date of commencement for these Regulation, is imparting five year training in Neurology and Neuro-Surgery, such institution shall continue to have five year training course.

(3) Diplomas

The period of training for obtaining a postgraduate Diploma shall be two completed years including the examination period.

MIGRATION

Under no circumstance, Migration/transfer of student undergoing any Post Graduate Degree / Diploma / Super speciality course shall be permitted by any university / Authority.

EXAMINATIONS

The examinations shall be organised on the basis of marking system to evaluate and certify candidate's level of knowledge, skill and competence at the end of the training and obtaining a minimum of 50% marks in theory as well as practical separately shall be mandatory for passing the whole examination. The examination for M.S., M.D., D.M., M.Ch., shall be held at the end of 3 academic years (six academic terms) and for diploma at the end of 2 academic years (four academic terms). The academic terms shall mean six months training period. For other details please refer to Regulations.

11. Departmental training Facilities:-

A department having an independent academic identity in a teaching institution, comprising of one or more units, having prescribed strength of faculty, staff and teaching beds shall be recognised for Post Graduate training.

11.1 Staff – Faculty

- (a) A clinical department or its unit training candidates for Broad or Super Specialities, shall have a minimum of three full time faculty members belonging to the concerned disciplines of whom one shall be a Professor, one Associate Professor/ Reader and one Astd. Professor/ Lecturer, possessing requisite qualification and teaching experience prescribed by the Medical Council of India;

Provided that the second or subsequent unit may be headed by an Associate Professor along with two Assistant Professors / Lecturers.

Of these faculty members only those who possess a total of eight years teaching experience, of which at least five years teaching experience is as Assistant Professor gained after obtaining Post Graduate Degree, shall be recognised as Post Graduate teachers.

- (b) In a department, training candidates for Super Speciality, there shall be a minimum of three faculty members with requisite Post Graduate qualification

and experience, one shall be Professor, one Associate Professor / Reader and one Assistant Professor / Lecturer.

Provided that the second or subsequent unit may be headed by an Associate Professor along with two Assistant Professors / Lecturers.

Of these only those faculty members who possess eight years teaching experience of which at least five years teaching experience is as Assistant Professor or above gained after obtaining the Post Graduate degree shall be recognised as Post Graduate teachers;

Provided that in the case of super speciality courses which are newly instituted, relaxation of qualification and experience for recognition as Post Graduate teachers, may be granted by the Medical Council of India for sufficient cause.

- (c) In addition to the faculty staff, the strength of Residents / Registrars / Tutors / Demonstrators, as well as technical and other para medical staff shall be as per the staff strength prescribed for 50 or 100 or 150 students in the ‘Minimum Requirements for 50/100/150 MBBS Admissions Annually Regulations.’

11.2 Minimum requirements for a Post Graduate institution :

- (a) An institution conducting both Undergraduate and Post Graduate teaching shall fulfill the prescribed minimum requirement for undergraduate training and also additional requirements for Post Graduate training depending on the type of work being carried out in the Department. The additional staff required to be provided in following departments shall be as under:-
- | | | |
|------------------------------------|---|---|
| 1) Department of Pathology | | |
| i) Associate Professor / Reader | - | 1 |
| ii) Assistant Professor / Lecturer | - | 1 |
| iii) Tutor / Demonstrator | - | 1 |
| 2) Department of Radiodiagnosis | | |
| i) Associate Professor / Reader | - | 1 |
| ii) Assistant Professor / Lecturer | - | 1 |
| iii) Tutor / Demonstrator | - | 1 |
| 3) Department of Anaesthesiology | | |
| i) Associate Professor / Reader | - | 1 |
| ii) Assistant Professor / Lecturer | - | 1 |
| iii) Tutor / Demonstrator | - | 1 |
- b) A Department imparting only Post Graduate training shall:-
- (i) Provide facilities consistent with the all round training including training in basic medical science and other departments related to the subject of training as recommended by the Medical Council of India.
- (ii) Have as many autopsies, biopsies and cytopsies as possible for teaching purposes; and

- (iii) Make available facilities of ancillary department for coordination of Training.

11.3 Bed Strength in Clinical Departments

A Department to be recognised for training of Post Graduate students, shall have at least 60 (Sixty) beds each of General Medicine, General Surgery, Obstetrics and Gynecology, 30 (thirty) beds each for Degree and Diploma courses and 20 (twenty) beds each in case of Super Speciality courses.

Explanation: - A unit shall consist of not less than 30 and more than 40 beds for Degree / Diploma Courses and not less than 20 and more than 30 beds for Super Speciality courses respectively.

11.4 Out – patient departments

There shall be adequate space and sufficient number of examination cubicles available in the out – patient Department. Besides the general outpatient services, Speciality Clinics shall also be available for the training of post-graduate students in the relevant broad and super speciality;

To determine the number of students who may be admitted for training, outpatient attendance, work turnover and ambulatory care also have to be taken into consideration.

11.5 Laboratory Facilities

The institution shall have adequate laboratory facilities for the training of the Post Graduate students, and such laboratories shall provide all the investigative facilities required and shall be regularly updated keeping in view the advancement of knowledge and technology and research requirements, and for training of students in non-clinical departments, proper and contemporary laboratory facilities shall be made available.

11.6 Equipment

The department shall have adequate number of all such equipments including the latest ones necessary for training and as may be prescribed by the Council for each speciality from time to time.

12. Number of Post Graduate Students to be admitted.

(1) The ratio of recognised Post Graduate teacher to number of students to be admitted for the degree and diploma courses shall be 1:1 each for degree and diploma courses in each unit per year, to the extent that in no circumstances more than two students for degree and one for Diploma shall be registered in a unit in one academic year.

(2) In case the institution is having only Post Graduate diploma courses in any subject then it shall have a unit of 30 beds with three full time teachers. The ratio of number of students and recognised Post Graduate teachers shall be 1:1 and in no circumstances more than three students can be admitted in a unit per year.

(3) The requirement of units and beds shall not apply in the case of Post Graduate degree or diploma courses in Basic and para-clinical departments. The ratio of recognised Post Graduate teacher to students shall, however be maintained at 1:1 both at degree as well as diploma level.

