B.S. Abdur Rahman Crescent Institute of Science & Technology

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

Regulations 2021
Curriculum and
Syllabi (I & II Semesters)

B.Sc. (Biotechnology)

B.S. Abdur Rahman Crescent Institute of Science & Technology
Deemed to be University u/s 3 of the UGC Act, 1956

REGULATIONS 2021
CURRICULUM AND SYLLABI (I & II Semesters)

B.Sc. BIOTECHNOLOGY

VISION AND MISSION OF THE INSTITUTION

VISION

B.S.Abdur Rahman Crescent Institute of Science and Technology aspires to be a leader in Education, Training and Research in multidisciplinary areas of importance and to play a vital role in the Socio-Economic progress of the Country in a sustainable manner.

MISSION

- To blossom into an internationally renowned Institute.
- To empower the youth through quality and value-based education.
- To promote professional leadership and entrepreneurship.
- To achieve excellence in all its endeavors to face global challenges.
- To provide excellent teaching and research ambience.
- To network with global Institutions of Excellence, Business, Industry and Research Organizations.
- To contribute to the knowledge base through Scientific enquiry, Applied Research and Innovation.

SCHOOL OF LIFE SCIENCES

VISION AND MISSION

VISION

To attain new heights in biotechnology research, shaping life sciences into a premier precision tool for the future for creation of wealth and ensuring social justice-specially for the welfare of the poor

MISSION

The mission of the school of life sciences and Technology is to maximize the benefits of biotechnology to the University, the nation and the globe by being an excellent quality, comprehensive, multidisciplinary school that supports, coordinates, disseminates and advances biotechnology in the areas of social welfare and entrepreneurship.

PROGRAMME EDUCATIONAL OBJECTIVES

- This course will facilitate the graduates to be professionally competent in Biotechnology to solve the problems in agricultural, environmental, food, biochemical and biomedical sciences.
- This course will offer students with a solid foundation in biological sciences, to enable them to work on applications in biotechnology as per the requirement of the industries, and also will enable the students to pursue higher studies and research.
- This course will enable students to acquire knowledge on the fundamentals of Biochemistry, Cell biology, Microbiology and Molecular biology to enable them to understand basic concepts in modern biology and help them to build their carrier in related fields.
- This course will facilitate the students to acquire knowledge in skill based courses such as Biofertilizer Technology, Agricultural Biotechnology, Medical Biotechnology, Herbal Technology, Disease Management and Mushroom Culture Technology enabling their skills and enhance confidence to them to venture into business opportunities.
- This programme will teach students the importance of Bioethics, entrepreneurship, communication and management skills.
- This course will also offer the graduates to demonstrate their proficiency in theory and practice of bio-techniques through life-long learning and provide confidence to perform as an individual and / or member of a team with professional and ethical behaviour.

PROGRAMME OUTCOMES

- Graduates of the course will have strong background in the interface of modern biology and skill based courses and are able to use these tools in business/industry and/or institutes wherever necessary.
- Graduates will identify, formulate, research literature, and analyze complex science problems reaching substantiated conclusions using first principles of mathematics, natural science, and applied sciences.
- Graduates will demonstrate knowledge and understanding of the science and
  management principles and apply these to one's own work, as a member and
  leader in a team, to manage projects and in multidisciplinary and diverse environment.
- Graduates of the course will be capable to get engaged in independent and life-long learning in the broadest context of technological changes.
- Graduates of the course will function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary industrial settings.
- Graduates of the course will communicate effectively on complex science activities with the science community and with the society at large.
- Graduates of the course will apply ethical principles and commit to professional ethics and responsibilities and norms of the Science, engineering and technology practice.
- Graduates of the course will design solutions for complex science problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety and cultural, societal, and environmental considerations.

PROGRAMME SPECIFIC OUTCOMES

- Acquire information on the basics of biotechnology for comprehensive and compact base which enables them to understand the emerging concepts in life sciences.
- Acquire Information on various domains of advanced biotechnology and their applications and research.
- Students will acquire techniques of Biotechnology that will help to interact with multi-disciplinary aspects of Biotechnology
- Students acquire key areas such as Patent drafting and application, Artificial Intelligence in diagnostic Medicine and precision agriculture, Bioentrepreneurship, Computer aided Drug Design, Regenerative Medicine, Biomass and Bioenergy will help to meet the necessities of Indian and international Biotech industries.

REGULATIONS - 2021

B.A. / BBA/ B.Com. / BCA / B.Sc. DEGREE PROGRAMMES

(Under Choice Based Credit System)

1.0 PRELIMINARY DEFINITIONS & NOMENCLATURE

In these Regulations, unless the context otherwise requires:

i) **"Programme"** means B.A. / BBA / BCA / B.Com. / B.Sc. Degree Programmes.

ii) **"Course"** means theory / practical / laboratory integrated theory / seminar / internship / project and any other subject that is normally studied in a semester like English, Mathematics, Environmental Science, etc.,

iii) **"Institution"** means B.S. Abdur Rahman Crescent Institute of Science and Technology.

iv) **"Academic Council"** means the Academic Council, which is the apex body on all academic matters of this Institute.

v) **"Dean (Academic Affairs)"** means the Dean (Academic Affairs) of the Institution who is responsible for the implementation of relevant rules and regulations for all the academic activities.

vi) **"Dean (Student Affairs**)" means the Dean (Students Affairs) of the Institution who is responsible for activities related to student welfare and discipline in the campus.

vii) **"Controller of Examinations"** means the Controller of Examination of the Institution who is responsible for the conduct of examinations and declaration of results.

viii) **"Dean of the School"** means the Dean of the School of the deparment concerned.

ix) **"Head of the Department"** means the Head of the Department concerned.

2.0 PROGRAMMES OFFEREDAND ELIGIBILITY CRITERIA FOR ADMISSION

2.1 UGProgrammesOffered

Degree	Mode of Study
B.A.	FullTime
BBA	
B.Com.	
BCA	
B.Sc.	

2.2 Eligibility Criteria

Students for admission to the first semester of the undergraduate degreeprogrammemust have passed the Higher Secondary Examination of the 10 +2 curriculum (Academic stream) or any other examination of any authority accepted bythisInstitution as equivalent thereto.

S.No.	Programme	Eligibility Criteria
1	BCA	10+2 (Higher Secondary) with Mathematics or equivalent subject
2	B.Sc. Computer Science	10+2 (Higher Secondary) with Mathematics or equivalent subject
3	B.Sc. Biotechnology	10+2 (Higher Secondary) with Chemistry and Biology as subjects
4	BBA (Financial Services)	10+2 (Higher Secondary)
5	BBA (General)	
6	B.Com. (General)	10+2 (Higher Secondary) with Mathematics, Physics and Chemistry / Physics, Chemistry, Botany and Zoology / Commerce / Statistics as subjects.
7	B.Com (Accounts and Finance)	
8	B.Com. (Hons.)	
9	B.A. English (Hons.)	10 +2 (Higher Secondary)
10	B.A. Islamic Studies	
11	B.A. Public Policy	

2.4 The eligibility criteria such as marks, number of attempts and physical fitness shall be as prescribed by the Institution in

adherence to the guidelines of regulatory / statuatory authorities from time to time.

3.0 STREAMS / SPECIALISATION OF STUDY

The following are the details of specialization / streams offered in various programmes:

S.No.	Program	Streams / Specialisation of Study
1.	BCA	i. Cloud Technology and Information Security ii. Mobile Applications and Information Security iii. Data Science iv. Multimedia and Web Application Development
2.	B.Sc.	i. Computer Science ii. Biotechnology
3.	BBA	i. General ii. Financial Services
4.	B.Com	i. General ii. Honours iii. Accounts and Finance
5.	B.A.	i. English (Honours) ii. Islamic Studies iii. Public Policy

4.0 STRUCTURE OF THE PROGRAMME

4.1 The curriculum of the UG programmes consists of the following components:

- Core Courses (CC)
- Allied Courses (AC)
- Ability Enhancement Courses (AEC)
- Skill Enhancement Courses (SEC)
- Elective Courses (EC)
- Laboratory Courses (LC)
- Laboratory Integrated Theory Courses (LITC)
- Value added courses
- Mandatory courses (MC)
- Generic Elective Courses (GEC)

- Discipline Specific Elective (DSE)
- Project - PROJ (Project work, seminar, and internship in industry or at appropriate workplace)

4.1.1 Personality and Character Development

All students shall enroll, on admission, in any of the following personality and character development programmes:

- National Cadet Corps (NCC)
- National Service Scheme (NSS)
- National Sports Organization (NSO)
- Youth Red Cross (YRC)
- Rotaract
- Crescent Indian Society Training Development (ISTD – C)
- Crescent Creative Strokes
- Crescent Technocrats Club

The training activities / events / camp shall normally be organized during the weekends / vacation period.

4.1.2 Online Courses for Credit Transfer

Students are permitted to undergo department approved online courses under SWAYAM up to 10% of credits of courses in a semester excluding project semester (if any) with the recommendation of the Head of the Department / Dean of School and with the prior approval of Dean Academic Affairs during his/ her period of study. The credits earned through online courses ratified by the respective Board of Studies shall be transferred following the due approval procedures. The online courses can be considered in lieu of core courses and elective courses.

4.1.3 Value Added Courses

The students are permitted to pursue department approved online courses (excluding courses registered for credit transfer) or courses offered / approved by the department as value added courses.

The details of the value added course viz., syllabus, schedule of classes and the course faculty shall be sent to Dean, Academic Affairs for approval. The students may also undergo the valued

added course offered by other departments with the consent of the Head of the Department offering the course.

These value added courses shall be specified in the consolidated mark sheet as additional courses pursued by the student over and above the curriculum during the period of study.

4.1.4 Industry Internship

The students shall undergo training for a period as specified in the curriculum during the summer vacation in any industry relevant to the field study.

The students are also permitted to undergo internship at a research organization / eminent academic institution for the period prescribed in the curriculum during the summer vacation, in lieu of Industrial training.

In any case, the student shall obtain necessary approval from the Head of the Department / Dean of School and the training has to be taken up at a stretch.

4.1.5 Industrial Visit

The student shall undergo at least one industrial visit every year. The Heads of Departments / Deans of Schools shall ensure the same.

4.2 Each course is normally assigned certain number of credits:

- One credit per lecture period per week
- One credit per tutorial period per week
- One credit for two to three periods and two credits for four periods of laboratory or practical sessions per week
- One credit for two periods of seminar / project work per week
- One credit for two weeks of industrial training or 80 hours per semester.

4.3 Each semester curriculum shall normally have a blend of lecture courses, laboratory courses, laboratory integrated theory courses, etc.

