



JAWAHARLAL INSTITUTE OF POSTGRADUATE MEDICAL EDUCATION & RESEARCH

(An Institution of National Importance under
Ministry of Health & Family Welfare, Govt. of India)
Dhanvantri Nagar, Puducherry-605006.

MBBS Revised Curriculum Phase - I

(Approved by 11th Standing Academic Committee, JIPMER)

2017



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ACKNOWLEDGEMENT

A curriculum is considered as the “heart” of any learning institution which means that any college or university cannot exist without a curriculum. With its importance in formal education, the curriculum has become a dynamic process due to the changes that occur in our society. Curriculum reform is a challenging and difficult task. Even the effort to ascribing a single definition to curriculum is difficult. Curriculum serves as a body of knowledge to be transmitted. It is also viewed as a process, and as praxis.

I express my heartfelt gratitude to the Director, JIPMER who inspite of being extraordinarily busy in his schedule spared his valuable time for providing guidance in making reforms in this curriculum.

I take this opportunity to express my deepest gratitude to Dr.D. Kadambari, HOD of Medical Education, Dr. Debdatta Basu, Professor (Sr.Scale) of Pathology, Dr. Zayapragassarazan. Z, Additional Professor of Medical Education, Dr. Nanda Kishore Maraju, Additional Professor of Surgery, Dr. Santosh Kumar, Technical Consultant, Medical Education and Head of the Departments and faculty members of Anatomy, Biochemistry and Physiology who earnestly offered their support to develop this curriculum.

I would also express my thanks to the staff members of academic section for their support in bringing out this curriculum in an effective manner.

Dr. R.P. SWAMINATHAN
Dean (Academic)

PREAMBLE

Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Puducherry, under Government of India since the year 1956, is one of the leading Medical Institutions of India. Spread over a sprawling 195 acre campus in an urban locale of Puducherry (formerly Pondicherry), The Institute was functioning under the administrative control of Directorate General of Health Service, Ministry of Health and Family Welfare, New Delhi On 14-7-2008 JIPMER has been declared as an “Institution of National Importance” by an Act of Parliament, JIPMER, Puducherry. A copy of the Act was Gazette notified on 14-7-2008. In order to demonstrate high standard of medical education on par with international level JIPMER is empowered to set patterns in Undergraduate and Postgraduate Medical Education in all its branches to encourage experiments in the curriculum as per the act and it is outside the jurisdiction of Medical Council of India. The Institution is now empowered to award Medical Degrees, Diplomas, etc., under the clauses 23 & 24 of the said Act. Such Degrees / Diploma, etc., shall be deemed to be included in the schedules to the respective Acts governing Medical Council of India, Indian Nursing Council and Dental Council of India, entitling the holders to the same privileges as those attached to the equivalent awards from the recognized Universities of India.

JIPMER imparts Undergraduate (UG), Postgraduate (PG) and Super Specialty Medical Training through a working hospital (JIPMER Hospital) with bed strength of 2134. Undergraduate degrees M.B.B.S., B.Sc. Nursing, B.Sc. Allied Medical Sciences and post graduate degrees M.Sc., M.D., M.S are offered in 43 disciplines. Super specialty courses (D.M./ M.Ch.) are offered in the following disciplines (Cardiology, Neurology, Cardiothoracic Surgery, Neurosurgery, Urology, Plastic Surgery, Pediatric Surgery, Pediatric Critical care, Neonatology, Clinical Immunology, Clinical Pharmacology, Nephrology, Medical Oncology, Endocrinology, Surgical Oncology, Cardiac Anaesthesia, Medical Gastroenterology and Surgical Gastroenterology). In addition to this Post-Doctoral Fellowship courses are also offered in 12 disciplines. Full-time Ph.D. Programs are also available in eleven disciplines as on date. Master of Public Health & Post Basic Diploma Courses in Nursing were started in January 2014. JIPMER also has started its outreach campus at Karaikal with an intake of 50 students for MBBS course, from the academic session 2015-16.

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1. OBJECTIVE OF MEDICAL GRADUATE TRAINING PROGRAMME

1. The undergraduate medical education programme is designed with a goal to create an “Indian Medical Graduate” (IMG) possessing requisite knowledge, skills, attitudes, values and responsiveness, so that he or she may function appropriately and effectively as a physician of first contact of the community while being globally relevant.
2. In order to fulfill this goal, the IMG must be able to function in the following ROLES appropriately and effectively:

Clinician

Leader and member of the health care team and system

Communicator

Lifelong learner

Professional

3. **Competencies:** Competency based learning would include designing and implementing medical education curriculum that focuses on the desired and observable ability in real life situations. In order to effectively fulfill the roles as listed above, the Indian Medical Graduate would have obtained the following set of competencies at the time of graduation:

Clinician who understands and provides preventive, promotive, curative, palliative and holistic care with compassion

Demonstrate knowledge of normal human structure, function and development from a molecular, cellular, biologic, clinical, behavioral and social perspective.

Demonstrate knowledge of abnormal human structure, function and development from a molecular, cellular, biological, clinical, behavioral and social perspective.

Demonstrate knowledge of medico-legal, societal, ethical and humanitarian principles that influence health care.

Demonstrate ability to elicit and record from the patient, and other relevant sources including relatives and caregivers, a history that is complete and relevant to disease identification, disease prevention and health promotion.

Demonstrate knowledge of national and regional health care policies including the National Rural Health Mission (NRHM), frameworks, economics and systems that influence health promotion, health care delivery, disease prevention, effectiveness, responsiveness, quality and patient safety.

Demonstrate ability to elicit and record from the patient, and other relevant sources including relatives and caregivers, a history that is contextual to gender, age, vulnerability, social and economic status, patient preferences, beliefs and values.

Demonstrate ability to perform a physical examination that is complete and relevant to disease identification, disease prevention and health promotion.

Demonstrate ability to perform a physical examination that is contextual to gender, social and economic status, patient preferences and values.

Demonstrate effective clinical problem solving, judgment and ability to interpret and integrate available data in order to address patient problems, generate differential diagnoses and develop individualized management plans that include preventive, promotive and therapeutic goals.

Maintain accurate clear and appropriate record of the patient in conformation with legal and administrative frame works.

Demonstrate ability to choose the appropriate diagnostic tests and interpret these tests based on scientific validity, cost effectiveness and clinical context.

Demonstrate ability to prescribe and safely administer appropriate therapies including nutritional interventions, pharmacotherapy and interventions based on the principles of rational drug therapy, scientific validity, evidence and cost that conform to established national and regional health programmes and policies for the following:

- a. Disease prevention,
- b. Health promotion and cure,
- c. Pain and distress alleviation, and
- d. Rehabilitation and palliation.

Demonstrate ability to provide a continuum of care at the primary and/or secondary level that addresses chronicity, mental and physical disability.

Demonstrate ability to appropriately identify and refer patients who may require specialized or advanced tertiary care.

Demonstrate familiarity with basic, clinical and translational research as it applies to the care of the patient.

Leader and member of the health care team and system with capabilities to collect analyze, synthesize and communicate health data appropriately.

Work effectively and appropriately with colleagues in an inter-professional health care team respecting diversity of roles, responsibilities and competencies of other professionals.

Recognize and function effectively, responsibly and appropriately as a health care team leader in primary and secondary health care settings.

Educate and motivate other members of the team and work in a collaborative and collegial fashion that will help maximize the health care delivery potential of the team.

Access and utilize components of the health care system and health delivery in a manner that is appropriate, cost effective, fair and in compliance with the national health care priorities and policies, as well as be able to collect, analyze and utilize health data.

Participate appropriately and effectively in measures that will advance quality of health care and patient safety within the health care system.

Recognize and advocate health promotion, disease prevention and health care quality improvement through prevention and early recognition: in a) life style diseases and b) cancer, in collaboration with other members of the health care team.

Communicator with patients, families, colleagues and community

Demonstrate ability to communicate adequately, sensitively, effectively and respectfully with patients in a language that the patient understands and in a manner that will improve patient satisfaction and health care outcomes.

Demonstrate ability to establish professional relationships with patients and families that are positive, understanding, humane, ethical, empathetic, and trustworthy.

Demonstrate ability to communicate with patients in a manner respectful of patient's preferences, values, prior experience, beliefs, confidentiality and privacy.

Demonstrate ability to communicate with patients, colleagues and families in a manner that encourages participation and shared decision-making.

Life long learner committed to continuous improvement of skills and knowledge

Demonstrate ability to perform an objective self-assessment of knowledge and skills, continue learning, refine existing skills and acquire new skills.

Demonstrate ability to apply newly gained knowledge or skills to the care of the patient.

Demonstrate ability to introspect and utilize experiences, to enhance personal and professional growth and learning.

Demonstrate ability to search (including through electronic means), and critically evaluate the medical literature and apply the information in the care of the patient.

Be able to identify and select an appropriate career pathway that is professionally rewarding and personally fulfilling.

Professional who is committed to excellence, is ethical, responsive and accountable to patients community and the profession

Practice selflessness, integrity, responsibility, accountability and respect

Respect and maintain professional boundaries between patients, colleagues and society

Demonstrate ability to recognize and manage ethical and professional conflicts

Abide by prescribed ethical and legal codes of conduct and practice

Demonstrate a commitment to the growth of the medical profession as a whole

4. In order to ensure that training is in alignment with the goals and competencies listed above:

There shall be a bridge course termed as "Foundation Course" to orient medical students to MBBS programme, and provide them with requisite knowledge, communication (including electronic), and technical and language skills required.

The curricular content shall be vertically and horizontally aligned and integrated to the maximum extent possible in order to enhance student interest and eliminate redundancy and overlap.

Teaching-learning methods shall be student centric and shall predominantly include small group learning, interactive teaching methods and case based learning.

Clinical training shall emphasize early clinical exposure, skill acquisition, certification in essential skills; community/primary/secondary care based learning experiences and emergencies.

Training shall primarily focus on preventive and community based approaches to health and disease, with specific emphasis on national health priorities such as family welfare, communicable diseases, epidemics and disaster management.

Acquisition and certification of skills shall be through experiences in patient care, diagnostic and skill laboratories.

The development of ethical values and overall professional growth as integral part of curriculum shall be emphasized through a structured longitudinal and dedicated programme on professional development and ethics.

Progress of the medical student shall be documented through structured periodic assessment that includes formative assessment. Logs of skill-based training shall be also maintained. Appropriate faculty development programmes shall be conducted regularly by institutions to facilitate medical teachers at all levels to continuously update their professional and teaching skill; and align their teaching skills to curricular objective.

2. ADMISSION, SELECTION, COUNSELING AND MIGRATION of MBBS COURSE

2.1 Number of Seats:

JIPMER, Puducherry admits **200*students i.e 150 students in JIPMER Puducherry and 50 students in JIPMER Karaikal** for MBBS course every year through **competitive entrance examination**. The distribution details of seats are as under

Category	JIPMER Puducherry	JIPMER Karaikal	TOTAL
General (UR)	55	19	74
OBC	28	9	37
SC	15	5	20
ST	7	2	9
P-UR	22	9	31
P-OBC	10	3	13
P-SC	5	1	6
P-ST	3	1	4
NRI/OCI	5	1	6
TOTAL	150	50	200

HORIZONTAL RESERVATION:-

ORTHOPEDICALLY HANDICAPPED (OPH)

(5% of the seats reserved horizontally to OPH candidates as per THE RIGHTS OF PERSONS WITH DISABILITIES ACT, 2016)

	JIPMER Puducherry	JIPMER Karaikal	TOTAL
OPH	5	1	6
P - OPH	2	-	2
TOTAL	7	1	8

The number and distribution of seats may vary depending upon the periodic directives /decisions from Competent Authorities.

ELIGIBILITY CRITERIA

- (i)** The Applicant should be an Indian National / Overseas Citizen of India.
- (ii)** He/She should complete age of 17 years at the time of admission or will complete the age on or before 31st December of the academic year of his/her admission to the 1st year M.B.B.S. Upper age limit is 25years
- (iii)** The applicants should have passed the qualifying examinations in the manner mentioned below:
- (iv)** The Higher / Senior Secondary Examination or the Indian School Certificate Examination which is equivalent to 10+2 Higher / Senior Secondary Examination after a period of 12 years study, the last two years of such study comprising Physics, Chemistry, Biology / Bio-technology (which shall include practical tests in these subjects) or any other elective with English at a level not less than the core course for English as prescribed by the National Council of Educational Research and Training after introduction of the 10+2+3 educational structure as recommended by the National Committee on Education.
- (v)** The Candidates who have passed the qualifying examination other than those mentioned in the list appended in Annexure – I, will have to submit an Eligibility Certificate before admission is finalized. Obtaining such an Eligibility Certificate from Association of Indian Universities, New Delhi is essential for OCI/NRI for admission to JIPMER M.B.B.S. Course.
- (vi)** The applicant must have passed in the subjects of Physics, Chemistry, Biology / Bio-technology and English individually and must have obtained a minimum of 50% marks taken together in Physics, Chemistry, Biology / Bio-technology at the qualifying examination. No candidate with piecemeal passing the subjects is eligible. Passing Biology as additional subject with other stream as main (Physics chemistry mathematics) will not be eligible.
- (vii)** For candidates belonging to the Scheduled Castes / Scheduled Tribe or Other Backward Classes / OPH the minimum marks obtained in the Physics, Chemistry, Biology/ Bio-technology taken together in the qualifying examination is 40%.
- (viii)** For OPH candidates in general category the minimum marks in Physics, Chemistry, Biology/ Biotechnology taken together in the qualifying examination is 45%.

Note: Applicants who have appeared or will be appearing in the qualifying examination in March / April of the academic year of admission and whose results have NOT yet been declared can also apply for admission, if other eligibility criteria (i) (ii) & (iii) are satisfied.

