



BLDE UNIVERSITY

Choice Based Credit System (CBCS)

Revised Curriculum for M.Sc. Medical Biochemistry 2016-17

Published by

BLDE UNIVERSITY

[Declared as Deemed to be University u/s 3 of UGC act, 1956, vide notification No.F.9-37/2007-U.3(A)]

The Constituent College

SHRI B. M. PATIL MEDICAL COLLEGE, HOSPITAL & RESEARCH CENTRE

Smt. Bangaramma Sajjan Campus, B. M. Patil Road (Sholapur Road), Vijayapura - 586103, Karnataka, India.
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SHRI B. M. PATIL MEDICAL COLLEGE, HOSPITAL AND RESEARCH CENTRE

BLDEU/REG/M.Sc.(Med)/2016-17/925

July 29, 2016

NOTIFICATION

- Sub: Revised Curriculum for M.Sc. Medical Programme in Anatomy, Physiology, Biochemistry and Microbiology with Semester based system.
- Ref: 1. Minutes of the meeting of the 20th meeting of the Academic Council of the University held on April 29, 2016.
2. Minutes of the meeting of the 36th Meeting of Board of Management of the University held on June 18, 2016.

The Board of Management of the University is pleased to approve the Revised Curriculum for M.Sc. Medical in Anatomy, Physiology, **Biochemistry** and Microbiology following Choice Based Credit System (CBCS) with semester scheme in its 36th meeting held on June 18, 2016.

The Revised Curriculum for the **M.Sc. Medical Programmes** shall be effective from the Academic Session 2016-17 onwards, in the Constituent College of the University viz. Shri B. M. Patil Medical College, Hospital and Research Centre, Vijayapura.

REGISTRAR

REGISTRAR

BLDE University, Vijayapura.

To,
The Dean, Faculty of Medicine and Principal
Shri B. M. Patil Medical College,
Hospital and Research Centre,
Vijayapura

Copy to:

- The Secretary, UGC, New Delhi
- The Vice-Principal
- The Medical Superintendent
- The Controller of Examinations
- The Prof. & HoDs of Pre, Para and Clinical Departments
- The Coordinator, IQAC
- PS to the Hon'ble Vice-Chancellor

Smt. Bangaramma Sajjan Campus, Dr.B.M.Patil Road (Solapur Road), Vijayapura-586103. Karnataka. India

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College : Phone : +91 8352-262770, Fax : +91 8352-263019, Website : www.bldeuniversity.ac.in, E-mail : bmpmc.principal@bldeuniversity.ac.in

Vision:

- To be a Leader and be recognized as an Institution striving for maintenance and enhancement of Quality Medical Education and Healthcare”

Mission:

- To be committed to promote sustainable development of higher education including Health science education, consistent with the statutory and regulatory requirements.
- Reflect the needs of changing technology and make use of the academic autonomy to identify the academic programs that are dynamic.
- Adopt global concepts in education in the healthcare sector.

SEMESTER-I						
Course Code	Course Name	Credits	Teaching hours	Marks		
				Internal Assessment	Semester Exam	Total
Theory						
MBC1.1	Medical Anatomy	4	4	20	60	80
MBC1.2	Medical Physiology	4	4	20	60	80
MBC1.3	Medical Biochemistry	4	4	20	60	80
MBC1.4	Medical Pharmacology	4	4	20	60	80
MBC1.5	Medical Microbiology	4	4	20	60	80
Practical						
MBC1.1P	Medical Anatomy	1	2	20	50	70
MBC1.2P	Medical Physiology	1	2	20	50	70
MBC1.3P	Medical Biochemistry	1	2	20	50	70
MBC1.4P	Medical Pharmacology	1	2	20	50	70
MBC1.5P	Medical Microbiology	1	2	20	50	70
Total		25	30	200	550	750

SEMESTER-II						
Course Code	Course Name	Credits	Teaching hours	Marks		
				Internal Assessment	Semester Exam	Total
Theory						
MBC2.1	Medical Anatomy	4	4	20	60	80
MBC2.2	Medical Physiology	4	4	20	60	80
MBC2.3	Medical Biochemistry	4	4	20	60	80
MBC2.4	Medical Pharmacology	4	4	20	60	80
MBC2.5	Medical Microbiology	4	4	20	60	80
MBC2.6	Research Methodology & Biostatistics (Core Course)	4	4	20	60	80
Practical						
MBC2.1P	Medical Anatomy	1	2	20	50	70
MBC2.2P	Medical Physiology	1	2	20	50	70
MBC2.3P	Medical Biochemistry	1	2	20	50	70
MBC2.4P	Medical Pharmacology	1	2	20	50	70
MBC2.5P	Medical Microbiology	1	2	20	50	70
MBC2.6P	Research Methodology & Biostatistics (Core Course)	1	2	20	50	70
Total		30	36	240	660	900