(4) The number of students to be admitted in case of Post Graduate degree (Super speciality) courses shall be one student per year per recognised Post Graduate teacher in a department having a minimum of three faculty members (one Professor, one Associate Professor/Reader & one Asstt. Professor/Lecturer) and twenty beds. If the number of Post Graduate teachers in the unit is more than one then the number of students may be increased proportionately but not more than two in a unit per year in any circumstances. For this purpose one student should associate with one Post Graduate teacher:

Provided that no Post Graduate seats left unfilled in an academic year, shall be carried forward to the next or subsequent academic years, being from 1st January to 31st December of any calendar year.

13. TRAINING PROGRAMME

13.1 The training given with due care to the Post Graduate students in the recognised institutions for the award of various Post Graduate medical degrees / diplomas shall determine the expertise of the specialist and / or medical teachers produced as a result of the educational programme during the period of stay in the institution.

13.2 All candidates joining the Post Graduate training programme shall work as 'Full Time Residents' during the period of training and shall attend not less than 80% (Eighty percent) of the imparted training during each academic year including assignments, assessed full time responsibilities and participation in all facets of the educational process.

13.3 The Post Graduate students undergoing Post Graduate Degree / Diploma / Super Speciality Course shall be paid stipend on par with the stipend being paid to the Post Graduate students of State Government Medical Institutions / Central Government Medical Institutions, in the State/Union Territory where the institution is located. Similarly, the matter of grant of leave to Post Graduate students shall be regulated as per the respective State Government rules.

13.4 (a) Every institution undertaking Post Graduate training programme shall set up an Academic cell or a curriculum committee, under the chairmanship of a senior faculty member, which shall work out the details of the training programme in each speciality in consultation with other department faculty staff and also coordinate and monitor the implementation of these training Programmes.

(b) The training programmes shall be updated as and when required. The structured training programme shall be written up and strictly followed, to enable the examiners to determine the training undergone by the candidates and the Medical Council of India inspectors to assess the same at the time of inspection.

(c) Post Graduate students shall maintain a record (log) book of the work carried out by them and the training programme undergone during the period of training including details of procedures, surgical operations assisted or done independently by M.S. / M.Ch. candidates.

(d) The Record (Log) Books shall be checked and assessed periodically by the faculty members imparting the training.

- 13.5 During the training for award of Degree / Super Speciality / Diploma in clinical disciplines, there shall be proper training in Basic medical sciences related to the disciplines concerned; so also in the applied aspects of the subject; and allied subjects related to the disciplines concerned. In the Post Graduate training programmes including both Clinical and Basic medical sciences, emphasis has to be laid on Preventive and Social aspects. Emergency care, facilities for Autopsies, Biopsies, Cytopsies, Endoscopy and Imaging etc. shall also be made available for training purposes.
- 13.6 The Post Graduate students shall be required to participate in the teaching and training programme of undergraduate students and interns.
- 13.7 Training in Medical Audit, Management, Health Economics, Health Information System, basics of statistics, exposure to human behaviour studies, knowledge of pharmaco – economics and introduction to non- linear mathematics shall be imparted to the Post Graduate students.
- 13.8 Implementation of the training programmes for the award of various Post Graduate Degree and Diplomas shall include the following:-

(a) Doctor of Medical (M.D.) / Master of Surgery (M.S.)

(i) Basic Medical Sciences – The teaching and training of the students shall be through Lectures, Seminars, Journal Clubs, Group Discussions, Participation in laboratory and experimental work, and involvement in Research Studies in the concerned speciality and exposure to the ‘Applied aspects’ of the subject relevant to clinical specialities.

(ii) Clinical disciplines

The teaching and training of the students shall include responsibility in the management and treatment of patients entrusted to their care; participation in Seminars, Journal clubs, Group Discussions, Clinical Meetings, Grand Rounds and Clinico - Pathological Conferences; practical training in Diagnosis and Medical and Surgical treatment; training in the Basic Medical Sciences, as well as in allied clinical specialities.

(b) Doctor of Medicine (D.M.) / Magister Chirurgiae (M.Ch.)

The training programme shall be on the same pattern as for M.D. / M.S. in clinical disciplines; with practical training including advanced Diagnostic, Therapeutic and Laboratory techniques, relevant to the subject of specialization. Post Graduate Degree / Diploma / Super Speciality Residents in Surgical specialities shall participate in surgical operations as well.

(c) **Diplomas**

The teaching and training of the students shall include graded clinical responsibility; Lectures, Seminars, Journal Clubs, Group Discussions and participation in Clinical and Clinico-Pathological Conferences, practical training to manage independently common problems in the speciality; and training in the Basic Medical Sciences.

14. EXAMINATIONS

The examinations shall be organised on the basis of 'Grading' or 'Marking system' to evaluate and to certify candidate's level of knowledge, skill and competence at the end of the training. Obtaining a minimum of 50% marks in 'Theory' as well as 'Practical' separately shall be mandatory for passing examination as a whole. The examination for M.D. / M.S., D.M., M.Ch shall be held at the end of 3rd academic year and for Diploma at the end of 2nd academic year. An academic term shall mean six month's training period.

(1) **EXAMINERS**

(a) All the Post Graduate Examiners shall be recognised Post Graduate Teachers holding recognised Post Graduate qualifications in the subject concerned.

(b) For all Post Graduate Examinations, the minimum number of Examiners shall be four, out of which at least two (50%) shall be External Examiners, who shall be invited from other recognised universities from outside the State. Two sets of internal examiners may be appointed one for M.D./M.S. and one for diploma.

(c) Under exceptional circumstances, examinations may be held with 3 (three) examiners provided two of them are external and Medical Council of India is intimated the justification of such action prior to publication of result for approval. Under no circumstances, result shall be published in such cases without the approval of Medical Council of India.

(d) The examining authorities may follow the guidelines regarding appointment of examiners given in Appendix-II.

(2) **Number of candidates**

The maximum number of candidates to be examined in Clinical / practical and Oral on any day shall not exceed six for M.D./M.S. degree, eight for diploma and two for D.M./M/Ch examinations.