PROCEDURE TO APPLY

Candidates seeking admission to MBBS course are required to **apply through on-line mode only**. The details of various schedule of admission to the course of particular academic year are as follows:-

Sl. No	Description	Tentative Schedule
1.	Advertisement in the dailies	1 st Week of March
2	Online Registration commencement	1 st Week of March
3	Online Registration last date	3 rd Week of April
4.	Download Hall Ticket commencement	1 st Week of May
5	Entrance Examination	1 st Sunday of June
6	Declaration of Results	Within 15 days from the exam date
7	First Counseling	Third week of June
8	Closing date of Admission	30 th September

2.2 SELECTION & COUNSELING

The selection of students to MBBS course would be done every year through **competitive entrance examination which scheduled to be held on 1st Sunday of June**

ENTRANCE EXAMINATION

1. Entrance Examination will be conducted through a **Computer Based Test (CBT) [Online] only.**
2. The duration of the examination shall be **2½ hours (Two hours and Thirty minutes).**
3. **The examination shall be conducted in ENGLISH medium ONLY**
4. The Entrance Examination is common to all and consists of **200 single best response type MCQs** having four alternatives and **the questions will be asked from the following subjects. and the distribution of no. of question is as detailed below and**
The questions for JIPMER MBBS Entrance Examination would be **based on the syllabus as prescribed by State Board Hr. Sec. and CBSE for XI & XII Standards.**

Subject	No. of Questions
Physics	60
Chemistry	60
Biology	60
English Language and Comprehension	10
Logical & Quantitative Reasoning	10
TOTAL	200

Awarding of Marks:-

1. The response of the candidate for a question(s), on click of “submit button” before closing of Examination shall be considered as the response chosen by the candidate.
2. Questions that are ANSWERED will be considered as ANSWERED
3. MARKED FOR REVIEW will be considered as NOT ANSWERED
4. Each answer with CORRECT RESPONSE shall be awarded FOUR MARKS.
5. **One fourth of the marks will be deducted for INCORRECT RESPONSE.**
(Negative Marking)
6. ZERO mark will be given for the question NOT ANSWERED.
7. The score such obtained will be the Raw Score
8. This Raw Score will be used to determine Percentile score for the purpose of Eligibility using Cut-Offs and Normalization [for the purpose of determining Merit / Ranking].

MERIT LIST

Merit Ranking would be based on percentile score. Normalization will be adopted if the entrance exam is conducted in multiple shifts. (Normalization is a process for ensuring that students are neither advantaged nor disadvantaged by the difficulty of questions since the entrance exam is conducted in Multiple Shifts)

- Merit List would be drawn category wise based on minimum percentile as given below:

CATEGORY	Minimum Percentile
Unreserved (UR)/OCI/NRI	50
Unreserved (UR) – OPH	45
SC / ST / OBC /- OPH	40

- Candidates who secure less than the minimum percentile in the Entrance Examination will NOT be considered for admission and their names will NOT be included in the Merit List.
- NRI / OCI candidates who opt for admission under Self Financing Scheme should also appear for entrance examination and will be considered for the 6 Seats earmarked.

RESOLVING TIES

In case of two or more candidates securing equal Percentile in the entrance examination their inter se merit shall be determined in the following order:

- a. **Negative Marks:** the candidate who have scored less negative marks will be ranked higher
- b. **Biology:** Higher Percentile scores in Biology will result in higher ranking
- c. **Chemistry:** If Biology Percentiles do not break the tie, higher Percentile scores in Chemistry will result in higher ranking
- d. **Physics:** If Biology and Chemistry Percentiles do not break the tie, higher Percentile scores in Physics will result in higher ranking.
- e. **Age:** If still the tie exists, the candidate elder by age will be ranked higher

The JIPMER MBBS Online Entrance Examination is a proprietary examination and is conducted by JIPMER. The contents of this test are confidential and involving intellectual property rights, and are owned by JIPMER, JIPMER explicitly prohibits the candidate from publishing, reproducing or transmitting any or some contents of this test, in whole or in part, in any form or by any means verbal or written, electronic or mechanical or for any purpose.

COUNSELING

1. The candidates would be called for counseling as per the merit order (Category wise) and they would be directed to opt either JIPMER, Puducherry or JIPMER Karaikal on the day of counseling.
2. Biometric finger print and image verifications of the candidate will be done to the selected candidates. If there is a mismatch, the candidate will NOT be permitted to attend the counseling apart from proceeding with legal action deemed fit by the Institution
3. If a candidate opts for JIPMER, Puducherry, he/ she will not be allowed to change JIPMER, Karaikal & vice versa i.e. Sliding will not be allowed from JIPMER, Puducherry to JIPMER, Karaikal and vice versa. He / She will not be eligible for the second counseling.
4. If a candidate did not opt a seat on the day of counseling. He/ She will be eligible to attend the subsequent counseling.
5. Admission to all candidates is based on the merit, category of the candidates, and the availability of seats at the time of counseling.

MIGRATION

Migration from one medical college to other is not a right of a student and shall not be entertained under any circumstances.

MID – STREAM DEPARTURE (Penalty):-

Any candidate who discontinues the course on or after 01st October of that year for any reason; the fees once paid will not be refunded and Rs.50,000/- (Rupees Fifty Thousand Only) will be levied from the candidate as a penalty.

ADMISSION PROCESS TO SELECTED CANDIDATES

The selected candidates will have to undergo a Medical Examination constituted by a Medical board setup by the Institute, consisting of faculty members of the Institute. If, in the assessment of the medical board, a candidate is found medically unfit to be admitted in the course, then he/she will be rejected and not admitted and the decision of the Board shall be final. In that case, in his/her place next candidate in order of merit will be admitted after found fit by the Medical Board and submission of following certificates in original as well as one set of self-attested copies.

- Original Hall ticket with the sign and seal of the centre Invigilator
- Rank Letter
- Proof of Date of Birth (Birth Certificate or X Std. Certificate).
- Pass Certificate of the qualifying examination.
- Statement of marks of the qualifying examination.
- Character and Conduct Certificate from the Head of the Institute last Studied.
- Residence Certificate issued by Revenue Authority not below the rank of Tahsildar.
- In case of Other Backward Classes/ Scheduled Caste/ Scheduled Tribe, a Community Certificate, recently obtained from the competent authority – a Revenue Officer not below the rank of Tahsildar.
- Transfer Certificate from the Head of the Institution last studied.
- Migration Certificate
- Medical Certificate in case of OPH Candidate.
- Six Passport size colour photographs recently taken.
- Recent NRI Status certificate of the parent or candidate issued by the Indian Embassy of the respective Country with the Embassy seal.
- Certificate of Registration for Overseas Citizen of India.

All the above certificates will be digitized and a carrier card of each candidate will be made available through campus digitization(Valid phone number of parents/e-mail ID to be provided to the academic section)

3. DURATION AND DETAILS OF COURSE

3.1 DURATION OF COURSE

The MBBS course comprises **four and a half years**, followed by **compulsory rotatory internship of one year**. The course follows semester system, each semester consisting of six months. Normally the MBBS course shall commence on 1st JULY of an academic year. The MBBS course is divided in to **three phases** as detailed below: -

Phase 1	Phase2	Phase 3	
1 st and 2 nd Semester	3 rd , 4 th and 5 th Semester	6 th and 7 th Semester	8 th and 9 th Semester
I MBBS Examination during 2nd (second) Semester	II MBBS Examination during 5th (fifth) Semester	III MBBS Part – 1 Examination during 7th (seventh)Semester	III MBBS Part –2 (final) Examination during 9th (ninth) Semester

3.2 DETAILS OF COURSE

Phase & year of MBBS training	Subjects & New Teaching Elements	Duration	Professional examination
Phase 1 * (I MBBS)	Foundation Course (2 weeks) Anatomy, Physiology, Biochemistry and Early Clinical Exposure. Professional Development including Ethics	12months	I Professional
Phase 2 (II MBBS)	Pathology, Microbiology and Pharmacology, Forensic Medicine and Toxicology Introduction to clinical subjects Professional Development including Ethics	18 months	II Professional
Phase 3 (III MBBS) Part I	Oto-rhino laryngology, Ophthalmology, Community Medicine and Forensic Medicine and Toxicology Clinical subjects Professional development including ethics	12 months	III Professional (Part 1)
Phase 3 (III MBBS) Part 2	Medicine, Surgery, Obstetrics and Gynecology and Pediatrics and specialties Professional Development including Ethics	12 months	III Professional (Part 2)

***Community Medicine will be integrated from Phase – I to Phase –III vertically and the syllabus will be provided in Phase - III**

Duration of each Phase in MBBS course

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
						Foundation					
I MBBS						I year exam		II MBBS			
II MBBS										II year exam	
III MBBS Part 1										Part 1 exam	
III MBBS Part 2										Part 2 exam	
<p>Internship No outside candidates will be permitted to do internship at JIPMER</p>											

CURRICULUM FOR PHASE I

FOUNDATION COURSE

A. GOAL

To help the incoming fresh class of MBBS students get oriented to the curricular programme, the study environment and introduce them to some of the essential aspects of medicine that fall outside the purview of the core medical science disciplines, including language and communication skills, ethics and professionalism and leadership and computer skills.

B. OBJECTIVES

At the end of the 2 weeks of the foundation course the learner will

1. Be familiar with the contents of the MBBS training programme and how to approach it
2. Demonstrate an understanding of the structure and functioning of the health care system in the country
3. Be aware of the social determinants of health and disease
4. Appreciate the importance of language and communication skills in the practice of Medicine
5. Recognize the need for developing team working and leadership skills
6. Understand the concept of medical ethics and the place of ethical reasoning in day to day practice
7. Be familiar with the basic use of computers and the internet as learning aids
8. Demonstrate coping skills that will help her/him to withstand the stresses of the training programme
9. Perform steps of basic life support and first aid independently
10. Appreciate the importance of research in the advancement of medical science

C. GUIDELINES FOR IMPLEMENTATION

The programme will be conducted with a modular approach. The class of 200 students will be divided into 4 groups of 50 each who will then rotate among different modules over a 6-week period. During the last week, the students will be divided into 5 groups.

The modules will be activity based with minimum didactic content. Learners will experience hands on training in skills such as first aid and basic life support. The importance of social responsibility in medical practice will be introduced to them in the form of visits to the community followed by an exercise in reflective writing and group discussions about their experiences.

D. CONTENT

1. Study skills
2. Library skills
3. Stress management
4. Innovation and patents
5. Leadership and Communication
6. Tamil
7. Computer skills
8. Scientific writing
10. First aid
11. Ethics, professionalism and Time Management
12. English
13. History of Medicine
14. Community orientation
15. Healthy lifestyle
16. Road safety

E. SCHEDULES

FOUNDATION COURSE

PROGRAMME SCHEDULE			
	Group A	Group B	Group C
DAY 1	Welcome address by Director/ Dean; interaction with faculty along with parents - (SSB Auditorium, Super Speciality Block, JIPMER)		
	The MBBS programme and how to approach it by JSA Volunteers and Co-ordinators - (SSB Auditorium, Super Specialty Block, JIPMER)		
DAY 2	History of Medicine (NTTC Hall-1)	Study Skills and Time Management (Exam Hall-2)	Library skills & Use of IT (Central Library)
	Orientation to First Year Subjects (Anatomy) (Biochemistry Lecture Hall)		
DAY 3	Library skills & Use of IT (E-learning Centre, JAC)	History of Medicine (NTTC Hall-1)	Study Skills and Time Management (Exam Hall-2)
	Orientation to First Year Subjects (Physiology) (Biochemistry Lecture Hall)		
DAY 4	Visit to JAC, WCH, EMS and Admin block		
DAY 5	Study Skills and Time Management (Exam Hall-2)	Library skills & Use of IT (E-learning Centre, JAC)	History of Medicine (NTTC Hall-1)
	Orientation to First Year Subjects (Biochemistry) – (Biochemistry Lecture Hall)		

DAY6	First aid & BLS (NTTC Hall-1)	Community Orientation (Exam Hall-3)	Tamil – I (Exam Hall-2)
		Team & Leadership Skills (Exam Hall-3)	
DAY 7	Tamil – I (Exam Hall-2)	First aid & BLS (NTTC Hall-1)	Community Orientation (Exam Hall-3)
			Team & Leadership Skills (Exam Hall-3)
DAY 8	Community Orientation (Exam Hall-3)	Tamil – I (Exam Hall-2)	First aid & BLS (NTTC Hall-1)
	Team & Leadership Skills (Exam Hall-3)		
DAY 9	Importance of English language in MBBS Course (Exam Hall-2)	Tamil – II (NTTC Hall-1)	Yoga & Healthy Life Style (Exam Hall-3)
	Ethics and Professionalism (NTTC Hall-1)	Stress management (Exam Hall-2)	Communication Skills (Exam Hall-3)
DAY 10	Road safety, Universal Precautions, Voluntary Blood and Organ Donation (Mini Auditorium, JIPMER Academic Centre)		
DAY11	Yoga & Healthy Life Style (Exam Hall-3)	Importance of English language in MBBS Course (Exam Hall-2)	Tamil – II (NTTC Hall-1)
	Communication Skills (Exam Hall-3)	Ethics and Professionalism (NTTC Hall-1)	Stress management (Exam Hall-2)
DAY 12	Tamil – II (NTTC Hall-1)	Yoga & Healthy Life Style (Exam Hall-3)	Importance of English language in MBBS Course (Exam Hall-2)
	Stress management (Exam Hall-2)	Communication Skills (Exam Hall-3)	Ethics and Professionalism (NTTC Hall-1)

PHASE I MBBS

A. GOAL

To develop and implement system-based and temporally synchronized teaching-learning content/modules and its annual timetable and detailed weekly timetables in MBBS First year Curriculum.

B. GUIDELINES FOR IMPLEMENTATION

Teaching-Learning

- I. Sequential coverage of the following content/modules
 1. General Module
 2. General Embryology, Genetics, General Histology, Hematological System &
 3. Immunological System
 4. Locomotor System & Autonomic Nervous System
 5. Endocrine System, Postnatal Growth & Development
 6. Respiratory System
 7. Cardiovascular System
 8. Gastrointestinal System, Hepatobiliary & Pancreatic System & Nutrition
 9. Renal System
 10. Reproductive System & Mammary Gland
 11. Nervous System, Head & Neck, Special Senses, Molecular Biology, Cancer Biology & Integrative Physiology
 12. Advanced Module
- II. Correlations between Anatomy, Physiology and Biochemistry to be emphasized throughout the course.
- III. Clinical correlations to be emphasized in Anatomy, Physiology and Biochemistry. Correlations with radiological and imaging studies to be also emphasized in Anatomy. About 20% of content to be taught by clinicians.
- IV. At least 4 hours of relevant early clinical exposure constituting visits to diagnostic and treatment facilities to be included during each module.
- V. A minimum 10% of theory content (which is not to be taught by the teacher) in each module to be assigned for Self-Directed Learning (SDL) in Anatomy, Physiology and Biochemistry.
- VI. Five learning modules for Professional Year 1 from Attitude and Communication (AT-COM) Competencies for the Indian Medical Graduate (MCI, 2015) to be included in curriculum (Eg., Module 5 in Anatomy in the first month of first semester and Modules 1, 2, 3 in Physiology and Module 4 in Biochemistry in the first month of second semester).

