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No. 23 & 26

MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)

Grade 'A' Accredited by NAAC

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CHOICE BASED CREDIT SYSTEM

(CBCS)

(with effect from 2019-2020 Batches)

Curriculum for M.Sc. Medical Biochemistry

Amended upto BOM 63/2021, Dated 17/02/2021

Amended History

1. Approved as per Resolution No. 3.2.1.6.i, of BOM – 57/2019, dated 26/04/2019.
2. Amended as per Resolution No. 3.1.1.4 of BOM – 59/2019, dated 11/11/2019.
3. Amended as per Resolution No. 3.2.1.5 of BOM-62/2020, dated 16/09/2020.
4. Amended as per Resolution No. 3.2.1.6 of BOM – 62/2020, dated 16/09/2020.

LEARNING OUTCOME BASED CURRICULAM FRAMEWORK

M.Sc Medical Biochemistry Course

Undergoing 3 years M.Sc Medical Biochemistry students should be able to garner

Knowledge of Biomolecules

- Biochemicals & their importance
- The various metabolic pathways
- Consequences of deficiency or excess of various biomolecules
- Abnormalities possible & their causes in metabolic pathways.
- Genetic / Molecular Biology in detail
- Disease processes & associated changes in various parameters

Skills

- To be able to interpret medical reports
- To be able to distinguish if an error in reporting
- To be able to troubleshoot in case of crisis in lab

Analytical & Diagnostic

- How to use knowledge gained to be associated with the clinical case.
- To be able to give advice on further diagnostic workup of a case.
- To help predict clinical outcome / line of management.
- To be able to think of newer ways or methods of analyzing biomolecules.
- To be able to have a researcher's mindset.

Name of the Degree: M.Sc. Medical Biochemistry

AIMS OF THE PROGRAM

To create keen interest in the molecular & genetic aspect of the existence & viability of a human body
The student should be able to develop curiosity & the ability to seek answers.
They should be able to get an exposure to the teaching research & diagnostic fields, so that they are able to take an informed decision for their career ahead.

Duration of Study: The duration of the study for M.Sc. Medical Biochemistry will be of six semesters spread over three years.

Program pattern- Commencement of Semester

- First Semester: August
- Second Semester: February
- Third Semester: August
- Fourth Semester: February
- Fifth Semester: August
- Sixth Semester: February

Eligibility Criteria: As a minimum criterion of eligibility, aspiring candidates are needed to have attained a B.Sc. in any discipline of Life Sciences, Biosciences, Bachelor's degree in any of Physics, Biological Sciences, M.B.B.S, BDS, BAMS, BHMS, B.Pharm., B.Tech (Biotechnology), Bachelor's Degree in Agricultural, Veterinary and Fishery Sciences, or equivalent examination with a minimum aggregate score of 50%.

For any query visit the website: www.mgmuhs.com

CURRICULUM FOR M. Sc. Medical Biochemistry

I st YEAR

Semester I							
	Syllabus Ref. No.	Subject	Credits	Teaching hours	Marks		
	Theory				Internal Assessment	Semester Exam	Total
	MB101T	Medical Anatomy	4	4	20	60	80
	MB102T	Medical Physiology	4	4	20	60	80
	MB103T	Medical Biochemistry	4	4	20	60	80
	MB104T	Medical Pharmacology	4	4	20	60	80
	MB105T	Medical Microbiology	4	4	20	60	80
	Practical						
	MB101P	Medical Anatomy	1	2	20	50	70
	MB102P	Medical Physiology	1	2	20	50	70
	MB103P	Medical Biochemistry	1	2	20	50	70
	MB104P	Medical Pharmacology	1	2	20	50	70
	MB105P	Medical Microbiology	1	2	20	50	70
	Total		25	30	200	550	750

Semester II

Syllabus Ref. No.	Subject	Credits	Teaching hours	Marks		
Theory				Internal Assessment	Semester Exam	Total
MB201T	Medical Anatomy	4	4	20	60	80
MB202T	Medical Physiology	4	4	20	60	80
MB203T	Medical Biochemistry	4	4	20	60	80
MB204T	Medical Pharmacology	4	4	20	60	80
MB205T	Medical Microbiology	4	4	20	60	80
MB206T	Research Methodology & Biostatistics (Core Course)	4	4	20	60	80
Practical						
MB201P	Medical Anatomy	1	2	20	50	70
MB202P	Medical Physiology	1	2	20	50	70
MB203P	Medical Biochemistry	1	2	20	50	70
MB204P	Medical Pharmacology	1	2	20	50	70
MB205P	Medical Microbiology	1	2	20	50	70
MB206P	Research Methodology & Biostatistics (Core Course)	1	2	20	50	70
Total		30	36	240	660	900

2ND YEAR

Semester III							
	Syllabus Ref. No.	Subject	Credits	Teaching hours	Marks		
	Theory				Internal Assessment	Semester Exam	Total
	MB301T	Instrumentation	4	4	20	100	120
		Core Elective course***	4	4	Internal Exam 80 Marks*		
	MB302CET	Molecular Biology					
	MB303CET	Clinical Nutrition					
	MB304	Clinical Postings	6	18		20*	20
	MB305	Dissertation/Project Proposal**	5	10		20*	20
	MB306	Seminar	2	2		20*	20
	Practical						
	MB301P	Separation Techniques	2	4	20	100	120
	MB302CEP	Core Elective practical*** Molecular Biology	1	2	Internal Exam 50 Marks*		
	MB303CEP	Nanobiotechnology					
		Total	24	44	40	260	300

* Exam to be Taken at Departmental Level

Semester IV							
	Syllabus Ref. No.	Subject	Credits	Teaching hours	Marks		
	Theory				Internal Assessment	Semester Exam	Total
	MB401T	Metabolism in disease conditions & principles of nutrition	4	4	20	100	120
		General elective ***	4	4			
	MB402GE	Bioethics, Biosafety, IPR & Technology Transfer	Internal Exam of 80 Marks *				
	MB403GE	Disaster Management and Mitigation Resources					
	MB403GE	Human rights					
	MB404	Clinical Postings	7	21		20*	20
	MB405	Dissertation / Project**	5	10		20*	20
	MB406	Seminar	2	2		20*	20
	Practical						
	MB401P	Standardisation & Estimation of various biomolecules. Isolation of biomolecules from sources	2	4	20	100	120
		Total	24	45	40	260	300

*** Exam to be Taken at Departmental Level**

IIIrd YEAR

Semester V							
	Syllabus Ref. No.	Subject	Credits	Teaching hours	Marks		
	Theory				Internal Assessment	Semester Exam	Total
	MB501T	Applied Biochemistry & Laboratory Medicine	4	4	20	100	120
	MB502	Clinical Postings	6	18		20*	20
	MB503	Dissertation / Project**	10	20		20*	20
	MB504	Seminar/Journal Club	2	2		20*	20
	Practical						
	MB501P	Organ Function Tests -Estimation of MDA, Catalase, SOD, Vitamin A, C, E, HbA1C -Lipid Profile - Cardiac Profile -ELISA & RIA	1	2	20	100	120
		Total	23	46	40	260	300

*** Exam to be Taken at Departmental Level**

Semester VI							
	Syllabus Ref. No.	Subject	Credits	Teaching hours	Marks		
	Theory				Internal Assessment	Semester Exam	Total
	MB601T	Molecular Biology, Bioinformatics & Recent Advances	4	4	20	100	120
	MB602	Clinical Postings	5	15		20*	20
	MB603	Seminar/Journal Club	1	1		20*	20
	Practical						
	MB601P	Practical for Molecular Biology	2	4	20	50	70
	MB602P	Dissertation / Project**	12	24		70	70
		Total	24	48	40	260	300

* Exam to be Taken at Departmental Level

** (a) *Dissertation / Project Course* commences in II nd Semester.

Students should undergo ICMR Online Course of Research Methodology before submitting the protocol for their Dissertation. (Ist / II nd Semester)

Allotment of Guide	II nd Semester (On or Before 30 April)
Submission of Protocol for Scientific and Ethical Committee Approval	III rd Semester (On or Before 14 th Aug)
Scientific and Ethical Approval	III rd Semester (On or Before 14 th October)
Commencement of Research Work	III rd Semester 15 th October
Submission of Thesis	VI th Semester 31 st March

*** (Elective): Any one subject is to be chosen from the subjects offered (Subjects offered may change from time to time depending on the availability of expertise)

Elective courses may or may not have practical and/or field work.

Annexure – G – IIIa**ACADEMIC SYLLABUS FOR SEMESTER-I**

Name of the Programme	M. SC MEDICAL _eg. Medical Biochemistry_____
Name of the Course	Part1 ()_____

Course Objective (Teaching Objectives)	To create keen interest in the molecular & genetic aspect of the existence & viability of a human body
Course Outcomes (earning Objectives)	The student should be able to develop curiosity & the ability to seek answers. They should be able to get an exposure to the teaching research & diagnostic fields, so that they are able to take an informed decision for their career ahead.