4.4 For successful completion of the programme, a student must earn a minimum total credit specified in the curriculum of the respective programme of study.

4.5 The medium of instruction, examinations and project report shall be English, except B.A. Islamic Studies (Arabic medium) and for courses in languages other than English.

5.0 DURATION OF THE PROGRAMME

5.1 A student is expected to complete the programme in 6 semesters but in any case not more than 10 continuous semesters reckoned from the date of first admission.

5.2 Each semester shall consist of a minimum of 90 working days including the days of examinations.

5.3 The maximum duration for completion of the programme as mentioned in clause 5.1 shall also include period of break of study vide clause 7.1 so that the student may be eligible for the award of the degree.

6.0 REGISTRATION AND ENROLLMENT

6.1 The students of first semester shall register and enroll for courses at the time of admission by paying the prescribed fees. For the subsequent semesters registration for the courses shall be done by the student one week before the last working day of the previous semester.

6.2 A student can enroll for a maximum of 32 credits during a semester including Redo / Predo Courses.

6.3 Change of Course

A student can change an enrolled course within 10 working days from the commencement of the course, with the approval of the Dean (Academic Affairs), on the recommendation of the Head of the Department / Dean of School of the student.

6.4 Withdrawal from a Course

A student can withdraw from an enrolled course at any time before the first continuous assessment test for genuine reasons, with the approval of the Dean (Academic Affairs), on the recommendation of the Head of the Department / Dean of School of the student.

7.0 BREAK OF STUDY FROM PROGRAMME

7.1 A student may be allowed / enforced to take a break of study for two semesters from the programme with the approval of Dean (Academic Affairs) for the following reasons:

7.1.1Medical or other valid grounds

7.1.2 Award of 'I' grade in all the courses in a semester due to lack of attendance

7.1.3 Debarred due to any act of indiscipline.

7.2 The total duration for completion of the programme shall not exceed the prescribed maximum number of semesters (vide clause 5.1).

7.3 A student who has availed break of study in the current semester (odd/even) can rejoin only in the subsequent corresponding (odd/even) semester in the next academic year on approval from Dean, Academic affairs.

7.4 During the break of study, the student shall not be allowed to attend any regular classes or participate in any activities of the institution. However he / she shall be permitted to enroll for the 'I' grade courses and appear for the arrear examinations.

8.0 CLASS ADVISOR AND FACULTY ADVISOR

8.1 Class Advisor

A faculty member will be nominated by the Head of the Department / Dean of School as class advisor for the class throughout the period of study.

The class advisor shall be responsible for maintaining the academic, curricular and co-curricular records of students of the class.

8.2 Faculty Advisor

To help the students in planning their courses of study and for general counseling, the Head of the Department / Dean of School of the students will attach a maximum of 20 students to a faculty member of the department who shall function as faculty advisor for the students throughout their period of study. Such faculty advisors shall guide the students in taking up the elective courses for registration and enrolment in every semester and

also offer advice to the students on academic and related personal matters.

9.0 COURSE COMMITTEE

9.1 Each common theory course offered to more than one group of students shall have a “Course Committee” comprising all the course faculty teaching the common course with one of them nominated as course coordinator. The nomination of the course coordinator shall be made by the Head of the Department / Dean (Academic Affairs) depending on whether all the course faculty teaching the common course belong to a single department or from several departments. The course committee shall ensure preparation of a common question paper and scheme of evaluation for the tests and semester end examination.

10.0 CLASS COMMITTEE

A class committee comprising faculty members handling the courses, student representatives and a senior faculty member not handling the courses as chairman will be constituted semester-wise by the Head of the Department.

10.1 The composition of the class committee will be as follows:

- One senior faculty member preferably not handling courses for the concerned semester, appointed as chairman by the Head of the Department.
- All the faculty members handling courses of the semester.
- Six student representatives (male and female) of each class nominated by the Head of the Department in consultation with the relevant faculty advisors.
- All faculty advisors and the class advisors
- Head of the Department - Ex-Officio Member

10.2 The class committee shall meet at least three times during the semester. The first meeting shall be held within two weeks from the date of commencement of classes, in which the components of continuous assessment for various courses and the weightages for each component of assessment shall be decided for the first and second assessment. The second meeting shall

be held within a week after the date of first assessment report, to review the students' performance and for follow up action.

10.3 During these two meetings the student members shall meaningfully interact and express opinions and suggestions to improve the effectiveness of the teaching-learning process, curriculum, and syllabi, etc.

10.4 The third meeting of the class committee, excluding the student members, shall meet after the semester end examinations to analyse the performance of the students in all the components of assessments and decide their grades in each course. The grades for a common course shall be decided by the concerned course committee and shall be presented to the class committee(s) by the course faculty concerned.

11.0 ASSESSMENT PROCEDURE AND PERCENTAGE WEIGHTAGE OF MARKS

11.1 Every theory course shall normally have a total of three assessments during a semester as given below:

Assessments	Course Coverage in Weeks	Duration	Weightage of Marks
Assessment 1	1 to 6	1.5 hours	25%
Assessment 2	7 to 12	1.5 hours	25%
Semester End Examination	Full course	3 hours	50%

11.2 Theory Course

Appearing for semester end theory examination for each course is mandatory and a student shall secure a minimum of 40% marks in each course in semester end examination for the successful completion of the course.

11.3 Laboratory Course

Every practical course shall have 60% weightage for continuous assessments and 40% for semester end examination. However,

a student shall have secured a minimum of 50% marks in the semester end practical examination for the award of pass grade.

11.4 Laboratory integrated theory courses

For laboratory integrated theory courses, the theory and practical components shall be assessed separately for 100 marks each and consolidated by assigning a weightage of 75% for theory component and 25% for practical components. Grading shall be done for this consolidated mark. Assessment of theory components shall have a total of three assessments with two continuous assessments carrying 25% weightage each and semester end examination carrying 50% weightage. The student shall secure a separate minimum of 40% in the semesterend theory examination.The evaluation of practical components shall be through continuous assessment.

11.5 The components of continuous assessment for theory / practical / laboratory integrated theory courses shall be finalized in the first class committee meeting.

11.6 Industry Internship

In the case of industry internship, the student shall submit a report, which shall be evaluated along with an oral examination by a committee of faculty members constituted by the Head of the Department. The student shall also submit an internship completion certificate issued by the industry / research / academic organisation. The weightage of marks for industry internship report and viva voce examination shall be 60% and 40% respectively.

11.7 Project Work

In the case of project work, a committee of faculty members constituted by the Head of the Department / Dean of the School shall carry out three periodic reviews. Based on the project report submitted by the students, an oral examination (viva voce) shall be conducted as semester end examination by an external examiner approved by the Controller of Examinations. The weightage for periodic reviews shall be 50%. Of the remaining 50%, 20% shall be for the project report and 30% for the viva voce examination.

11.8 Assessment of seminars and comprehension shall be carried out by a committee of faculty members constituted by the Head of the Department.

11.9 For the first attempt of the arrear theory examination, the internal assessment marks scored for a course during first appearance shall be used for grading along with the marks scored in the arrear examination. From the subsequent appearance onwards, full weightage shall be assigned to the marks scored in the semester end examination and the internal assessment marks secured during course of study shall become invalid.

In case of laboratory integrated theory courses, after one regular and one arrear appearance, the internal mark of theory component is invalid and full weightage shall be assigned to the marks scored in the semester end examination for theory component. There shall be no arrear or improvement examination for lab components.

12.0 SUBSTITUTE EXAMINATIONS

12.1 A student who is absent, for genuine reasons, may be permitted to write a substitute examination for any one of the two continuous assessment tests of a course by paying the prescribed substitute examination fee. However, permission to take up a substitute examination will be given under exceptional circumstances, such as accidents, admission to a hospital due to illness, etc. by a committee constituted by the Head of the Department / Dean of the School for that purpose. There is no substitute examination for semester end examination.

12.2 A student shall apply for a substitute exam in the prescribed form to the Head of the Department / Dean of the School within a week from the date of assessment test. However, the substitute examination will be conducted only after the last instructional day of the semester.

13.0 ATTENDANCE REQUIREMENT AND SEMESTER / COURSE REPETITION

13.1 A student shall earn 100% attendance in the contact periods of every course, subject to a maximum relaxation of 25% to become eligible to appear for the semester end examination in that course, failing which the student shall be awarded “I” grade in that course.

13.2 The faculty member of each course shall cumulate the attendance details for the semester and furnish the names of the students who have not earned the required attendance in the concerned course to the class advisor. The class advisor shall consolidate and furnish the list of students who have earned less than 75% attendance, in various courses, to the Dean (Academic Affairs) through the Head of the Department/ Dean of the School. Thereupon, the Dean (Academic Affairs) shall officially notify the names of such students prevented from writing the semester end examination in each course.

13.3 If a student secures attendance between 65% and less than 75% in any course in a semester, due to medical reasons (hospitalization / accident / specific illness) or due to participation in the institution approved events, the student shall be given exemption from the prescribed attendance requirement and the student shall be permitted to appear for the semester end examination of that course. In all such cases, the students shall submit the required documents immediately after joining the classes to the class advisor, which shall be approved by the Head of the Department / Dean of the School. The Vice Chancellor, based on the recommendation of the Dean (Academic Affairs) may approve the condonation of attendance.

13.4 A student who has obtained an “I” grade in all the courses in a semester is not permitted to move to the next higher semester. Such students shall repeat all the courses of the semester in the subsequent academic year.

13.5 The student awarded “I” grade, shall enroll and repeat the course when it is offered next. In case of “I” grade in an elective course either the same elective course may be repeated, or a new elective course may be taken with the approval of Head of the Department / Dean of the School.

13.6 A student who is awarded “U” grade in a course shall have the option to either write the semester end arrear examination at the end of the subsequent semesters, or to redo the course in the evening when the course is offered by the department. Marks scored in the continuous assessment in the redo course shall be considered for grading along with the marks scored in the semester end (redo) examination. If any student obtains “U” grade in the redo course, the marks scored in the continuous assessment test (redo) for that course shall be considered as internal mark for further appearance of arrear examination.

13.7 If a student with “U” grade, who prefers to redo any particular course, fails to earn the minimum 75% attendance while doing that course, then he / she is not permitted to write the semester end examination and his / her earlier “U” grade and continuous assessment marks shall continue.

14.0 REDO COURSES

14.1 A student can register for a maximum of three redo courses per semester without affecting the regular semester classes, whenever such courses are offered by the concerned department, based on the availability of faculty members and subject to a specified minimum number of students registering for each of such courses.

14.2 The number of contact hours and the assessment procedure for any redo course shall be the same as regular courses, except there is no provision for any substitute examination and withdrawal from a redo course.