Separately in
Anatomy,
Physiology
and
Biochemistry

- VII. One third of the total teaching time to consist of interactive lectures. At the end of a lecture, feedback on learning of students to be given using MCQs.
- VIII. Two-thirds of the total teaching time to consist of practicals/OSPEs, small group discussions (including discussions on clinical problems and case studies) and oral presentations with AV aids by students (Eg., for theory content assigned for SDL).
- IX. Adult learning principles will be followed in teaching and student centred learning strategy to be used.
- X. Anonymous constructive feedback from students on teaching, without naming and blaming anyone, to be obtained after lectures and other teaching sessions using paper based or online method.
- XI. Detailed feedback from students with suitable questionnaire will be obtained after each module using paper based or online method.
- XII. Provision of a copy of PowerPoint presentations and other electronic teaching content to the student before the classes by email/intranet with protection desirable.

Assessment

- I. One day every week (Monday) will be marked for formative assessment in all three departments and individual feedback.
- II. Four Internal assessment (theory and practical) and one end up examination will be conducted in all three departments
- III. Theory content assigned for SDL to have formative assessment and individual feedback as described below. Theory content assigned for SDL to be included for internal assessment and first professional examination (Content under Guideline VI not to be included for internal assessment and first professional examination).
- IV. Formative assessment methods (examples) include
 - (A) On spot Viva Voce
 - (B) On spot MCQs
 - (C) Previously assigned and assessed written assignment
 - (D) On spot OSPE
 - (E) On spot oral presentations on previously assigned topics
- V. A blueprint of content of modules (theory and practical) will be prepared before every internal assessment and before first professional examination. All questions to have model answers and marking schemes.
- VI. A model blueprint and a model question paper will be provided to the student at the beginning of the course.
- VII. Final theory assessment to consist of two papers in each discipline with five brief answers of four marks each and ten two-marks question under each section.
- VIII. To use OSPE for assessment of practical skills
- IX. Minimum pass marks to be set at 50% for IA as well as the Summative assessment.

Student Support

- I. Support will be provided to students with lower achievement during the MBBS Course to bring up their learning to the requirement.
- II. Students with failures in first professional examination will be given learning support and opportunity to be given to them to join phase II MBBS on time.

C. ANNUAL TIMETABLE

DEPARTMENTS OF ANATOMY, PHYSIOLOGY, BIOCHEMISTRY

MODULE	NAME OF THE MODULE	WEEK
1.	Foundation Course	1 – 2
2.	General Module	3–5
3.	General Embryology, Genetics, General Histology, Hematological System & Immunological System	
4.	Locomotor System & Autonomic Nervous System	6-17
5.	Endocrine System, Postnatal Growth & Development	18-20
6.	Respiratory system	21-22
7.	Cardiovascular System	23-25
	Winter Vacation December	26
8.	Gastrointestinal System, Hepatobiliary & Pancreatic System & Nutrition	27-29
9.	Renal System	30-31
10.	Reproductive System and Mammary Gland	32-34
11.	Nervous System, Head & Neck , Special Senses, Molecular Biology, Cancer Biology & Integrative Physiology	36-41
12.	Advanced Module	43-45
	SEND UP Theory	46
	SEND UP Practical	47
	Preparatory holidays	48
	FINAL Theory	49
	FINAL Practical	50

TOTAL TEACHING HOURS

Foundation course	100 hrs
Anatomy	700 hrs
Physiology	500 hrs
Biochemistry	280 hrs

D. SYSTEM-BASED & TEMPORALLY SYNCHRONIZED CONTENT**DEPARTMENTS OF ANATOMY, PHYSIOLOGY, BIOCHEMISTRY****I MBBS SYSTEM-BASED AND TEMPORARILY SYNCHRONIZED CONTENT
(MODULES 1- 11)**

MODULE	SECTION	DEPT.	NAME OF THE MODULE/DESCRIPTION
1-3			SESSION- I
1			GENERAL MODULE
	1.1	ANATOMY	GENERAL ANATOMY
		1.1.1 (Theory)	<ul style="list-style-type: none">● Introduction to Anatomy – Anatomical terms● Introduction to Skeletal system – Bones● Introduction to Skeletal system – Joints● Introduction to Muscular system● Introduction to Vascular system and Lymphatic system● Introduction to Nervous System● Introduction to Integumentary System
		1.1.2 (Theory SDL)	<ul style="list-style-type: none">● Types of ossification
		1.1.3 (Practical)	<ul style="list-style-type: none">● Anatomical position, terms, planes & sections● Skeletal system● Muscular system● Nervous system● Vascular system and lymphatic system● Integumentary system
	1.2	PHYSIOLOGY	GENERAL PHYSIOLOGY
		1.2.1 (Theory)	<ul style="list-style-type: none">● Importance of Physiology in medicine● Functional organization of human body, Principles of Homeostasis and physiological control mechanism● Intercellular connections and Communications● Transport across cell membrane● Body fluids: Principles and methods of measurement of body fluid compartments
		1.2.2 (Theory SDL)	<ul style="list-style-type: none">● Functional organization of Cell and its organelles
		1.2.3 (Practical)	<ul style="list-style-type: none">● Introduction● Microscopy and collection of blood samples
	1.3	BIOCHEMISTRY	GENERAL BIOCHEMISTRY
		1.3.1 (Theory)	<ul style="list-style-type: none">● Enzyme kinetics, Inhibition and regulation of enzyme activity, Isoenzymes:● Chemistry of carbohydrates / lipids / proteins: Biological oxidation and ATP synthesis:● Enzymes in clinical diagnosis:
		1.3.2 (Theory SDL)	<ul style="list-style-type: none">● Enzymes in clinical diagnosis:
		1.3.3 (Practical)	<ul style="list-style-type: none">● Color reactions of carbohydrates● Color reactions of proteins

2	GENERAL EMBRYOLOGY, GENETICS, GENERAL HISTOLOGY, HEMATOLOGICAL SYSTEM & IMMUNOLOGICAL SYSTEM	
2.1	ANATOMY	GENERAL EMBRYOLOGY, GENETICS & GENERAL HISTOLOGY
	2.1.1 (Theory)	GENERAL EMBRYOLOGY <ul style="list-style-type: none"> ● Cell structure & Division ● Gametogenesis ● week of development ● II week of development ● III week of development ● Embryonic period ● Placenta & umbilical cord ● Twinning & teratogens GENETICS <ul style="list-style-type: none"> ● Structural aberrations of chromosomes ● Numerical aberrations of chromosomes ● Modes of inheritance ● Prenatal diagnosis and Genetic counseling
	2.1.2 (Theory SDL)	<ul style="list-style-type: none"> ● Structure & Classification of chromosomes ● Karyotyping
	2.1.3 (Practical)	General Histology Practical: <ul style="list-style-type: none"> ● Epithelial tissue ● Connective tissue-General ● Cartilage ● Bone ● Muscular tissue ● Peripheral Nerve & Autonomic Ganglia ● Blood vessels ● Lymphoid organs-I ● Lymphoid organs-II ● Skin ● Demonstration of Embryology models ● Demonstration of genetics models
2.2	PHYSIOLOGY	HEMATOLOGY & IMMUNOLOGY
	2.2.1 (Theory)	<ul style="list-style-type: none"> ● Introduction to blood and Functions of plasma proteins ● Abnormal Hemoglobins, Jaundice & Physiological basis of Jaundice ● Classification and physiological basis of Anemia; Hematinic Factors ● Physiological basis of investigations for Anemia and Jaundice ● Blood Grouping, physiological basis of blood transfusion and its reactions (2) ● White blood cells – Structure, Functions and fate of WBCs ● Principles of Haemopoiesis and Bone marrow micro-environment ● Erythropoiesis – Principles and Regulation ● Leucopoiesis - Principles and regulation ● Immunity and Development of immunity

		<ul style="list-style-type: none"> Adaptive immunity and its mechanisms Immune Response and Complement System Immune tolerance, Immunotherapy, Immunodeficiency and Immunomodulation Thrombopoiesis, structure, functions and fate of Platelets Hemostasis and Clotting mechanisms Haemostatic Balance – Anti-haemostatic and pro-haemostatic mechanisms Haemorrhagic Disorders Tests for Platelet and Clotting functions
	2.2.2 (Theory SDL)	<ul style="list-style-type: none"> Red Blood Cell – Structure, Functions and fate of RBCs Red blood cell turnover Lymphoid organs and Lymph Innate immunity and its mechanisms
	2.2.3 (Practical)	<ul style="list-style-type: none"> Hb estimation Hemocytometry & PCV Revision of Hemoglobin RBC Count ESR and Osmotic fragility Peripheral Smear TLC DLC Blood Group, BT, CT Arneth Count Revision Blood Group, BT, CT AEC Platelet & Retic demo Revision of TLC, RBC Revision of Hb, BT & CT Revision of hematology
2.3	BIOCHEMISTRY	HEMATOLOGY & IMMUNOLOGY
	2.3.1 (Theory)	Immunoglobulin structure and types, antigen-antibody complex Hemoglobin; Structure and function Heme: Synthesis, Catabolism and disorders Anemia: Vitamins : B12 , folic Acid , B6, Iron Hemoglobinopathies
	2.3.2 (Theory SDL)	Biochemical Investigations in Anemia
	2.3.3 (Practical)	<ul style="list-style-type: none"> Demonstration of immunological techniques (ELISA, Chemiluminiscence) Colorimetry, Demonstration of Hb and its derivatives

3	LOCOMOTOR SYSTEM & AUTONOMIC NERVOUS SYSTEM	
	<p data-bbox="204 165 248 197">3.1</p> <p data-bbox="325 165 496 197">ANATOMY</p> <p data-bbox="325 533 448 600">3.1.1 (Theory)</p> <p data-bbox="325 1025 520 1093">3.1.2 (Theory SDL)</p> <p data-bbox="325 1608 472 1675">3.1.3 (Practical)</p>	<p data-bbox="616 165 978 197">LOCOMOTOR SYSTEM</p> <p data-bbox="616 219 1177 250">LOCOMOTOR SYSTEM – Upper Limb</p> <ul data-bbox="667 255 1461 618" style="list-style-type: none"> ● AT-COM ● Introduction & development of locomotor system, pectoral region ● Axilla ● Shoulder joint complex ● Elbow & wrist joints ● Hand – muscles, vessels & nerves ● Hand – spaces ● Nerve injuries of upper limb ● Venous & lymphatic drainage of upper limb <p data-bbox="616 622 1166 654">LOCOMOTOR SYSTEM – Lower Limb</p> <ul data-bbox="667 658 1286 909" style="list-style-type: none"> ● Introduction, femoral triangle, adductor canal ● Hip joint ● Popliteal fossa ● Knee joint ● Ankle joint, joints of foot ● Arches of foot ● Venous drainage of lower limb <ul data-bbox="667 922 1187 1205" style="list-style-type: none"> ● Cubital fossa ● Intermuscular spaces around shoulder ● Radioulnar joints ● Hand grips ● Femoral canal ● Saphenous opening ● Tibiofemoral joints ● Gait <p data-bbox="616 1218 1177 1249">LOCOMOTOR SYSTEM – Upper Limb</p> <p data-bbox="616 1254 692 1285">Gross</p> <ul data-bbox="667 1290 1082 1550" style="list-style-type: none"> ● Pectoral region ● Axilla ● Scapular region ● Arm ● Forearm ● Hand ● Surface anatomy & radiology <p data-bbox="616 1554 750 1585">Osteology</p> <ul data-bbox="667 1590 922 1729" style="list-style-type: none"> ● Clavicle, scapula ● Humerus ● Radius, ulna ● Articulated hand <p data-bbox="616 1733 1177 1765">LOCOMOTOR SYSTEM – Lower Limb</p> <p data-bbox="616 1769 692 1800">Gross</p> <ul data-bbox="667 1805 1445 2065" style="list-style-type: none"> ● Front of thigh ● Adductor compartment ● Gluteal region ● Posterior compartment of thigh ● Popliteal fossa ● Anterior & lateral compartment of leg and dorsum of foot ● Posterior compartment of leg & retinacula around ankle

			<ul style="list-style-type: none"> • Sole • Surface anatomy & radiology <p>Osteology</p> <ul style="list-style-type: none"> • Hip bone • Femur • Tibia & fibula <p>Articulated foot</p>
	3.2	PHYSIOLOGY	LOCOMOTOR SYSTEM & AUTONOMIC NERVOUS SYSTEM
		3.2.1	<p>Theory</p> <ul style="list-style-type: none"> • Resting Membrane Potential • Nerve • Neuromuscular junction • Skeletal Muscle • Smooth muscle • Autonomic nervous system : functional organization • Sympathetic and para sympathetic systems • Autonomic function tests
		3.2.2	<p>Theory SDL</p> <ul style="list-style-type: none"> • Dysfunctions of autonomic nervous system
		3.2.3	<p>Practical</p> <ul style="list-style-type: none"> • Mosso's Ergography • Nerve conduction test and Surface EMG • Lying to standing • Deep breathing difference • Isometric handgrip test • Cold pressor test
	3.3	BIOCHEMISTRY	LOCOMOTOR SYSTEM & AUTONOMIC NERVOUS SYSTEM
		3.3.1	<p>Theory</p> <p>Minerals: Calcium, Phosphorus, Magnesium</p> <ul style="list-style-type: none"> • Vitamins: Vitamin D and pantothenic acid • Rickets, Fanconi syndrome
		3.3.2	<p>Theory SDL</p> <ul style="list-style-type: none"> • Disorders of muscles: Muscular dystrophy, malignant hyperthermia
		3.3.3	<p>Practical</p> <ul style="list-style-type: none"> • Estimation of calcium and Phosphorus