Unit No.	Theory Topics	Hours allotted No. of hrs
1.	Module 1	4
	Cell Biology- Biophysical principles of Basic Sciences, Structure & function of different cell organelles, Separation of cell organelles, Markers for cell organelles, Structure & function of cell membrane, Cytoskeleton elements, Transport mechanism, Ion channels, Artificial membrane (liposome & its application)	
2.	Module 2	10
a)	Chemistry of Carbohydrate- Definition, Physiological functions, Classification, Monosaccharide, Disaccharide, Polysaccharides, Properties of Carbohydrates, Epimers, Isomers, Mutarotation	
b)	Chemistry of Lipids- Definition, Physiological functions, Classification of lipids, fatty acids, Essential fatty acids, Simple lipids, Compound Lipids, Derived Lipids	
3.	Module 3	10
a)	Chemistry of Protein- Amino acids & their Classification, various ways of Classification of protein, Structure of protein, Properties of proteins, Isoelectric pH, Denaturation, Biologically important peptides	
b)	Chemistry of Nucleic acids- Nucleosides, Nucleotides, Purine & Pyrimidine bases, Types & structure of DNA, Types & structure of RNA	

Unit No.	Theory Topics	Hours allotted No. of hrs
4.	Module 4	5
	<p>Enzyme- Definition , Nomenclature & Classification- Systematic & recommended nomenclature, IUBMB Classification of enzymes only (names, definition, general reaction catalyzed and one example for each class).</p> <p>Properties of enzymes- Mechanism of action of an enzyme with regard to its effect on activation energy of a reaction. Concept of active sites in enzymes, Lock & key & induced fit models of enzyme- substrate binding, Specificity of enzymes- reaction & substrate specificity-definition & an example for each,</p> <p>Cofactors- metals & coenzymes (definition, examples of coenzymes) & examples of enzymes that require them .</p> <p>Factors that influence enzyme activity- Effect of pH (concept of optimal pH with examples).</p> <p>Effect of temperature (concept of optimal temperature). Overview of concept of effect of substrate concentration (Michaelis- Mention equation(no derivation required), basic concept of K_m & V_{max}).</p> <p>Effects of enzyme & product concentration</p> <p>Inhibition of enzymes- Types of enzyme inhibition – competitive, non- competitive, suicide inhibition, Examples of commonly used drugs that act by competitive inhibition of enzymes.</p> <p>Regulation of enzyme activity – Overview of mechanisms involved in regulating the activity of enzymes, Allosteric activation & inhibition .Covalent modification- (phosphorylation & de phosphorylation) Induction & repression , Concept of feed back inhibition.</p> <p>Isoenzymes , Therapeutic & diagnostic uses of enzymes</p>	
5.	Module 5	15
a)	Vitamins- Sources , RDA, Functions & deficiency manifestation of Fat soluble vitamins(A, D, E, K), Water soluble vitamins (B complex & Vitamin C)	

b)	Biological Oxidation- Role of ATP, The respiratory chain & oxidative phosphorylation, Role of brown fat (non-shivering thermogenesis & role of uncoupling protein / thennogenin).	
Unit No.	Theory Topics	Hours allotted No. of hrs
c)	Minerals- Sources, Functions & deficiency manifestation of Calcium, Phosphorus, Iron, Copper, Zinc, Magnesium, Maganese, Iodine, Sodium, Potassium, Fluoride, Selenium	
6.	Module 6	8
a)	Hb Chemistry- Structure & functions of Hb, Physiological Hb , Abnormal Hb, Hb derivatives	
b)	Hormone- Classification of hormones: Group 1 & Group 2 hormones	
c)	Signal Transduction – Mechanism of intracellular signaling of hormones, G protein coupled receptors. Second messengers in hormone action: cAMP, cGMP, Ca ²⁺ & phosphatidyl inositol. Hoemone receptors as gene-specific transcription factors	
	Total	45 hrs

Unit No.	Tutorial Topics	Hours allotted No. of---hrs
1	Cell Biology	1
2	Chemistry of Carbohydrate	1
3	Chemistry of Lipids	1
4	Chemistry of Protein	2
5	Chemistry of Nucleic acids	1
6	Enzyme	1
7	Factors that influence enzyme activity	1
8	Inhibition of enzymes	1
9	Vitamins	2
10	Biological Oxidation	1
11	Minerals	1
12	Hb Chemistry	1
13	Hormone	1
	Total	15 hrs

Unit No	Practical Topics	Hours allotted No. of hrs
1	Test for Monosaccharides	2
2	Test for Disaccharides	2
3	Test for Polysaccharides & Osazone formation	2
4	Colour reaction of Proteins	2
5	Precipitation reaction of Proteins	2
6	Urine : Physical Characteristics & normal constituents	2
7	Urine report : Physical Characteristics & abnormal constituents	4
8	Chemistry of Bile	2
9	Tests for Vitamin A & Vitamin C	4
10	Estimation of Serum Calcium	2
11	Estimation of Serum Phosphorus (inorganic)	2
12	Revision Practicals	4
	Total	30 hrs

Reference Books:

1. Textbook of Medical Biochemistry (As per the revised curriculum of MCI, 2019), Dr. S K Gupta .
2. Textbook of Biochemistry for Medical Students(As per revised MCI curriculum), D M Vasudevan, Sreekumari S, Kannan Vaidyanathan .
3. Textbook of Medical Biochemistry, M.N. Chatterjee, Rama Shinde.
4. Textbook of Biochemistry, Debajyoti Das

Annexure – G – IIIb

ACADEMIC SYLLABUS FOR SEMESTER-II

Name of the Programme	M. SC MEDICAL _eg. Medical Biochemistry_____
Name of the Course	Part2 ()_____

Course Objective (Teaching Objectives)	To create keen interest in the molecular & genetic aspect of the existence & viability of a human body
Course Outcomes (earning Objectives)	The student should be able to develop curiosity & the ability to seek answers. They should be able to get an exposure to the teaching research & diagnostic fields, so that they are able to take an informed decision for their career ahead.

Unit No.	Theory Topics	Hours allotted No. of hrs
1.	Module 7	8
	Carbohydrate Metabolism- Digestion of carbohydrates, Glucose transporters, Glycolysis, Rapaport-Leubering cycle, Citric acid cycle/ Kreb's cycle/ tricarboxylic acid (TCA) cycle, Pentose phosphate pathway (PPP), Glycogenesis, Glycogenolysis, Glucogenesis, Uronic acid pathway, Metabolism of galactose, Metabolism of fructose, Minor pathways of Carbohydrate Metabolism, regulation of blood glucose levels, Diabetes mellitus, Glucose Tolerance Test (GTT)	
2.	Module 8	6
	Lipid Metabolism- Digestion of lipids, Fatty acid oxidation, Biosynthesis of Fatty acids, Metabolism in the adipose tissue, Metabolism of ketone bodies, Metabolism of cholesterol, Fatty liver, Atherosclerosis	
3.	Module 9	9
	Protein Metabolism – Digestion & absorption, General pathways of amino acid catabolism (Transamination, Deamination, Decarboxylation, Transdeamination), Ammonia Metabolism (Urea cycle, Glutamine formation), Metabolism of Glycine, Aromatic amino acids, Sulphur containing amino acids, Glutamic acid	

Unit No.	Theory Topics	Hours allotted No. of hrs
4	Module 10	8
a)	<p>Nucleic acid Metabolism- Overview of the pathway of de novo synthesis of purine nucleotides (starting material & end products only- AMP & GMP), Salvage pathway for purine bases & nucleotides. Lesch-Nyhan syndrome (cause & biochemical basis of clinical features).</p> <p>Overview of the pathway of degradation of purines to form uric acid, including role of the xanthine oxidase.</p> <p>Hyperuricemia & gout (causes, clinical features, principles of treatment, including mechanism of action of allopurinol & probenecid).</p> <p>Overview of pathway of de novo synthesis of pyrimidine nucleotides, showing only starting material, rate-limiting enzyme & end products.</p>	
b)	<p>Hb Metabolism- Heme synthesis, Heme degradation, Porphyria, Important physiological & pathological causes of jaundice in the newborn.</p> <p>Genetic code- Characteristics (universal, unambiguous, degenerate, without punctuation[continuous/commaless]). Basis of degeneracy of the genetic code (wobble hypothesis).</p>	
c)	Protein Biosynthesis- Prokaryotic & Eukaryotic Replication, Transcription, Translation(Initiation, elongation, Termination, Inhibitors of protein biosynthesis) in brief.	
5	Module 11	8
a)	Detoxification- Definition & examples, Biochemical importance of the two phases of xenobiotic metabolism. The cytochrome P450 enzyme system.	
b)	Water & Electrolyte balance- Distribution of water in various body compartments. Intra-extracellular fluid composition (sodium & potassium), Blood volume & osmolality, Hormonal regulation of water balance & its disorders.	
c)	Acid & Base balance- Definition of acid, Base & buffer. Normal pH of body fluid & importance of maintaining normal pH, Sources of hydrogen ions in the body, Simple acid base disorders, Mechanisms of regulation of pH	
6	Module 12	6

	Organ function test- LFT, RFT, TFT, PFT, GFT	
	Total	45

Unit No.	Tutorial Topics	Hours allotted No. of---hrs
1	Carbohydrate Metabolism	2
2	Lipid Metabolism	2
3	Protein Metabolism	2
4	Nucleic acid Metabolism	1
5	Hb Metabolism	2
6	Protein Biosynthesis	1
7	Detoxification	1
8	Water & Electrolyte balance	1
9	Acid & Base balance	1
10	Organ function test- LFT, RFT, TFT, PFT, GFT	2
	Total	15

Unit No.	Practical Topics	Hours allotted No. of---hrs
1	Estimation of Blood Sugar	2
2	Estimation of Blood Urea	2
3	Estimation of Serum Creatinine	2
4	Estimation of Urine Creatinine	2
5	Estimation of Total protein, a lbumin & A/ G ratio	2
6	Estimation of Total Serum Bilirubin	2
7	Estimation of Serum Cholesterol	2
8	Estimation of Serum Uric acid	2
9	Estimation of Serum Electrolytes	2
10	Estimation of Serum S.G.O.T.	2
11	Estimation of Serum S.G.P.T.	2
12	Estimation of Serum Alkaline Phosphatse	2
13	Estimation of Serum Amylase	2
14	Revision	4
	Total	30