15.0 PASSING AND DECLARATION OF RESULTS AND GRADE SHEET

15.1 All assessments of a course shall be made on absolute marks basis. The class committee without the student members shall meet to analyse the performance of students in all assessments of a course and award letter grades following the relative grading system. The letter grades and the corresponding grade points are as follows:

Letter Grade	Grade Points
S	10
A	9
B	8
C	7
D	6
E	5
U	0
W	-
I	-

"W" - denotes withdrawal from the course.

"I" - denotes inadequate attendance in the course and prevention from appearance of semester end examination

"U" - denotes unsuccessful performance in the course.

15.2 A student who earns a minimum of five grade points ('E' grade) in a course is declared to have successfully completed the course. Such a course cannot be repeated by the student for improvement of grade.

15.3 Upon awarding grades, the results shall be endorsed by the chairman of the class committee and Head of the Department / Dean of the School. The Controller of Examination shall further approve and declaretheresults.

15.4 Within one week from the date of declaration of result, a student can apply for revaluation of his / her semester end theory examination answer scripts of one or more courses, on payment of prescribed fee, through proper application to the Controller of Examinations. Subsequently the Head of the Department/ Dean of the School offered the course shall constitute a revaluation committee consisting of chairman of the class committee as convener, the faculty member of the course and a senior faculty member having expertise in that course as members. The committee shall meet within a week to revalue the answer scripts and submit its report to the Controller of Examinations for consideration and decision.

15.5 After results are declared, grade sheets shall be issued to each student, which contains the following details: a) list of courses

enrolled during the semester including redo courses / arrear courses, if any; b) grades scored; c) Grade Point Average (GPA) for the semester and d) Cumulative Grade Point Average (CGPA) of all courses enrolled from first semester onwards.

GPA is the ratio of the sum of the products of the number of credits of courses registered and the grade points corresponding to the grades scored in those courses, taken for all the courses, to the sum of the number of credits of all the courses in the semester.

If C_i, is the number of credits assigned for the i^{th} course and GP_i is the Grade Point in the i^{th} course,

$$GPA = \frac{\sum_{i=1}^{n}(C_i)(GPi)}{\sum_{i=1}^{n} C_i}$$

Where n = number of courses

The Cumulative Grade Point Average (CGPA) is calculated in a similar manner, considering all the courses enrolled from the first semester.

“I” and "W" grades are excluded for calculating GPA.

"U", “I”and **"W"** grades are excluded for calculating CGPA.

The formula for the conversion of CGPA to equivalent percentage of marks shall be as follows:

Percentage equivalent of marks = CGPA X 10

15.6 After successful completion of the programme, the degree shall be awarded to the students with the following classifications based on CGPA.

Classification	CGPA
First Class with Distinction	8.50 and above and passing all the courses in first appearance and completing the programme within the prescribed period of six semesters.
First Class	6.50 and above, having completed within a period of eight semesters.
Second Class	Others

15.6.1 Eligiblity for First Class with Distinction

- A student should not have obtained “U” or “I” grade in any course during his/her study.
- A student should have completed the UG programmewithin

the minimum prescribed period of study (except clause 7.1.1)

15.6.2 Eligibility for First Class

- A student should have passed the examination in all the courses not more than two semesters beyond the minimum prescribed period of study (except clause clause 7.1.1)

15.6.3 The students who do not satisfy clause 16.6.1 and clause 16.6.2 shall be classified as second class.

15.6.4 The CGPA shall be rounded to two decimal places for the purpose of classification. The CGPA shall be considered up to three decimal places for the purpose of comparison of performance of students and ranking.

16.0 SUPPLEMENTARY EXAMINATION

Final year students and passed out students can apply for supplementary examination for a maximum of three courses thus providing an opportunity to complete their degree programme. The students can apply for supplementary examination within three weeks of the declaration of results in the even semester.

17.0 DISCIPLINE

17.1 Every student is expected to observe discipline and decorum both inside and outside the campus and not to indulge in any activity which tends to affect the reputation of the Institution.

17.2 Any act of indiscipline of a student, reported to the Dean (Student Affairs), through the Head of the Department / Dean of the School concerned shall be referred to a Discipline and Welfare Committee constituted by the Registrar for taking appropriate action. This committee shall also address the grievances related to the conduct of online classes.

18.0 ELIGIBILITY FOR THE AWARD OF DEGREE

18.1 A student shall be declared to be eligible for the award of B.A. / BBA / BCA / B.Com. / B.Sc. degree provided the student has:

i) Successfully earned the required number of total credits as specified in the curriculum of the programme of study within a

maximum period of 10 semesters from the date of admission, including break of study.

ii) Successfully completed the requirements of the enrolled professional development activity.

iii) No dues to the Institution, Library, Hostel, etc.

iv) No disciplinary action pending against him/her.

18.2 The award of the degree must have been approved by the Institution.

19.0 POWER TO MODIFY

Notwithstanding all that has been stated above, the Academic Council has the right to modify the above regulations from time to time.

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B.S. ABDUR RAHMAN CRESCENT INSTITUTE OF SCIENCE AND TECHNOLOGY

B.Sc. BIOTECHNOLOGY
CURRICULUM FRAMEWORK, REGULATIONS 2021
(SIX SEMESTERS / FULL TIME)

SEMESTER I

Sl. No.	Course Group	Course Code	CourseTitle	L	T	P	C
1.	AEC	LND 1181	General Tamil – I	2	1	0	3
		LND 1182	German – I	2	1	0	3
		LND 1183	Arabic Language	3	0	0	3
2.	AEC	END 1183	General English– I	2	1	0	2
3.	CC	LSD 1101	Cell Biology	4	0	0	4
4.	CC	LSD 1102	Cell Biology Laboratory	0	0	4	2
5.	CC	LSD 1103	Microbiology	4	0	0	4
6.	CC	LSD 1104	Microbiology Laboratory	0	0	4	2
7.	GEC		General Elective I	4	0	0	4
8.	GEC		Laboratory for General Elective- I	0	0	4	2
			Credits				**23**

SEMESTER II

Sl. No.	Course Group	Course Code	CourseTitle	L	T	P	C
1.	CC	LSD 1201	Biomolecules	4	0	0	4
2.	CC	LSD 1202	Biomolecules Laboratory	0	0	4	2
3.	CC	LSD 1203	Basics of Genetics	4	0	0	4
4.	CC	LSD 1204	Basics of Genetics Laboratory	0	0	4	2
5.	GEC		General Elective II	4	0	0	4
6.	GEC		Laboratory for General Elective- II	0	0	4	2
7.	AEC	GED 1207	Environmental Studies	2	0	0	2
			Credits				**20**

SEMESTER III

Sl. No.	Course Group	Course Code	CourseTitle	L	T	P	C
1.	CC	LSD 2101	Biochemistry	4	0	0	4
2.	CC	LSD 2102	Biochemistry Laboratory	0	0	4	2
3.	CC	LSD 2103	Molecular Biology	4	0	0	4
4.	CC	LSD 2104	Molecular Biology Laboratory	0	0	4	2
5.	CC	LSD 2105	Enzymology	4	0	0	4
6.	CC	LSD 2106	Enzymology Laboratory	0	0	4	2
7.	SEC	GED 2102	Aptitude and Interpersonal Skills	2	0	0	1
8.	GEC		General Elective III	4	0	0	4
9	GEC		Laboratory for General Elective- III	0	0	4	2
			Credits				**25**

SEMESTER IV

Sl. No.	Course Group	Course Code	CourseTitle	L	T	P	C
1.	CC	LSD 2201	Bioprocess Technology	4	0	0	4
2.	CC	LSD 2202	Bioprocess Technology Laboratory	0	0	4	2
3.	CC	LSD 2203	Medical Biotechnology	4	0	0	4
4.	CC	LSD 2204	Medical Biotechnology Laboratory	0	0	4	2
5.	CC	LSD 2205	Bioinformatics	4	0	0	4
6.	CC	LSD 2206	Bioinformatics Laboratory	0	0	4	2
7.	GEC		General Elective IV	4	0	0	4
8.	GEC		Laboratory for General Elective- IV	0	0	4	2
9.	SEC	GED 2204	Aptitude and Workplace Skills	2	0	0	1
			Credits				**25**

SEMESTER V

Sl. No.	Course Group	Course Code	CourseTitle	L	T	P	C
1.	CC	LSD 3101	Plant Biotechnology	4	0	0	4
2.	CC	LSD 3102	Plant Biotechnology Laboratory	0	0	4	2
3.	CC	LSD 3103	Animal Biotechnology	4	0	0	4
4.	CC	LSD 3104	Animal Biotechnology Laboratory	0	0	4	2
5.	DSE		Discipline Specific Elective I	4	0	0	4
6.	DSE		Discipline Specific Elective I Laboratory	0	0	4	2
7.	DSE		Discipline Specific Elective II	4	0	0	4
8.	DSE		Discipline Specific Elective II Laboratory	0	0	4	2
9	AEC		Internship	0	0	0	1
			Credits				**25**

SEMESTER VI

Sl. No.	Course Group	Course Code	CourseTitle	L	T	P	C
1.	CC	LSD 3201	Immunotechnology	4	0	0	4
2.	CC	LSD 3202	Immunotechnology Laboratory	0	0	4	2
3	CC	LSD 3203	Genomics and Proteomics	4	0	0	4
4	CC	LSD 3203	Genomics and Proteomics Laboratory	0	0	4	2
5	DSE		Discipline Specific Elective III	4	0	0	4
6	DSE		Discipline Specific Elective III Laboratory	0	0	4	2
7	DSE		Discipline Specific Elective IV	4	0	0	4
8	DSE		Discipline Specific Elective IV Laboratory	0	0	4	2
			Credits				**24**

TotalCredits–142

GENERAL ELECTIVE COURSES

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	GEC	LSDX 001	Basics of Computer	4	0	0	4
2.	GEC	LSDX 002	Basics of Computer Laboratory	0	0	4	2
3.	GEC	LSDX 003	Artificial Intelligence in Medicine	4	0	0	4
4.	GEC	LSDX 004	Artificial Intelligence Laboratory	0	0	4	2
5.	GEC	LSDX 005	Intellectual Property Rights	4	0	0	4
6.	GEC	LSDX 006	Patent drafting and application Laboratory	0	0	4	2
7.	GEC	LSDX 007	Biostatistics	4	0	0	4
8.	GEC	LSDX 008	Biostatistics and experimental designing Laboratory	0	0	4	2
9.	GEC	LSDX 009	Bioinstrumentation	4	0	0	4
10.	GEC	LSDX 010	Bioinstrumentation Laboratory	0	0	4	2
11.	GEC	LSDX 011	Herbal Technology	4	0	0	4
12.	GEC	LSDX 012	Herbal Technology Laboratory	0	0	4	2
13.	GEC	LSDX 013	Bioentrepreneurship	4	0	0	4
14.	GEC	LSDX 014	Bioentrepreneurship Laboratory	0	0	4	2
15.	GEC	LSDX 015	Waste Management	4	0	0	4
16.	GEC	LSDX 016	Waste Management Laboratory	0	0	4	2
17.	GEC	LSDX 017	Phytochemistry	4	0	0	4
18.	GEC	LSDX 018	Phytochemistry Laboratory	0	0	4	2
19.	GE	LSDX 019	Pharmacology	4	0	0	4