(3) **Number of examinations**

The university shall conduct not more than two examinations in a year, for any subject, with an interval of not less than 4 and not more than 6 months between the two examinations.

(4) **I. Doctor of Medicine (M.D.)/Master of Surgery (M.S.)**

M.D./M.S. examinations, in any subject shall consist of Thesis, Theory Papers, and clinical/Practical and Oral examinations.

(a) THESIS

Every candidate shall carry out work on an assigned research project under the guidance of a recognised Post Graduate Teacher, the result of which shall be written up and submitted in the form of a Thesis.

Thesis shall be submitted at least six months before the Theory and Clinical / Practical examination.

The thesis shall be examined by a minimum of three examiners; one internal and two external examiners, who shall not be the examiners for Theory and Clinical Examination. A candidate shall be allowed to appear for the Theory and Practical / Clinical examination only after the acceptance of the Thesis by the examiners.

Objectives

1. The student would be able to demonstrate capability in research by planning and conducting systematic scientific inquiry & data analysis and deriving conclusion.
2. Communicate scientific information for health planning.

Guide for thesis:

1. Chief guide will be from the concerned department.
2. Co-guide will be from the department or from other disciplines related to the thesis.

Submission of thesis protocol:

It should be submitted at the end of six months after admission to the course.

- 1) Protocol in essence should consist of:
 - a) Introduction and objectives of the research project.
 - b) Brief review of literature
 - c) Suggested materials and methods, and (scheme of work)
 - d) Statistician should be consulted at the time of selection of groups, number of cases and method of study. He should also be consulted during the study.
 - e) Bibliography
- 2) The protocol must be presented in the concerned department before being forwarded to the Research Committee of the Institute.
- 3) Protocol will be approved by the research committee appointed by the Dean / Principal to scrutinise the thesis protocol with reference to its feasibility, statistical validity, ethical (human/animal) aspects, etc.

Submission of thesis

1. The thesis shall relate to the candidate's own work on a specific research problem or a series of clinical case studies in accordance with the approved plan.
2. The thesis shall be written in English, printed or typed double line spacing, on white bond paper 22x28 cm with a margin of 3.5 cm, bearing the matter on one side of paper only and neatly bound with the title, the name of the College and University printed on the front cover.

3. The thesis shall contain: Introduction, review of literature, material and methods, observations, discussion, conclusion and summary and reference as per index medicus.

Each candidate shall submit to the Dean four copies of thesis, through their respective Heads of the Department not later than six months prior to the date of commencement of theory examination in the subject.

Evaluation of Thesis:

1. The thesis shall be referred by the University for Evaluation, to at least a minimum of three examiners – one internal and two external. The examiners will report independently to the Controller of Examinations and recommend whether the thesis is
 - a) approved
 - b) returned for improvements as suggested or
 - c) rejected (Reasons for rejection should be detailed)
2. The thesis shall be deemed to have been accepted when it has been approved by at least two examiners.
3. Where improvements have been suggested by two or more of the examiners, the candidate shall be required to re-submit the thesis, after making the requisite improvements for evaluation.
4. When a thesis is rejected by the examiners, it shall be returned to the candidate who shall have to write it again. The second thesis, as and when submitted shall be treated as a fresh thesis and processed.
5. Acceptance of thesis submitted by the candidate shall be a pre-condition for his / her admission to the written, oral and practical / clinical part of the examination.
6. There shall be no separate marks allotted for thesis.

Provided that under special circumstances if the report from one or more examiners is not received by the time the Post-Graduate examination is due, the candidate may be permitted provisionally to sit for the examination but the result be kept with held till the receipt of the report subject to the condition that if the thesis is rejected then the candidate in addition to writing a fresh thesis, shall have to appear in the entire examination again.

6. A candidate whose thesis stands approved by the examiners but fails in the examination, shall not be required to submit a fresh one if he / she appears in the examination in the same branch on a subsequent occasion.

(b) Theory

- (i) There shall be four theory papers.

In case of M.D. / M.S. Courses in Basic Medical Sciences, the syllabus will be as per distribution (Given in curriculum). Each paper will have 2 essay type questions (25 x 2 marks) and 5 short answer questions (10 x 5 marks). Model question papers are given for each speciality.

In case of M.D., M.S. in Clinical disciplines, Paper I shall be Basic Medical Sciences and Paper IV will be Recent Advances in the concerned subjects (Given in curriculum).

Paper I of Clinical subjects will have 10 short answer questions (10 x 10 marks) and Paper II to IV will have 2 essay type questions (25 x 2 marks) and 5 short answer questions (10 x 5 marks) in each paper. Model question papers are given for each speciality.

(ii) Basic Medical Sciences

(iii) The theory examinations shall be held well in advance before the Clinical and Practical examination, so that the answer books can be assessed and evaluated before the commencement of the Clinical/Practical and Oral examination.

(c) Clinical / Practical and Oral

(i) Clinical examination for the subjects in Clinical Sciences shall be conducted to test the knowledge and competence of the candidates for undertaking independent work as a specialist/Teacher, for which candidates shall examine a minimum one long case and two short cases.

(ii) Practical examination for the subjects in Basic Medical Sciences shall be conducted to test the knowledge and competence of the candidates for making valid and relevant observations based on the experimental/Laboratory studies and his ability to perform such studies as are relevant to his subject.

1. The Oral examination shall be thorough and shall aim at assessing the candidate knowledge and competence about the subject, investigative procedures, therapeutic technique and other aspects of the speciality, which form a part of the examination.

II. Doctor of Medicine (D.M.)/Magister of Chirurgiae (M.Ch.)

The Examination consists of: (i) Theory and (ii) Clinical/Practical and Oral.

(a) Theory

There shall be four theory papers; one paper out of these shall be on 'Basic Medical Sciences' and another paper on 'Recent Advances'. The theory examination shall be held in advance before the Clinical and Practical examination, so that the answer books can be assessed and evaluated before the commencement of the clinical / Practical and Oral examination.

(b) Clinical / Practical and Oral

Examination is conducted for a period of one day (not exceeding two candidates per day), shall consist of carrying out special investigative techniques for Diagnosis and Therapy. M.Ch candidates shall also be examined in surgical procedures.