MGM INSTITUTE OF HEALTH SCIENCES			
M. Sc. Medical Students			
Syllabus for Research Methodology and Biostatistics			
		No. of Hours	
		Theor y	Practic al
I. Research Methodology:			
Scientific Methods of Research : Definition of Research, Assumptions, Operations and Aims of Scientific Research. Research Process, Significance and Criteria of Good Research , Research Methods versus Methodology, Different Steps in Writing Report, Technique of Interpretation, Precaution in interpretation, Significance of Report Writing, Layout of the Research Report		5	—
Research Designs: Prospective, retrospective, Observational Studies: Descriptive, explanatory, and exploratory, Experimental Studies: Pre-test design, post-test design, Follow-up or longitudinal design, Cohort Studies, Case Control Studies, Cross sectional studies, Intervention studies, Panel Studies.		5	—
Sampling Designs : Census and Sample Survey, Implications of a Sample Design, Steps in Sampling Design Criteria of Selecting a Sampling Procedure, Characteristics of a Good Sample Design, Different Types of Sample Designs (Probability sampling and non probability sampling), How to Select a Random Sample?, Systematic sampling, Stratified sampling, Cluster sampling, Area sampling, Multi-stage sampling, Sampling with probability proportional to size, Sequential sampling.		4	0
Measurement in research: Measurement Scales, Sources of Error in Measurement, Tests of Sound Measurement, Technique of Developing Measurement Tools, Scaling Meaning of Scaling, Scale Classification Bases, Important Scaling Techniques, Scale Construction Techniques, Possible sources of error in measurement, Tests of sound measurement		5	5
Methods of Data Collection: Types of data, Collection of Primary Data, Observation Method, Interview Method, Collection of Primary Data		3	0
Ethics and Ethical practice in research and plagiarism		1	
Sampling Fundamentals : Need and importance for Sampling, Central Limit Theorem, Sampling Theory, Concept of Standard Error, Estimation, Estimating the Population Mean Estimating Population Proportion, Sample Size and its Determination, Determination of Sample Size through the Approach Based on Precision Rate and Confidence Level.		5	2
II. Biostatistics			

Data Presentation : Types of numerical data: Nominal, Ordinal, Ranked, Discrete and continuous. Tables: Frequency distributions, Relative frequency, Graph: Bar charts, Histograms, Frequency polygons, one way scatter plots, Box plots, two way scatter plots, line graphs	3	3
Measures of Central Tendency and Dispersion : Mean, Median, Mode Range, Inter quartile range, variance and Standard Deviation, Coefficient of variation, grouped mean and grouped standard deviation (including merits and demerits).	3	3
Testing of Hypotheses: Definition, Basic Concepts, Procedure for Hypothesis Testing, Normal distribution, data transformation Important Parametric Tests, Hypothesis Testing of Means, Hypothesis Testing for Differences between Means, Hypothesis Testing for Comparing Two Related Samples, Hypothesis Testing of Proportions, Hypothesis Testing for Difference between Proportions, Testing the Equality of Variances of Two Normal Populations.	6	6
Chi-square Test: Chi-square as a Non-parametric Test, Conditions for the Application Chi-square test, Steps Involved in Applying Chi-square Test, Alternative Formula, Yates' Correction, and Coefficient by Contingency.	2	2
Measures of Relationship: Need and meaning, Correlation and Simple Regression Analysis	2	2
Analysis of Variance and Covariance: Analysis of Variance (ANOVA): Concept and technique of ANOVA, One-way ANOVA, Two-way ANOVA, ANOVA in Latin-Square Design Analysis of Co-variance (ANOCOVA), ANOCOVA Technique.	4	4
Nonparametric or Distribution-free Tests: Important Nonparametric or Distribution-free Test Sign test, Wilcoxon signed-Rank Test, Wilcoxon Rank Sum Test: Mann-Whitney U test Kruskal Walli's test, Friedman's test, and Spearman Correlation test.	3	3
Vital Health Statistics: Measurement of Population: rate, crude rate, specific rate, <i>Measurement of fertility:</i> specific fertility rate, Total fertility rate, <i>Reproduction rate</i> , Gross Reproduction Rate, Net Reproduction Rate, Measures related to mortality: Crude Death Rate (CDR) , Age-specific death Rate, Infant and child mortality rate, Measures related to morbidity.	4	3
Computer Application Use of Computer in data analysis and research, Use of Software and Statistical package.	0	2
Total hours	55	35

Assessment Pattern for MSc Medical Courses (2019 Onwards)

1. LETTER GRADES AND GRADE POINTS:

MGMIHS has adopted the UGC recommended system of awarding grades and CGPA under Choice Based Credit Semester System for MSc Medical courses.

1. MGMIHS would be following the absolute grading system, where the marks are compounded to grades based on pre-determined class intervals.
2. The UGC recommended 10-point grading system with the following letter grades will be followed:

Table 1: Grades and Grade Points

Letter Grade	Grade Point
O (Outstanding)	10
A+ (Excellent)	9
A (Very Good)	8
B (Good)	7
C (Above Average)	6
F (Fail)/ RA (Reappear)	0
Ab (Absent)	0
Not Completed (NC)	0
RC (<50% in attendance or in Internal Assessment)	

- a. A student obtaining Grade RA shall be considered failed and will be required to reappear in the examination.
- b. Candidates with NC grading are those detained in a course (s); while RC indicate student not fulfilling the minimum criteria for academic progress or less than 50%in attendance or less than 50% in internal assessments (IA). Registrations of such students for the respective courses shall be treated as cancelled. If the course is a core course, the candidate has to re-register and repeat the course when it is offered next time.
- c. **CBCS Grading System - Marks Equivalence Table**

Table 2: Grades and Grade Points

Letter Grade	Grade Point	% of Marks
O (Outstanding)	10	86-100
A+ (Excellent)	9	70-85
A (Very Good)	8	60 -69
B (Good)	7	55 -59
C (Above Average) – Pass both for UG and PGs	6	50- 54
F (Fail))/ RA (Reappear)	0	Less than 50
Ab (Absent)	0	-
NC- not completed	0	-
RC- Repeat the Course	0	0

Table 3: Cumulative Grades and Grade Points

Letter Grade	Grade Point	CGPA
O (Outstanding)	10	9.01 - 10.00
A+ (Excellent)	9	8.01 – 9.00
A (Very Good)	8	7.01 – 8.00
B (Good)	7	6.00 - 7.00
C (Above Average)	6	5.01 - 6.00

- d. **Assessment of a Course:** Evaluation for a course shall be done on a continuous basis. Uniform procedure will be adopted under the CBCS to conduct continuous internal assessments (IA), followed by one end-semester university examination (ES) for each course.
- e. Courses in programs wherein Theory and Lab are assessed jointly, the minimum passing head has to be 50% Grade each for theory and practical's separately. RA grade in any one of the components will amount to reappearing in both components. i.e. theory and practical.

2. Eligibility to appear for the end-semester examinations for a course includes:

2.1 Candidates having $\geq 75\%$ attendance and obtaining the minimum 35% in internal assessments in each course to qualify for appearing in the end-semester university examinations.

2.2 The students desirous of appearing for university examination shall submit the application form duly filled along with the prescribed examination fee.

2.3 Incomplete application forms or application forms submitted without prescribed fee or application form submitted after due date will be rejected and student shall not be allowed to appear for examination.

3. Passing Heads

3.1 The minimum passing head shall be 50% in both Theory and practicals separately including the internal assessment.

3.2 Elective subjects – the minimum prescribed marks for a pass in elective subject should be 50%. The marks obtained in an elective subjects should be communicated to the university before the commencement of the university examination. (From IIIrdSem Onwards)

4 Detention:

A student not meeting any of the above criteria may be detained (NC) in that particular course for the semester. In the subsequent semester, such a candidate improve in all, including attendance and/or IA minimum to become eligible for the next end-semester examination.

5 The maximum duration for completing the course will be 6 years (minimum duration of course x 2) i.e. (3x2) =6 years for PG Courses, failing which his/her registration will be cancelled. Full fees of entire course of three years may be liable to be paid by the students.

6 Carry over benefit:

6.1 A candidate who fails in any two main subjects of previous semester shall be permitted to carry over those subjects to the next semester.

6.2 A candidate shall not be allowed to appear in the final semester examination unless the candidate has cleared all the previous semester examinations.

7 Grace Marks for PG Courses:

No grace marks will be awarded for PG Exams.

8. University End-Semester Examination

8.1 There will be one final university examination at the end of every semester.

8.2 A candidate must have minimum 75% attendance (Irrespective of the type of absence) in theory and practical in each subject to be eligible for appearing the University examination.

8.3 The Dean shall send to the university a certificate of completion of required attendance and other requirements of the applicant as prescribed by the university, two weeks before the date of commencement of the written examination.

8.4 A candidate shall be eligible to sit for the examination only, if she / he has secured minimum 35% in internal assessment of that subject. The internal examinations will be conducted at college/ department level.

8.5 Notwithstanding – anything in any examination, a deficiency of attendance at lectures or practical maximum to the extent of 10% - may be condoned by the Dean.

8.6 If a candidate fails either in theory or in practical, he/ she have to re-appear for both.

8.7 There shall be no provision of re- evaluation of answer sheets. Candidates may apply to the university following due procedure for recounting of theory marks in the Presence of the subject experts.