20.	GE	LSDX 020	Pharmacology Laboratory	0	0	4	2
21.	GE	LSDX 021	Biopharmaceutics and Pharmacokinetics	4	0	0	4
22.	GE	LSDX 022	Biopharmaceutics and Pharmacokinetics Laboratory	0	0	4	2
23.	GE	LSDX 023	Basic Biomedical Instrumentation	4	0	0	4
24.	GE	LSDX 024	Basic Biomedical Instrumentation Laboratory	0	0	4	2
25.	GE	LSDX 024	Environmental Biotechnology	4	0	0	4
26.	GE	LSDX 025	Environmental Biotechnology Laboratory	0	0	4	2

DISCIPLINE SPECIFIC ELECTIVES

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1	DSE	LSDX 051	Disease Management	4	0	0	4
2	DSE	LSDX 052	Disease Management Laboratory	0	0	4	2
3	DSE	LSDX 053	Cytogenetics	4	0	0	4
4	DSE	LSDX 054	Cytogenetics Laboratory	0	0	4	2
5	DSE	LSDX 055	Agricultural Biotechnology	4	0	0	4
6	DSE	LSDX 056	Agricultural Biotechnology Laboratory	0	0	4	2
9	DSE	LSDX 057	Nanobiotechnology	4	0	0	4
10	DSE	LSDX 058	Nanobiotechnology Laboratory	0	0	4	2
11	DSE	LSDX 059	Regenerative Medicine	4	0	0	4
12	DSE	LSDX 060	Regenerative Medicine Laboratory	0	0	4	2
13	DSE	LSDX 061	Cancer Biology	4	0	0	4

14	DSE	LSDX 062	Cancer Biology Laboratory	0	0	4	2
15	DSE	LSDX 063	Developmental Biology	4	0	0	4
16	DSE	LSDX 064	Developmental Biology Laboratory	0	0	4	2
17	DSE	LSDX 065	Food Biotechnology	4	0	0	4
18	DSE	LSDX 066	Food Biotechnology Laboratory	0	0	4	2
19	DSE	LSDX 067	Biofertilizer Technology	4	0	0	4
20	DSE	LSDX 068	Biofertilizer Technology Laboratory	0	0	4	2
21	DSE	LSDX 069	Computer aided Drug Design	4	0	0	4
22	DSE	LSDX 070	Computer aided Drug Design Laboratory	0	0	4	2
23	DSE	LSDX 071	Biomass and Bioenergy	4	0	0	4
24	DSE	LSDX 072	Biomass and Bioenergy Laboratory	0	0	4	2
25	DSE	LSDX 073	rDNA Technology	4	0	0	4
26	DSE	LSDX 074	rDNA Technology Laboratory	0	0	4	2
27	DSE	LSDX 075	Industrial Biotechnology	4	0	0	4
28	DSE	LSDX 076	Industrial Biotechnology Laboratory	0	0	4	2
29	DSE	LSDX 077	Molecular Farming	4	0	0	4
30	DSE	LSDX 078	Molecular Farming Laboratory	0	0	4	2
31	DSE	LSDX 079	Biophysics	4	0	0	4
32	DSE	LSDX 080	Biophysics Laboratory	0	0	4	2
33	DSE	LSDX 081	Molecular Diagnostics	4	0	0	4
34	DSE	LSDX 082	Molecular Diagnostics Laboratory	0	0	4	2
35	DSE	LSDX 083	Downstream Process	4	0	0	4

36	DSE	LSDX 084	Downstream Process Laboratory	0	0	4	2
37	DSE	LSDX 085	Epidemiology	4	0	0	4
38	DSE	LSDX 086	Epidemiology Lab	0	0	4	2

SEMESTER I

LND 1181	பொதுத் தமிழ் - I	L	T	P	C
SDG 16	GENERAL TAMIL -I	2	1	0	3

நோக்கங்கள்

- சமூக மாற்றச்சிந்தனைகளை உள்ளடக்கிய தற்காலஇலக்கியங்களை அறிமுகம் செய்தல்
- இருபதாம் நூற்றாண்டு மரபுக்கவிதைகளை அறிமுகம் செய்தல்
- புதுக்கவிதை, சிறுகதை, உரைநடை ஆகிய இலக்கியங்களை நயம் பாராட்டுதல்
- புதுக்கவிதை மற்றும் சிறுகதையின் தோற்றம் வளர்ச்சி குறித்து எடுத்துரைத்தல்
- சந்திப் பிழையின்றி எழுத மாணவர்களைப் பயிற்றுவித்தல்
- கவிதை மற்றும் சிறுகதை எழுதமாணவர்களை ஊக்கப்படுத்துதல்

அலகு I	இருபதாம் நூற்றாண்டு மரபுக்கவிதைகள்	8

கவிமணி தேசிய விநாயகம் பிள்ளை - உடல் நலம் பேணல், பாரதியார்– செந்தமிழ் நாடு, பாரதிதாசன்– நீங்களே சொல்லுங்கள், கண்ணதாசன்– குடும்பம் ஒரு கதம்பம்.

அலகு II	புதுக்கவிதைகள்	8

இன்குலாப்– போராட்டம், அப்துல்ரகுமான்– மண், வைரமுத்து–விதைச் சோளம், நா.காமராசன்–அலிகள், ஆண்டாள் பிரியதர்சினி– தொலைந்து போனது, மு.மேத்தா–தேசப்பிதாவுக்கு ஒரு தெருப்பாடகனின் அஞ்சலி, ஹைக்கூ கவிதைகள்.

அலகு III	சிறுகதைகள்	8

ஜெயகாந்தன்–நந்தவனத்தில் ஓர் ஆண்டி, கி.இராஜநாராயணன்– கதவு, சு.சமுத்திரம்- ஏழை-ஆப்பிள்-நட்சத்திரம், மாதவிக்குட்டி–நெய்ப்பாயாசம், தி.ஜானகிராமன்–முள்முடி.

அலகுIV	மொழிப்பயிற்சி	7

கலைச்சொல்லாக்கம், பிழைத்திருத்தம் (ஒருமை, ல-ள-ழகர, ர-ற-கர, ண-ந-னகரவேறுபாடுகள்), அயற்சொற்களைதல்.

அலகு V	இலக்கிய வரலாறு	7

பாடந்தழுவியது (இருபதாம் நூற்றாண்டு மரபுக் கவிதைகள், புதுக்கவிதையின் தோற்றமும் வளர்ச்சியும், சிறுகதையின் தோற்றமும் வளர்ச்சியும்)

அலகு VI	படைப்பிலக்கியம்	7

கவிதை எழுதுதல், சிறுகதை வரைதல்

L – 30 ; T – 15 ; TOTAL HOURS – 45

குறிப்புகள்

1. பொதுத் தமிழ்– செய்யுள் திரட்டு– தமிழ்த் துறை வெளியீடு
2. தமிழ் இலக்கிய வரலாறு–சோம. இளவரசு
3. சிறுகதைத் தொகுப்பு (கட்டுரைக் களஞ்சியம்)

வெளிப்பாடு				

- மாணவர்கள் சமூக மாற்றச்சிந்தனைகளை அறிந்து கொள்வர்
- இருபதாம் நூற்றாண்டு மரபுக்கவிதைகள் குறித்த அறிவினைப்பெறுவர்.
- சந்திப்பிழைகளைநீக்கி எழுதும் திறன் பெறுவர்
- இருபதாம் நூற்றாண்டு தமிழ் இலக்கியத்தின் வரலாறு, வளர்ச்சி, பாடுபொருள் ஆகியவற்றை உணர்ந்து கொள்வர்.
- இருபதாம் நூற்றாண்டு தமிழ் இலக்கியப் படைப்பாளர்களைப் பற்றி அறிந்து கொள்வர்.
- புத்திலக்கியங்களைப் படைக்கும் திறனையும் திறனாய்வு செய்யும் திறனையும்பெறுவர்

Board of Studies (BoS):
15th BoS of the Department of Commerce held on 24.6.2021

Academic Council:
17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO12	PSO1	PSO2	PSO3	PSO4
CO1							M	M	M	M		M				
CO2							L	L	L	M		M				
CO3							L	M	L	L		L				
CO4							L	L	M	L		L				
CO5							L	L	L	L		L				
CO6							M	M	M	M		L				

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 16: Peace, Justice and Strong Institutions

Strengthen relevant national institutions, including through international cooperation, for building capacity at all levels, in particular in developing countries, to prevent violence and combat terrorism and crime through the Quranic, Vedic and Biblical literature.

LND 1182	GERMAN – I	L	T	P	C
SDG: 4		2	1	0	3

COURSE OBJECTIVES:

The objectives of this course are:

COB1: To improve the proficiency of students in German language.

COB2: To create awareness of using vocabulary among students.

COB3: To expose them to correct grammatical forms of the language.

COB4: To empower them for successful communication in the society.

COB5: To understand matters which are of daily usage

COB6: To understand them for describe the people need and their requirements.

MODULE I GUTEN TAG! 7

Learn alphabet, introduction to German -greetings, identifying countries and their capital cities and languages, introducing oneself, read and write Cardinal numbers till 100, Read and write telephone numbers and e-mail addresses. Grammar - question words, sentence structure and formation, Regular verbs - Conjugation and personal pronouns.

MODULE II FREUNDE, KOLLEGEN UND ICH 7

Introducing Others and Family Members, To speak about hobbies, jobs, learn Cardinal numbers from 101, Days, Months, Seasons, Colours, Day Timings, directions; Vocabulary: related to the topic; Grammar: Definite Articles, Irregular Verbs & Conjugations, Auxiliary verbs, ja/neinFragenundAntworten, Nouns singular/plural.

MODULE III IN DER STADT 8

To know places, buildings, know transport systems, understand international words, Shopping, talk to sales person while purchasing goods, return faulty goods at a shop, asking someone to repeat something , read and write Ordinal numbers till 100,; Vocabulary: related to the topic; Grammar: Indefinite articles, Negotiation, Imperative - Sie form.