SEMESTER-III						
Course Code	Course Name	Credits	Teaching hours	Marks		
Theory				Internal Assessment	Semester Exam	Total
Theory						
MBC3.1	Instrumentation	4	4	20	60	80
Core Elective course**		4	4	Internal Exam 80 Marks		
MBC3.2	Molecular Biology					
MBC3.3	Clinical Nutrition					
MBC3.4	Clinical Postings	6	18	50		50
MBC3.5	Dissertation/Project Proposal*	5	10	50	-	50
MBC3.6	Seminar	2	2	50		50
Practical						
MBC3.7P	Separation Techniques	2	4	20	50	70
Core Elective practical		1	2	Internal Exam 70 Marks		
MBC3.2P	Molecular Biology					
MBC3.8P	Nanobiotechnology					
Total		24	44	190	110	300

SEMESTER-IV						
Course Code	Course Name	Credits	Teaching hours	Marks		
				Internal Assessment	Semester Exam	Total
Theory						
MBC4.1	Metabolism in disease conditions & principles of nutrition	4	4	20	60	80
	General elective **	4	4			
MBC4.2	Bioethics, Biosafety, IPR & Technology Transfer	Internal Exam of 80 Marks				
MBC4.3	Disaster Management and Mitigation Resources					
MBC4.4	Human rights					
MBC4.5	Clinical Postings					
MBC4.6	Dissertation / Project*	5	10	50		50
MBC4.7	Seminar	2	2	50		50
Practical						
MBC4.8P	Standardisation & Estimation of various biomolecules. Isolation of biomolecules from sources	2	4	20	50	70
Total		24	45	190	110	300

SEMESTER-V						
Course Code	Course Name	Credits	Teaching hours	Marks		
				Internal Assessment	Semester Exam	Total
Theory						
MBC5.1	Applied Biochemistry & Laboratory Medicine	4	4	20	60	80
MBC5.2	Clinical Postings	6	18	50		50
MBC5.3	Dissertation / Project*	12	24	50		50
Practical						
MBC5.4P	Organ Function Tests -Estimation of MDA, Catalase, SOD, Vitamin A, C, E, HbA1C -Lipid Profile - Cardiac Profile -ELISA & RIA	1	2	20	50	70
Total		23	46	140	110	250

SEMESTER-VI						
Course Code	Course Name	Credits	Teaching hours	Marks		
				Internal Assessment	Semester Exam	Total
Theory						
MBC6.1	Molecular Biology, Bioinformatics & Recent Advances	4	4	20	60	80
MBC6.2	Clinical Postings	6	18	50		50
MBC6.3	Dissertation / Project*	12	24		100	100
Practical						
MBC6.1P	Practical for Molecular Biology	2	4	20	50	70
Total		24	50	90	210	300

Annexure G – IV Outline of course curriculum MSc-Medical Courses

SEMESTER –I													
Course Code	Course Name	Hrs/week					Hrs/semester				Exam Marks		
		Lecture/week	Tutorial/week	Practical hrs/week	Total Hrs/Week	Total Credits/Week	Lecture/semester	Tutorial/semester	Practical/semester	Total hours	IA	semester Exam	Total marks
Theory													
MBC11	Anatomy	3	1		4	4	45	15		60	20	60	80
MBC12	Physiology	3	1		4	4	45	15		60	20	60	80
MBC13	Biochemistry	3	1		4	4	45	15		60	20	60	80
MBC14	Pharmacology	3	1		4	4	45	15		60	20	60	80
MBC15	Microbiology	3	1		4	4	45	15		60	20	60	80
Practical													
MBC11P	Anatomy			2	2	1			30	30	20	50	70
MBC12P	Physiology			2	2	1			30	30	20	50	70
MBC13P	Biochemistry			2	2	1			30	30	20	50	70
MBC14P	Pharmacology			2	2	1			30	30	20	50	70
MBC15P	Microbiology			2	2	1			30	30	20	50	70
Total						25				450			750