8.8 Internal assessments shall be submitted by the Head of the Department to the university through the Dean MGMMC at least two weeks before commencement of University theory examination.

8.9 Supplementary examination: There shall be no supplementary examination

8.10 Re-Verification -There shall be provision of retotaling of the answer sheets, candidate shall be permitted to apply for recounting/retotaling of theory papers within 8 days from the date of declaration of results.

8.11 Scheme of University Exam Theory PG Program: General structure / patterns for setting up question papers for Theory / Practical courses, their evaluation weightages for PG programs are given in the following tables.

8.12 Theory Question Paper Pattern for Core Subjects in University Examinations (For 1st & 2nd Semester)

Under CBCS - 60Marks

Question Type	No. of Questions	Questions to be Answered	Questions X Marks	Total Marks
Brief Answer Questions	7	6	1X 10	60

General Instructions (Theory):

- A. Time duration of each Theory Paper will be of Three (3) Hrs .
- B. Total Marks of each Theory Paper will be 60 Marks

8. 13 Practical Question Paper Pattern For University Examinations Under CBCS - 50 Marks

Exercise	Description	Marks
Q No 1	Practical exercise – 1	1 x15=15 M
Q No 2	Station exercise	5x5M=25 M
Q No 3	VIVA	10 M
		Total = 50 M

General Instructions (Practical):

- A. All the students have to remain present at the examination center 15 minutes before the scheduled time for examination.
- B. Students have to carry with them certified journal, I-card or examination receipt, and other necessary requirements for examination.
- C. Candidate should not leave the practical hall without the permission of examiner.
- D. Use of calculator is allowed but the use of mobile phones is strictly prohibited.
- E. The candidate has to leave the laboratory only after the submission of all the answer sheets of the exercises performed.

8.14 Internal examination pattern (Theory) : 30marks

Question type	No. of questions	Questions to be answered	Question X marks	Total marks
Brief Answer Questions	4	3	1X10	30

8.15 Breakup of theory IA calculation for 20 marks

Internal exam (Department -30 Marks)	15 marks
Seminar	5 marks
	Total = 20 M

8.16 Internal Examination Pattern (Practical): 30 Marks

Practical Exercise	10marks
Station Exercise	10 marks
Viva	10 marks
Total practical	30 Marks

8.17 Breakup of practical IA calculation:

Internal exam (Department -30 Marks)	15 marks
Journal	5 marks
	Total = 20 M

Internal Assessment marks should be submitted to the university by respective departments at least 15 days prior to onset of university examination.

9. Submission of Protocol of Dissertation: Students should undergo Online Course of Research Methodology (MCI- PG) before submitting the protocol for their Dissertation.

MGM Institute of Health Sciences, Navi Mumbai

MGM MEDICAL COLLEGE

Academic Year 2019 – 2020

Academic Calendar For M.Sc. (3 Years) Medical Courses

(Anatomy, Physiology, Biochemistry, Pharmacology, Microbiology)

SCHEDULE OF ACTIVITY	DATES
Commencement of First Semester	01.08.2019
Receipt of completed Eligibility forms at MGMIHS from Respective college without late fees	On or before 30.10.2019
Receipt of completed Eligibility forms at MGMIHS from Respective college with late fees (Only for new admission)	On or before 30.11.2019
Commencement of Internal Exam	3 rd Week of November 2019
Winter Vacation for Staff	16.10.2019 to 15.11.2019
Notification of First Semester University Examination	As per MGMIHS
Commencement of First Semester University Examination	1 Week of January 2020
Conclusion of respective semesters	Last week of January 2020
Declaration of final Result	As per MGMIHS
Commencement of Second Semester	1 st Week of February 2020
Commencement of Internal Examination	3 rd Week of April 2020
Allotment of Guide for Dissertation	On or Before 30 th April 2020
Notification of Second Semester University Examination	As per MGMIHS
Summer Vacation for staff	01.05.2020 to 10.06.2020
Commencement of Second Semester University Examination	1 Week of July 2020
Conclusion of Second Semester	15 July 2020
Declaration of final Result	As per MGMIHS
Commencement of Next Academic Session	16.07.2020

MGM Institute of Health Sciences, Navi Mumbai

MGM MEDICAL COLLEGE

Academic Year 2019 – 2020

Academic Calendar For M.Sc. (3 Years) Medical Courses

(Anatomy, Physiology, Biochemistry, Pharmacology, Microbiology)

SCHEDULE OF ACTIVITY	DATES
Commencement of Third Semester	16.07.2020
Submission of Protocol for Scientific and Ethical Approval	14.08.2020
Commencement of Internal Exam	3 rd Week of November 2020
Winter Vacation for Staff	16.10.2020 to 15.11.2020
Notification of First and Third Semester University Examination	As per MGMIHS
Commencement of Third Semester University Examination	1 Week of January 2021
Conclusion of respective semesters	15 January 2021
Declaration of final Result	As per MGMIHS
Commencement of Fourth Semester	3 rd week of January 2021
Commencement of Internal Examination	2nd Week of April 2021
Notification of Fourth Semester University Examination	As per MGMIHS
Summer Vacation for staff	01.05.2021 to 10.06.2021
Commencement of Fourth Semester University Examination	3 rd Week of June 2021
Conclusion of Respective Semesters	30 June 2021
Declaration of final Result	As per MGMIHS
Commencement of Next Academic Section	1.07.2021

MGM Institute of Health Sciences, Navi Mumbai

MGM MEDICAL COLLEGE

Academic Year 2019 – 2020

Academic Calendar For M.Sc. (3 Years) Medical Courses

(Anatomy, Physiology, Biochemistry, Pharmacology, Microbiology)

SCHEDULE OF ACTIVITY	DATES
Commencement of Fifth Semester	1.07.2021
Commencement of Internal Exam	3 rd Week of November 2021
Winter Vacation for Staff	16.10.2021 to 15.11.2021
Notification of First, Third and Fifth Semester University Examination	As per MGMIHS
Commencement of Fifth Semester University Examination	First Week of December 2021
Conclusion of Fifth semester	Second Week of December 2021
Declaration of final Result	As per MGMIHS
Commencement of Sixth Semester	16 December 2021
Submission of Dissertation	31 March 2022
Commencement of Internal Examination	2nd Week of April 2022
Notification of Fourth Semester University Examination	As per MGMIHS
Summer Vacation for staff	01.05.2022 to 10.06.2022
Commencement of Sixth Semester University Examination	1st June 2022
Conclusion of Respective Semesters	30 June 2022
Declaration of final Result	As per MGMIHS

ACADEMIC SYLLABUS FOR SEMESTER-III

Name of the Programme	M. SC MEDICAL _eg. Medical Biochemistry_____
Course Code	_____
Name of the Course	Part 3 ()_____

Unit No.	Theory Topics	Hours allotted No. of hrs
1	<u>Module 13</u> Centrifuge – Types, uses, application, Mechanism of working, Principle, and maintenance., Colorimeter- Types, uses, application and maintenance Spectrophotometer- Types, uses, application and maintenance, Flurimeter - Types, uses, application and maintenance, Flame Photometry- Types, uses, application and maintenance	10
2	<u>Module 14-</u> Chromatography- Theory, type, principle and application of Paper chromatography, TLC, Ion exchange, Affinity Chromatography, Molecular Exclusion chromatography, Gas liquid chromatography, HPLC, HPTLC	10
3	<u>Module 15-</u> Electrophoresis- Theory, Principle and application of paper, Agar gel, Polyacrylamide gel, Immuno-electrophoresis, Iso-electric focusing, 2 D Electrophoresis, Turbidimetry and Nephelometry- Theory- Principle, parts & applications, Gravimetry Electrochemistry (pH electrodes, ion-selective electrodes, gas-sensing electrodes), ABG Analyser	10
4	<u>Module 16</u> Principle, uses and application, Maintenance of – Electron microscopy, Flowcytometry, Radio isotopic techniques, Nature of radioactivity Detection and instruments, Applications of radioisotopes	10
5	<u>Module 17</u> Nanotechnology and microfabrication ,Techniques to study in vivo metabolism - NMR, SPECT, PET scans, etc, Composition, Functions and analysis of Body fluids- Blood, Lymph, Bile, CSF, Urine, Synovial fluid, Gastric juice, Saliva, sweat, Tears.	10
6	<u>Module 18</u> Automation in Clinical Biochemistry Laboratory, Semi autoanalyser, Autoanalyser, Dry chemistry analyser, Chemiluminescence, Good clinical laboratory practice, Internal quality control, external quality control, laboratory accreditation (Need of accreditation, Process of accreditation, re-requisites for accreditation, Benefits of accreditation), Diagnostic kits	10
	Total	60

M.Sc. Medical Biochemistry
Practical syllabus Semester- III

Unit No.	Practicals	No. of---hrs
1	Chromatographic separation of Sugar	7
2	Chromatographic separation of Amino acids & Urinary Amino Acids	10
3	Chromatographic separation of Plasma Lipids	8
4	Paper Electrophoretic separation of Plasma proteins, Lipoproteins, Hemoglobin	6
5	Polyacrylamide Electrophoretic separation of Plasma proteins	6
6	Polyacrylamide Electrophoretic separation of Lipoproteins	6
7	Agar Electrophoretic separation of LDH isoenzymes	6
8	Cellulose Acetate Electrophoresis separation of hemoglobin	6
9	Preparation of a Levy Jennings chart and plot inter-assay and intra-assay variation for the laboratory.	5
	Total	60

ACADEMIC SYLLABUS FOR SEMESTER-III (ELECTIVE- 1)