Oral examination shall be comprehensive to test the candidate's overall knowledge of the subject.

CRITERIA FOR EVALUATION OF M.S./M.D./M.Ch./DM COURSES

S. No.	Description	M.S./M.D./M.Ch./DM Courses
1.	THEORY	
	No. of Theory Papers	4
	Marks for each Theory Paper	100
	Total marks for Theory Paper	400
	Passing Minimum for Theory	200/400 (40% minimum in each paper)
2.	PRACTICAL/CLINICAL	300
3.	Oral	100
	Passing minimum for Practical/Clinical including Oral	200/400
	<u>Passing Minimum:</u> The candidate shall secure not less than 50% marks in each head of passing which shall include (1) Theory – aggregate 50% (In addition, in each Theory paper a candidate has to secure minimum of 40%) (2) Practical/Clinical/Viva - aggregate 50% (3) If any candidate fails even under one head, he/she has to re-appear for both Theory and Practical/Clinical/Viva examination.	

III Post Graduate Diploma

Diploma examination in any subject shall consist of Theory, Practical / Clinical and Oral.

(a) Theory

There shall be three 'Theory' papers, one paper out of these shall be on 'Basic Medical Sciences'. The theory examination will be held well in advance before the clinical examination, so that the answer books can be assessed before the commencement of the Practical / Clinical and Viva-Voce examination.

(b) Clinical and Oral

Clinical examination for the subject in clinical Science shall be conducted to test /aimed at assessing the knowledge and competence of the candidate for undertaking independent work as a Specialist / Teacher for which a candidate shall examine a minimum of one long case and two short cases.

The oral examination shall be thorough and shall aim at assessing the candidate's knowledge and competence about the subject, investigative procedures, therapeutic technique and other aspects of the speciality, which shall form a part of the examination.

The candidate shall secure not less than 50% marks in each head of passing which shall include (1) Theory (2) Practical including clinical and viva voce examinations.

CRITERIA FOR EVALUATION OF P.G. DIPLOMA COURSES

S. No.	Description	P.G. Diploma Courses
1.	THEORY	
	No. of Theory Papers	3
	Marks for each Theory Paper	100
	Total marks for Theory Paper	300
	Passing Minimum for Theory	150/300 (40% minimum in each paper)
2.	PRACTICAL/CLINICAL	200
3.	Oral	100
	Passing minimum for Practical/Clinical including Oral	150/300
	<u>Passing Minimum:</u>	
	The candidate shall secure not less than 50% marks in each head of passing which shall include	
	(1) Theory – aggregate 50% (In addition, in each Theory paper a candidate has to secure minimum of 40%)	
	(2) Practical/Clinical/Viva - aggregate 50%	
	(3) If any candidate fails even under one head, he/she has to re-appear for both Theory and Practical/Clinical/Viva examination.	

P.S.: Practical / Clinical examination is usually conducted for a period of one day only except in the following basic sciences:

Pathology	– 2 days
Anatomy	– 2 days
Biochemistry	– 2 days
Physiology	– 2 days
Pharmacology	– 2 days
Microbiology	– 3 days

P.S. No of candidates that can be examined in Clinical / Practical / Viva

M.D. / M.S.	-	6 candidates per day
D.M. / M.Ch.	-	2 candidates per day
P.G. Diploma	-	8 candidates per day

APPENDIX-II

POST GRADUATE EXAMINATION

GUIDELINES ON APPOINTMENT OF POST GRADUATE EXAMINERS

1. No person shall be appointed as an internal examiner in any subject unless he / she has three years experience as recognized Post Graduate teacher in the concerned subject. For external examiners, he / she should have minimum six years experience as recognized Post Graduate diploma in the concerned subject.
2. There shall be at least four examiners in each subject at an examination out of which at least 50% (Fifty percent) shall be external examiners. The external examiner who

fulfils the condition laid down in clause – 1 above shall ordinarily be invited from another recognised university, from outside the State: provided that in exceptional circumstances examinations may be held with 3 (three) examiners if two of them are external

3. An examiner shall ordinarily be appointed for not more than two consecutive terms.
4. The same set of examiners shall ordinarily be responsible for the written, practical or part of examination.
5. Where there is more than one centre of examination, there shall be Co-ordinator appointed by the University who shall supervise and Co-ordinate the examination on behalf of the University with independent authority.
6. Where there is more than one centre of examination, there shall be Co-ordinator / Convenor / Chairman who shall be the senior most internal Examiner, appointed by the University and shall supervise and Co-ordinate the examination on behalf of the University with independent authority.

SCHEDULE

Specialities / Subjects in which Postgraduate Degree and Diploma can be awarded by the Indian Universities and the eligibility requirements of candidates for registration for the same.

A. BASIC MEDICAL SCIENCES - M.D. (DOCTOR OF MEDICINE) for which candidates must possess recognised degree of MBBS (or its equivalent recognised degree)

1. Anatomy
2. Biochemistry
3. Microbiology
4. Pathology
5. Pharmacology
6. Physiology

B. CLINICAL DISCIPLINES - M.D. (DOCTOR OF MEDICINE) for which candidates must possess recognised degree of MBBS (or its equivalent recognised degree)

- 1) Anaesthesiology
- 2) Community Medicine
- 3) Dermatology, Venerology and Leprosy
- 4) General Medicine
- 5) Paediatrics
- 6) Psychiatry
- 7) Radio-diagnosis
- 8) Radio-therapy
- 9) Tuberculosis & Respiratory Medicine or Pulmonary Medicine.

C. CLINICAL DISCIPLINES - M.S. (MASTER OF SURGERY) for which candidates must possess recognised degree of MBBS (or its equivalent recognised degree).

1. General Surgery
2. Obstetrics & Gynecology
3. Ophthalmology
4. Orthopedics
5. Otorhinolaryngology

D. D.M. (DOCTOR OF MEDICINE) for which candidates must possess recognised degree of M.D. (or its equivalent recognised degree) in the subject shown against them.