Total Marks for IA	
Theory	Practical
30	30

Theory Internal Assessment	
Theory	15
Seminar	5
Total	20

Practical Internal Assessment	
Practical	15
Journal	5
Total	20

SEMESTER –II													
Course Code	Course Name	Hrs/week					Hrs/semester				Exam Marks		
		Lecture/week	Tutorial/week	Practical hrs/week	Total Hrs/Week	Total Credits/Week	Lecture/semester	Tutorial/semester	Practical/semester	Total hours	IA	semester Exams	Total marks
Theory													
MBC21	Anatomy	3	1		4	4	45	15		60	20	60	80
MBC22	Physiology	3	1		4	4	45	15		60	20	60	80
MBC23	Biochemistry	3	1		4	4	45	15		60	20	60	80
MBC24	Pharmacology	3	1		4	4	45	15		60	20	60	80
MBC25	Microbiology	3	1		4	4	45	15		60	20	60	80
MBC26	Research Methodology & Biostatistics	4			4	4	60			60	20	60	80
Practical													
MBC21P	Anatomy			2	2	1			30	30	20	50	70
MBC22P	Physiology			2	2	1			30	30	20	50	70
MBC23P	Biochemistry			2	2	1			30	30	20	50	70
MBC24P	Pharmacology			2	2	1			30	30	20	50	70
MBC25P	Microbiology			2	2	1			30	30	20	50	70
MBC26P	Research Methodology & Biostatistics			2	2	1			30	30	20	50	70
Total						30				540			900

Total Marks for IA	
Theory	Practical
30	30

Theory Internal Assement	
Theory	15
Seminar	5
Total	20

Practical Internal Assement	
Practical	15
Journal	5
Total	20

Rules and Regulations of Curriculum

M.Sc. Medical Biochemistry

Definitions of Key Words:

1. **Academic Year:** Two consecutive (one odd + one even) semesters constitute one academic year. Choice Based Credit System (CBCS).
2. The CBCS provides choice for students to select from the prescribed courses (core, elective or minor or soft skill courses).
3. **Course:** Usually referred to, as “papers” is a component of a programme. All courses need not carry the same weight. The courses should define learning objectives and learning outcomes. A course may be designed to comprise lectures/ tutorials/ laboratory work/ outreach activities/ project work/ viva/ seminars/ term papers/assignments/ presentations/ self-study etc. or a combination of some of these.
4. **Credit Based Semester System (CBSS):** Under the CBSS, the requirement for awarding a degree or diploma or certificate is prescribed in terms of number of credits to be completed by the students.
5. **Credit:** A unit by which the course work is interpreted. It functions the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week.
6. **Cumulative Grade Point Average (CGPA):** It is a measure of overall cumulative performance of a student over all semesters. The CGPA is the sum total of the credit points obtained by the student in various courses in all semesters and the sum of the total credits of all courses in all the semesters.
7. **Grade Point:** It is a numerical marking allotted to each letter grade on a 10-point scale.
8. **Letter Grade:** It is an appreciated point of the student’s performance in a selected course. Grades are denoted by letters O, A+, A, B, C and RA x. Programme: An educational programme leading to award of a Degree certificate.
9. **Semester Grade Point Average (SGPA):** It is index of performance of all performance of work in a semester. Its total credit points obtained by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.

10. **Semester:** Each semester will consist of minimum of 180 working days. The odd semester may be scheduled from June/ July to December and even semester from December/ January to June.

Duration of Study Programme:

The duration of the study for M.Sc. Medical Biochemistry will be of 3 years.

Program pattern:

- First Semester: July
- Second Semester: January
- Third Semester: July
- Fourth Semester: January
- Fifth Semester- July
- Sixth Semester-January

Eligibility Criteria:

A candidate seeking admission into this course shall have one of the following qualifications

- a) B.Sc. Degree with life sciences as one of the optional
- b) M.B.B.S.

Any of the following bachelor degree passing with not less than II class

- c) B.Sc graduates of biological Sciences.
- d) B.Sc. Zoology/Microbiology/Botany/Physiology
- e) Other health sciences
- f) BHMS
- g) BAMS
- h) B.Vsc

Medium of Instruction:

English shall be the Medium of Instruction for all the Subjects of study and for examinations.