Name of the Programme	M. SC MEDICAL BIOCHEMISTRY
Name of the Course	MOLECULAR BIOLOGY AND GENOMICS

Course objective	<ol style="list-style-type: none">1. Nucleic acid structure and interactions, signaling proteins and membrane proteins, enzyme kinetics and drug discovery and protein design.2. It includes all steps in eukaryotic gene expression from chromatin accessibility to translation and mRNA turnover. Including the dynamics of proteins and membrane-bound organelles in eukaryotic cells.3. Including cell and molecular biology of signaling and cancer, DNA repair and apoptosis.4. Protein synthesis mechanisms, especially with respect to ribosome structure-function and accuracy of translation, considered mainly in prokaryotes.5. Nucleosome positioning in relation to promoter architecture; promoter remodelling. The roles of histone acetylation, and the targeted acetylases (and deacetylases), and the action of ATP-dependent 'chromatin remodelling machines'.
Course outcomes	<p>At end of the course accomplishment the students will marvel in</p> <ol style="list-style-type: none">1. Molecular biology is the basic science that has as its goal an explanation of life processes at the sub cellular and molecular level.2. The organization of the genome, the replication, the formation of RNA (transcription), the processing of pre mRNA and the protein synthesis (translation).3. Relate properties of cancerous cells to mutational changes in gene function.4. Account for regulation of cell form and movement; including cytoskeleton organization and generation of force and cell motility.5. Describe and carry out basic molecular genetic methods; including work with bacteria, PCR amplification and analysis and electrophoresis of nucleic acid.6. They will generate and test hypotheses, analyze data using statistical methods where appropriate, and appreciate the limitations of conclusions drawn from experimental data.

Unit no.	THEORY- Topics	Hours allotted 60hrs
1	Structure of Nucleic Acid: DNA, RNA, mRNA, tRNA, rRNA, Denaturation and Renaturation of DNA, T _m ; GC content from T _m , Renaturation kinetics of DNA and complexity of DNA, Cot curves Satellite DNA: Repetitive DNA, SNP, STR,	10 hrs
2	DNA Replication: Prokaryotic and eukaryotic DNA replication, Mechanism of DNA replication, Enzymes and accessory proteins involved in DNA replication. DNA Damage & Repair.	8 hrs
3	DNA Recombination Models of homologous recombination - Homologous recombination protein machinery - Homologous recombination in eukaryotes	8 hrs
4	Transcription Prokaryotic transcription, Eukaryotic transcription, RNA polymerases, General and specific transcription factors, Regulatory elements and mechanisms of transcription regulation, 5'-Cap formation, Transcription termination, 3'-end processing and polyadenylation, Post-transcriptional gene silencing	10 hrs
5	RNA splicing Nuclear splicing, splice some and small nuclear RNAs, group I and group II introns, <i>Cis</i> - and <i>Trans</i> -splicing reactions, tRNA splicing, alternate splicing.	8 hrs
6	Translation Prokaryotic and eukaryotic translation: Synthesis of aminoacyl-tRNAsynthetases, Mechanism of initiation, elongation and termination, Regulation of translation, co-and post-translational modifications of proteins	8 hrs
7	Regulation of gene expression Induction and repression, operon theory, <i>lac</i> operon, <i>trp</i> operon, <i>ara</i> operon, attenuation, positive and negative control, catabolite repression, regulation of transcription by Camp and CRP	8 hrs

Reference Books:

- 1) Molecular Biology; David Freifelder, Narosa Publishing House, 2nd edition (2004)
- 2) Microbial Genetics; David Freifelder, Narosa Publishing House, 2nd edition (2004)
- 3) Principles of Gene Manipulations; S. B. Primrose, R. M. Twyman, R. W. Old, Blackwell Science, 6th Edition (2003).
- 4) Gene VIII; Benjamin Lewin; Oxford Univ. Press, 8th edition (2004)
- 5) Advanced Molecular Biology; R. M. Twyman, 1st Edition, (2003)
- 6) Instant Notes on Molecular Biology; P.C. Turner, A. G. Mclellan, A. D. Bates & M. R. H. White, 2nd Edition (2002)

Name of the Programme	M. SC MEDICAL BIOCHEMISTRY
Name of the Course	MOLECULAR BIOLOGY & GENOMICS (PRACTICAL)

Sr No.	Practical (60 Hrs.)
1	DNA extraction from blood - Manual Method
2	Isolation of RNA
3	Purification and Concentration of the DNA/RNA- Spectrophotometer
4	Estimation of DNA by Chemical Means- Diphenyl amine method
5	Estimation of RNA by Chemical Means- Orcinol Method
6	Isolation of nucleic acids from the given sample and determination of the DNA and RNA content.
7	PCR analysis of DNA fragments by agarose gel electrophoresis

****Note: Any 5 Practical from each paper is mandatory.**

ACADEMIC SYLLABUS FOR SEMESTER-III (ELECTIVE- II)

Name of the Programme	M.Sc. Medical Biochemistry
Name of the Course	Principles of Nutrition
Teaching Objective	To apprehend the candidate with: <ul style="list-style-type: none">• The basic concept of nutrition.• The importance of nutrients for the growth and maintenance of human body.• The nutrition through life cycle and the dietary guidelines during therapeutic conditions
Learning Outcomes	After the course accomplishment the student will be able to: <ul style="list-style-type: none">• Discuss the role of nutrients for human health and certain disorders• Describe the different forms of nutrients and about the procurement and requirement of nutrients

Topic No.	Topics and Details	No. of lectures
1	Basic Concepts of nutrition Micro & macronutrients, food groups, Food pyramid, Balanced diet, BMI, BMR, TEE, IBW, Body composition, RDA	3
2	Macronutrients: Carbohydrates, protein, Fat Classification, Nutritional significance of Macronutrients, deficiency and toxicity Therapeutic significance of macronutrients	6
3	Micronutrients: Vitamins and Minerals Classification, Nutritional significance of Micronutrients Deficiency and toxicity Therapeutic significance of micronutrients	10
4	Nutrition through lifecycle: Nutrition during pregnancy, lactation, infancy, toddler, preschooler, school going kids, adolescents, adults, elderly	12
5	Functional Foods and Nutraceuticals in Health & Disease: History, Definition, Classification, Effects on human health and potential applications in risk reduction of diseases	3
6	Therapeutic Nutrition: Introduction, different types of hospital diets Dietary guidelines for febrile condition Dietary guidelines for GI disorders: diarrhea, constipation, peptic ulcer, ulcerative colitis Dietary guidelines for obese and underweight Dietary guidelines for diabetes Dietary guidelines for heart disease Dietary guidelines for renal and liver diseases	14
9.	Sports Nutrition: Evolution and growth of sports nutrition as a discipline, Anthropometric and physiological measurement Various techniques for measuring body composition, Work capacity, Physical fitness, Parameters of fitness, Fitness tests, Nutritional demands of sports and dietary recommendations	8
Total		60 hrs

- 1.. Mahan, L.K. and Escott-Stump, S. (2000): Krause's Food Nutrition and Diet Therapy, 13th Edition, W.B. Saunders Ltd.
2. Shils, M.E., Olson, J.A., Shike, M. and Ross, A.C. (1999): Modern Nutrition in Health and Disease, 9th Edition, Williams and Wilkins.
3. Indian Council of Medical Research. Nutritive Value of Indian Foods – Latest Publication. •
4. Indian Council of Medical Research. Recommended Dietary Intakes for Indians – Latest Recommendations.
5. Guthrie H.: Introductory Nutrition (6th Ed.) Times Mirror/Mosby College Publishing, 1986.
7. Robinson, Lawler: Normal & Therapeutic Nutrition (17th Ed.) Macmillan Publishing Co. 1986.
8. Swaminathan S.: Advanced Textbook On Food & Nutrition Vol. 1 & N (2nd Ed. Revised _ Enlarged) Bapp Co. 1985.
9. Robinson. Basic Nutrition And Diet Therapy (8th Edition)

Practical

Sr. No	Topic	No. of Practical Classes
1	Anthropometric Assessments	3
2	Formation and use of 24 hour dietary recall	6
3	Food frequency table formation	3
4	Standardization of weight and measures	3
5.	Nutrition status assessment of children	3
6.	Nutrition status assessment of elderly people	3
7.	Nutritional status assessment of adults	3
8.	Physical fitness assessment	6
		30

ACADEMIC SYLLABUS FOR SEMESTER-IV

Name of the Programme	M. SC MEDICAL _eg. Medical Biochemistry_____
Course Code	_____
Name of the Course	Part 4 ()_____