Sl. No.	Area of Specialisation	Prior Requirement
1.	Cardiology	MD(Medicine) MD (Paediatrics)

E. M.Ch. (MASTER OF CHIRURGIE) for which candidates must possess recognised degree of M.S. (or its equivalent recognised degree) in the subjects shown against them.

Sl. No.	Area of Specialisation	Prior Requirement
1.	Cardio vascular & Thoracic Surgery	MS (Surgery)
2.	Urology	MS (Surgery)

F. DIPLOMAS for which candidates must possess recognised degree of MBBS (or its equivalent recognised degree).

1. Dermatology, Venerology and Leprosy (DDVL)
2. Ophthalmology (D.O.)
3. Orthopedics (D.Ortho.)
4. Paediatrics(D.C.H.)
5. Radio-diagnosis (D.M.R.D.)

BASIC MEDICAL SCIENCES (M.D. Doctor of Medicine)

ANATOMY

COURSE CONTENT

Paper – I	: Regional Anatomy, Gross Anatomy & Surgical Anatomy
Paper – II	: Histology, Histochemistry & histological Techniques
Paper – III	: Embryology & Genetics
Paper – IV	: Neuro Anatomy, Recent advances & Biostatistics & Basic principles of Research

GROSS ANATOMY

Osteology –	Skeletal connective tissue – cartilage and bone Ossification of bones, appendicular & axial skeleton and skull
Arthrology –	Movements and mechanisms of joints Joints of upper and lower limbs. Vertebral and thoracic articulations Joints of skull, Temporomandibular joint
Myology –	Structure and functions of various muscles Muscles of Head & neck, Trunk and limbs
Angiology –	Vascular patterns, Heart, Vessels of Head, neck, brain, Trunk and limbs. Regional lymph nodes vessels
Neurology –	divisions – Central & peripheral, Spinal cord, Brainstem, Cerebellum and Cerebrum
Splanchnology –	Respiratory, Alimentary, Urogenital & Endocrine.

HISTOLOGY

Cell biology	– Cell structure, Cell cycle, Cell divisions and differentiation
Histology	– General histology – Tissues of the body structure and function. Systemic histology – Histology of all organ systems, with function and histogenesis Immune system and cell types involved in defense mechanism. Clinical significance of major histocompatibility complex. Immunohistochemical techniques
Practical –	Preparation and processing of tissues for histological study Staining – Special stains for identification of various components Histomorphometry Electron micrographs - Identification of cell and cell organelles Museum and Embalming techniques

EMBRYOLOGY & GENETICS

1. General Embryology
2. Systemic Embryology - Stem cell Applications, Cloning & Molecular biology.
Gametogenesis, Fertilization, Implantation,
Early development of embryo and development of various organ systems,
Congenital malformations and molecular basis of congenital malformations.
3. Basics of Medical Genetics, Clinical genetics Genomics and DNA analysis

Human chromosomes – Structure, Aberrations, Syndromes & Molecular Cytogenetics
 Gene – Structure, Function, disorders and gene therapy.
 Patterns of inheritance, Mutations
 Prenatal diagnosis, Genetic Counseling

Practical- Identification of slides of various stages of development of embryo-human/chick/pig. Cell culture, harvesting of chromosomes, identification and interpretation.

NEUROANATOMY

Structure and function of various tracts of spinal cord and its blood supply – arterial and venous drainage with clinical significance.

Parts of brain and its blood supply – arterial and venous drainage with clinical significance.

Cross section of brain at various levels – normal structure and clinical significance

Various neurological disorders – somatic and sensory

Ventricles of brain, CSF secretion and drainage and Barriers of the brain tissue.

Cranial nerves – connections, functions and distribution

Practical

Identification of neurons and nerve fibers – routine and special stains.

cross section of spinal cord at various levels

cross section of Parts of Brain stem at various levels.

cross section of Cerebrum and cerebellum, both coronal and

horizontal at different levels for the identification of various nuclei, their structure and function to correlate with various neurological disorders.

STATISTICS

Biostatistics - Basic principles and concepts of biostatistics applied to health sciences

Parametric & Non parametric data, Mean, Median, Mode, Standard deviation, Standard error, Analysis of variance, coefficient correlation, Chi-square test, t-test.

POSTGRADUATE TRAINING PROGRAMME

M.D. Anatomy

FIRST YEAR OF TRAINING

Teaching	Should get involved in teaching of Gross Anatomy/applied to first year MBBS students during dissection hours on all working days	12 hrs /week
	Should get involved in small group teaching session – teaching of bones and microscopic slides of histology – demonstration classes	Osteology 4hrs/week Histology 4hrs/week
Learning	Should be posted in clinical departments like Orthopedics, Plastic surgery, Radio Diagnosis and General surgery as per the guidelines of MCI to acquire surgical anatomy skills and knowledge of clinically oriented problems	one month in each departments
Laboratory Skill	Should assist and guide first year MBBS students in the dissections of the cadaver.	12 hrs /week

	<p>Should assist and guide in identification of general & systemic histology slides of various tissues and organs for MBBS students</p> <p>Should acquire and acquaint the knowledge of various types of microscopes their configuration and applications.</p> <p>Should acquaint him/herself with and necessary training in computer operations for data retrieval and power point presentations etc. for teaching & research.</p>	Histology 4hrs/week
Research	<p>Should get involved in preparation of research protocol for PG dissertation work – selection of problem, literature search, application of methods, selection of material, methods of analysis of data and hypothesis. Discussion with Supervisor/Guides & Co guides</p>	2 hrs/week