CBCS – Definition and benefits: Choice Based Credit System is a flexible system of learning. The distinguishing features of CBCS are the following:

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

Semester System and Choice Based Credit System:

The semester system initiates the teaching-learning process and screws longitudinal and latitudinal mobility of students in learning. The credit based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice based credit system provides a sun shone" type approach in which the students can take choice of courses, learn and adopt an interdisciplinary approach of learning.

Semesters:

An academic year consists of two semesters:

	PG
Odd Semester 1 st semester	July – December
Odd Semester 3 rd , 5 th semesters	
Even Semester 2 nd , 4 th , 6 th semesters	December - June

Credits:

Credit defines the coefficient of contents/syllabus prescribed for a course and determines the number of hours of instruction required per week. Thus, normally in each of the courses, credits will be assigned on the basis of the number of lectures/ tutorial laboratory work and other forms of learning required, to complete the course contents in a 15-20 week schedule:

- a. **1 credit** = 1 hour of lecture per week
- b. **3 credits** = 3 hours of instruction per week
- ✓ Credits will be assigned on the basis of the lectures (L) / tutorials (T) / Clinical Training (CR) / laboratory work (P) / Research Project (RP) and other forms of learning in a 15- 20 week schedule
 - L - One credit for one hour lecture per week
 - c. **P/T** - One credit for every two hours of laboratory or practical
 - d. **CR** - One credit for every three hours of Clinical training/Clinical rotation/posting
 - e. **RP** - One credit for every two hours of Research Project per week – Max Credit 20- 25

	Lecture - L	Tutorial - T	Practical - P	Clinical Training/ Rotation– CT/CR	Research Project– RP*
1 Credit	1 Hour	2 Hours	2 Hours	3 Hours	2 Hours
RP*	Maximum Credit 20 – 25 / Semester				

Types of Courses: Courses in a programme may be of three kinds:

- **Core Course**
- **Elective Course**
- **Ability Enhancement Compulsory Courses**

Core Course: A course, which should compulsorily be studied by a candidate as a basic requirement is termed as a Core course. There may be a Core Course in every semester. This is the course which is to be compulsorily studied by a student as a basic requirement to complete programme of respective study.

Elective Course: A course which can be chosen from a very specific or advanced the subject of study or which provides an extended scope or which enables an exposure to some other domain or expertise the candidates ability is called an Elective Course.

Discipline Specific Elective (DSE) Course: Elective courses offered by the main subject of study are referred to as Discipline Specific Elective. The University / Institute may also offer discipline related Elective courses of interdisciplinary nature. An elective may be “Discipline Specific Electives (DSE)” gazing on those courses which add intellectual efficiency to the students.

Dissertation / Project: An Elective/Core course designed to acquire special / advanced knowledge, such as supplement study / support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher / faculty member is called dissertation / project.

Generic Elective (GE) Course: An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective. P.S.: A core course offered in a discipline / subject may be treated as an elective by other discipline / subject and vice versa and such electives may also be referred to as Generic Elective.

Ability Enhancement Compulsory Courses: The Ability Enhancement (AE) Courses may be of two kinds: Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement Courses (SEC).

“AECC” courses are the courses based upon the content that leads to Knowledge enhancement (i) Environmental Science and (ii) English/MIL Communication. These are mandatory for all disciplines.

Assigning Credit Hours per Course: While there is flexibility for the departments in allocation of credits to various courses offered, the general formula would be:

- All core course should be restricted to a maximum of 4 credits.
- All electives should be restricted to a maximum of 3 credits.
- All ability enhancement course should be restricted to a maximum of 2 credits.
- Projects should be restricted to a maximum of 20-25 credits.

Rules and Regulation for Examination of M.Sc. Medical Biochemistry under CBCS Pattern

1. **Title of the Programme offered:** M.Sc. Medical Biochemistry
2. **Duration of the Programme:** Three years.
3. **Medium of instruction:** The medium of instruction and examination shall be in English
4. **Letter Grades and Grade Points:**

Adopted the UGC recommended system of awarding grades and CGPA under Choice Based Credit Semester System.

- 4.1 Would be following the absolute grading system, where the marks are compounded to grades based on pre-determined class intervals.
- 4.2 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)	

- 4.3 A student obtaining Grade F/RA will be considered failed and will require reappearing in the examination.
- 4.4 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% 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.

5. CBCS Grading System - Marks Equivalence Table

5.1 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) – Passing criteria for M.Sc. Medical Biochemistry	6	50- 54
F (Fail))/ RA (Reappear)	0	Less than 50
Ab (Absent)	0	-
NC- not completed	0	-
RC- Repeat the Course	0	0

5.2 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

6. 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 internal assessments (IA), followed by one end-semester university examination (ES) for each course.