Unit No.	Theory Topics	No. of hrs
1	<u>Module 19</u> Metabolic & applied / Clinical Aspects of carbohydrates, proteins, lipid & Nucleic acid , Integration of carbohydrates, proteins and lipid metabolism Starvation metabolism , Starve and fed cycle- Liver adipose tissue, brain, RBCs Disease of carbohydrate metabolism and mucopolysacchridosis Disease of lipid metabolism, CVD and Mucolipidosis	10
2	<u>Module 20</u> Inborn errors of metabolism: Disease of protein metabolism, Disease of nucleotide metabolism and Hb metabolism, New born screening, Hemoglobinopathies	10
3	<u>Module 21</u> Cell biology- Structure of the cell and different subcellular organelles, Structure and functions of cell membrane, solute transport across biological Membranes, Intracellular traffic and sorting of proteins, Intracellular signaling pathways, membrane receptors and second messengers Extracellular matrix: composition, importance and biomedical importance, cellular adhesion molecules and intercellular communication, Cytoskeleton, muscle contraction and cell motility, Cell cycle, mitosis, meiosis and mechanisms of cell death, Red and white blood cells Cancer- Carcinogens: physical, chemical and biological, Clonal origin of cancers, Genetic basis of carcinogenesis, Role of oncogenes and tumour suppressor genes, Familial cancer syndromes, Cancer stem cells, Epigenetic regulation in cancer, Gene expression profiling in cancer, Cancer cell biology: cell cycle abnormalities, telomerase activity, proliferative capacity and decreased apoptosis, Metastasis, Tumor markers, Biochemical basis of cancer chemotherapy and drug resistance, New methods of anti-cancer therapy: targeted cancer therapy, cancer immunotherapy, Cell cycle, apoptosis, Cancer, Mitochondrial diseases	10
4	<u>Module 22</u> Biochemistry of the endocrine system -Classification and general mechanism of action of hormones, Biosynthesis, secretion, regulation, transport and mode of action of hypothalamic peptides, adenohipophyseal and neurohipophyseal hormones, thyroid and parathyroid hormones, calcitonin, pancreatic hormones, adrenocortical and medullary hormones, gonadal hormones, gastrointestinal hormones, opioid peptides, parahormones, Endocrine interrelationship and their involvement in metabolic regulation, Neuro-modulators and their mechanism of action and physiological significance, Biochemical aspects of diagnosis and treatment of endocrinal disorders: Endocrine disorders, Disorders of mineral metabolism, Water metabolism and its regulation, Acid base balance & disorder ,Iron deficiency anemia	10

Unit No.	Theory Topics	No. of hrs
5	<p><u>Module 23</u></p> <p>Bone and mineral metabolism- Bone structure and metabolism;metabolism of calcium, phosphate and magnesium; regulation and abnormalities of bone metabolism; vitamin D; parathyroid hormone; calcitonin;parathyroid hormone-related (PTHrP); osteoporosis – pathophysiology; markers of bone turnover</p> <p>Nervous system - Neurotransmitters and their receptors,Ion channels and channelopathies, Neurotrophic factors, Protein aggregation and neurodegeneration, Alzheimer’s disease, Parkinson's disease, Huntington’s disease, multiple sclerosis, Prions and prion diseases,Guillain-Barre syndrome – immunopathogenesis, Myasthenia gravis – pathophysiology,Hereditary myopathies - Duchenne muscular dystrophy, Inherited disorders of muscle energy metabolism, Mitochondrial myopathies,Pathophysiology of psychiatric disorders such as anxiety, depression and schizophrenia,Pathophysiology of specialized tissues- Muscle, Nerve, Vision, Collagen, Connective tissue</p>	10
6	<p><u>Module 24</u></p> <p>Principles of nutrition- Balanced diet and its planning, BMR, SDA, Colorimetry, Nutritive importance of various foods, Calorific values of foods: Thermogenic effect of food, Food toxins and additives, Parenteral nutrition diet management in different physiological/ pathological conditions, Anthropometric techniques, obesity, PEM, National Nutrition Programme</p>	10
	Total	60

M.Sc. Medical Biochemistry
Practical syllabus Semester- IV

Unit No.	Practical	No. Of hrs
1	Standardisation & Estimation of Blood Urea by different methods	4
2	Standardisation & Estimation of Serum Protein by different methods	4
3	Standardisation & Estimation of Serum S.G.P.T./S.G.O.T by different methods	4
4	Standardisation & Estimation of Plasma Glucose by different methods	4
5	Standardisation & Estimation of Serum Uric acid by different methods	4
6	Standardisation & Estimation of Serum Creatinine by different methods	4
7	Standardization & Estimation of Bilirubin	4
8	Estimation of Fe & TIBC	2
9	Estimation of Calcium, Magnesium	2
10	Estimation of Copper & Ceruloplasmin	2
11	Estimation of Vitamin D, B 12 & Folate	4
12	Estimation of VMA	4
13	Isolation of Casein from milk	2
14	Isolation of Starch from Potato	4
15	Isolation of Lycopene from Tomato	4
16	Isolation of Lecithin from Egg yolk	4
17	Glucose Tolerance Test	2
18	Blood Gas Analysis	2
	Total	60

Name of the Programme	M. SC MEDICAL BIOCHEMISTRY
Name of the Course	BIOETHICS, BIOSAFETY, IPR & TECHNOLOGY TRANSFER

Course objective	<p>The students will gain structural knowledge on:</p> <ol style="list-style-type: none"> 1. To list the routes of exposure for a pathogen to a human being . 2. To demonstrate and assess the proper use of PPE, best practices, biological containment, and be prepared to safely conduct research 3. To identify the role of the Biosafety Professional in Biomedical Research Laboratories 4. To appreciate the importance of assertion in interpersonal communication and be introduced to some key assertion strategies 5. To understand the interpersonal nature of giving feedback, receiving criticism and resolving conflicts. 6. To establish attentive listening as an assertion strategy
Course outcomes	<p>Students will learn to:</p> <ol style="list-style-type: none"> 1. Effectively manage the health and safety aspects of a biological laboratory. 2. Give reliable, professional and informed advice and information to colleagues and managers. 3. Help to ensure that their institution complies with relevant legislation, liaise effectively with enforcing authorities and be aware of the penalties for failing to comply. 4. Build a context of understanding through communication. 5. Mediate between other conflicting parties. 6. Exhibit de-escalatory behaviors in situations of conflict. 7. Demonstrate acknowledgment and validation of the feelings, opinions, and contributions of others.

Unit no.	Topics	Hours allotted 60hrs
1	Ethics: Benefits of Ethics, ELSI of Bioscience, recombinant therapeutic products for human health care, genetic modifications and food consumption, release of genetically engineered organisms, applications of human genetic rDNA research, human embryonic stem cell research.	15 hrs
2	Patenting: Patent and Trademark, Bioscience products and processes, Intellectual property rights, Plant breeders rights, trademarks, industrial designs, copyright biotechnology in developing countries. Biosafety and its implementation, Quality <i>control in</i> Biotechnology.	15 hrs
	Introduction to quality assurance, accreditation & SOP writing : Concept of ISO standards and certification , National regulatory body for accreditation, Quality parameters, GMP & GLP, Standard operating procedures, Application of QA in field of genetics, Data management of clinical and testing laboratory	15 hrs
3	Funding of biotech business (Financing alternatives, funding, funding for Bioscience/ Medical Health Sector in India, Exit strategy, licensing strategies, valuation), support mechanisms for entrepreneurship (Bio-entrepreneurship efforts in India, difficulties in India experienced, organizations supporting growth, areas of scope, funding agencies in India, policy initiatives), Role of knowledge centers and R&D (knowledge centers like universities and research institutions, role of technology and up gradation)	15 hrs

Reference Books:

1. www.pdfdrive.net
2. www.khanacademy.org
3. www.acadeicearths.org
4. www.edx.org
5. www.open2study.com
6. www.academicjournals.org

Name of the Programme	M. SC MEDICAL BIOCHEMISTRY
Name of the Course	DISASTER MANAGEMENT AND MITIGATION RESOURCES

Course objective	<p>The course will uplift about:</p> <ol style="list-style-type: none"> 1. Understand and appreciate the specific contributions of the Red Cross/Red Crescent movement to the practice and conceptual understanding of disaster management and humanitarian response and their significance in the current context. 2. Recognize issues, debates and challenges arising from the nexus between paradigm of development and disasters. 3. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives. 4. Respond to disaster risk reduction initiatives and disasters in an effective, humane and sustainable manner.
Course outcomes	<p>At the successful completion of course the student will gain:</p> <ol style="list-style-type: none"> 1. knowledge and understanding of the disaster phenomenon, its different contextual aspects, impacts and public health consequences. 2. Knowledge and understanding of the International Strategy for Disaster Reduction (UN-ISDR) and to increase skills and abilities for implementing the Disaster Risk Reduction (DRR) Strategy. 3. Ensure skills and abilities to analyse potential effects of disasters and of the strategies and methods to deliver public health response to avert these effects.

Unit no.	Topics	Hours allotted 60hrs
1	Introduction: Definition of Disaster, hazard, global and Indian scenario, general perspective, importance of study in human life, Direct and indirect effects of disasters, long term effects of disasters. Introduction to global warming and climate change.	08 hrs
2	Natural Disaster and Manmade disasters: Natural Disaster: Meaning and nature of natural disaster, Flood, Flash flood, drought, cloud burst, Earthquake, Landslides, Avalanches, Volcanic eruptions, Mudflow, Cyclone, Storm, Storm Surge, climate change, global warming, sea level rise, ozone depletion Manmade Disasters: Chemical, Industrial, Nuclear and Fire Hazards. Role of growing population and subsequent industrialization, urbanization and changing lifestyle of human beings in frequent occurrences of manmade disasters.	15 hrs
3	Disaster Management, Policy and Administration: Disaster management: meaning, concept, importance, objective of disaster management policy, disaster risks in India, Paradigm shift in disaster management. Policy and administration: Importance and principles of disaster management policies, command and co-ordination of in disaster management, rescue operations-how to start with and how to proceed in due course of time, study of flowchart showing the entire process.	12 hrs
4	Financing Relief Measures: Ways to raise finance for relief expenditure, role of government agencies and NGO's in this process, Legal aspects related to finance raising as well as overall management of disasters. Various NGO's and the works they have carried out in the past on the occurrence of various disasters, Ways to approach these teams. International relief aid agencies and their role in extreme events.	13 hrs
5	Preventive and Mitigation Measures: Pre-disaster, during disaster and post-disaster measures in some events in general structural mapping: Risk mapping, assessment and analysis, sea walls and embankments, Bio shield, shelters, early warning and communication Non Structural Mitigation: Community based disaster preparedness, risk transfer and risk financing, capacity development and training, awareness and education, contingency plans. Do's and don'ts in case of disasters and effective implementation of relief aids.	12 hrs