4	ENDOCRINE SYSTEM, POSTNATAL GROWTH & DEVELOPMENT	
4.1	ANATOMY	ENDOCRINE SYSTEM
	4.1.1 (Theory)	<ul style="list-style-type: none"> ● Pituitary gland- Gross, microscopic and developmental anatomy ● Thyroid and parathyroid - Gross anatomy ● Thyroid and parathyroid - Microscopic and developmental anatomy ● Adrenal gland - Gross, microscopic and developmental anatomy Postnatal growth and development- I, II, III, IV
	4.1.2 (Theory &SDL)	<ul style="list-style-type: none"> ● Islets of Langerhans ● Diffuse Endocrine system
	4.1.3 (Practical)	<ul style="list-style-type: none"> ● Demonstration of gross specimen ● Demonstration of embryology models ● Histology - pituitary and adrenal gland ● Histology - thyroid and parathyroid
4.2	PHYSIOLOGY	ENDOCRINE SYSTEM
	4.2.1 (Theory)	<ul style="list-style-type: none"> ● Mechanisms of hormonal action ● Pituitary Gland and Hypothalamus, Hypothalamo-Pituitary-Endocrine axis ● Anterior Pituitary hormones ● Hormones from Posterior and Intermediate lobe of Pituitary, Hypothalamic Hormones ● Endocrine disorders of Hypothalamus and pituitary gland ● Thyroid Hormone – Biosynthesis, Secretion and Regulation of thyroid secretion ● Physiological effects of Thyroid Hormone ● Endocrine disorders of thyroid gland ● Adrenocortical hormones – Biosynthesis, Functions and Regulation of secretion ● Endocrine disorders of Adrenal gland ● Endocrine Pancreas – insulin & glucagon- Biosynthesis, Secretion, Functions and Regulation of secretion ● Disorders of endocrine pancreas ● Hormones of Calcium Homeostasis - Biosynthesis, Functions and Regulation of secretion ● Disorders of Calcium Homeostasis ● Pineal gland ● Hormonal changes in Stress response
	4.2.2 (Theory SDL)	<ul style="list-style-type: none"> ● Introduction and General Principles of regulation of endocrine secretions ● Thyroid function tests ● Adrenomedullary hormones – Biosynthesis, Functions and Regulation of secretion ● Local hormones
	4.2.3 (Practical)	CVS and RS practicals will be taken during these 3 weeks' time
4.3	BIOCHEMISTRY	ENDOCRINE SYSTEM
	4.3.1 (Theory)	<ul style="list-style-type: none"> ● Regulation of blood glucose, Metabolism in starvation, ● Thyroid function tests, Adrenocortical function tests, ● Diabetes mellitus, OGTT,
	4.3.2 (Theory SDL)	<ul style="list-style-type: none"> ● Interpretation of thyroid and adrenal function test
	4.3.3 (Practical)	<ul style="list-style-type: none"> ● Demonstration of Blood Glucose Estimation, ABG , PT

5	RESPIRATORY SYSTEM	
5.1	ANATOMY	RESPIRATORY SYSTEM
	5.1.1 (Theory)	<ul style="list-style-type: none"> ● Introduction of respiratory system, paranasal air sinuses ● Nasal cavity & Nasopharynx ● Larynx I ● Larynx II ● Thoracic cage, inlet, outlet, intercostal space ● Intercostal muscles, nerves and vessels ● Diaphragm ● Pleura ● Development of respiratory system
	5.1.2 (Theory & SDL)	<ul style="list-style-type: none"> ● Trachea, bronchi & Bronchopulmonary segments ● Cross sectional anatomy of thoracic cavity ● Diaphragmatic hernia
	5.1.3 (Practical)	<ul style="list-style-type: none"> ● Thoracic vertebra & sternum ● Thoracic ribs, joints ● Nasal cavities, nasopharynx ● Lungs – right and left ● Histology of trachea, bronchi, lung, epiglottis ● Embryology models ● Radiological anatomy of respiratory system- nasal cavity, paranasal sinuses ● chest x-ray ● Surface anatomy of respiratory system
5.2	PHYSIOLOGY	RESPIRATORY SYSTEM
	5.2.1 (Theory)	<ul style="list-style-type: none"> ● Functional organization & non respiratory functions of RS ● Mechanics of breathing & compliance ● Pulmonary surfactant & Transport of gases ● Regulation of respiration ● Application of PFT – Obstructive vs Restrictive ● Respiration in altered barometric pressure
	5.2.2 (Theory & SDL)	<ul style="list-style-type: none"> ● Lung Volumes & capacities ● Classification & Methods of estimating PFT ● Oxygen therapy ● Abnormal respiration ● Assisted Ventilation & CPR
	5.2.3 (Practical)	<ul style="list-style-type: none"> ● Stethography ● Effect of posture on vital capacity ● Clinical Examination of RS ● PFT (demo)
5.2	BIOCHEMISTRY	RESPIRATORY SYSTEM
	5.3.1 (Theory)	<ul style="list-style-type: none"> ● General aspects of acid base balance, Respiratory regulation of blood pH and related disorders ● Interpretation of acid base disorders
	5.3.2 (Theory & SDL)	<ul style="list-style-type: none"> ● Interpretation of acid base disorders
	5.3.3 (Practical)	<ul style="list-style-type: none"> ● ATCOM (Communication skills part I)

6	CARDIOVASCULAR SYSTEM	
6.1	ANATOMY	CARDIOVASCULAR SYSTEM
	6.1.1 (Theory)	<ul style="list-style-type: none"> • Introduction to CVS, Mediastinum and contents • Pericardium and External features of the Heart • Blood supply to heart • Chambers of heart-I&Chambers of heart-II • Superior mediastinum&Posterior mediastinum • Embryology-development of heart, aortic arches, major veins
	6.1.2 (Theory SDL)	<ul style="list-style-type: none"> • Nerve supply to heart, heart valve complex • Atrial and ventricular septal defects, TOF, PDA, Coarctation of aorta • Fetal circulation
	6.1.3 (Practical)	<ul style="list-style-type: none"> • Location of heart, pericardium and pericardial sinuses • External features of heart, blood vessels of the heart • Internal features of chambers of the heart • Superior mediastinum&Posterior mediastinum • Surface and radiological anatomy • Embryology models
6.2	PHYSIOLOGY	CARDIOVASCULAR SYSTEM
	6.2.1 (Theory)	<ul style="list-style-type: none"> • Properties of cardiac muscle • Conductive system of heart • Electrophysiology of heart and ECG • Cardiac cycle • Cardiac output • Regulation of heart rate • Cardiac hemodynamics • Blood pressure (mechanism &regulation) • Hypertension • Hypotension & shock • Heart failure & its management • Cerebral circulation • Coronary circulation • Cutaneous & Splanchnic circulation • CVS, RS changes during exercise
	6.2.2 (Theory SDL)	<ul style="list-style-type: none"> • Functional anatomy of heart • JVP and heart sounds • Physiology of blood vessels • Fetal circulation
	6.2.3 (Practical)	<ul style="list-style-type: none"> • Examination of peripheral pulses & recording of BP • ECG • Effect of posture on BP • Effect of exercise on BP • Systolic time interval (demo) • Examination of cardiovascular system • Cardiac AFT
6.3	BIOCHEMISTRY	CARDIOVASCULAR SYSTEM
	6.3.1 (Theory)	<ul style="list-style-type: none"> • Collagen – structure, disorders • Lipid metabolism, prostaglandins • Sulphur containing aa, Homocysteine metabolism and disorders • Free radicals and antioxidants • Interpretation of lipid profile,
	6.3.2 (Theory SDL)	<ul style="list-style-type: none"> • Hyper lipoproteinemia, metabolic syndrome
	6.3.3 (Practical)	<ul style="list-style-type: none"> • Demonstration of estimation of cholesterol and Troponin I

7	GASTROINTESTINAL SYSTEM, HEPATOBILIARY & PANCREATIC SYSTEM & NUTRITION		
	7.1	ANATOMY	GASTROINTESTINAL SYSTEM, HEPATOBILIARY & PANCREATIC SYSTEM
		7.1.1 (Theory)	<ul style="list-style-type: none"> ● Introduction to GIT & Anterolateral abdominal wall ● Inguinal Canal ● Peritoneum ● Pharynx and esophagus ● Stomach ● Duodenum ● Pancreas ● Liver ● Extrahepatic Biliary Apparatus ● Portal vein & Portosystemic Anastomosis ● Caecum & Vermiform Appendix ● Rectum ● Anal Canal, Ischio-anal fossa ● Development of GIT
		7.1.2 (Theory SDL)	<ul style="list-style-type: none"> ● Oral cavity ● Inguinal Hernia ● Surgical Incisions ● Pyloric stenosis
		7.1.3 (Practical)	<p>Gross Anatomy Demonstration</p> <ul style="list-style-type: none"> ● Anterolateral Abdominal Wall & Inguinal Canal ● Peritoneal folds and recesses ● Stomach , Duodenum & Coeliac Trunk ● Jejunum , Ileum & Superior Mesenteric Artery ● Caecum & Appendix ● Colon, Rectum, Anal Canal & Inf. Mesenteric Artery ● Liver ● Extrahepatic Biliary Apparatus & Portal vein ● Pancreas ● Spleen <p>Osteology :</p> <ul style="list-style-type: none"> ○ Lumbar Vertebra & Sacrum ○ Osteology of Pelvis <ul style="list-style-type: none"> ● Surface anatomy of all organs of GIT ● Radiology - Plain and contrast Radiographs ● Demonstration of GIT Embryology models <p>Histology:</p> <ul style="list-style-type: none"> ○ Salivary Glands- Serous, Mucous, Mixed ● Esophagus, Stomach ● Duodenum, Jejunum, Ileum ● Colon, Appendix ● Liver, Gallbladder, Pancreas

7.2	PHYSIOLOGY	GASTROINTESTINAL SYSTEM, HEPATOBILIARY & PANCREATIC SYSTEM & NUTRITION
	7.2.1 (Theory)	<ul style="list-style-type: none"> • Functional organization of gastrointestinal tract and principles of GI tract • Enteric nervous System and applied aspects • Overview of Gastrointestinal Motility and Electro-mechanical Events in GI Tract • Role of Oral cavity and Salivary glands in GI Function • Role of Esophagus in GI Function; Deglutition and Esophageal motility • Functional organization of Stomach and its Electro-mechanical activities • Gastric Acid Secretion and its Regulation • Gastric function tests and Peptic Ulcer disease • Exocrine Pancreas – Secretion and Regulation • Duodenum – Secretory, Digestive and Absorptive Events • Liver – Functional organization and role in Digestion • Gall bladder - Functional organization and role in Digestion • Small intestine – Secretion, absorption, motility and electro-mechanical properties • Large Intestine – Absorption, secretion, motility and electromechanical properties • Review of Gastrointestinal Motility and applied aspects • Upper and Lower GI disorder&Problem based learning
	7.2.2 (Theory SDL)	<ul style="list-style-type: none"> • Pancreatic function tests and Liver function tests • Gastrointestinal Hormones • Digestion and absorption of carbohydrate / protein / fat in the GI tract • Gastrointestinal flora, GI lymphoid organs and Immune functions
	7.2.3 (Practical)	<ul style="list-style-type: none"> • Abdominal examination
7.3	BIOCHEMISTRY	GASTROINTESTINAL SYSTEM, HEPATOBILIARY & PANCREATIC SYSTEM & NUTRITION
	7.3.1 (Theory)	Gastrointestinal system and Nutrition <ul style="list-style-type: none"> • Digestion and absorption of carbohydrates, lipids, amino acids • Metabolism of carbohydrates (Glycogenesis , Glycogenolysis, Gluconeogenesis) and amino acids (Aromatic aa , glycine, branched chain, polyamine) • Micronutrients; Vitamins , Minerals • BMR, SDA, Balanced diet, dietary fibers Hepatobiliary and Pancreatic function tests <ul style="list-style-type: none"> • Bilirubin metabolism, Bile acid synthesis • Xenobiotics • Types of jaundice and their biochemical alterations
	7.3.2 (Theory SDL)	<ul style="list-style-type: none"> • Diet therapy in disease conditions, PEM • Interpretation of LFT, Pancreatic function tests
	7.3.3 (Practical)	Demonstration of chromatography <ul style="list-style-type: none"> • Estimation of Bilirubin

8	RENAL SYSTEM	
8.1	ANATOMY	RENAL SYSTEM
	8.1.1 (Theory)	<ul style="list-style-type: none"> ● Kidney & ureter ● Urinary Bladder ● Urethra Male & Female ● Development of Kidney, Ureter and Urinary Bladder
	8.1.2 (Theory SDL)	<ul style="list-style-type: none"> ● Renal Angle ● Morris Parallelogram
	8.1.3 (Practical)	<ul style="list-style-type: none"> ● Gross <ul style="list-style-type: none"> ○ Posterior Abdominal Wall ○ Kidney & its Relations ○ Ureter ○ Urinary Bladder ● Histology <ul style="list-style-type: none"> ○ Kidney ○ Ureter and Urinary Bladder ● Embryology Models
8.2	PHYSIOLOGY	RENAL SYSTEM
	8.2.1 (Theory)	<ul style="list-style-type: none"> ● Renal circulation-special features. ● Measurement and regulation of renal circulation and clearance ● Juxtaglomerular apparatus ● Glomerular filtration & GFR-Factors and measurement ● Renin-Angiotensin-Aldosterone system ● Tubular function (reabsorption, secretion and handling of solutes, electrolytes and water) ● Mechanism of urine concentration and dilution ● Role of kidney in Water and Osmolarity balance ● Role of kidney in acid base balance ● Micturition, Cysto-metrogram, Disorders of Bladder function and Micturition ● Physiological basis of Renal failure, Dialysis
	8.2.2 (Theory SDL)	<ul style="list-style-type: none"> ● Functional organization of the renal system, Non-excretory functions of Kidney ● Principle of Diuresis and Diuretics
	8.2.3 (Practical)	No Practical
8.3	BIOCHEMISTRY	RENAL SYSTEM
	8.2.1 (Theory)	<ul style="list-style-type: none"> ● Excretory function: Formation of ammonia, Detoxification of ammonia, Urea cycle ● Regulatory function: Water and electrolyte balance(Na,K,Cl), Renal regulation of pH ● Renal function test: Tests for glomerular and tubular functions
	8.2.2 (Theory SDL)	<ul style="list-style-type: none"> ● Interpretation of RFT, Disorders of urea cycle (Hyperammonemia) ● Lab diagnosis of renal failure, nephritic/ nephrotic syndrome, RTA ● Interpretation of metabolic acidosis and metabolic alkalosis
	8.2.3 (Practical)	<ul style="list-style-type: none"> ● Urine analysis – normal and abnormal ● Demonstration of urea, creatinine, pH meter and pH indicator, potentiometric analysis of electrolytes