MODULE IV GUTEN APPETIT! 8

To speak about food, Daily routine ,Going to the market – asking prices, filling up simple forms; Vocabulary: related to the topic; Grammar: Verb position, Simple Present Tense with regular and irregular verbs.

MODULE V TAG FÜR TAG 7

To learn time related expressions and asking Time , speak about family, ask excuse; Vocabulary: related to the topic; Simple Conversation skills (pertaining chiefly to simple dialogues in everyday situations), Grammar: Preposition – am, im, um, von bis, Modal verbs, Present perfect Tense with regular and irregular verbs

MODULE VI ZEIT MIT FREUNDEN 8

To speak about birthdays, understand and write an invitation, converse in the restaurant and Pay; Vocabulary: related to the topic; Simple Text -Translation and Reading Comprehension Practice German Into English Vice versa: Grammar: Accusative personal pronouns, Possessive Pronomen, Verbs and prepositions, Gern - word Usage in Sentence formation.

L – 30; T – 15; Total Hours – 45

TEXT BOOKS:

1. Stefanie Dengler, “Netzwerk A1.1”, Goyal Publishers & Distributors Pvt. Ltd., Delhi, 2015.

PRACTICE BOOK:

1. Johannes Gerbes, “Fit fürs Goethe-Zertifikat A1”, Goyal Publishers & Distributors Pvt. Ltd., Delhi, 2010.

REFERENCES:

1. Paul Rusch, “Einfach Grammatik”, Goyal Publishers & Distributors Pvt. Ltd., Delhi, 2012.
2. Hermann Funk, “studio d A1”, Goyal Publishers & Distributors Pvt. Ltd., Delhi, 2009. 15OH78 German Language.

COURSE OUTCOMES:

On successful completion of this course learners will be able to

CO1: Show their proficiency in German Language.

CO2: Use appropriate vocabulary in real life contexts.

CO3: Use appropriate grammatical forms while communicating with people.

CO4: Effectively use the language in social and academic contexts.

CO5: Comprehend matters which are of daily usage

CO6: Communicate as per people’s need and requirement.

Board of Studies (BoS): 14th BoS of the Department of Commerce held on 22.04.2021

Academic Council: 17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 1	PO 12	PSO1	PSO2	PSO3	PSO4
CO1	H	H	M	H		H	H	H	M	H	M	H				
CO2				H		H	H	H	H	H		H				
CO3				H		H	H	H	H	H		H				
CO4				H		H	H	H		H		H				
CO5				H		H	H	H		H		H				
CO6				H		H	H	H		H		H				

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 4 : Quality Education

The substantially improve the relevant skills which develop the confidence in young people, including technical and vocational skills, help for employment, decent work and entrepreneurship.

LND 1183	ARABIC LANGUAGE	L	T	P	C
SDG 4		3	0	0	3

COURSE OBJECTIVES:

The course aims to teach

COB1: Arabic alphabets, reading and writing and pronunciation.

COB2: Listening and writing of words related to market, doctor, parts of body, dining.

COB3: Arabic simple sentences using names of animals, birds, singular and plural.

COB4: Listening and writing of Countries' names, singular, dual and plural.

COB5: Arabic sentences using verbs, tenses and numbers.

MODULE I **INTRODUCTION TO ARABIC READING AND WRITING** **9**

Introduction to Arabic alphabets - reading from right to left - Listening to audio & video – practice correct pronunciation – Writing join letters from right to left - (lessons: 1 and 2): (حجرةالدراسة ، حجرةالدراسة 2، المرور) - introduction to Arabic words in and around the classroom – Transport - Vocabulary related to market - introduction of verbs (lessons: 4 – 6).

MODULE II **LISTENING ARABIC COMMUNICATION** **9**

Reading skill: Lessons 4 – 6. Words related to doctor, parts of body, dining, fruits, food items, family members, house and air travel (أسماءأعضاءالجسموالمطعموالفواكهوغيرها) Vocabulary related to names of animals, birds (lessons: 7 – 12).

MODULE III **SIMPLE SENTENCES** **9**

Home – singular and plural - introduction to gender: irst person, second person and third person – inerrogatory sentences - arabic simple sentences – nominal sentence and verbal sentence (الجملةالاسميةوالفعلية) (lessons: 13 & 14) Words related to kitchen utensils – cooking (أسماءأوانيالمطبخوالطبخ)– introduction to gender: firt person, second person and third person (التذكيروالتأنيث) – singular and plural – vocabulary related to office – possession (الإضافة) -
(lessons: 15 – 17)

MODULE IV **COMMUNICATION PRACTICE** **9**

Countries names – world map - performing ablution – vocabulary related to prayer - singular, dual and plural - situational communication - emphasis on interrogation (المحادثةالعربية) (lessons: 18 – 20)

MODULE V TENS, SINGULAR & PLURAL 9

Sentence making – words related to prayer – verbs and tenses – communication on dining – gender - singular and dual – numbers – discussion of evening – dining manners (المفرد والتثنية والجمع والعدد) (lessons: 21 – 25)

L – 30; Total Hours – 30

TEXT BOOKS:

1. Al QirathulArabiyya Lil Mubtadiyeen القراءة العربية للمبتدئين (UmmulQura University, Makkah), BukhariAalim Arabic College, 2005.

REFERENCES:

1. Al Arabiya Lin Nashiyeen (Education Ministry, K.S.A.), BukhariAalim Arabic College, 2005.
2. Dr. V. Abdur Raheem, Durus Al LugathilArabiyya Li GhairinNatiqeenBiha, Islamic Foundation Trust, Chennai, 2002.

COURSE OUTCOMES:

At the end of the course, the student is expected to:

CO1: Vocabulary related to the market, doctor, parts of body, dining.

CO2: Identify Arabic names of animals, birds, singular and plural, interrogatory sentences.

CO3: Recognize Arabic alphabets, reading and writing and pronunciation.

CO4: Use countries names, singular, dual and plural.

CO5: Form Arabic sentences using verbs, tenses and numbers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO 2	PSO3	PSO4	PSO5
CO1						L									
CO2							M								
CO3							M								
CO4						L									
CO5							M								

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 4: Developing Language skill

Statement: Arabic language enhances effective communication in the workplace.

END 1183	GENERAL ENGLISH - I	L	T	P	C
SDG: 4		3	0	0	3

COURSE OBJECTIVES:

COB1: To enable students to read, comprehend and appreciate the value of literature to life

COB2: To help them acquire language skills through Literature

COB3: To develop LSRW skills through practice in variety of contexts

COB4: To improve their vocabulary and correct English usage.

MODULE I **9**

Poetry: No Man is an Island – John Donne;
O Captain! My Captain! –Walt Whitman

Speaking: Introducing oneself and Introducing each other

Writing: Hints Development

Language: Articles, Adjectives & Adverbs (comparisons), Punctuation

Vocabulary: Homophones and homographs

MODULE II **9**

Prose: "Spoken English and Broken English" – G.B.Shaw

Listening: Listening for gist (general meaning)
The Speech that made Obama President. (6.12 minutes)

Speaking: Conversations - formal and semi formal contexts

Writing: Jumbled sentences

Language: Pronouns and Linking words, Conjunctions

Vocabulary: Register – Formal, semi-formal and Informal

MODULE III **9**

Short story: "The Cherry Tree" - Ruskin Bond

Speaking: Asking questions (about companies. Products, Jobs)

Creative Writing: Open ended stories

Language: Question Forms – 'Wh' & Yes/No

Vocabulary: Prefixes and Suffixes, negative prefixes

MODULE IV **9**

Short story: "The Last Leaf" - O. Henry

Speaking: Role play (Telephone call to a supplier, enquiry about products)

Writing: Letter of Enquiry, Replies to Enquiry

Language: Tenses

Vocabulary: Synonyms and Antonyms

MODULE V **9**

Prose: "Voluntary Poverty" – Mahatma Gandhi

Listening: Listening for specific information - You must follow if you want success by SundarPichai. (8.42 minutes)

Speaking: Giving the summary of an article (from newspapers)

Writing: Order Letter, Complaint Letter

Language: Subject -Verb Agreement

Vocabulary: Business Vocabulary (marketing, air travel)

L – 45; Total Hours- 45

REFERENCES:

1. Guy Brook-Hart, Business Benchmark Upper- Intermediate Student's Book, CUP, 2006
2. Sriraman.T, Macmillan College Prose, Laksmi Publications, 2015
3. Whitby, Norman, Business Benchmark: Pre-intermediate to Intermediate, 2nd Edition, CUP, 2014.
4. Swan.M, Practical English Usage, OUP, 2005.
5. https://www.thehindu.com/opinion/open-page/it-has-done-more-harm-than-good/article5129459.ece
6. https://www.youtube.com/watch?v=OFPwDe22CoY
7. https://www.youtube.com/watch?v=iAlsg_orac8

COURSE OUTCOMES:

CO1: Respond to literary texts efficiently

CO2: Appreciate and critically analyze literary texts

CO3: Display effective LSRW skills in academic and professional contexts

CO4: Demonstrate a range of appropriate vocabulary in a variety of situations

CO5: Communicate effectively using grammatically correct language

Board of Studies (BoS) :
13th BoS of the Department of English held on 17.6.2021.

Academic Council:
17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	H	H	H	H	M	H	H	L	L	M
CO2	H	H	H	H	H	M	H		L	M
CO3	M	H	H	L	M	H	H	M		L
CO4	H	H	H	H	H	H	H	H	L	
CO5	L	H	L	H	H	M	H			

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Statement: The acquisition of LSRW skills of English language could help students in promoting lifelong learning opportunities.

LSD 1101	CELL BIOLOGY	L	T	P	C
SDG: 3		4	0	0	4

COURSE OBJECTIVES:

COB1: To get an overview of classes of cells and structural and function aspects of membrane structure and functions

COB2: To develop a detailed knowledge of cell organelle

COB3: To understand cytoskeleton structure

COB4: To familiarize with principles of cell signalling mechanisms

COB5: To develop basic understanding of Cell division

MODULE I INTRODUCTION TO CELLS 12

Discovery of cells-a brief history: Cell Theory; Basic properties of cell, Different classes of cell: Prokaryotic and eukaryotic cell; difference between plant cell and animal cell.

MODULE II CELL MEMBRANE 12

Structure and function of plasma membrane, Transport of substances through cell membrane- osmosis, diffusion and its types, Active transport (sodium pump) and passive transport; membrane potential, measuring membrane potential, ion channels- Na+ and K+ channels, action potential and nerve impulse.