6.1 For all category of courses offered (Theory, Practical, Discipline Specific Elective [DE] ; Generic Elective [GE] and Ability Enhancement Courses [AE]; Skills Enhancement Courses [SE] Theory or P (Practical) & RP(Research Project), assessment will comprise of Internal Assessment (IA) in the form of continuous comprehensive evaluation and mid-semester exam, end-semester (ES) examination or college exam as applicable.

6.2 Courses in programs wherein Theory and Practical/Clinical 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.

6.3 Evaluation for a course with clinical rotation or clinical training will be done on a continuous basis.

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

- 7.1 Candidates having $\geq 75\%$ attendance and obtaining the minimum 40% in internal assessment in each course to qualify for appearing in the end-semester university examinations.
- 7.2 The students desirous of appearing for university examination shall submit the application form duly filled along with the prescribed examination fee.
- 7.3 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.

8. Passing Heads

- 8.1 Courses where theory and practical are involved, the minimum passing head shall be 50% in total including the internal assessment.
- 8.2 Elective subjects – the minimum prescribed marks for a pass in elective subject should be 50%. The marks obtained in elective subjects should be communicated to the university before the commencement of the university examination.

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

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

11 Carry over benefit:

- 11.1 A student will be allowed to keep term for Semester II irrespective of number of heads of failure in Semester I.
- 11.2 A student will be allowed to keep term for Semester III if she/he passes each Semester I and II OR fails in not more than 2 courses each in semester I and II.
- 11.3 Student will be allowed to keep term for Semester IV irrespective of number of heads of failure in Semester III. However, student must mandatorily have passed each course of Semester I and II in order to appear for Semester IV exam.
- 11.4 Student will be allowed to keep term for Semester V, if she/he passes Semester I,II, III and IV OR has passed in all courses of Semester I and II and fails in not more than two courses each of Semester III and IV.
- 11.5 Student will be allowed to keep term for Semester VI, irrespective of number of heads of failure in Semester V. However, student must mandatorily have passed each course of Semester I, II, III and IV in order to appear for Semester VI exam.

12 Grace Marks for PG Courses:

- 12.1 A student shall be eligible for grace marks, provided he/she appeared in all the papers prescribed for the examination.
- 12.2 Maximum up to 5 grace marks may be allowed for passing, spread over between subjects.
- 12.3 No grace marks will be awarded in internal evaluation.

13 University End-Semester Examinations

- 13.1 There will be one final university examination at the end of every semester.
- 13.2 A student 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.
- 13.3 The Principal / Director 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.
- 13.4 A student shall be eligible to sit for the examination only, if she / he secure a minimum of 40% in internal assessment (individually in theory and practical as applicable). Internal examinations will be conducted at college/ department level.
- 13.5 Notwithstanding any circumstances, a deficiency of attendance at lectures or practical maximum to the extent of 10% - may be condoned by the Principal / Director.
- 13.6 If a student fails either in theory or in practical, he/ she have to re-appear for both.
- 13.7 There shall be no provision of re-evaluation of answer sheets. Student may apply to the university following due procedure for recounting of theory marks in the presence of the subject experts.
- 13.8 Internal assessment shall be submitted by the Head of the Department to the University through Dean at least two weeks before commencement of University theory examination.

14. Supplementary examination: The supplementary examination will be held in the next semester. Eligibility to appear for supplementary examination will be as per rule number 11.1-11.5.

15. Re-Verification

There shall be provision of re-totaling of the answer sheets; candidate shall be permitted to apply for recounting/re-totaling of theory papers within 8 days from the date of declaration of results.

16. Scheme of University Exam Theory PG Program: General structure / patterns for setting up question papers for Theory / Practical courses, for PG program are given in the following tables. Changes may be incorporated as per requirements of specific courses.

Dissertation work:

During the course of study every candidate has to prepare a dissertation work on a selected topic under the guidance of a recognized post-graduate teacher. The dissertation is aimed to train a post graduate student in research methods and techniques. It includes identification of a problem, formulation of a hypothesis, search and review of literature, getting acquainted with recent advances, designing of a research study, collection of data, critical analysis, and comparison of results and drawing conclusions.