9	REPRODUCTIVE SYSTEM & MAMMARY GLAND	
9.1	ANATOMY	REPRODUCTIVE SYSTEM & MAMMARY GLAND
	9.1.1 (Theory)	<ul style="list-style-type: none"> ● External genitalia – male and female ● Testis and spermatic cord ● Perineum ● Pelvic diaphragm with pelvic peritoneal pouches ● Prostate and accessory male reproductive organs ● Uterus, Adnexa and ovaries& ● Lateral pelvic wall ● Mammary gland ● Development of reproductive system
	9.1.2 (Theory SDL)	<ul style="list-style-type: none"> ● Prostatic urethra ● Ambiguous genitalia ● Remnants of mesonephric and paramesonephric ducts
	9.1.3 (Practical)	<p>Gross Anatomy:</p> <ul style="list-style-type: none"> ● Male reproductive organs (Male external genitalia, & prostate, Testis, seminal vesicles) ● Female reproductive organs (Uterus with adnexa & vagina, Supports of uterus and Ovaries) ● Lateral pelvic wall ● Sections of pelvic cavity – Male and female ● Models for development of reproductive system <p>Histology:</p> <ul style="list-style-type: none"> ● Testis, epididymis, Vas deferens ● Seminal vesicle & prostate, Penis, Uterus, Uterine tube ● Ovary, mammary gland, and placenta <p>Radiology:Hystero-salpingography, Cystoscopy</p>
9.2	PHYSIOLOGY	REPRODUCTIVE SYSTEM
	9.2.1 (Theory)	<ul style="list-style-type: none"> ● Sex differentiation and development ● Male reproduction system ● Female reproduction system ● Physiology of pregnancy and parturition ● Physiology of contraception
	9.2.2 (Theory SDL)	<ul style="list-style-type: none"> ● Physiology of breast development and lactation
	9.2.3(Practical)	<ul style="list-style-type: none"> ● No Practical
9.3	BIOCHEMISTRY	● REPRODUCTIVE SYSTEM
	9.3.1(Theory)	<ul style="list-style-type: none"> ● Biosynthesis of Gonadal Hormones ● Gonadal function test ● Prenatal screening test
	9.3.2 (Theory SDL)	<ul style="list-style-type: none"> ● Disorders of Gonadal hormonal function
	9.3.3(Practical)	<ul style="list-style-type: none"> ● No Practical

10	NERVOUS SYSTEM, HEAD & NECK, SPECIAL SENSES, MOLECULAR BIOLOGY, CANCER BIOLOGY & INTEGRATIVE PHYSIOLOGY		
	10.1	ANATOMY	CENTRAL NERVOUS SYSTEM, HEAD & NECK & SPECIAL SENSES <ul style="list-style-type: none"> ● Scalp ● Posterior Triangle of neck ● Anterior Triangle of neck ● Parotid region ● Submandibular region ● Infratemporal fossa ● Temporomandibular joint ● Pharynx ● Meninges & Dural venous sinuses ● Cavernous sinus ● Development of Pharyngeal arches ● Development of Arterial arches ● Development of face & palate Special senses: <ul style="list-style-type: none"> ● Tongue ● Eyeball ● Extraocular muscles ● External ear and middle ear ● Internal ear ● Development of eye ● Development of ear Central nervous system: <ul style="list-style-type: none"> ● Spinal cord ● Cranial nerve nuclei ● Medulla ● Pons ● Midbrain ● Thalamus & Basal nuclei ● Gross features & White matter of cerebrum ● Cerebellum ● Ventricles of brain ● Blood supply of brain ● Development of Nervous system
		10.1.2 (Theory SDL)	<ul style="list-style-type: none"> ● Cervical sympathetic chain ● Pterygopalatine fossa ● Lymphatic drainage of neck ● Cross –section at C7 ● Eyelid and lacrimal apparatus ● Blood-brain barrier & CSF circulation ● Circumventricular organs ● Lumbar puncture ● Limbic system
		10.1.3 (Practical)	Gross Anatomy Head & Neck <ul style="list-style-type: none"> ● Face-Muscles, vessels & Nerves ● Triangles of neck ● Parotid region ● Submandibular region ● Infratemporal fossa & muscles of mastication

			<ul style="list-style-type: none"> ● Pharynx ● Dural venous sinuses <p>Special senses</p> <ul style="list-style-type: none"> ● Tongue & Eyeball ● Orbit ● Ear <p>Central Nervous System</p> <ul style="list-style-type: none"> ● Spinal cord ● Brainstem ● Ventricles of brain ● Thalamus & Basal nuclei ● Cerebrum ● White fibres of cerebrum ● Cerebellum ● Radiology & Surface Anatomy <p>Osteology</p> <ul style="list-style-type: none"> ● Skull ● Mandible & Cervical Vertebrae <p>Histology (2 hrs/batch for Each topic)</p> <ul style="list-style-type: none"> ● Tongue ● Cornea, optic nerve ● Retina ● Ear ● Spinal cord ● Medulla ● Pons & Midbrain ● Cerebrum & Cerebellum
10.2	PHYSIOLOGY	CENTRAL NERVOUS SYSTEM, SPECIAL SENSES & INTEGRATIVE PHYSIOLOGY	
	10.2.1 (Theory)		<ul style="list-style-type: none"> ● Functional organization of nervous system ● Synaptic transmission in CNS: and neurotransmitters ● Introduction to sensory system : physiology of receptors ● Sensory communication to spinal cord ● Ascending pathways ● Physiology of pain, itch and temperature ● The Thalamus ● The Sensory cortex ● Applied sensory physiology ● Introduction to and organization of motor system ● Segmental organization of motor system ● Muscle spindle and Golgi tendon organ ● The spinal reflexes ● Descending pathways ● Regulation of posture and movement ● Basal ganglia ● cerebellum ● Vestibular apparatus ● Functions of hypothalamus ● Reticular activating system, EEG and sleep ● Limbic system

		<ul style="list-style-type: none"> • Physiology of learning and memory • Physiology of language and speech • Association cortex, cortical plasticity • Functional anatomy of eye • The image forming mechanisms • Visual pathway and visual cortex • Visual acuity, visual field • Color vision • Functional anatomy and functions of the ear • The auditory pathways • Mechanism of hearing • Hearing defects and hearing tests • Physiology of smell • Physiology of taste
	10.2.2 (Theory SDL)	<ul style="list-style-type: none"> • Trigeminal system • CSF • The photoreceptor mechanism • Movements of eye
	10.2.3 (Practical)	<ul style="list-style-type: none"> • Examination of motor system • Reflexes • Examination of sensory system • Examination of cranial nerves (I - VI) • Examination of cranial nerves (VII-XII) • Perimetry
10.3	MOLECULAR BIOLOGY, CANCER BIOLOGY	
	10.3.1 (Theory)	<ul style="list-style-type: none"> • Nucleotide chemistry and metabolism, Gout • Replication, transcription, translation, regulation of gene expression • Tumor markers, oncogene, tumor suppressor • Inhibitors of replication, transcription, translation
	10.3.2 (Theory SDL)	<ul style="list-style-type: none"> • Interpretation of CSF analysis
	10.3.3 (Practical)	<ul style="list-style-type: none"> • Demonstration of Electrophoresis, PCR, Western blotting

11	ADVANCED	
11.1	ANATOMY	
	11.1.1 (Theory)	Continuation of Central Nervous System
	11.1.2 (Theory SDL)	Continuation of Central Nervous System
	11.1.3 (Practical)	Continuation of Central Nervous System
11.2	PHYSIOLOGY	Continuation of Central Nervous System& Advanced
	11.2.1 (Theory)	<ul style="list-style-type: none"> • Physiology of Yoga • Physiology of Ageing • Physiology of Temperature regulation • Stem cell Physiology • Physiological basis of stress • Space physiology
	11.2.2 (Theory SDL)	<ul style="list-style-type: none"> • Stem cell therapy
	11.2.3 (Practical)	<ul style="list-style-type: none"> • Evoked potentials demonstration
11.3	BIOCHEMSITRY	ADVANCES IN BIOCHEMISTRY
	11.3.1 (Theory)	<ul style="list-style-type: none"> • Radioactivity, Human genome project, Genetic engineering • Integrated metabolism • Lab and molecular diagnostics
	11.3.2 (Theory SDL)	<ul style="list-style-type: none"> • Personalized medicine
	11.3.3 (Practical)	<ul style="list-style-type: none"> • Glucometer • Dipsticks tests

List of Histology slides for Practical

General Histology			
Hyaline cartilage	Cardiac muscle	Mucous gland	Peripheral nerve H & E
Elastic cartilage	Large sized artery	Mixed gland	Peripheral nerve (Osmic acid stain)
Fibro cartilage	Medium sized artery	Lymph node	Spinal ganglion
Compact bone L.S	Medium sized vein	Spleen	Autonomic ganglion
Compact bone T.S	Large sized vein	Thymus	Thick skin
Skeletal muscle	Serous gland	Tonsil	Thin skin
Systemic Histology			
Oesophagus	Ureter	Epiglottis	Tongue – Circumvallate papillae
Stomach - Fundus	Urinary bladder	Trachea	Spinal cord – Cervical
Stomach – Pylorus	Adrenal gland	Lung	Spinal cord – Thoracic
Duodenum	Testis	Pituitary	Spinal cord – Lumbar
Jejunum	Epididymis	Thyroid	Spinal cord – Sacral
Ileum	Vas deferens	Parathyroid	Medulla – Pyramid level
Large intestine	Seminal vesicle	Cornea	Medulla - Sensory decussation level
Appendix	Prostate	Retina	Medulla - Mid olivary level
Liver	Penis	Optic nerve	Pons – Lower
Gall bladder	Ovary	Cochlea	Pons – Upper
Pancreas	Fallopian tube	Tongue – Filiform papillae	Midbrain – Inf.colliculus
Kidney	Uterus	Tongue – Fungiform papillae	Midbrain – Sup.colliculus

List of essential laboratory skills for independent performance

A. ANATOMY

i. Marking surface anatomy

Students should be able to mark the following structures

LOCOMOTOR SYSTEM - UPPER LIMB		
Axillary artery	Deep palmar arch	Flexor retinaculum
Brachial artery	Median nerve	Extensor retinaculum
Radial artery	Radial nerve	Median cubital vein
Ulnar artery	Ulnar nerve	Cephalic vein
Superficial palmar arch	Axillary nerve	Anatomical snuff box

LOCOMOTOR SYSTEM - LOWER LIMB		
Femoral artery	Sciatic nerve	Great saphenous vein
Popliteal artery	Common peroneal nerve	Short saphenous vein
Anterior tibial artery	Deep peroneal nerve	Femoral vein
Posterior tibial artery	Superficial peroneal nerve	Inguinal ligament
Dorsalis pedis artery	Flexor retinaculum	Saphenous opening
Femoral nerve	Extensor retinaculum	Bryant's triangle

CARDIO-VASCULAR, RESPIRATORY SYSTEM AND ENDOCRINE SYSTEM		
Heart borders	Pulmonary auscultatory area	Borders of left lung
Mitral valve	Apex of heart	Fissures of right lung
Aortic valve	Arch of aorta	Fissure of left lung
Tricuspid valve	Superior vena cava	Sternal angle
Pulmonary valve	Rt & Lt Subclavian veins	Pleural reflection
Mitral auscultatory area	Rt & Lt Brachiocephalic veins	Thyroid gland
Aortic auscultatory area	Trachea	Right adrenal gland
Tricuspid auscultatory area	Borders of right lung	Left adrenal gland

GASTROINTESTINAL SYSTEM, & RENAL SYSTEMS

Trans pyloric plane	Inguinal canal	McBurney's point
Subcostal plane	Stomach	Morrison's parallelogram
Trans tubercular plane	Liver	Abdominal aorta
Abdominal regions	Pancreas	Inferior vena cava
Superficial inguinal ring	Fundus of gall bladder	Root of mesentery
Deep inguinal ring	Base of appendix	Renal angle

HEAD & NECK AND NEUROANATOMY

Internal jugular vein	Superficial temporal artery	Lateral sulcus
External jugular vein	Middle meningeal artery	Pterion
Common carotid artery	Facial artery	Parotid gland and duct
Internal carotid artery	Spinal accessory nerve	Submandibular gland
External carotid artery	Vagus nerve	Mastoid antrum (MacEwen triangle)

B. PHYSIOLOGY

i.	Collection of blood samples
ii.	Hemoglobin estimation
iii.	RBC count
iv.	Peripheral smear
v.	TLC / DLC
vi.	Blood grouping
vii.	BT/CT
viii.	Bedside tests of ANS function
ix.	Examination of Respiratory system

x.	Pulmonary function tests
xi.	ECG
xii.	Examination of Cardiovascular system
xiii.	Examination of abdomen
xiv.	Examination of the motor system
xv.	Examination of the sensory system
xvi.	Examination of cranial nerves