MODULE III CELL ORGANELLE AND CYTOSKELETON 12

Nucleus-structure and function, concept of chromosomes; Mitochondria, Chloroplast, Endoplasmic reticulum, Golgi apparatus, lysosome, Membrane transport- exocytosis and endocytosis, cytoskeleton structures- intermediate filaments, microtubules tubulin, centrosome structure, actin filaments, muscle contraction.

MODULE IV CELL SIGNALING 12

Principles of cell signalling, cell surface receptors, ion channel coupled receptors, G-protein coupled receptors, GCCRs, cAMP signalling pathway, Calcium signalling pathway, Enzyme coupled receptors, RTKs, Ras pathway.

MODULE V CELL DIVISION AND CELL CYCLE 12

Cell cycle, regulation of cell cycle, mitosis-different stages of mitosis and proteins involved, meiosis- stages of meiosis I and II; genetic recombination, Meiotic nondisjunction.

L – 60; Total Hours – 60

TEXT BOOKS:

1. Albert et.al. “Essential Cell Biology”, John Wiley & Sons, 4Ed, New York, 2015.
2. Cooper and Hausman. “The Cell: A molecular approach.” ASM Press, 4Ed, Washington D.C. 2007.

REFERENCES:

1. Harris, H. 1995. The Cells of the Body: A History of Somatic Cell Genetics. Cold Spring Harbor Laboratory Press.
2. Watson J D , McKenna H J . Novel factors from stromal cells: bone marrow and thymus microenvironments. Int’l. J. Cell Cloning. 1992;10:144–252.

COURSE OUTCOMES:

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

CO1: Familiar with the basic make up of cells.

CO2: Develop the structure and function of biological membrane

CO3: Understand how the different cell organelle functions

CO4: Understand the cell signaling network and their role in body functioning

CO5: Identify and analyze the significance of cell division and the regulatory molecules

Board of Studies (BoS) :
8th BoS of SLS held on 5.07.2021

Academic Council:
17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	M	M	H	H					H			
CO2	M	M	H	H					H			
CO3	M	M	H	H					H			
CO4	M	M	H	H		H			H			M
CO5	M	M	H	H					H			

SDG 3: Good Health and Well Being

Statement: Good health is essential to sustainable development. The continuing burden of HIV and other infectious diseases, and emerging challenges such as noncommunicable diseases. Universal health coverage will be integral to achieving good health, ending poverty and reducing inequalities. Studying this course is essential to understand the basics of biological and health sciences to pursue research and develop remedies for the diseases.

LSD 1102	CELL BIOLOGY LABORATORY	L	T	P	C
		0	0	4	2

SDG: 3

COURSE OBJECTIVES:

COB1: To learn the technique of microscopic observation of cell

COB2: To understand the process of cellular organelle

COB3: To learn the cell cycle study technique

COB4: To learn buccal smear techniques

COB5: To learn about Mitochndria and chlroplast

PRACTICALS

List of Experiments:

1. Introduction to microscopes used for cell biology studies
2. Microscopic study of cell and cell organelles
3. Cell counting and viability
4. Mitosis and the Cell Cycle in Onion Root-Tip Cells
5. Blood smear preparation
6. Buccal Smear Preparation
7. Isolation of Mitochondria
8. Isolation of Chloroplast

P – 60; Total Hours –60

TEXT BOOKS:

1. Debarati Das. Essential Practical Handbook of Cell Biology & Genetics, Biometry & Microbiology, 1st Ed, Academic Press, 2017 ISBN: 9789383420599, 9383420596.

REFERENCES:

1. Celis “Cell Biology: A Laboratory Handbook” 3Rd Edition, Elsevier, 2008, ISBN 9788131219683

COURSE OUTCOMES: At the end of the course students will be able to

CO1: develop expertise in microscopic techniques

CO2: conduct experiments related to cell organelle

CO3: conduct experiments relating cell cycle

CO4: Acquire knowledge to learn buccal smear

CO5: gain knowledge on isolating the mitochondria and chloroplast

Board of Studies (BoS) :	**Academic Council:**
8thBoS of SLS held on 5.07.2021	17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	H	H		H	M			M	H	L	H	
CO2	M	H		H	M			H	H	L	M	
CO3	M	H		H	M			H	H	L	H	
CO4	M	H		H	M			H	H	L	H	
CO5	M	H		H	M			H	H	L	H	

Note: L- Low Correlation M - Medium Correlation H - High Correlation

SDG 3. Good Health and Well Being

Statement: Good health is essential to sustainable development. The continuing burden of HIV and other infectious diseases, and emerging challenges such as noncommunicable diseases. Universal health coverage will be integral to achieving good health, ending poverty and reducing inequalities. Studying this course is essential to understand the basics of biological and health sciences to pursue research and develop remedies for the diseases.

LSD 1103	MICROBIOLOGY	L	T	P	C
SDG: 3, 15		4	0	0	4

COURSE OBJECTIVES:

COB1: To offer a sense of the history of microbial science, its methodology and its many contributions to humanity.

COB2: To ensures the students to understand about the sterilization and disinfection techniques.

COB3: To give knowledge about the role of microbes in food production

COB4: Cultivate an understanding about the importance of Pathogenesis, lab diagnosis, prevention and control of important microbial diseases.

COB5: To educate the students about the role of microbes in the ecosystems

MODULE I BASICS OF MICROBIOLOGY 12

Microbiology - history and scope– General structure & functions -viruses, bacteria, algae, fungi, protozoa –Microscopy - Principles & classification of microbes – Whittaker five kingdom classification.

MODULE II STERILIZATION 12

Sterilization and disinfection - stain and staining methods –. Microbial media – methods of obtaining pure cultures - Phases of growth curve, Factors influencing the growth of microbes –classification of microorganisms.

MODULE III FOOD AND INDUSTRIAL MICROBIOLOGY 12

Role of microbes in food production - Microbiology of fermented food and dairy products - Alcoholic beverages- Food spoilage and Preservation processes. Production of antibiotics, amino acids and organic Acids.

MODULE IV MEDICAL MICROBIOLOGY 12

Pathogenesis, lab diagnosis, prevention and control of important microbial diseases. Pathogenic bacterial diseases, Fungal diseases, Viral Diseases and Protozoan diseases.

MODULE V ENVIRONMENTAL MICROBIOLOGY 12

Role of microbes in the ecosystems – Microorganisms in soil, air and water. Sewage treatment methods - biological nitrogen fixation - biofertilizers.

L – 60; Total Hours – 60

TEXT BOOKS:

1. Microbiology: An Introduction: Tortora, Funke & Case. 7th edition, 2001

REFERENCES:

1. A. H. Patel, “Industrial microbiology”, Macmillan Publishers India, 2nd Edition, 2002.
2. Pelezar, chan, “Microbiology ”– Krieg Tata McGraw Hill Publications, 3rdEdition, 2007.
3. Prescott, Harley and Klein, “Microbiology”, McGraw Hill publications, Fifth edition, 2003.
4. Wulf Crueger and Anneliese Crueger, “Biotechnology – A textbook of Industrial Microbiology”, Panima publishing corporation, New Delhi , 2000, reprint 2005.
5. Jacquelyn G.Black, “Microbiology -Principles and Explorations” Wiley publications, 4th Edition, 2008.

COURSE OUTCOMES:

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

CO1: demonstrate a broad understanding of the diversity and range of microorganisms, the interactions between humans and microorganisms, the role of microorganisms in industrial and environmental processes, and their role in the development of the techniques that underpin modern molecular biology

CO2: demonstrate proficiency in a set of core microbiological and molecular biological technical methods, including both an understanding of the principles of the methods and their utilisation in laboratory settings

CO3: demonstrate familiarity with the risk assessment process, and use this information to operate safely in the laboratory environment

CO4: collect, organise, analyse, evaluate and interpret experimental data using appropriate quantitative, technological and critical thinking skills

CO5: able tocommunicate microbiological principles and information effectively to diverse audiences, using a variety of formats

Board of Studies (BoS) : 8thBoS of SLS held on 5.07.2021

Academic Council: 17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	H			H		M	M	M	H	H	M	
CO2	H			H		M	M	M	H	H	M	
CO3	H		H	H	H	M	M	M	H	H	M	
CO4	H		H	H	H	M	M	M	H	H	M	
CO5	H		H	H	H	M	M	M	H	H	M	

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 3. Good Health and Well Being

Statement: Good health is essential to sustainable development. The continuing burden of HIV and other infectious diseases, and emerging challenges such as noncommunicable diseases. Universal health coverage will be integral to achieving good health, ending poverty and reducing inequalities. Studying this course is essential to understand the basics of biological and health sciences to pursue research and develop remedies for the diseases.

SDG15: Life on Earth

Statement: Human life depends on the earth as much as the ocean for our sustenance and livelihoods. This course foucussed on the importance of microbial species and its good as well as its bad sides. Studying this course will help the students to understand the living things and its importance.

LSD 1104	MICROBIOLOGY LABORATORY	L	T	P	C
		0	0	4	2

SDG: 3, 15

COURSE OBJECTIVES:

COB1: Provides an opportunity to experimentally verify the theoretical concepts already studied

COB2: Develop their skills in the preparation, identification and quantification ofMicroorganisms

COB3: To give knowledge about the staining methods used microorganisms

COB4: Support an understanding about the importance of production and demonstration of antibiotic resistance

COB5: To educate the students about the Biochemical tests to identify various organisms

PRACTICALS

List of Experiments:

1. Bio-safety guideline.
2. Preparation of media for growth of various organisms.
3. Identification and culturing of various organisms
4. Staining of microorganisms. – Gram's staining,
5. Staining of microorganisms - spore staining,
6. Staining of microorganisms -capsular staining.
7. Measure of bacterial population by turbidometry and studying the effect of temperature, pH, carbon and nitrogen.
8. Assay of antibiotics production and demonstration of antibiotic resistance.
9. Biochemical tests to identify various organisms

P – 60; Total Hours –60

TEXT BOOKS:

1. A Photographic Atlas for the Microbiology Laboratory, 4thEdition, Michael J. Leboffe, San Diego City College, Burton E. Pierce, Morton Publishing Company, 2011.
2. Laboratory Exercises in Microbiology, Fifth Edition, John P. Harley, Lansing M. Prescott, The McGraw−Hill Pub Ltd. 2002

REFERENCES:

1. Pelezar, chan, "Microbiology"– Krieg Tata McGraw Hill Publications, 3rdEdition, 2007.
2. Prescott, Harley and Klein, "Microbiology", McGraw Hill publications, Fifth edition, 2003.

3. Wulf Crueger and Anneliese Crueger, “Biotechnology – A textbook of Industrial Microbiology”, Panima publishing corporation, New Delhi, 2000, reprint 2005.
4. Jacquelyn G.Black, “Microbiology -Principles and Explorations” Wiley publications, 4th Edition, 2008.