Every candidate shall submit to the Registrar (Academics) of the University in the prescribed proforma, a synopsis containing particulars of proposed dissertation work within six months from the date of commencement of the II year on or before the dates notified by the University. The synopsis shall be sent through the proper channel. Such synopsis will be reviewed and the dissertation topic will be registered by the University. No change in the dissertation topic or guide shall be made without prior approval of the University.

The dissertation should be written under the following headings

1. Introduction
2. Aims or Objectives of study
3. Review of Literature
4. Material and Methods
5. Results
6. Discussion
7. Conclusion
8. Summary
9. References
10. Tables
11. Annexure

Six copies of dissertation thus prepared shall be submitted to the Controller of Examinations six months before final examination on or before the dates notified by the University.

The dissertation shall be valued by examiners appointed by the University. Approval of dissertation work is an essential precondition for a candidate to appear in the University examination.

A Co-guide may be included provided the work requires substantial contribution from a sister department or from another medical institution recognized for teaching/training. The co-guide shall be a recognized post graduate teacher of the University.

Change of guide: In the event of a registered guide leaving the college for any reason or in any other event, guide may be changed with prior permission from the university.

8. Eligibility for award of degree

18.1 A candidate shall have passed in all the subjects of all semester's I-VI and submitted research project report to be eligible for award of M.Sc. Medical Biochemistry degree.

The performance of a candidate in a course will be indicated as a letter grade, whereas grade point will indicate the position of the candidate in that batch of candidates. A student is considered to have completed a course successfully and earned the prescribed credits if he/she secures a letter grade other than F/RA. A letter grade RA in any course implies he/she has to Re-appear for the examination to complete the course.

18.2 The RA grade once awarded in the grade card of the student is not deleted even when he/she completes the course successfully later. The grade acquired later by the student will be indicated in the grade sheet of the subsequent semester in which the candidate has appeared for clearance in supplementary exams

18.3 If a student secures RA grade in the Project Work/Dissertation, he/she shall improve it and resubmit it, if it involves only rewriting / incorporating the revisions suggested by the evaluators. If the assessment indicates lack of student performance or data collection then the student maybe permitted to re-register by paying the prescribed re-registration fee and complete the same in the subsequent semesters.

A candidate shall be declared to have passed the examination if he/she obtains the following minimum qualifying grade / marks:-

- (a) For Core courses CT (Core Theory), CL (Core Lab), DE (Discipline centric Electives), clinical rotation shall obtain Grade B (50 % of marks) in the University End Semester Examination (ES) and in aggregate in each course which includes both Internal Assessment and End Semester Examination.
- (b) For Generic Electives (GE), Ability Enhancement (AE) and Skill Enhancement (SE) courses student shall obtain Grade D (40 % of marks) in the College Examination.

Computation of SGPA and CGPA

The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

- i. The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone & earned by a student, i.e.,

$$\text{SGPA (Si)} = \frac{\sum(C_i \times G_i)}{\sum C_i}$$

Where C_i is the number of credits of the i th course and G_i is the grade point scored by the student in the i th course.

- ii. The CGPA is also calculated in the same manner taking into account all the courses undergone & earned by a student over all the semesters of a programme, i.e.

$$\text{CGPA} = \frac{\sum(C_i \times S_i)}{\sum C_i}$$

Where S_i is the SGPA of the i th semester and C_i is the total number of credits in that semester.

- iii. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

Illustration of Computation of SGPA and CGPA

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit x Grade)
Course 1	3	A	8	3 X 8 = 24
Course 2	4	B+	7	4 X 7 = 28
Course 3	3	B	6	3 X 6 = 18
Course 4	3	O	10	3 X 10 = 30
Course 5	3	C	5	3 X 5 = 15
Course 6	4	B	6	4 X 6 = 24
	20			139

Illustration for SGPA
Thus, $\text{SGPA} = 139/20 = 6.95$

Semester 1	Semester 2	Semester 3	Semester 4
Credit : 20	Credit : 22	Credit : 25	Credit : 26
SGPA : 6.9	SGPA : 6.8	SGPA : 6.6	SGPA : 6.0
Semester 5	Semester 6		
Credit : 26	Credit : 25		
SGPA : 6.3	SGPA : 8.0		

Illustration for CGPA

Thus,

$$\text{CGPA} = \frac{20 \times 6.9 + 22 \times 6.8 + 25 \times 6.6 + 26 \times 6.0 + 26 \times 6.3 + 25 \times 8.0}{144} = 6.75/\text{B+}$$

- ii. Transcript: Based on the above recommendations on Letter grades, grade points and SGPA and CGPA, the transcript for each semester and a consolidated transcript indicating the performance in all semesters may be issued.