C. BIOCHEMISTRY

i.	Urine analysis
ii.	Glucometer
iii.	Dipstick tests

E. LEARNING RESOURCE MATERIALS FOR STUDENTS

1. ANATOMY

S/No.	Title of the book	Author/Editor
GENERAL ANATOMY		
1	General Anatomy-Elsevier	Vishram Singh
2	Hand book of General Anatomy-CBS publishers	BD Chaurasia
GROSS ANATOMY – TEXTBOOK		
1	Gray’s Anatomy for Students. South Asia Edn- Elsevier. 2017.	Raveendranath V. et al
2	Clinically Oriented Anatomy. Wolter Kluwer.	Moore K.L, Dalley A.F, Agur A.M
3	Clinical Anatomy: A Problem Solving Approach. Jaypee Brothers Medical Publishers Private Limited; (vol. 1 & 2)	Kulkarni V.N
4	Human Anatomy: Regional & Applied. CBS Publishers: (Vol. I, II, III)	BD Chaurasia’s
SURFACE & RADIOLOGICAL ANATOMY		
1	Surface & Radiological Anatomy. CBS Publishers.	A. Halim
GROSS ANATOMY – ATLAS		
1	Atlas of Anatomy (Thieme Anatomy) .Thieme Medical Publishers Inc.	Gilroy A.M, Ross L.M, Mac Pherson B. R. Schuenke M, Schutle E, Schumacher U
2	Grant’s Atlas of Anatomy. Wolter Kluwer	Agur A.M, Dalley A.F
3	Atlas of Human Anatomy. Elsevier.	Netter.
GROSS ANATOMY- DISSECTION MANUAL		
1	Thieme dissector-Thieme Medical publishers (Three volumes)	Vishramsingh, GP Pal, SD Gangane
2	Cunningham’s Manual of Practical Anatomy – Oxford;(Vol. 1, 2 & 3)	Rachel Koshi.
3	Dissection Manual with Regions & Applied Anatomy – Japee publishers-Volume 1, 2 & 3	Mercy Davis
HISTOLOGY		
1	Di Fiore’s. Atlas of Histology: With Functional Correlations- Lippincott Williams and Wilkins.	Eroschenko V.P,
2	Inderbir Singh’s Textbook of Human Histology with Colour Atlas and Practical Guide-Jaypee Brothers Medical Publishers Private Limited.	Neelam V.
EMBRYOLOGY		
1	Text book of Human Embryology - CBS Publishers	Yogesh Sontakke
2	Human Embryology. Jaypee Brothers Medical Publishers Private Limited.	Singh I.B.
3	Medical Embryology. Wolter Kluwer.	Langman S.

NEUROANATOMY		
S/No.	Title of the book	Author/Editor
1.	Neuroanatomy for Medical Students - Lippincott Wolters Kluwer	G P Pal
2.	Textbook of Clinical Neuroanatomy- Elsevier.	Vishram Singh
3.	Clinical Neuroanatomy- Lippincott Williams and Wilkins.	Snell R.S
GENETICS		
1.	Principles of Clinical Genetics - JAYPEE Brothers	YogeshSontakke
POST NATAL GROWTH AND DEVELOPMENT		
1.	Manual - WHO Project IND/MCH/003/1984-85.	
DICTIONARY		
1.	Dorland's pocket medical dictionary-Elsevier	

2. PHYSIOLOGY

S/No.	Title of the book	Author/Editor
TEXT BOOK		
1.	Ganong's Review of Medical Physiology, 25 th edition	Boitano S, Brooks H, Barman SM, Barrett KE.
2.	Guyton and Hall Textbook of Medical Physiology. 13 th edition	Hall JE
3.	Comprehensive Textbook of Medical Physiology –Two volumes	G K Pal Pravai Pal Nivedita Nanda
4.	Best & Taylor's Physiological Basis of Medical Practice, 13 th edition	Tandon OP, Tripathi Y
5.	Understanding Medical Physiology: A Textbook for Medical Students. 4 th edition	Bijlani RL, Manjunatha S
PRACTICAL		
1.	Textbook of Practical Physiology – 4 th Edition	G K Pal
2.	A Textbook of Practical Physiology. 8 th edition	Ghai CL.

3. BIOCHEMISTRY

Title of the book	Author/Editor
TEXT BOOK	
Harper's Illustrated Biochemistry, 30 th edition	R.K. Murray, D.K. Granner, P.A. Mayes and V.W. Rodwell
Lippincott's Illustrated Reviews: Biochemistry, 4 th edition	Pamela C. Champe, Richard A. Harvey, Denise R. Ferrier
Text book of Medical Biochemistry, 6 th edition	DM Vasudevan
Text book of Medical Biochemistry, 3 rd edition	Dinesh Puri
REFERENCE BOOK	
Principles and Techniques of Biochemistry and Molecular Biology, 7 th edition	Wilson, K. & Walker, J
Principles of Biochemistry, 6 th edition.	Albert L. Lehninger
Mark's Basic Medical Biochemistry – A Clinical Approach 5 th edition	Michael Liberman Alisa Peet

Early clinical exposure – Topics and Collaborating departments

<u>Sl.No.</u>	Topics	Collaborating departments
1.	Post natal growth and development	Community Medicine, Pediatrics
2.	Nutritional assessment	Pediatrics
3.	Kinesiology and Peripheral nerve injuries	Orthopedics
4.	Hernia, Varicose veins, Spaces and Surgical anatomy	Surgery
5.	GI bleed, appendicitis	Surgery
6.	Surgical significance of thyroid and parotid glands	Surgery
7.	Pleural effusion, pneumothorax and pleural tapping	Medicine
8.	Facial nerve palsy, paraplegia, hemiplegia	Medicine
9.	Cerebellar and Basal nuclei functions	Medicine
10.	Parturition and pregnancy changes	Obstetrics & Gynecology
11.	Refractive errors	Ophthalmology
12.	Surgical anatomy of ENT	ENT
13.	Cross sectional images, CT and MRI	Radiology
14.	Angiography and ECHO images	Cardiology
15.	Cleft lip & palate	Plastic surgery

4. EXAMINATION RULES & REGULATIONS

4.1 Essentialities for qualifying to appear in professional examinations.

The performance in essential components of training are to be assessed, based on:

A) ATTENDANCE

75% attendance in a subject for appearing in the examination is compulsory inclusive of attendance in non-lecture teaching i.e. seminars, group discussions, tutorials, demonstrations, practical's, hospital (Tertiary, Secondary, Primary) posting and bed side clinics etc.

For appearing at the Professional Examination, student should have minimum 75% attendance in each subject, even if shortage is in one subject, he/ she will be detained for the entire examination.

Students cannot appear in part or separately in individual subjects during the first appearance at the Professional examination.

No student shall be permitted to any one of the parts of MBBS Examinations unless he/she has attended the course in the subjects for the prescribed period and produce the necessary certificate of study, attendance and progress from the Head of the Department.

Regulations for condonation of lack of attendance:

There shall be no condonation of lack of attendance for the course.

B) INTERNAL ASSESSMENT

1. There will be four notified tests in each subject and one send up examination before the final examination.(Professional Examination)
2. The weightage of marks towards internal assessment will be as shown below:
 - a. First internal assessment: 15%
 - b. Second internal assessment; 15%
 - c. Third internal assessment: 15%
 - d. Fourth internal assessment: 15%
 - e. Send up examination: 40%.
3. The notified tests will consist of theory (one-hour duration) and practical examinations. During send up examination theory will be for three-hour duration and practical will be conducted as per the first professional examination.
4. **It is mandatory to attain a minimum of 50% marks in the internal assessment to be eligible to appear in the final examination.**
5. The students failing in the notified tests shall be required to appear for a retest within two weeks of the declaration of the results in the concerned subject to improve their performance. The modalities of the retest will be decided by the concerned department under intimation to the office of Dean (Academic).
6. The notified tests in all three subjects will be conducted over a period of three days. Rest three days of the week will be utilized for regular teaching.

The format of the send up examination shall be the same as final exit examination. However, there shall be no gap in the theory papers and the practical examinations shall be held after a gap NOT exceeding three days after completion of the theory papers

FINAL EXIT EXAMINATION – RULES & REGULATIONS

Final exit examinations are to be designed with a view to ascertain whether the candidate has acquired the necessary knowledge, minimum skills, ethical and professional values with clear concepts of the fundamentals which are necessary for him/her to function effectively and appropriately as a physician of first contact. Assessment shall be carried out on an objective basis to the extent possible. **Eligibility to appear for final exit examination for all the subjects include 75% attendance in theory, 75% attendance in practicals, 50% marks in theory internal assessment and 50% marks in practicals internal assessment, duly certified by the concerned department HOD/ Faculty In-charge of examinations from the department.**

The candidates who lacks eligible attendance and/ or internal assessment marks will be detained. The detained candidates in phase I has to improve the attendance and/or internal assessment by attending special classes/ notified tests within the period of supplementary examination. Those candidates who fulfils the above said criteria alone will be permitted along with failed candidates in the supplementary examinations. Those who fail in supplementary examination has to join with next year batch. And those who have been detained and not showing any improvement during the 60 to 90 days period before supplementary examination also have to join next year batch. Medical leave of absence of more than one month has to be certified by Medical board of JIPMER. Medical Leave more than three months, the candidate will be permitted to appear for examination with the next year batch only.

Nature of questions will be structured essay, short answer type/objective type and marks for each part indicated separately.

Practical/clinical examinations will be conducted in the laboratories or hospital wards. The objective will be to assess proficiency and skill to conduct experiments, interpret data and form logical conclusion. Clinical cases kept in the examination must be common conditions that the student may encounter as a physician of first contact in the community. Rare syndromes and disorders are to be discouraged. Emphasis should be on candidate's capability in elicit a history demonstrate physical signs write a case record, analyze the case and develop a management plan.

Viva/oral includes assessment of management approach and handling of emergencies, ethical and professional values. Candidate's skill in interpretation of common investigative data, X-Rays, identification of specimens, ECG, etc. also is to be assessed.

There shall be one main examination in a year and a supplementary to be held not earlier than 60 days and no later than 90 days after the publication of its results.

A student shall not be allowed to graduate later than 09 (nine) years of joining first MBBS course (Double the duration of the course). The candidate's name will be struck off from the roll if he/she did not complete the entire course within the stipulation mentioned (Double the duration of the course). Break in study without any valid reason is not permitted and if it is more than six months duration in phase I, the name of the candidate will be struck off from the roll.

First Professional Examinations:-

1. The first Professional examination shall be held at the end of Phase 1 training (12 months), in the subjects of Anatomy, Physiology and Biochemistry.
2. **Maximum number of attempts allowed at the first Professional examinations will be four.**

Marks distribution - Phase – I (First Professional Examination)

ANATOMY		Maximum marks	
Theory	Paper 1	80	220
	Paper 2	80	
	Internal Assessment	40	
Viva – Voce Examination		20	
Practical	Final Practical examination	100	130
	Internal Assessment (25 + Record = 5)	30	
Total marks			350

PHYSIOLOGY		Maximum marks	
Theory	Paper 1	80	220
	Paper 2	80	
	Internal Assessment	40	
Viva – Voce Examination		20	
Practical	Final Practical examination	100	130
	Internal Assessment (25 + Record = 5)	30	
Total marks			350

Biochemistry		Maximum marks	
Theory	Paper 1	80	220
	Paper 2	80	
	Internal Assessment	40	
Viva – Voce Examination		20	
Practical	Final Practical examination	100	130
	Internal Assessment (25 + Record = 5)	30	
Total marks			350

Criteria for Passing in a Subject:

A candidate should obtain minimum 50% marks in Final exit examination separately in Theory (Paper 1 & 2 together, minimum 80 marks), Practical (Minimum 50 marks) and final theory, internal assessment (theory) and viva voce together (110 marks) in order to be declared passed in that subject.

GUIDELINES AND RULES FOR APPOINTMENT OF EXAMINERS

A. QUALIFICATION OF EXAMINERS:

An examiner shall possess MBBS Degree with Post- Graduate Degree (MD/MS) or an equivalent qualification in the particular subject concerned from a University/College recognized by the Medical Council of India.

However, in the subjects of Anatomy, Physiology, Bio- Chemistry, Microbiology, and Pharmacology qualification could be M.Sc. with D.Sc./Ph.D. in the concerned subject from a University/College recognized by Medical Council of India

B. EXPERIENCE FOR EXAMINERS:

The person, being appointed as examiner, should after obtaining above(as in A) qualification have at least five years total undergraduate (MBBS)teaching experience in the subject as a faculty /senior resident /tutor/equivalent in a recognized university/Medical College.

C. APPOINTMENT OF INTERNAL EXAMINERS:

1. All qualified faculty having teaching experience for at least 6 months in JIPMER shall be eligible for appointment by rotation as Internal Examiners in the subject concerned provided, they fulfill Clause A& B. Of the internal examiners, one examiner shall be the HOD of the Department. He/she will also be the chairperson. If the HOD is not available for any reasons the next senior faculty may be inducted. Examiners may be included from non medical scientists in the Department of Anatomy, Physiology, Bio-Chemistry Microbiology and Pharmacology but at least 50%(2 out of four) of examiners shall be always from medical stream.
2. At least one internal examiner should be available always. If an internal examiner is not available, external examiners may be appointed in his/ her place.
3. Internal examiners who have written books relevant to the subject examined should give a written undertaking on conflict of interest.
4. Internal examiners must accept examinership in preference to other commitments. No teacher appointed as internal examiner should refuse examinership. In case of genuine hardship like illness, the application seeking exemption from examiner ship should be submitted through the Head of the department. Only under exceptional circumstances can she/he decline. The reason for the decline must be given in writing to the head of the Institute/Dean (Academic).
5. Internal examiners for theory paper evaluation should, to the extent possible be different from those who are appointed for practicals/clinicals, based on the number of candidates appearing in the examination.

D.APPOINTMENT OF EXTERNAL EXAMINERS

1. External Examiners shall be appointed from the rank of Professor / Additional Professor / Associate Professor/Reader/Assistant Professor provided; they fulfill the requisite qualification and experiences as laid down in clause A and B.
2. Two external examiners must be appointed from different universities for each practical/clinical examination. In the event of an examiner being unable to come due to unforeseen reasons, the Examination may be conducted with a third internal examiner after obtaining permission from the Dean/Controller of examinations. This should be rarest of rare occurrence. The external examiners will rotate for every 4 sessions (2main and 2 supplementary examinations)
3. External examiners for theory paper evaluation should preferably be different from those who are appointed for practicals/clinical based on the number of candidates appearing for the examinations.
4. External examiners should as far as possible be appointed from Government and reputed Institutes.
5. When the number of candidates is 150 or more, the exam will be conducted over 6-8 days with 2 sets of examiners (both internal and external). The chairperson for each set of examination will be the senior among the 2 internals.
7. Examiners who drop out on flimsy grounds should be 'blacklisted' from the panel of examiners.