SECOND YEAR OF TRAINING

Teaching	<p>Should get involved in teaching of Gross Anatomy/applied to first year MBBS students during dissection hours on all working days</p>	12 hrs /week
	<p>Should get involved in small group teaching session – teaching of bones and microscopic slides of histology – demonstration classes</p>	Osteology 4hrs/week Histology 4hrs/week
	<p>Should be involved in correction work/evaluation process of Periodic Notified Test conducted for the first year MBBS students – both in theory and practical including viva voce.</p>	
Learning	<p>Communication skills and knowledge through seminars and journal clubs</p>	2 hrs /week
Laboratory Skill	<p>In addition to the above said, candidate should acquire the necessary training in</p> <ul style="list-style-type: none"> • embalming of cadavers of all types • tissue processing viz. fixation, dehydration, clearing and embedding • staining – routine hematoxiline and eosine – special for epithelium, connective tissue, muscle, gland & nervous tissue • museum technique – mounting of specimens for museum both wet and dry, making of various type of models, injection corrosion cast & plastination techniques. <p><i>Optional (If facilities available)</i> Cytogenetics techniques – cell culture, harvesting</p>	

	and processing blood samples for karyotyping. Various type of banding techniques. Automated karyotyping using software	
Research	Maintenance of work book/log book pertaining to dissertation work undertaken and the same to be documented in electronic format. Discussion with Supervisor/Guides & Co guides	2 hrs/week

THIRD YEAR OF TRAINING

Teaching	Should get involved in teaching of Gross Anatomy/applied to first year MBBS students during dissection hours on all working days	12 hrs /week
	Should get involved in small group teaching session – teaching of bones and microscopic slides of histology – demonstration classes	Osteology 4hrs/week Histology 4hrs/week
	Should be involved in correction work/evaluation process of Periodic Notified Test conducted for the first year MBBS students – both in theory and practicals including viva voce.	
	Should be involved in organizing/delivering lectures for first year MBBS students on selected topics of interest in Gross Anatomy, Human Embryology & Medical Genetics Should get associated/involved in the integrated teaching programmes*. * Programmes like ‘ <u>post natal growth and development</u> ’ in collaboration with Department of Pediatrics and Preventive Medicine.	12 hrs /week
Learning	Should obtain the necessary skills in delivering lectures through computer assisted teaching – power point presentation as per the guidelines of NTTTC.	
Laboratory Skill	Should have equipped appropriately with the guidelines required to undertake and perform embalming procedures. Should be aware of “Anatomy Act” Other Techniques <ul style="list-style-type: none"> • tissue processing viz. fixation, dehydration, clearing and embedding • staining – routine hematoxiline and eosine <ul style="list-style-type: none"> – special for epithelium, connective tissue, muscle, gland & nervous tissue • museum technique – injection corrosion cast, resin cast of organs and plastination technique. 	Minimum five cadavers Should submit routine and special stain slides of minimum number of five for each tissue Should submit at least one model of any one among the procedures stated.

Radiological Anatomy (X rays, MRI & CT) :	5 marks
Anthropometry :	5 marks
Viva-Voce on Dissertation = 15 Minutes. :	15 marks
Pedagogy – Micro Teaching :	15 marks

GUIDELINES FOR QUESTION PAPER SETTERS:

1. The question may be set strictly according to the course content which has been provided in a classified manner for each paper.
2. Each paper should have three questions. The first two questions should be of long answer type and the third question with five components, which will be of short answer type.
3. At least one of the questions may be of problem solving type.

The model Question paper has been provided for reference.

MODEL QUESTION PAPERS

M.D. DEGREE EXAMINATION IN ANATOMY

PAPER – I : GROSS ANATOMY & APPLIED ANATOMY

Time : 3 hours

Maximum Marks : 100

(The answers to be illustrated with suitable diagram)

1. Describe the fibrous skeleton of heart and discuss its applied significance. (25 marks)
2. Describe the position function and surgical relevance of perineal muscles in females. (25 marks)
3. Write briefly on : (5 x 10 = 50 marks)
 - a) Scapulo-humeral rhythm.
 - b) Vascular segmentation of Liver
 - c) Pharyngeal constrictors.
 - d) Neck shaft angle and blood supply of femur
 - e) Sub diaphragmatic spaces

M.D. DEGREE EXAMINATION IN ANATOMY

PAPER – II : HISTOLOGY, HISTOCHEMISTRY & HISTOLOGICAL TECHNIQUES

Time : 3 hours

Maximum Marks : 100

(The answers to be illustrated with suitable diagram)

1. Describe and discuss the ultra structure of Retina. (25 marks)

2. Describe and discuss the methods involved in Immunohistochemistry.(25 marks)
3. Write briefly on : (5x 10 = 50 marks)
 - a) Ultra structure of conducting tissues of heart.
 - b) Cell surface receptors.
 - c) Diagnostic applications of enzyme histochemical technique.
 - d) Histomorphometry
 - e) Fluorescence microscopy

M.D. DEGREE EXAMINATION IN ANATOMY

PAPER – III : EMBRYOLOGY & GENETICS

Time : 3 hours

Maximum Marks : 100

(The answers to be illustrated with suitable diagram)

1. Describe the rotation of mid gut in normal conditions and discuss the congenital anomalies associated in different types of errors of rotation. (25 marks)
2. Discuss 'X chromosome inactivation' and its clinical significance. Add a note on methylation assay. (25 marks)
3. Write briefly on : (5 x 10 = 50 marks)
 - a) Genetic engineering.
 - b) Ectopic thyroid gland and thyroglossal cyst
 - c) Stem cell isolation and application.
 - d) Congenital anomalies of Uterus and Vagina
 - e) Steps involved in in-vitro fertilisation

M.D. DEGREE EXAMINATION IN ANATOMY

PAPER –IV :
NEURO ANATOMY, RECENT ADVANCES IN ANATOMY
& BASIC PRINCIPLES OF RESEARCH

Time : 3 hours

Maximum Marks : 100

(The answers to be illustrated with suitable diagrams, charts & graphs)

1. Describe the structure, functions and connections of Lateral Geniculate body. Mention its arterial supply. (25 marks)
2. Describe sources of human stem cells. Mention its therapeutic relevance and ethical issues. (25 marks)
3. Write briefly on : (5 x 10 = 50 marks)
 - a) Selection of an appropriate statistical test for a Case Control study
 - b) Methods available for the literature search in research.

- c) Reticular formation in brain stem.
- d) Afferent connections of cerebellum.
- e) Arterial supply to basal nuclei.