Reference Books:

1. ShailendraK.Singh : Safety & Risk Management, Mittal Publishers
2. J.H.Diwan : Safety, Security & Risk Management,APH
3. Stephen Ayers &Garmvik: Text Book of Critical Care, Holbook and Shoemaker
4. www.pdfdrive.net
5. www.khanacademy.org
6. www.acadeicearths.org
7. www.edx.org
8. www.open2study.com
9. www.academicjournals.org

Name of the Programme	M. SC MEDICAL BIOCHEMISTRY
Name of the Course	HUMAN RIGHTS

Course objective	<p>Students will comprehend on:</p> <ol style="list-style-type: none"> 1. A branch of public international law, and relevant juridical mechanisms at global as well as regional levels, 2. Human rights as an object of study in history, philosophy and the social sciences, as well as a practical reality in national and international politics. 3. Different forms of promoting and implementing human rights, domestically as well as on the international level. 4. The role of human rights in contemporary issues relating to terrorism, religion, ethnicity, gender and development. 5. Cholarly values such as transparency, impartiality, clarity, reliance and the importance of sound reasoning and empirical inference.
Course outcomes	<p>Student will be able to virtue:</p> <ol style="list-style-type: none"> 1. identify, contextualise and use information about the human rights situation in a given country 2. critically appraise source material, including cases from human rights committees and tribunals and reports and summary records from treaty bodies 3. analyse a country's situation or an international situation in terms of human rights and formulate human rights-based initiatives and policies 4. Promote human rights through legal as well as non-legal means. 5. Participate in legal, political and other debates involving human rights in a knowledgeable and constructive way

Unit no.	Topics	Hours allotted 60hrs
1	<i>Background:</i> Introduction, Meaning, Nature and Scope, Development of Human Rights, Theories of Rights, Types of Rights	08 hrs
2	<i>Human rights at various level :</i> Human Rights at Global Level UNO, Human Rights – UDHR 1948 – UN Conventions on Human Rights: International Covenant on civil and Political Rights 1966, International Convent on Economic, Social and Cultural Right, Racial Discrimination -1966 International, Instruments: U.N. Commission for Human Rights, European Convention on Human Rights.	15 hrs
3	<i>Human rights in India :</i> Development of Human Rights in India, Human Rights and the Constitution of India, Protection of Human Rights Act 1993- National Human Rights Commission, State Human Rights Commission, Composition Powers and Functions, National Commission for Minorities, SC/ST and Woman	12 hrs
4	<i>Human Rights Violations:</i> Human Rights Violations against Women, Human Rights Violations against Children, 35 Human Rights Violations against Minorities SC/ST and Trans-genders, Preventive Measures.	13 hrs
5	<i>Political issues:</i> Political Economic and Health Issues, Poverty, Unemployment, Corruption and Human Rights, Terrorism and Human Rights, Environment and Human Rights, Health and Human Rights	12 hrs

Reference Books:

1. JagannathMohanty Teaching of Human sRights New Trends and Innovations Deep & Deep Publications Pvt. Ltd. New Delhi2009
2. Ram Ahuja: Violence Against Women Rawat Publications JewaharNager Jaipur.1998.
3. SivagamiParmasivam Human Rights Salem 2008
4. Hingorani R.C.: Human Rights in India: Oxford and IBA New Delhi.

**Evaluation Pattern- MSc Medical Biochemistry (Admission Batch 2019
Onwards)**

Evaluation Pattern for IIIrd and IVth Semester Exam (Core Subject)

Final Theory Marks will be 120 Marks (100 Marks University Theory Exam + 20 Marks Internal Assessment)

Theory Marks 100 (Time 3 Hours)

Question Type	Marks Per Question	No. of Questions	Questions to be Answered	Questions X Marks	Total Marks
Brief Answer Questions	10	11	10	10 X 10	100

Practical Exam Pattern- Marks 100

Exercise	Description	Marks
Q No 1	Practical exercise	2 x25=50 M
Q No 2	Station exercise	5x5M=25 M
Q No 3	VIVA	25 M
		Total = 100 M

Internal Examination (Mid-Semester Exam)

Theory Marks 50 (Time 1 1/2 Hours)

Question Type	Marks Per Question	No. of Questions	Questions to be Answered	Questions X Marks	Total Marks
Brief Answer Questions	10	6	5	5 X 10	50

Practical Marks 50

Exercise	Description	Marks
Q No 1	Practical exercise – 1	1 x25=25 M
Q No 2	Station exercise	5x2M=10 M
Q No 3	VIVA	15 M
		Total = 50 M

For Calculation of Internal Assessment

The Marks obtained in Internal Examination out of 50 will be converted to out of 20 for Theory and Practical Internal Assessment.

Evaluation Pattern for IIIrd and IVth Semester Exam (Elective Subjects & PG Activity)

Elective Subjects

- IIIrd Semester students have a choice to select one Core Elective Subject out of the two as mentioned above; for which there will be Internal Evaluation exam for Theory and Practical.
- IVth Semester students have a choice to select one General Elective Subject out of the three mentioned above; for which there will be Internal Evaluation exam for Theory.

Evaluation Pattern for Elective Subject (Theory)- Time 3 Hrs

Section	Question	Marks Distribution	Marks Alloted per section	Marks
Section A	MCQ	10 X 1 M=10	10	10
Section B	SAQ	3/4 X 5 M= 15	15	35
	LAQ	2/3 X10 M= 20	20	
Section C	SAQ	3/4 X 5 M= 15	15	35
	LAQ	2/3 X10 M= 20	20	
				Total 80

Practical Exam Pattern

Exercise	Discription	Marks
Q 1	Practical Exercise	1 X 20 = 20 M
Q 2	Station Exercise	2 X 5 = 10 M
Q 3	Viva	10 M
	Journal	10 M
		Total = 50 M

PG Activities

- The record of Clinical Postings, Dissertation/ Project/ Seminars will be maintained in Logbook. Each of the activity will be evaluated as per the evaluation format given in the Logbook and will be signed by the Departmental Co-ordinator before Semester end Examination.

Allotment of Marks for PG Activities

PG Activity	Marks Alloted
Clinical & Sectional Postings	20
Seminars/ Journal Clubs	20
Dissertation/ Project Work	20

The Marks obtained in the Internal Assessment, Elective Subjects and PG Activities to be sent to MGMIHS before the Semester End Examination as per the date announced by the university.

ACADEMIC SYLLABUS FOR SEMESTER-V

Name of the Programme	M. SC MEDICAL _eg. Medical Biochemistry_____
Course Code	_____
Name of the Course	Part 5 ()_____

Unit No.	Theory Topics	No. of hrs
1.	Module 25 Environmental Biochemistry, Aging, Free radicals/Antioxidants in health & diseases, Regulation of enzyme activity, enzyme kinetics & inhibition	10
2	Module 26 Role of reproductive hormones in spermatogenesis, Menstrual cycle, Ovulation, Pregnancy, Lactation	
3	Module 27 Hemostasis and thrombosis ,Biochemical mechanisms, related laboratory tests, antiplatelet /anticoagulant/fibrinolytic Therapy Cardiovascular system- Atherosclerosis - pathogenesis, risk factors, prevention and treatment ,Cardiac failure, acute coronary syndrome, cardiac biomarkers Kidney- Kidney function tests; pathophysiology, biochemistry, laboratory findings and management in acute kidney injury and chronic kidney disease; estimation of GFR; glomerular diseases - pathogenesis and mechanisms of glomerular injury, nephrotic syndrome, diabetic nephropathy; tubular disorders - renal tubular acidosis, proteinuria, nephrolithiasis, kidney transplant; biochemical aspects of renal stones.	10
4	Module 28 Immunology- Basic of Immunology- Antigen, Antibody, Primary response, Secondary response, Innate Immunity, Cellmediated immunity, Ag-Ab reactions, T & B cells, MHC, Complement system, cytokines, ELISA, RIA Applied Immunology- Acquired immunodeficiency syndrome(AIDS) Transplantation, Inflammation, Hypersensitivity reactions, Autoimmune disorders	10
5	Module 29 Respiratory system- Gaseous exchange in lungs - physiological features and disturbances, arterial blood gases, Pathogenesis of cystic emphysema, alpha-1 anti-trypsin deficiency Gastrointestinal system- Gastric physiology, Pathophysiology of peptic ulcer disease, including role of <i>H. pylori</i> ; gastric function tests; Zollinger-Ellison syndrome, Digestion and absorption of nutrients; evaluation of malabsorption (steatorrhea,lactose intolerance) Celiac disease, Inflammatory bowel disease, Protein losing enteropathy, Regulatory peptides in the gut, Neuroendocrine tumours Liver- Liver function tests, Hyperbilirubinemias, Viral hepatitis, Serologic/virologic markers, Alcoholic liver disease, fatty liver, chronic liver disease, cirrhosis and its Complications, Pathogenesis of ascites, Hepatic encephalopathy, Metabolic diseases affecting liver, Reye's syndrome, Diseases of gall bladder/bile ducts - pathogenesis of gallstones, Pancreas - acute and chronic pancreatitis, cystic fibrosis, pancreatic function tests.	10
6.	Module 30 Body Fluids- Blood, Lymph, Bile, CSF, Urine, Synovial fluid, Gastric Juice, Saliva, Sweat, Teras, Profile test (hypothalamus and pituitary, adrenal glands, gonads, thyroid, parathyroid, liver, kidney, heart, stomach, pancreas, intestine, etc) and associated disorders	10
	Total	60