E. ROLE OF CHAIRPERSON

1. THE CHAIRPERSON will be the HOD/senior most internal examiner in the session concerned.
2. He will be in charge of the smooth conduct of the examinations and confidential despatch of results.
3. He will attend the board meeting of examiners.
4. If he/she is not available on the day of the board meeting the other internal examiner may be co-opted.

F. PATTERN OF CLINICAL/PRACTICAL EXAMINATION

1. NOT more than 25 students should be examined on one day for practical/ clinical examination.
2. Students may be divided into equal batches not exceeding 30.
3. The examination pattern should emphasize clinical skills and made as objective as possible to remove bias. The examiners can divide into 'stations' for assessment. A list of 'must know' skills should be tested for all students.
4. The examiners may further split into 2 or 4 groups (twos or singles) during the practical's/clinical. It must however be ensured that all students are examined by all examiners during any given examination.

G. THEORY PAPER SETTING

1. Paper Setters should submit the requested Question Papers within the stipulated period. Internal Question Paper Setters should not use these Questions for the sent up examination.
2. Question Paper Setters should maintain absolute confidentiality about these Questions and Question Papers. Question Paper Setters as far as possible should avoid using abbreviations and short terms while setting the Questions.
3. Theory papers will be obtained from two internal and two external examiners. After masking the paper setters names, the HOD / senior most faculty will moderate/vet the papers and the selected questions will be typed, signed and sealed under the direct Supervision of the Professor(Examinations) and the Assistant Controller of Examinations.
4. Theory paper questions should be precise with no ambiguity and should be appropriate for the time allotted. It should preferably be broken in parts and marks allotted for each part. This will help maintain objectivity during evaluation.
5. A major portion (90%) of the questions should be from the 'must know' category. Rare disease entities should be avoided.

Notwithstanding anything stated in this Regulation, for any unforeseen issues arising, and not covered by this Regulation, or in the event of differences of interpretation, the Director may take a decision, after obtaining the opinion/advice of a Committee consisting of any or all the Deans and senior faculties. The decision of the Director shall be final.

THEORY EVALUATION

Theory should be evaluated by two examiners-one internal one external. When there is a regular batch of 150 students or more appearing for the Examination there should be two numbers of Internals and two numbers of External Examiners to evaluate the Theory paper and each Examiner will be assigned 150 papers for evaluation. Theory should be evaluated by two examiners-One Internal and One External when the number of candidates are less.

1. Theory evaluators will be different from those of practical/clinical whenever qualified examiners are available, based on the number of candidates appearing for the examinations.
2. Theory evaluation should begin soon after the examination and finish well ahead of the practicals.
3. There shall be no provision for re-evaluation of answer booklet. However a student shall be entitled to apply for re-totaling of the marks in a particular subject.
4. A student will not be permitted to see his evaluated answer booklets. The identity of the evaluator shall not be disclosed to the student concerned under any circumstances.
5. The answer booklets shall be maintained till the student completes his/her MBBS Course and shall thereafter be disposed of in the manner as per the procedure laid down.
6. In any given subject if the number of failures are >25 , a second evaluation will be done by another set of two Examiners and the average mark will be taken for the computation of the result
7. The grace marks up to a maximum of five percent of total marks in theory may be awarded at the discretion of the competent authority to a student who has failed only in one subject.

CODE OF CONDUCT FOR STUDENTS

Maintenance of Discipline among students of the JIPMER:

1. All powers relating to discipline and disciplinary action are vested in the Director.
2. The Director may delegate all such powers, as he/she deems proper to the Dean and to such other persons as he/she may specify on his behalf.
3. Without prejudice to the generality of power to enforce discipline under the Rules. The following shall amount to acts of gross indiscipline:
 - i. Physical assault or threat to use physical force against any member of the teaching or non-teaching staff of any Department/Centre of JIPMER or any other persons within the premises/campus of JIPMER
 - ii. Carrying or use or threat of use of any weapon.
 - iii. Violation of the status, dignity and honour of students belonging to the Scheduled Castes, Scheduled Tribes and Other Backward Classes.
 - iv. Any practice, whether verbal or otherwise, derogatory to women.
 - v. Any attempt at bribing or corruption in any manner.
 - vi. Willful destruction of institutional property.
 - vii. Creating ill-will or intolerance on religious or communal grounds.
 - viii. Causing disruption in any manner of the functioning of the JIPMER, Puducherry.

Regarding ragging the directive of Supreme Court will be followed strictly. It is as under:

“As per direction of the Hon’ble Supreme Court of India, the Government has banned ragging completely in any form inside and outside of the campus and the Institute authorities are determined not to allow any form of the ragging. Whoever directly or indirectly commits, participates in abets or instigates ragging within or outside any educational Institution, shall be suspended, expelled or restricted from the Institution and shall also be liable to fine which may extend to Rs.10,000/-. The punishment may also include cancellation of admission suspension from attending the classes, withholding/withdrawing fellowship/scholarship and other financial benefits, withholding or cancelling the result. The decision shall be taken by the Head of the Institution”.

I. Without prejudice to the generality of his/her powers relating to the maintenance of discipline and taking such action in the interest of maintaining discipline as may seem to him/ her appropriate. The Director, may in exercise of his/her powers aforesaid order or direct that any student or students:

- a) Be expelled;
- b) Be, for a stated period: Be not for a stated period, admitted to a course or courses of study in JIPMER.
- c) Be fined with a sum of rupees that may be specified;
- d) Be debarred from taking any examination(s) for one or more semesters.

- e) Withhold the result of the student(s) concerned in the Examination(s) in which he/she or they have appeared be cancelled.
- f) Be prohibited for appearing or completing any examination for any unfair means like copying, taking notes, mobiles or any other electronic gadgets inside the examination halls.

II. Prohibition of and Punishment for Ragging:

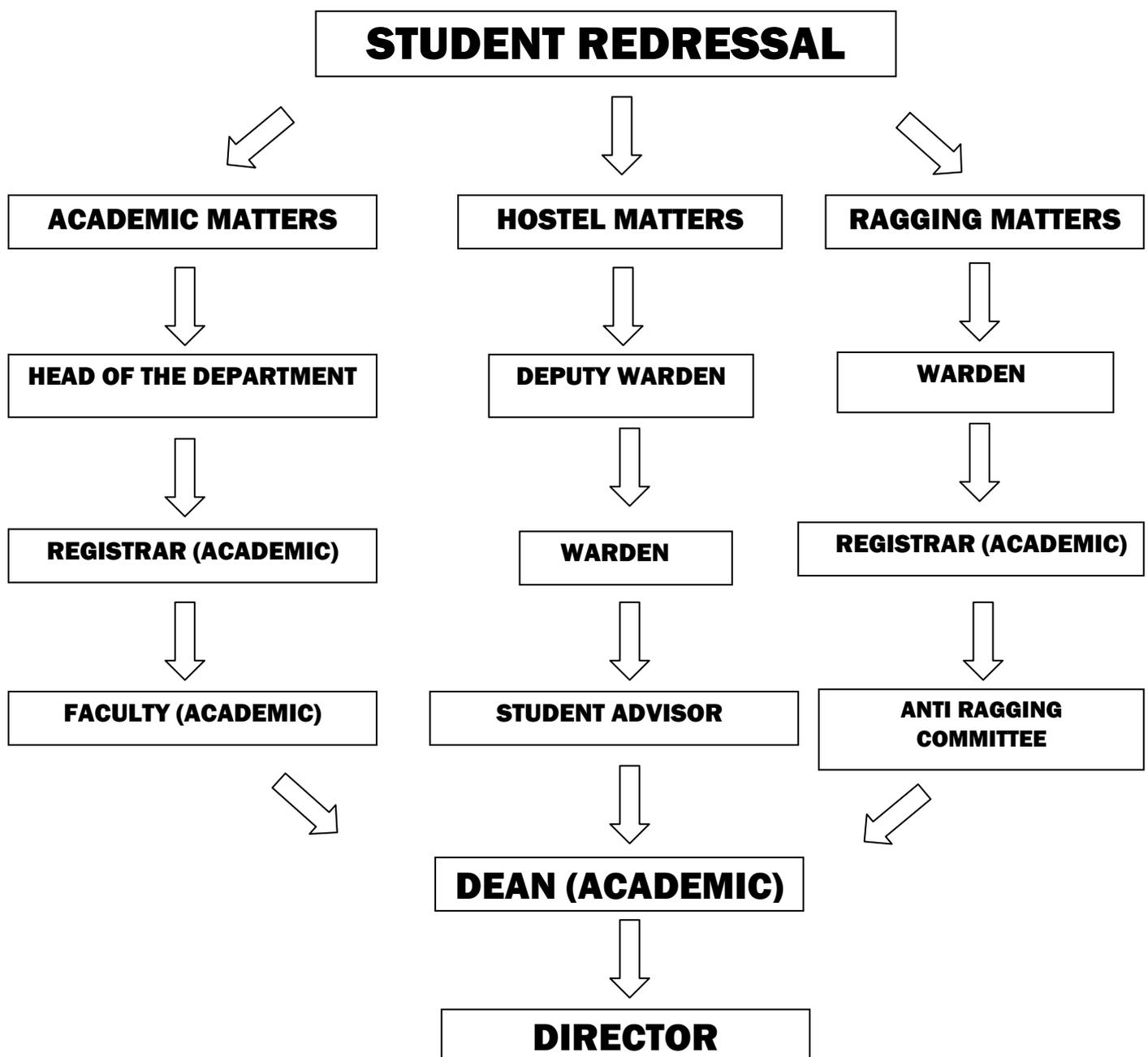
1. Ragging in any form is strictly prohibited, within the premises of College/Department of Institution and any part of JIPMER and also outside the JIPMER Campus.
2. Any individual or collective act or practice or ragging constitute gross indiscipline shall be dealt with under the Rules.
3. Ragging for the purposes of this rules, ordinarily means any act, conduct or practice by which dominant power or status of senior students is brought to bear on students freshly enrolled or students who are, in any way, considered junior or inferior by other students and includes individual or collective acts or practice which:
 - a) Involve physical assault or threat or use of physical force;
 - b) Violate the status, dignity and honour of women students;
 - c) Violate the status, dignity and honour of students belonging to the Scheduled Castes, Scheduled Tribes and Other Backward Castes.
 - d) Expose students to ridicule and contempt and affect their self-esteem;
 - e) Entail verbal abuse and aggression, indecent gesture and obscene behaviour.
4. The Director, Dean, Hostel Superintendent and Faculty of JIPMER shall take immediate action on any information of the occurrence of ragging.
5. Notwithstanding anything in Clause (4) above, the Dean or any other Faculty member/or authority may also suomoto enquire into any incident of ragging and make a report to the Director of the identity of those who have engaged and the nature of the incident.
6. The Dean may also submit an initial report establishing the identity of the perpetrators of ragging and the nature of the ragging incident.
7. On the receipt of a report under clause (5) or (6) or a determination by the relevant authority disclosing the occurrence or ragging incidents described in the Clause 3(a), (b) and (c) the Director shall direct or order rustication of a student or students for a specific number of semester.
8. The Director may in other cases of ragging order or direct that any student or students be expelled or be not, for a stated period, admitted to a course of study at JIPMER, departmental examination for one or more semesters or that the result of the student or students concerned in the examination(s) in which they appeared be cancelled.
9. In case where students who have obtained degree(s) of JIPMER are found guilty under this Rules, appropriate action will be taken for withdrawal of degrees conferred by the JIPMER.
10. For the purpose of this Rules, abetment to ragging will also amount to ragging.

III. Anti Sexual Harassment Monitoring Committee:

A statutory committee, comprising of members from the teaching and non-teaching staff as well as students looks into matters related to sexual harassment of students and staff in the college. Any person aggrieved in this matter may fearlessly approach the committee for a fair and concerned hearing and redressal.

IV. Unauthorized Absence of Students:

Unauthorized absence of students will be informed to the Students and also Parents or Local Guardians. At least 3 reminders will be issued with a gap of 10 days by the Academic Section to these students. Thereafter the action of cancellation of the registration of the concerned will be decided by the Dean/Director, JIPMER.



TIME TABLE
(I & II SEMESTER (REGULAR BATCH))

TIME DAYS	8.00 A.M to 9.00 A.M	9.00 A.M to 10.00 A.M	10.00 A.M to 11.00 A.M	11.00 A.M to 1.00 P.M	2.00 P.M to 4.30 P.M (Practical)
	FORMATIVE ASSESSMENT				
Monday	Anatomy	Biochemistry	Physiology	Anatomy	Anatomy (A Batch)
					Physiology (B & C Batch)
					Biochemistry (D Batch)
Tuesday	Physiology	Biochemistry	Anatomy	Anatomy	Anatomy (B Batch)
					Physiology (A & D Batch)
					Biochemistry (C Batch)
Wednesday	Anatomy	Physiology	Physiology	Anatomy	Anatomy (C Batch)
					Physiology (A & D Batch)
					Biochemistry (B Batch)
Thursday	Biochemistry	Biochemistry	Physiology	Anatomy	Anatomy (D Batch)
					Physiology (B & C Batch)
					Biochemistry (A Batch)
Friday	Anatomy	Physiology	Physiology/ Com. Med	Anatomy/ Com. Med	EARLY CLINICAL EXPOSURE
Saturday	Biochemistry	Anatomy	Physiology	Anatomy	

Leave Eligibility and Vacation:-

1. Medical Leave:-

Maximum of 30 (thirty) days per year would be allowed subject to certification by JIPMER Medical Board

2. Winter Vacation – The last week of December

3. Summer Vacation – Starts after the first year final exit exam. (One month duration)

Annexure- I – MODEL QUESTION PAPERS

ANATOMY

Paper - 1

Time: Three Hours

Maximum Marks: 80

Each Section to be answered in separate answer book

Illustrate your answers with suitable diagrams

SECTION A

General Anatomy, General Embryology, Genetics, General Histology and Locomotor System.