TEXT BOOKS RECOMMENDED

	Title	Author
Gross Anatomy	Grays Anatomy 39th Ed	
	Cunningham's manual of Practical Anatomy (in 3 volumes)	
	Clinically oriented Anatomy	Moore & Dalley
	Last's Anatomy 11th	Sinnathamby
	Surgical Anatomy	McGregor
	Clinical Anatomy by Regions	Richard Snell
	Grants Method of Anatomy, 11th Edition	Basmajian
	Anatomy for Surgeons (in 3 volumes)	W.Henry Hollinshed
Histology	Wheater Functional Histology 5thEd	Young's
	Basic Histology Text & Atlas, 10th Edition	Junqueira
	Cell biology & Histology 5th	Gartner
	Histology	Hams
	Di Fiors Atlas of Histology	
Embryology	Medical embryology	Jan Langman
	Developing Human	Moore
	Before we are born: Essentials of Embryology & Birth Defects. 6th Edition	Moore
	Human Embryology	Hamilton, Boyd & Mossman
Neuro Anatomy	Neuro anatomy	Carpenter
	Clinical Neuro Anatomy 6th Ed	Snell
Genetics	Genetics in Medicine 6thEd	Thompson & Thompson
	Emery's Elements of Medical Genetics, 11th Ed	Mueller
	Medical Genetics 3rd Ed	Jorde

List of Journal recommended for seminars & Journal Club

S.No.	Name of journal
1.	Journal of Anatomy
2.	Anatomical Record
3.	Developmental Dynamics
4.	Cells, Tissue and Organs (Acta Anatomica)
5.	Biology of Reproduction
6.	Genetical Research
7.	Journal of Pineal Research
8.	Mutation research & Environmental mutagenesis
9.	American Journal of Medical Genetics
10.	Journal of Medical Genetics

BIOCHEMISTRY

GOAL

The goals of post-graduate education in Biochemistry is to enable a student to conceptualize and explain biochemical events of life processes in health and disease and apply biochemical knowledge and skills for problem solving in clinical situations and in scientific research to help further understanding of life processes at the molecular level.

OBJECTIVES

KNOWLEDGE:

At the end of three year training in Biochemistry, the MD student should be able to describe and explain concepts and principles of biochemical processes related to the human system.

1. Apply the principles of Biochemistry to explain molecular processes in health and disease states in clinical situations.
2. Apply basic principles of Biostatistics for research work.

SKILLS

At the end of three year training in Biochemistry, the MD student should be able to:

1. Perform biochemical laboratory investigations and experiments relevant to clinical management and biochemical research.
2. Analyze, interpret and evaluate laboratory data.
3. Rationalize the application in clinical management and experimental research.
4. Organize a laboratory set up to deliver optimum investigative support for patient care services.
5. Plan and conduct lectures, practical demonstrations, tutorial classes and small group discussion on various biochemical topics for undergraduate students of medical and Para-medical courses.
6. Be familiar with literature search and computer skills.
7. Critically review and comment on research papers and make oral presentations.
8. Prepare research protocols, conduct experimental studies analyze and solve clinical and experimental problems.

COURSE CONTENT:

- I. Physical and organic aspects of biochemistry, Biostatistics and General Principles of biochemical techniques.
- II. Cell and Molecular biology, Endocrinology and Immunology.
- III. Enzymology, Macro and Micronutrients, Intermediary metabolism, Inborn errors of metabolism, Human nutrition.
- IV. Clinical biochemistry, Laboratory management and Recent advances in Biochemistry

I. (A) PHYSICAL AND ORGANIC ASPECTS OF BIOCHEMISTRY

Electrolytic dissociation, mass law, acids, bases, buffers, indicators and pH and their applied aspects.

1. Surface tension, osmosis, viscosity, diffusion colloidal system, membrane phenomena, adsorption, Donnan equilibrium and their applications in biological system.
2. Principles of isolation and purification of biomolecules.

3. Ribose, Xylose, glucose, mannose, galactose, fructose, Deoxy sugars, amino sugars, uronic acids, lactose, maltose, sucrose starch, insulin, glycogen, cellulose, glycoaminoglycans, Blood group Antigens – Basic chemistry, Structure function relationships.
4. Saturated and unsaturated fatty acids, their derivatives, triacylglycerols, phospholipids, glycolipids, sterols, lipoproteins –Basic chemistry, structure function relationships.
5. Amino acids, peptides, polypeptides, hemoglobins, immunoglobins, collagen and proteoglycans, levels of organization of proteins with reference to insulin, hemoglobin and collagen – Basic chemistry, structure function relationships.
6. Purines, pyrimidines, their derivatives, nucleic acids, nucleotides and poly nucleotides – Basic chemistry, structure function relationships.

(NOTE: Only the description of accepted structures of common biomolecules is required. While structure, physical and chemical properties of the following are included structural elucidation is **NOT** required.)

I. (B) BIOSTATISTICS:

Basic principles and concepts of biostatistics as applied to health sciences - basic concepts of probability, mean, standard deviation, binomial expression, Analysis of variance, Co-efficient of correlation, Chi square test, Parametric data, Non parametric data, Regression Analysis, ROC curve, evaluation of a new diagnostic procedure etc.,.

I. (C) PRINCIPLES OF BIOCHEMICAL TECHNIQUES.

1. Principles, types and applications of photometry- colorimetry, spectrophotometry, Reflectance, flame photometry, absorption spectroscopy and fluorimetry, mass spectrometry, fluorescence and Chemiluminescence, spectroscopy, etc.
2. Ion selective electrodes.
3. Principles, types and applications of Centrifugation.
4. Principles, types and applications of electrophoresis (incl. isoelectric focusing, isotachopheresis, immunoelectrophoresis in details also).
5. Radioactivity, isotopes, detection and measurement of radioactivity, tracer techniques, counters, radiation hazards and their prevention, radioimmunoassay, radiation in food preservation.
6. Principles and applications of chromatography (paper, column, affinity, ion exchange, adsorption and partition, GLC, TLC, HPLC) Gel filtration.

II. (A) CELL BIOLOGY:

Structure- function of cell, cytoskeleton, nucleus, nucleolus, mitochondria and plasmic reticulum, ribosome, golgi complex, lysosomes, plasma membranes, gap junctions, cell division – mitosis and meiosis, cell cycle.