M.Sc. Medical Biochemistry

Practical syllabus Semester- V

Unit No.	Practicals	No. ofhrs
1	Estimation of Malondialdehyde (MDA)	2
2	Estimation of Superoxide Dismutase (SOD)	2
3	Estimation of Catalase (CAT)	2
4	Estimation of Vitamin A , C & E	2
5	Estimation of Serum Lipid Profile	2
6	Estimation of Serum Cardiac Profile	2
7	Estimation of HbA1C	2
8	Gastric Function Tests	2
9	Liver Function Tests	2
10	Renal Function Tests	2
11	Demonstration on ELISA & RIA	2
12	CSF Analysis	2
13	Determination of enzyme activity & study of enzyme kinetics using any 2 suitable enzymes	2
	Total	30

Evaluation Pattern for Vth Sem MSc Medical Courses

(From Batch 2019-20 Onwards)

A. Evaluation Pattern for Vth Semester Exam

- 1. Theory: Final Theory Marks will be 120 Marks (100 Marks University Theory Exam + 20 Marks Internal Assessment)**

Theory Marks 100 (Time 3 Hours)

Question Type	Marks Per Question	No. of Questions	Questions to be Answered	Questions X Marks	Total Marks
Brief Answer Questions	10	11	10	10 X 10	100

- 2. Practicals: Final Practical Marks will be 120 Marks (100 Marks University Practical Exam+ 20 Marks Internal Assessment)**

Practical Exam - Marks 100

Exercise	Description	Marks
Q No 1	Exercise 1	50
Q No 2	Exercise 2	25
Q No 3	VIVA	25
		Total = 100 M

(Exercise 1- Table Exercises / Stations Excercise2- Table Exercise/ Spots)

B. Evaluation Pattern for Vth Semester Internal Examination

1. Theory: Theory Marks 50 (Time 1 1/2 Hours)

Question Type	Marks Per Question	No. of Questions	Questions to be Answered	Questions X Marks	Total Marks
Brief Answer Questions	10	6	5	5 X 10	50

2. Practical: Practical Marks 50

Exercise	Description	Marks
Q No 1	Exercise -1	25
Q No 2	Exercise-2	15
Q No 3	VIVA	10 M
		Total = 50 M

(Exercise 1- Table Exercise/ Stations

Exercise 2- Table Exercise / Spots)

C. For Calculation of Internal Assessment

The Marks obtained in Internal Examination out of 50 will be converted to out of 20 for Theory and Practical Internal Assessment.

	Internal Exam Marks	Internal Assessment Marks
Theory	50	20
Practical	50	20

D. Assessment of PG Activities

- The record of Clinical Postings, Dissertation/ Project/ Seminars will be maintained in Logbook. Each of the activity will be evaluated as per the evaluation format given in the Logbook and will be signed by the Departmental Co-ordinator before Semester end Examination.

Allotment of Marks for PG Activities

PG Activity	Marks Allotted
Clinical & Sectional Postings	20
Seminars/ Journal Clubs	20
Dissertation/ Project Work	20

Note: The Marks obtained in the Internal Assessment and PG Activities to be sent to MGMIHS before the Semester End Examination as per the date announced by the university.

Evaluation pattern FOR IIIrd Year (5th Sem) M.Sc Medical Biochemistry
(Admission Batch 2019-20 Onwards)
Skeleton – IIIrd Year M.Sc Medical Biochemistry

Semester V							
	Syllabus Ref. No.	Subject	Credits	Teaching hours	Marks		
	Theory				Internal Assessment	Semester Exam	Total
		Immunology & organ system	4	4	20	100	120
		Core Elective course**	4	4	Internal Exam 80 Marks		
		Biostatistical tools					
		SPSS					
		Clinical Postings	6	18		20*	20
		Dissertation/Project Proposal*	5	10		20*	20
		Seminar	2	2		20*	20
	Practical						
		Estimation of Antioxidants & Profiles	2	4	20	100	120
		Core Elective practical Molecular Biology Nanobiotechnology	1	2	Internal Exam 50 Marks		
		Total	24	44	100	200	300

***Departmental level examination**

Name of the Programme	M. SC MEDICAL _eg. Medical Biochemistry_____
Course Code	_____
Name of the Course	Part 6 ()_____

Unit No.	Theory Topics	No. of hrs
1.	<u>Module 31</u> Molecular Biology- Replication, Transcription, Translation, Post translational modification & regulation, Mutation & repair of DNA & its associated diseases, Mitochondrial DNA & its diseases	6
3.	<u>Module 32</u> Regulation of Gene expression, Positive & negative regulations: Lac Operon, Arabinose Operon, Histidine Operon , Gene Mapping, Chromosomal walking <u>Genetic Engineering:</u> Recombinant DNA technology & its applications, restriction endonuclease, Plasmid, Vectors, Cosmid, Gene Cloning, Gene library	6
4	<u>Module 33</u> Techniques in DNA analysis- DNA sequencing methods, PCR, RFLP, Blotting techniques, Hybridization, Microarray, DNA chip technology, cloning techniques.	4
5	<u>Module 34</u> Bioinformatics- Biological sequence data bases, NCBI, Gene Bank, EMBL OMIM, database search algorithms (BLAST, FAST, Multiple sequence alignment), Proteomics, Genomics, metabolomics	4
6.	<u>Module 35</u> Recent advances- Human Genome project, Molecular diagnostics Gene therapy, Stem cell research Research Assignment	8 32
	Total	60

M.Sc. Medical Biochemistry

Practical syllabus Semester- VI

Unit No.	Practicals	No. Of hrs
1	Isolation & Estimation of DNA	2
2	Isolation & Estimation of RNA	2
3	Demonstration on Polymerase chain reaction	4
4	SDS-PAGE technique for PCR product	4
5	Demonstration on restriction fragment length polymorphism	4
6	Demonstration on Northern & Western blotting techniques	4
7	Demonstration on Plasmid DNA isolation	4
8	Demonstration of RTPCR	4
9	Problem on Bioinformatics	2
10	Thesis Work	30
	Total	60

Evaluation Pattern for VIth Sem MSc Medical Courses

(From Batch 2019-20 Onwards)

A. Evaluation Pattern for VIth Semester Exam

1. Theory: Final Theory Marks will be 120 Marks (100 Marks University Theory Exam + 20 Marks Internal Assessment)

Theory- Marks 100 (Time 3 Hours)

Question Type	Marks Per Question	No. of Questions	Questions to be Answered	Questions X Marks	Total Marks
Brief Answer Questions	10	11	10	10 X 10	100

2 Practical Examination

- a. Practical Marks will be 70 Marks (50 Marks University Practical + 20 Marks Internal Assessment)

Exercise	Description	Marks
Q No 1	Exercise 1	25
Q No 2	Exercise 2	15
Q No 3	VIVA	10
		Total = 50 M

b. Thesis Evaluation – Marks 70

	Subject Knowledge	Objectives, Concept and Methodology	Result, Discussion and Outcome	External Examiner Viva	Internal Examiner Viva	Total Marks
Marks Allotted	10	10	10	20	20	70

B. Internal Examination (Mid-Semester Exam)

Theory Marks 50 (Time 1 1/2 Hours)

Question Type	Marks Per Question	No. of Questions	Questions to be Answered	Questions X Marks	Total Marks
Brief Answer Questions	10	6	5	5 X 10	50

Practical Marks 50

Exercise	Description	Marks
Q No 1	Exercise 1	15
Q No 2	Exercise 2	25
Q No 3	VIVA	10
		Total = 50 M

(Exercise 1- Table Exercise/ Spots

Exercise 2- Thesis Defense/ Stations)

C. For Calculation of Internal Assessment

The Marks obtained in Internal Examination out of 50 will be converted to out of 20 for Theory and Practical Internal Assessment.

	Internal Exam Marks	Internal Assessment Marks
Theory	50	20
Practical	50	20

D. Evaluation of PG Activities

- The record of Clinical Postings, Dissertation/ Project/ Seminars will be maintained in Logbook. Each of the activity will be evaluated as per the evaluation format given in the Logbook and will be signed by the Departmental Co-ordinator before Semester end Examination.

Allotment of Marks for PG Activities

PG Activity	Marks Allotted
Clinical & Sectional Postings	20
Seminars/ Journal Clubs	20

The Marks obtained in the Internal Assessment and PG Activities to be sent to MGMIHS before the Semester End Examination as per the date announced by the university.

Evaluation pattern FOR IIIrd Year (6th Sem) M.Sc Medical Biochemistry
(Admission Batch 2019-20 Onwards)
Skeleton – IIIrd Year M.Sc Medical Biochemistry

Semester VI							
	Syllabus Ref. No.	Subject	Credits	Teaching hours	Marks		
	Theory				Internal Assessment	Semester Exam	Total
		Molecular Biology	4	4	20	100	120
		Core Elective course**	4	4	Internal Exam 80 Marks		
		Genetic testing & Counseling					
		Molecular Techniques					
		Clinical Postings	6	18		20*	20
		Dissertation/Project Proposal*	5	10		20*	20
		Seminar	2	2		20*	20
	Practical						
		Molecular Biology Techniques	2	4	20	100	120
		Core Elective practical Molecular Biology Nanobiotechnology	1	2	Internal Exam 50 Marks		
		Total	24	44	100	200	300

*Department level examination



MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)

Grade 'A' Accredited by NAAC

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