1. Explain briefly: (5x4=20)
 - a) Prenatal diagnosis.
 - b) Microscopic anatomy of Large artery.
 - c) Inguinal lymph nodes and its applied aspects.
 - d) Joints – types with examples and movements allowed.
 - e) Palmar aponeurosis.

2. Write short notes on: (10x2=20)
 - a) Fascia lata.
 - b) Pedigree chart.
 - c) Cotyledons of placenta.
 - d) Development of Neural crest cells and its derivatives.
 - e) Latissimusdorsi muscle – Nerve supply and actions.
 - f) Ossification of fibula.
 - g) Histology of skeletal muscle.
 - h) Name the sesamoid bones with the related muscles of lower limb.
 - i) Anatomical snuff box – Boundaries and contents.
 - j) Pulp space.

SECTION B

Gastrointestinal System, Renal System, Reproductive System and Breast including related Systemic Histology and Systemic Embryology.

3. Explain briefly: (5x4=20)
 - a) Gross anatomy of prostate gland.
 - b) Histology of the kidney.
 - c) Peritoneal pouches related to Uterus.
 - d) Pancreas – Development and anomalies.
 - e) Histology of Mammary gland.

4. Write short notes on: (10x2=20)
 - a) Derivatives of mesonephric duct.
 - b) Pampiniform plexus of veins.
 - c) Umbilicus.
 - d) Applied significance of Prepuce of Penis.
 - e) Thoracolumbar fascia.
 - f) Porta hepatis.
 - g) Trigone of urinary bladder.
 - h) Parts and gross features of colon.
 - i) Ligamentum teres uteri.
 - j) Mid gut rotation.

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ANATOMY

Paper - 2

Time: Three Hours

Maximum Marks: 80

Each Section to be answered in separate answer book

Illustrate your answers with suitable diagrams

SECTION A

Endocrine System, Postnatal growth and development. Cardiovascular system and Respiratory System including related Systemic Histology and Systemic Embryology.

1. Explain briefly: (5x4=20)
 - a) Pituitary gland – gross anatomy, blood supply & applied aspects
 - b) Development of Pharyngeal pouches.
 - c) Mediastinum – Definition, subdivisions and contents.
 - d) Movements of Thorax.
 - e) Cardiac plexus.

2. Write short notes on: (10x2=20)
 - a) Anomalies of diaphragm.
 - b) Crux of the heart.
 - c) Impressions on the medial aspect of left lung.
 - d) Cardiomegaly.
 - e) Carina.
 - f) Clinical importance of Bronchopulmonary segments.
 - g) Mitral valve complex.
 - h) Development and anomalies of trachea.
 - i) Laryngeal inlet.
 - j) Road to health card.

SECTION B

Head and Neck, Nervous System and Special Senses including related Systemic Histology and Systemic Embryology.

3. Explain briefly: (5x4=20)
 - a) Vertebral artery – parts, course and branches.
 - b) Extra ocular muscles – attachment, nerve supply and actions.
 - c) Tympanic cavity.
 - d) Internal jugular vein.
 - e) Deep cervical fascia.

4. Write short notes on: (10x2=20)
 - a) Fibres passing in the inferior cerebellar peduncle.
 - b) Styloid apparatus.
 - c) Secretomotor supply to parotid gland.
 - d) Pterygoid process.
 - e) Interventricular communication & CSF circulation.
 - f) Motor & sensory speech areas.
 - g) Name the Bony landmarks with associated fontanelle.
 - h) Name the muscles with nerve supply of soft palate.
 - i) Movements of vocal cord with muscles involved.
 - j) Nasopharyngeal & oropharyngeal isthmus.

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PHYSIOLOGY

Paper - 1

Time: Three Hours

Maximum Marks: 80

Each Section to be answered in separate answer book

Illustrate your answers with suitable diagrams

SECTION A

(General Physiology, Blood, Nerve and Muscle Physiology, ANS and GI System)

1. Explain briefly: (5x4=20)
 - a) Secondary active transport.
 - b) Stages of erythropoiesis.
 - c) Wallerian degeneration.
 - d) Mechanisms of neuromuscular transmission.
 - e) Types of gastric motility.

2. Write short notes on: (10x2=20)
 - a) Positive feedback mechanism.
 - b) Important functions of tight junctions.
 - c) ABO incompatibility.
 - d) Four important functions of plasma proteins.
 - e) Four important properties of skeletal muscle.
 - f) Functions of liver.
 - g) Name two tests to identify Autonomic nervous system dysfunction.
 - h) Sodium-potassium pump.
 - i) Why there is clay-colored stool in obstructive jaundice?
 - j) Why RBC count is more in males?

SECTION B

(Endocrine Physiology, Reproductive Physiology and Renal System)

3. Explain briefly: (5x4=20)
 - a) Mechanism of action of growth hormone.
 - b) Physiological actions of insulin.
 - c) Tests for ovulation.
 - d) Micturition reflex.
 - e) Role of vasa recta in counter-current mechanism of urine concentration.

4. Write short notes on: (10x2=20)
 - a) Effects of parathyroidectomy.
 - b) Functions of Leydig cells.
 - c) Permissive action of glucocorticoids.
 - d) Iodide trapping mechanism.
 - e) Features of acromegaly.
 - f) Maternal cardiovascular changes during pregnancy.
 - g) Functions of 'Principal' cells in the nephron.
 - h) Write two functions of estrogen.
 - i) Why is albumin not filtered normally through the glomerular capillaries?
 - j) Why there is hyper-pigmentation in Addison disease?

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PHYSIOLOGY

Paper - 2

Time: Three Hours

Maximum Marks: 80

**Each Section to be answered in separate answer book
Illustrate your answers with suitable diagrams**

SECTION A

(Cardiovascular System, Respiratory System and Environmental Physiology)

1. Explain briefly (5x4=20)
 - a) Factors affecting stroke volume that regulate cardiac output.
 - b) Special features of coronary circulation.
 - c) Role of surfactant in pulmonary function.
 - d) Role of 'pattern generators' in the regulation of respiration.
 - e) Short term regulation of blood pressure.

2. Write short notes on: (10x2=20)
 - a) Electrocardiogram.
 - b) Effect of parasympathetic stimulation on heart rate.
 - c) Hypovolemic shock.
 - d) Physiological basis of treatment of pulmonary oedema.
 - e) Anaemic hypoxia.
 - f) Haldane effect.
 - g) Chronic mountain sickness.
 - h) Four indications for cardiopulmonary resuscitation.
 - i) Complete heart block.
 - j) Kussmaul breathing.

SECTION B

(Neurophysiology (CNS), Special Senses and Integrative Physiology)

3. Explain briefly (5x4=20)
 - a) Stretch reflex.
 - b) Pain pathway.
 - c) Draw a labelled diagram of visual pathway and mention the effects of lesions at various levels.
 - d) Types of aphasia.
 - e) Role of hippocampus in memory.

4. Write short notes on: (10x2=20)
 - a) Features of Parkinson's disease.
 - b) Four important functions of cerebellum.
 - c) Role of hypothalamus in temperature regulation.
 - d) Kluver – Bucy syndrome.
 - e) Sensitization and habituation.
 - f) Schematic diagram of direct and indirect light reflex.
 - g) Clinical significance of free radicals.
 - h) Amacrine cells.
 - i) Inhibitory Post Synaptic Potential (IPSP).
 - j) Categorical hemisphere.

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BIOCHEMISTRY

Paper - 1

Time: Three Hours

Maximum Marks: 80

Each Section to be answered in separate answer book

Illustrate your answers with suitable diagrams

SECTION A

(Chemistry of Carbohydrates / lipids / proteins, Enzymes, Biological oxidation and ATP synthesis, Immunoglobulin structure and types, antigen-antibody complex Hemoglobin; Structure and function, Hemoglobinopathies, Heme synthesis and disorders, Minerals, Metabolism in starvation, Thyroid function tests, Adrenocortical function tests)

1. Explain briefly: (5x4=20)
- a) Mention the enzyme defect, clinical features and laboratory diagnosis of acute intermittent porphyria.
 - b) Describe the secondary structure of proteins. List two disorders associated with defect in protein folding
 - c) Describe substrate level phosphorylation? Mention one example. How does it differ from mitochondrial oxidative phosphorylation?
 - d) Explain what an isoenzymes and state their biological significance. With the help of suitable examples, describe their application in diagnosis of diseases.
 - e) Explain how the structure of myoglobin and haemoglobin influence their function.
2. Write short notes on: (10x2=20)
- a) Name an enzyme increased in
 - a) Acute pancreatitis
 - b) Acute liver disease
 - b) Name factors responsible for the right shift of oxygen dissociation curve.
 - c) What is the composition of surfactant in full term infant? Which drug can enhance the maturation of lungs?
 - d) Name two enzymes which require copper as co-enzyme.
 - e) Explain the basis of ketogenesis in uncontrolled diabetes mellitus
 - f) Mention the defect in sickle cell anemia.
 - g) What is pheochromocytoma? Name one urinary parameter elevated in pheochromocytoma.
 - h) List the immunoglobulins formed during primary and secondary immune responses.
 - i) What are advanced glycation end products? How do they affect body functions?
 - j) Discuss the significance of Thyroid Stimulating Hormone (TSH) assay in differentiating primary hypothyroidism from primary hyperthyroidism.

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SECTION B

(Acid base balance and disorders, Lipid metabolism, Hyperlipoproteinemia, Metabolic syndrome, Interpretation of lipid profile, Free radicals and antioxidants, Bilirubin metabolism, Bile acid synthesis, Types of jaundice and their biochemical alterations)

3. Explain briefly: (5x4=20)
- Describe the regulation of blood pH by kidneys.
 - Define jaundice. Explain how the differential diagnosis of jaundice is made on the basis of laboratory tests
 - Explain the biochemical basis of the following diseases.
 - Gaucher's disease
 - Zellweger's syndrome
 - TaySach's disease
 - Familial hypercholesterolemia (type IIa)
 - Discuss the significance of lecithin-cholesterol acyl transferase (LCAT) and cholesterol ester transfer protein (CETP) in lipoprotein metabolism.
 - Name two reactive oxygen species formed and two antioxidants present in the human body. Name two diseases that can be caused by free radicals and the basis for the same.
4. Write short notes on: (10x2=20)
- What is carnitine? Explain its role in fatty acid oxidation.
 - Explain the biochemical basis of metabolic acidosis.
 - What is metabolic syndrome?
 - What is physiological jaundice of the new born? How is it caused?
 - What is fatty liver? Name any two lipotropic factors.
 - If serum sodium level is 150 mmol/L, serum potassium level is 5 mmol/L, serum chloride level is 100 mmol/L and serum bicarbonate level is 20 mmol/L, calculate the anion gap and interpret it.
 - Mention two important enzymes and their reactions involved in bilirubin synthesis.
 - Name two drugs which reduce cholesterol levels and their mechanism of action.
 - Why is lipoprotein (a) level linked with an increased risk for myocardial infarction?
 - Provide the normal range values of parameters evaluated in plasma lipid profile

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BIOCHEMISTRY

Paper - 2

Time: Three Hours

Maximum Marks: 80

Each Section to be answered in separate answer book

Illustrate your answers with suitable diagrams

SECTION A

(Digestion and absorption, Carbohydrate metabolism, Amino acid metabolism, Nutrition, Vitamins, Biochemistry of Diabetes mellitus)

1. Explain briefly: (5x4=20)
 1. Explain the role of Vitamin A in vision.
 2. Mention the reference range for fasting and post prandial blood glucose levels. Explain the role of insulin in the regulation of blood glucose levels
 3. Point out the biochemical derangements in the following pathological conditions:
i) Tyrosinosis ii) Phenylketonuria iii) Homocystinurias iv) Albinism
 4. Explain the process of gluconeogenesis. Explain the mechanisms of regulation of gluconeogenesis and glycolysis
 5. Discuss the metabolic fate of glutamic acid. Explain why deficiency of pyridoxal phosphate can lead to convulsions.

2. Write short notes on: (10x2=20)
 1. Why is pyridoxine supplemented with anti-tuberculosis therapy?
 2. Explain the formation and functions of serotonin.
 3. Describe the glucose-alanine cycle. What is its significance?
 4. Mention the basis of using neomycin and lactulose in the treatment of hyperammonemia.
 5. Mention the biosynthesis and significance of nitric oxide.
 6. Name two glucose transporters and the tissues where they are located.
 7. Which vitamin is deficient in scurvy? Name two biochemical reactions needing this vitamin as a co-factor.
 8. Explain why hyperhomocysteinemia develops in vitamin B12 deficiency?
 9. Discuss the nutritional deficiencies observed in kwashiorkor and marasmus and their metabolic effects.
 10. Explain the anti-oxidant function of vitamin E.

SECTION B

(Ammonia synthesis & detoxification, Renal regulation of water, electrolytes & pH, Tests of glomerular & tubular function, Markers of GFR, Nucleotide chemistry and metabolism, Molecular biology, Cancer biology, Radioactivity, Xenobiotics, Personalized medicine)

3. Explain briefly: (5x4=20)

1. Discuss the formation and fate of ammonia in the human body.
2. What is meant by “clearance tests”? Add a note on creatinine clearance and its significance.
3. What is the genetic code? Explain any four features of genetic code.
4. Enumerate the post transcriptional modifications of mRNA. Name one inhibitor of transcription
5. Describe the catabolic pathway of purine nucleotides. Describe the various causes, biochemical assessment and treatment of hyperuricemia.

4. Write short notes on: (10x2=20)

1. What is mutation? Explain point mutation with an example.
2. Explain the principle of polymerase chain reaction.
3. What is over flow proteinuria? Give an example.
4. Name two radioisotopes. Mention their uses in clinical medicine
5. Name one clinical condition where the following tumor markers are elevated
 - a) Prostate specific antigen
 - b) CA-125
6. What are detoxification reactions? Give one example.
7. Represent diagrammatically the structure of tRNA.
8. Name two anticancer drugs and state their mechanism of action.
9. Explain the molecular basis for the development of xerodermapigmentosum.
10. Explain the term microalbuminuria and its clinical significance.

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