COURSE OUTCOMES:

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

CO1: characterize and isolate of bacteria isolated from different sources.

CO2: demonstrate proficiency in Growth kinetics of bacteria.

CO3: demonstrate familiarity with staining of microorganisms

CO4: collect, organise, analyse, evaluate and interpret experimental data of bacterial population by turbidometry

CO5: able tofamiliarity with production and demonstration of antibiotic resistance

Board of Studies (BoS) : **Academic Council:**

8thBoS of SLS held on 5.07.2021 17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	M	H		H	M			M	H	L	H	
CO2	M	H		H	M			H	H	L	M	
CO3	M	H		H	M			H	H	L	H	
CO4	M	H		H	M			H	H	L	H	
CO5	M	H		H	M			H	H	L	H	

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 3: Good Health and Well Being

Statement: Good health is essential to sustainable development. The continuing burden of HIV and other infectious diseases, and emerging challenges such as noncommunicable diseases. Universal health coverage will be integral to achieving good health, ending poverty and reducing inequalities. Studying this course is essential to understand the basics of biological and health sciences to pursue research and develop remedies for the diseases.

SDG15: Life on Earth

Statement: Human life depends on the earth as much as the ocean for our sustenance and livelihoods. This course foucussed on the importance of microbial species and its good as well as its bad sides. Studying this course will help the students to understand the living things and its importance.

SEMESTER II

LSD 1201	BIOMOLECULES	L	T	P	C
		4	0	0	4

SDG: 3

COURSE OBJECTIVES:

COB1: To familiarize students with various molecules of life

COB2: To familiarize students with biomolecules with regard to their structures and functions

COB3: The course will also acquaint them with the basic knowledge about biochemistry

COB4: The course will also acquaint them with the basic knowledge about molecular biology.

COB5: The course will also make the student understand the knowledge at genetic level.

MODULE I CHEMICAL BONDS AND BIOMOLECUES 12

Physical properties and hydrogen bonding of water; structure of water and its solvent properties; hydrophobic interactions. Ionization of water and ion product of water; the pH scale; relationship between pH and pKa (Henderson-Hasselbalch equation); buffers and its properties.

MODULE II PROTEIN 12

Biological functions of proteins; structure of alpha-amino acids, abbreviations and classification of 20 amino acids; zwitterion nature of amino acid in aqueous solutions; essential amino acids; peptide bond formation; backbone structure of Proteins/polypeptides; basic understanding of primary, secondary, tertiary, and quaternary structure of proteins/peptides; fibrous and globular proteins; elementary ideas on protein denaturation and renaturation.

MODULE III CARBOHYDRATES 12

Definition and biological functions of carbohydrates; classification into monosaccharides, oligosaccharides and polysaccharides; optical isomerism, open chain and ring structures of carbohydrates; mutarotation; structure of biologically important carbohydrates (D-glucose, D-galactose, D-mannose, D-fructose, D-ribose, D-2-deoxyribose, D-maltose, D-lactose, D-sucrose); polysaccharides starch, cellulose, glycogen and mucopolysaccharides; suitability of polysaccharides as storage material.

MODULE IV LIPIDS 12

Introduction of lipids, biological functions; general formulae, nomenclature and properties of fatty acids; essential and non-essential fatty acids; classification of lipids; general structure and function of major lipid subclasses: acylglycerols, phosphoglycerides, sphingolipids, waxes, terpenes, steroids and prostaglandins; saponifiable and non-saponifiable lipids; suitability of triglycerides as storage lipids; saponification number and iodine number; bio membranes structure.

MODULE V NUCLEIC ACID 12

Nucleosides and nucleotides; generalized structural plan of nucleic acids. Evidence of DNA as genetic material; Watson-Crick model of DNA; size of DNA in prokaryotic and eukaryotic cells. Central dogma of molecular biology; gene, genome and chromosome. Basic ideas of DNA replication, transcription and protein biosynthesis; genetic code and codons. RNA structure and functions, types of DNA and RNA.

L – 60; Total Hours – 60

TEXT BOOKS:

1. Lehninger: Principles of Biochemistry (2017) by Nelson and Cox. Seventh edition. WH Freeman and Co.
2. Biochemistry (2015) by Berg, Tymoczko, Gatto, Stryer. Eighth Edition. WH Freeman and Co.

REFERENCES:

1. Outlines of Biochemistry by Conn and Stumpf (5th Edition, 1987) Wiley, New Delhi.
2. Introducing Biochemistry (1982) by Wood and Pickering. ELBS/John Muray.

COURSE OUTCOMES:

CO1: After the completion of the course students will understand significance water as a solvent of life and know the relationship with biomolecules.

CO2: understand the structure and function of proteins as building block of life.

CO3:understand the knowledge on carbohydrates as monosaccharides and polysaccharides.

CO4:understand the structures, function, and classification of lipids.

CO5: understand the structure of nucleic acids, along with basic steps in the processing of genetic engineering.

Board of Studies (BoS) :
8th BoS of SLS held on 5.07.2021

Academic Council:
17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	H	M		H			H		H	L		
CO2	H	M		H			H		H	L		
CO3	H	M		H			H		H	L		
CO4	H	M		H			H		H	L		
CO5	H	M		H			H		H	L		

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 3: Good Health and Well Being

Statement: Good health is essential to sustainable development. The continuing burden of HIV and other infectious diseases, and emerging challenges such as noncommunicable diseases. Universal health coverage will be integral to achieving good health, ending poverty and reducing inequalities. Studying this course is essential to understand the basics of biological and health sciences to pursue research and develop remedies for the diseases.

LSD 1202	BIOMOLECULES LABORATORY	L	T	P	C
SDG: 3		0	0	4	2

COURSE OBJECTIVES:

COB1: To explore about the biomolecules and their reaction.

COB2: To have an idea about the buffersbehaviour and its preparation according to calculation.

COB3: To obtain the knowledge about the analysis of different biomolecules.

COB4: To gain an idea about some basic principles which is important for estimation of biomolecules.

PRACTICALS

List of Experiments:

1. Preparation of Phosphate Buffer Saline at pH7.
2. Qualitative analysis of proteins from given samples.
3. Qualitative analysis of carbohydrates from given samples
4. Qualitative analysis of Lipids from given samples
5. Qualitative analysis of Nucleic acid from given samples
6. Protein estimation by Lowry methods

P – 60; Total Hours –60

TEXT BOOKS:

1. Nelson D. L, Cox M. M. Lehninger's Principle of Biochemistry. 5th Ed.,W. H. Freeman, 2008.
2. Martin D. W, Mayer P. A. and Rodwell V. W. Harper's Review of Biochemistry 30th Ed., Maruzen Asian Lange Med.,2010.
3. Dixon M, Webb E. C,Thorne C.J.R and Tipton K.F.Enzymes. 3rd Ed., Longmans, Green &Co.,Academic Press, New York, 1979.

REFERENCES:

1. Wilson K., Walker J, Practical biochemistry Fifth Edition Cambridge Press.
2. R David Freifelder., Physical biochemistry: Application to biochemistry and Molecular biology
3. Second edition. W.H. Freeman and Company, New York.

COURSE OUTCOMES:

CO1: On the completion of the above objective's student will be able to explore about the technical knowledge to handle the instrument.

CO2: On the completion of the course students will have an idea about basic principles of estimation technique.

CO3: Students will be expert in gain the knowledge on lipid estimation

CO4: Student will acquire the knowledge of carbohydrate estimation**.**

CO5: student will get the idea to do the protein estimation from any sample

Board of Studies (BoS) :
8th BoS of SLS held on 5.07.2021

Academic Council:
17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	H	H	M	H	H	M	L	H	H	H	M	
CO2	H	H	M	H	H	M	L	H	H	H	M	
CO3	H	H	M	H	H	M	L	H	H	H	M	
CO4	H	H	M	H	H	M	L	H	H	H	M	
CO5	H	H	M	H	H	M	L	H	H	H	M	

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 3: Good Health and Well Being

Statement: Good health is essential to sustainable development. The continuing burden of HIV and other infectious diseases, and emerging challenges such as noncommunicable diseases. Universal health coverage will be integral to achieving good health, ending poverty and reducing inequalities. Studying this course is essential to understand the basics of biological and health sciences to pursue research and develop remedies for the diseases.

LSD 1203	BASICS OF GENETICS	L	T	P	C
SDG: 3, 15		4	0	0	4

COURSE OBJECTIVES:

COB1: To introduce students to basics genetics

COB2: To introduce students to concept of allelic interaction

COB3: To introduce students to genome organization

COB4: To introduce students to sex linkage

COB5: To introduce students to extrachromosomal inheritance

MODULE I INTRODUCTION TO GENETICS 12

Historical developments in the field of genetics; various organisms suitable for genetic experimentation and their genetic significance; Mendelian genetics: Mendel's experimental design, monohybrid, di-hybrid crosses, Law of segregation & Principle of independent assortment; test cross and back cross, chromosomal theory of inheritance.

MODULE II ALLELIC INTERACTIONS 12

Concept of dominance, recessive, incomplete dominance, co-dominance, semi-dominance, pleiotropy, multiple allele, pseudo-allele, essential and lethal genes, penetrance and expressivity.

MODULE III CHROMOSOME AND GENOMIC ORGANIZATION 12

Structure and characteristics of bacterial and eukaryotic chromosomes, chromosome morphology, concept of euchromatin and heterochromatin. Packaging of DNA molecules into chromosomes, chromosome banding pattern, karyotype, giant chromosomes, one gene, one polypeptide hypothesis, concept of cistron, exons, introns, genetic code, gene function.

MODULE IV SEX DETERMINATION AND SEX LINKAGE 12

Mechanisms of sex determination, Environmental factors and sex determination, sex differentiation, Barr bodies, dosage compensation, genetic balance theory, Fragile-X-syndrome and chromosome, sex influenced dominance, sex limited gene expression, sex linked inheritance. Genetic linkage, crossing over and chromosome mapping: Linkage and Recombination of genes in a chromosome crossing over, Cytological basis of crossing over, Molecular mechanism of crossing over, Crossing over at four strand stage, Multiple crossing-over Genetic mapping.

MODULE V EXTRA CHROMOSOMAL INHERITANCE 12

Rules of extranuclear inheritance, maternal effects, maternal inheritance, cytoplasmic inheritance, organelle heredity, genomic imprinting. Evolution and population genetics: Inbreeding and outbreeding, Hardy Weinberg law (prediction, derivation), allelic and genotype frequencies, changes in allelic frequencies, systems of mating, evolutionary genetics, natural selection.