Course Registration

- 17.1. After admission to a Program, a student identity number is generated .This PRN number may be used in the process of registration for a course.
- 17.2 The registration process is a registration for the courses in a semester. The registration card is generated after a student completes the choice of electives. Every student shall register for the stipulated number of Courses/Credits semester wise even if electives are not prescribed in their regulations for the said semester. Every student must register for Elective/Ability Enhancement Courses semester-wise for the courses he/she intends to undergo in that semester within two weeks of commencement of the semester.

The list of students registered for each elective will be communicated to the HoDs/ Course Chairpersons. Students will be requested to authenticate the chosen electives by appending their signature in acceptance with approval by the HoDs/ Course Chairpersons. A soft copy of the registered students will be submitted to the elective course offering departments for their official use.

Re - Entry after Break of Study:

The University regulations for readmission are applicable for a candidate seeking re-entry to a program.

- a) Students admitted the program and absenting for more than 3 months must seek readmission into the appropriate semester as per university norms.
- b) The student shall follow the syllabus in vogue (currently approved / is being followed) for the program.
- c) All re-admissions of students are subject to the approval of the Vice-Chancellor.

Ranking

The first two ranks of the programme will be decided on the basis of grades of CGPA in the courses (core and DE courses only). In case of a tie, marks % [of core and DE courses only] will be taken into account.

Classification of Successful Candidates

Overall Performance in a Program and Ranking of a candidate is in accordance with the University regulations.

Consolidated Grade Card – M.Sc. Medical Biochemistry Program			
Letter Grade	% Marks Range	Grade point	CGPA RANGE
O	80 & Above	10	9.01 – 10
A+	75-80	9	8.01 - 9.00
A	60-74	8	7.01 - 8.00
B+	55-59	7	6.01- 7.00
B	50-54	6	5.01- 6.00
F/RA (Reappear)	Less than 50	0	4.51 – 5.00
Ab (Absent)		0	
Not Completed (NC)		0	
Repeat the course (RC = <50% in attendance or Internal Assessment)		0	

A successful candidate will be:

- i. Who secures not less than O grade with a CGPA of 9.01 – 10.00 shall be declared to have secured 'OUTSTANDING' provided he/she passes the whole examination in the FIRST ATTEMPT;
- ii. Who secures not less than A+ grade with a CGPA of 8.01 – 9.00 shall be declared to have secured 'EXCELLENT' provided he/she passes the whole examination in the FIRST ATTEMPT;
- iii. Who secures not less than A grade with a CGPA of 7.01 –8.00 and completes the course within the stipulated course period shall be declared to have passed the examinations with 'Very Good'
- iv. All other candidates (with grade B and above) shall be declared to have passed the examinations.

SYLLABUS**Course Objective (Teaching Objectives):**

- To create keen interest in the molecular & genetic aspect of the existence & viability of a human body

Course Outcomes (Learning 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	

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, 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- Menton 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 / thermogenin).	
c)	Minerals- Sources, Functions & deficiency manifestation of Calcium, Phosphorus, Iron, Copper, Zinc, Magnesium, Manganese, 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. Hormone 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

SYLLABUS

Course Objective (Teaching Objectives)

- To create keen interest in the molecular & genetic aspect of the existence & viability of a human body

Course Outcomes (learning 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	

4	Module 10	
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)	<p>Protein Biosynthesis- Prokaryotic & Eukaryotic Replication, Transcription, Translation(Initiation, elongation, Termination, Inhibitors of protein biosynthesis) in brief.</p>	
5	Module 11	
a)	<p>Detoxification- Definition & examples, Biochemical importance of the two phases of xenobiotic metabolism. The cytochrome P450 enzyme system.</p>	
b)	<p>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.</p>	
c)	<p>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</p>	
6	Module 12	
	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.	MBC1.1P 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

Syllabus for Research Methodology and Biostatistics		
I. Research Methodology:	No. of Hours	
	Theory	Practical
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	
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	
Methods of Data Collection: Types of data, Collection of Primary Data, Observation Method, Interview Method, Collection of Primary Data	3	
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	

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, Measurement of fertility: specific fertility rate, Total fertility rate, Reproduction rate, 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