1. Cell fractionation and differentiation of cellular and sub cellular organelles, Cell sorting.
2. Biomembranes, receptors, membrane bound biomolecules, mechanisms of transport across the cell membranes.
3. Cell culture – Principles and applications.

II. (B) MOLECULAR BIOLOGY AND HUMAN GENTICS:

1. Structural organization of DNA and RNA, Replication of DNA, mutation and mechanisms of DNA repair, Transcription, its regulation and post-transcriptional processing, Translation, its regulation and posttranslational modifications; regulation and expression of genes, Genetic engineering- Various processes and techniques, Blotting techniques, Recombinant DNA technology, PCR, DNA sequencing, Cloning, Monoclonal antibodies, Concepts of genomics, proteomics and array techniques, Basic concepts in bioinformatics. Role of reverse transcriptase, Gene therapy, Apoptosis, Basics of inheritance of Genetic disorders; Molecular basis of cancer, Tumour Markers.
2. Mechanism of action of cytotoxic drugs and antibiotics.
Concept of genetic counseling, medical ethics.

II. (C) ENDOCRINOLOGY:

1. Classification and general mechanism of action of hormones. Biogenesis, secretion, regulation, transport, mode of action and disorders of the following – hypothalamic peptides, adenohipophyseal and neurohypophyseal hormones, thyroid hormones, parathyroid hormones, calcitonin, pancreatic hormones, adenocortical and medullary hormones, gonadal hormones, gastrointestinal hormones, opioid peptides, Para hormones. Endorphins and encephalins.
2. Biochemistry of conception, reproduction and contraception.

II. (D) IMMUNOLOGY

1. Concepts, mechanisms and role of Innate and acquired immunity, humoral and cell mediated immunity, antigen and antibodies, MHC.
2. Recognition of antigens: Primary interaction, antigen processing and presentation
Immune response : Lymphocyte maturation, activation of T and B lymphocytes, cytokines, regulation of immune response, immunologic tolerance, hypersensitivity, autoimmunity and autoimmune diseases, immunodeficiency, tumor immunity, transplantation, immunosuppression and immunopotentialiation including vaccination

III. (A) ENZYMOLOGY:

1. General properties, classification and nomenclature, coenzymes; Mechanism of enzyme activity, Km value, Enzyme kinetics, Equilibrium, Thermodynamics of Enzyme catalysed reactions; Factors influencing enzyme kinetics, Enzyme inhibition, Regulation of enzyme action, Isoenzymes, Clinical enzymology,
2. Biological oxidation, Electron transport chain, Oxidative phosphorylation and Bioenergetics.
3. Metabolism of Xenobiotics, Free Radical Biology, Environmental Biochemistry.

III. (B) INTERMEDIARY METABOLISM:

1. Digestion and absorption of food and other nutrients.
2. Methods of studying intermediary metabolism.
3. Intermediary metabolism of carbohydrates, lipids and amino acids,
4. Metabolism of nucleic acids and heme.
5. Muscular contraction, nerve conduction, coagulation of blood.
6. Metabolism in specialized tissues like erythrocytes, lens, nervous tissue etc.
7. Metabolic interrelationships and metabolism in starvation and well-fed state, Role of hormones in regulation of metabolism.

III. (C) MICRONUTRIENTS:

1. Vitamins - structure, sources, metabolism, biochemical role, RDA, deficiency manifestations of vitamins, hyper vitaminoses, and antivitaminases.
2. Mineral metabolism Sources, Metabolism, Functions, Daily requirement / RDA, deficiency manifestation, toxicity of minerals and trace elements.

III. (D) INBORN ERRORS OF METABOLISM

Inborn errors of carbohydrate, lipid, amino acid, nucleic acids, mineral metabolism and Hemoglobin metabolism; Biochemical basis of Management of disorders.

III. (E) HUMAN NUTRITION

Principal food constituents, general nutritional requirements, energy requirements, biological value of proteins, specific dynamic action, balanced diet, diet formulation in health and disease, mixed diet, nutritional supplements, food toxins and additives, parenteral nutrition, disorders of nutrition, obesity, protein and protein energy - malnutrition, dietary fibers, laboratory diagnosis of nutritional disorders.

IV. (A) CLINICAL BIOCHEMISTRY

Definition, types, clinical features, biochemical basis of disease, complications and laboratory diagnoses of

- a) Diabetes mellitus, Hypoglycemia, Ketosis, Glycogenoses, Galactosemia, Hyper lipoproteinemias, Fatty liver, Alcoholic liver disease, Hepatic failure, Malabsorption syndrome, Malnutrition, Aminoaciduria, Hemoglobinopathies, Immunoglobulinopathies, Porphyrias,
 - b) Atherosclerosis, laboratory diagnosis of Myocardial Infarction.
 - c) Digestive systems and related organs; Gastric and pancreatic function tests, hepatobiliary function tests, Jaundice.
 - d) Endocrines; Thyroid function tests, Adrenal and Gonadal function tests.
1. Acid base balance, fluid and electrolyte balance and related disorders, Renal function tests, principles of dialysis.
 2. CSF in health and disease.
 3. Pleural and peritoneal fluid analysis.
 4. Diseases of central nervous system, Alzheimer's disease.
 5. Immunological disorders, diseases of clotting, Biochemistry of AIDS, Prion Diseases.
 6. Laboratory workup of a patient with any organ disease.

(B) LAB MANAGEMENT

- (1) **METHOD EVALUATION:** Analytical goals, precision and accuracy, bias, sensitivity and specificity, selection of method and evaluation.
- (2) **TOTAL QUALITY MANAGEMENT:** Fundamental concepts, control of preanalytical, analytical and post analytical variables, internal and external quality control programs, Accreditation programmes.
- (3) **AUTOMATION:** Definition, instrumental concepts, types of analyzers, Trends in automation in Biochemistry laboratory Laboratory information systems.

IV. (C) RECENT ADVANCES IN BIOCHEMISTRY.

Recent biochemical concepts in health and disease, newer analytical methods - As discussed in recent/current Medical/Biochemical journals and recent editions of text books of Biochemistry.

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