L – 60; Total Hours –60

TEXT BOOKS:

1. Gardner, E.J., Simmons, M.J., Snustad, D.P. Principles of Genetics. VIII Edition John Wiley & Sons, 2006
2. Snustad, D.P., Simmons, M.J. Principles of Genetics. V Edition. John Wiley and Sons Inc., 2009.
3. Klug, W.S., Cummings, M.R., Spencer, C.A. Concepts of Genetics. IX Edition. Benjamin Cummings., 2009
4. Russell, P. J. Genetics- A Molecular Approach. III Edition. Benjamin Cummings. 5. Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. IX Edition. Introduction to Genetic Analysis, W. H. Freeman & Co., 2009.

COURSE OUTCOMES:

CO1: To introduce students to basics genetics

CO2: To introduce students to concept of allelic interaction

CO3: To introduce students to genome organization

CO4: To introduce students to sex linkage

CO5: To introduce students to extrachromosomal inheritance

Board of Studies (BoS) : 8th BoS of SLS held on 5.07.2021

Academic Council: 17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1		L	H	H			M		H			
CO2		L	H	H			M		H			
CO3		L	H	H			M		H			
CO4		L	H	H			M		H		H	
CO5		L	H	H			M		H			

Note : L - Low Correlation M - Medium Correlation H - High Correlation

SDG 3: Good Health and Well Being

Statement: Good health is essential to sustainable development. The continuing burden of HIV and other infectious diseases, and emerging challenges such as noncommunicable diseases. Universal health coverage will be integral to achieving good health, ending poverty and reducing inequalities. Studying this course is essential to understand the basics of biological and health sciences to pursue research and develop remedies for the diseases.

SDG15: Life on Earth

Statement: Human life depends on the earth as much as the ocean for our sustenance and livelihoods. This course foucussed on the the genetic make up of human beings. Studying this course will help the students to understand the living things and its importance.

LSD 1204	BASICS OF GENETICS LABORATORY	L	T	P	C
		0	0	4	2

SDG: 3, 15

COURSE OBJECTIVES:

COB1: To understand mitosis

COB2: To understand meiosis

COB3: To understand mendelian inheritance

COB4: To understand pedigree charts

COB5: To understand genotyping

PRACTICALS

1. Permanent and temporary mount of mitosis.
2. Permanent and temporary mount of meiosis.
3. Mendelian deviations in dihybrid crosses
4. Demonstration of - Barr Body translocation.
5. Karyotyping with the help of photographs
6. Pedigree charts of some common characters like blood group, color blindness and PTC tasting.
7. Study of polyploidy in onion root tip by colchicine treatment.
8. Staining based karyotyping analysis of cancer cells
9. Genotyping

P – 60; Total Hours – 60

TEXT BOOKS:

1. G. Koliantz and D.B. Szymanski. Genetics A Laboratory Manual, 2nd edition Spi Lab Edition, 2009.

COURSE OUTCOMES:

CO1: To understand cell cycle

CO2: To understand karyotyping

CO3: To understand mendelian inheritance

CO4: To understand pedigree charts

CO5: To understand genotyping

Board of Studies (BoS) :
8thBoS of SLS held on 5.07.2021

Academic Council:
17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	H	H	L	H			M	H	H	H	H	
CO2	H	H	L	H			M	H	H	H	H	
CO3	H	H	L	H			M	H	H	H	H	
CO4	H	H	L	H			M	H	H	H	H	
CO5	H	H	L	H			M	H	H	H	H	

SDG 3: Good Health and Well Being
SDG15: Life on Earth

Statement: Good health is essential to sustainable development. The continuing burden of HIV and other infectious diseases, and emerging challenges such as noncommunicable diseases. Universal health coverage will be integral to achieving good health, ending poverty and reducing inequalities. Studying this course is essential to understand the basics of biological and health sciences to pursue research and develop remedies for the diseases.

SDG15: Life on Earth
Statement: Human life depends on the earth as much as the ocean for our sustenance and livelihoods. This course foucussed on the the genetic make up of human beings. Studying this course will help the students to understand the living things and its importance.

GED 1207	ENVIRONMENTAL STUDIES	L	T	P	C
SDG: All		2	0	0	2

COURSE OBJECTIVES:

To make the student conversant with the

COB1: Various natural resources, availability, utilisation and its current scenario.

COB2: Diverse ecosystems and its function, importance of biodiversity, its values, threats and conservation.

COB3: Types of pollutants and its impacts on the environment and the effects of natural disasters.

COB4: Impacts of human population, human health, diseases and immunisation for a sustainable lifestyle.

MODULE I MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES AND NATURAL RESOURCES **8**

Definition, scope and importance, Need for public awareness.

Natural resources and associated problems(a) Land resources: Land as a resource, land degradation, soil erosion and desertification -(b) Forest resources: Use and over-exploitation, deforestation, dams and their effects on forest and tribal people -(c) Water resources: Use and over-utilization of surface and ground water,conflicts over water, dams-benefits and problems,Water conservation: rain water harvesting, watershed management -(d) Mineral resources: Use and exploitation, environmental effects of extractingand using mineral resources,mining -(e) Food resources: World food problems, changes caused by agriculture andovergrazing, effects of modern agriculture - (f) Energy resources: Growing energy needs, renewable and non-renewableenergy sources, use of alternate energy sources.

MODULE II ECOSYSTEMS AND BIODIVERSITY **8**

Ecosystems: Concept of an ecosystem; Structure and function of an ecosystem; Producers, consumers and decomposers; Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of thefollowing ecosystem(a)Terrestrial Ecosystems: Forest ecosystem, Grassland ecosystem, Desert ecosystem (b) Aquatic fresh water ecosystems: Ponds and lakes, rivers and streams (c) Aquatic salt water ecosystems: oceans and estuaries.

Biodiversity:Classification: genetic, species and ecosystem diversity; Bio-

geographical classification of India and India as a mega-diversity nation;Invasive, endangered, endemic and extinct species;Hot sports of biodiversity and Red Data book;Values of biodiversity, Threats to biodiversity; Conservation of biodiversity.

MODULE III ENVIRONMENTAL POLLUTION AND ITS CONTROL 8

Definition, Cause, effects and control measures of (a) Air pollution, (b) Water pollution, (c) Soil pollution, (d) Marine pollution, (e) Noise pollution, (f) Thermal pollution, (g) Nuclear hazards, (h) ill-effects of fireworks and upkeep of clean environment - El Nino and La Nina.

Solid waste Management - Causes, effects and control measures of urban, industrial wastes and e-waste -Disaster management: flood, drought, cyclone, landslide, avalanche, volcanic eruptions, earthquake and tsunami.

MODULE IV HUMAN POPULATION, SOCIAL ISSUES AND HEALTH 6

Population, population growth, variation among nations; population explosion; Family Welfare Programme - Unsustainable to sustainable development - Resettlement and rehabilitation of people - Environment Protection Act - Public awareness -Human Rights - Value Education - Women and Child Welfare - HIV/AIDS - Environment and human health: air-borne, water borne, infectious diseases, contagious diseases and immunization (all types of vaccines from birth), risks due to chemicals in food and water, endocrine disrupting chemicals, cancer and environment.

Case studies related to current situation.

L – 30; Total Hours – 30

TEXT BOOKS:

1. ErachBharucha, “Textbook for Environmental Studies for Undergraduate Courses of all Branches of Higher Education for University Grants Commission”, Orient BlackswanPvt. Ltd., Hyderabad, India, 2013.
2. Benny Joseph, “Environmental Studies”, Tata McGraw-Hill Education, India, 2009.
3. Ravikrishnan A, “Environmental Science and Engineering”, Sri Krishna Publications, Tamil Nadu, India, 2018.
4. Raman Sivakumar, “Introduction to Environmental Science and Engineering”, McGraw Hill Education, India, 2009.
5. Venugopala Rao P, “Principles of Environmental Science and Engineering”, Prentice Hall India Learning Private Limited; India, 2006.
6. Anubha Kaushik and Kaushik C.P., “Environmental Science and Engineering”, New Age International Pvt. Ltd., New Delhi, India, 2009.

REFERENCES:

1. Masters G.M., “Introduction to Environmental Engineering and Science”, Prentice Hall, New Delhi, 1997.
2. Henry J.G. and Heike G.W., “Environmental Science and Engineering”, Prentice Hall International Inc., New Jersy, 1996.
3. Miller T.G. Jr., “Environmental Science”, Wadsworth Publishing Co. Boston, USA, 2016.
4. “Waste to Resources: A Waste Management Handbook”, the Energy and Resources Institute, 2014.
5. https://www.teriin.org/article/e-waste-management-india-challenges-and-opportunities.
6. https://green.harvard.edu/tools-resources/how/6-ways-minimize-your-e-waste.
7. https://www.aiims.edu/en/departments-and-centers/central-facilities/265-biomedical/7346-bio-medical-waste-management.html.
8. https://tspcb.cgg.gov.in/Shared%20Documents/Guidelines%20for%20Management%20of%20Healthcare%20Waste%20Waste%20Management%20Rules,%202016%20by%20Health%20Care%20Facilities.pdf.

COURSE OUTCOMES:

The student will be able to

CO1: Analyse the current scenario of various natural resources and their depletion and suggest remedies to curb the exploitation.

CO2: Identify food chains and web and its function in the environment, assess the impacts on the biodiversity and propose solutions to conserve it.

CO3: Analyse the types and impacts of pollutants in the environment and propose suitable methods to alleviate the pollutants and the natural disasters.

CO4: Assess on the impact of human population and the health related issues and immunisation practices and sustainable developments for a healthy life

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Board of Studies (BoS) : 11thBoS of Chem held on 17.06.2021

Academic Council: 17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	L	M	-	-	L	M	-	-	-	-	-	-	-	-
CO2	-	-	-	M	H	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	M	M	-	-	L	-	M	-	-
CO4	-	-	-	-	-	M	M	M	-	-	-	L	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG All: No Poverty, Zero Hunger, Good Health and Well-Being, Quality Education, Gender Equality, Clean Water and Sanitation, Affordable & Clean Energy, Decent Work and Economic Growth, Industry, Innovation & Infrastructure, Reduced Inequalities, Sustainable Cities and Communities, Responsible Consumption and Production, Climate Action, Life Below Water, Life on Land, Peace, Justice and Strong Institutions, Partnerships for the Goals.

Statement: This course discuss about the environment, all the natural resources available, sharing of resources, effective utilization, effects of over utilisation, health and environmental issues pertained to that, global warming and related issues, climates, disasters, impact assessments, population, human rights, societal welfare, laws to conserve the environment and sustainability.