Study & Evaluation Scheme

of

Bachelor of Science

[Applicable w.e.f. Academic Session - 2019-20 till revised]

[As per CBCS guidelines given by UGC]

TEERTHANKER MAHAVEER UNIVERSITY

N.H.-24, Delhi Road, Moradabad, Uttar Pradesh-244001

Website: www.tmu.ac.in

TEERTHANKER MAHAVEER UNIVERSITY
(Established under Govt. of U.P. Act No. 30, 2008)
Delhi Road, Bagarpur, Moradabad (U.P.)

Study & Evaluation Scheme	
SUMMARY	
Institute Name	*TeerthankerKunthnath College of Education (TKCOE), Pakwara, Moradabad*
Programme	*Bachelor of Science*
Duration	*Three Years full time (Six Semesters)*
Medium	*English and Hindi*
Minimum Required Attendance	*75%*
Credits	
Credits Required for Degree	*142*

Assessment:					
Evaluation			**Internal**	**External**	**Total**
Theory			40	60	100
Practical/ Dissertations/ Project Reports/ Viva-Voce			50	50	100
Class Test-1	**Class Test-2**	**Class Test-3**	**Assignment(s)**	**Attendance& Participation**	**Total**
Best two out of three					
10	10	10	10	10	40
Duration of Examination			**External**	**Internal**	
			3 Hours	1.5 Hours	

To qualify the course a student is required to secure a minimum of 45% marks in aggregate including the semester end examination and teacher's continuous evaluation.(i.e. both internal and external).A candidate who secures less than 45% of marks in a course shall be deemed to have failed in that course. The student should have at least 45% marks in aggregate to clear the semester.

Question Paper Structure	
1	*The question paper shall consist of six questions. Out of which first question shall be of short answer type (not exceeding 50 words) and will be compulsory. Question no. 2 to 6 (from Unit-I to V) shall have explanatory answers (approximately 350 to 400 words) along with having an internal choice within each unit.*
2	*Question No. 1 shall contain 8 parts from all units of the syllabus with at least one question from each unit and students shall have to answer any five, each part will carry 2 marks.*
3	*The remaining five questions shall have internal choice within each unit; each question will carry 10 marks.*
IMPORTANT NOTES:	
1	*The purpose of examination should be to assess the CourseOutcomes (CO) that will ultimately lead to the attainment of Programme Specific Outcomes (PSOs). A question paper must assess the following aspects of learning: Remember, Understand, Apply, Analyze, Evaluate & Create (reference to Bloom's Taxonomy).*
2	*There shall be continuous evaluation of the student and there will be a provision of fortnight progress report.*

Program Structure-B.Sc.

A. Introduction:

Bachelor of Science (BSc) is an undergraduate degree course usually of three years' duration. It is one of the highly demanded and esteem degree course carry out at the graduate level. Students those who are enrolling with Bachelor of Science use to learn the basic knowledge about the art of creative, technology, mathematics along with science. The course is considered as a foundation course for students who wants to make their career in the field of Science. This course forms the basis of science and comprises of the subjects like physics, chemistry, biology, zoology and Mathematics. This course revolves around various aspects of Science, imparting both theoretical and practical knowledge in the field of science.

The course is also beneficial for students who wish to pursue multi and inter-disciplinary science careers in future. This Programmemaintains a balance between theory and practice, and coherence and integration among its various components, representing a wide knowledge in relative field of science. This course is designed to develop key practical skills and knowledge in science. Bachelor of science stimulates curiosity and promotes scientific discovery. Learning of science develops the power of observation, logical thinking and scientific attitude. It prepares the candidates for increasingly inter and multi-disciplinary careers in the field of science.

The B.Sc. programmes will be three academic years consisting of six semesters. Student will be permitted to complete the programme within a maximum period of five years from the date of admission to the programme. After the completion of the B.Sc degree there are various options available for the science students, they can go for master degree in Science i.e. M.Sc, go in a research area and can even look for professional job oriented courses.

The institute emphasis on the following courses ***balanced with core and programme specific Elective courses:***The curriculum of B.Sc. program emphasizes an intensive, flexible management dictation with 36 credits of core courses (all types), 72 credits of programme specific Elective courses,34 credits are allotted to ability enhancement courses (AECC), Total 142credits are allotted for the B.Sc. degree.

Course handouts for students will be provided in every course. A course handout is a thorough teaching plan of a faculty taking up a course. It is a blueprint which will guide the students about the pedagogical tools being used at different stages of the syllabus coverage and more specifically the topic-wise complete plan of discourse, that is, how the faculty members treat each and every topic from the syllabus and what they want the student to do, as an extra effort, for creating an effective learning. It may be a case study, a role-play, a classroom exercise, an assignment- home or field, or anything else which is relevant and which can enhance their learning about that particular concept or topic. Due to limited availability of time, most relevant topics will have this kind of method in course handout.

B.Sc.-: Three-Year (6-Semester) CBCS Programme			
Basic Structure: Distribution of Courses			
S.No.	**Type of Course**	**Credit Hours**	**Total Credits**
1	Core Course (CC)	06 Courses of 4 Credit Hrs. each (Total Credit Hrs. 15X4) 06 Courses of 2 Credit Hrs. each (Total Credit Hrs. 6X2)	36
2	Ability-Enhancement Compulsory Course (AECC)	06Courses of 3 Credit Hrs. each (Total Credit Hrs. 06X3) 04Courses of 4 Credit Hrs. each (Total Credit Hrs. 04X4)	34
3	Program/Discipline Specific Elective Course (DSEC)	12 Courses of4 Credit Hrs. each (Total Credit Hrs. 12X4) 12 Course of 4 Credit Hrs. each (Total Credit Hrs. 12X2)	72
Total Credits			**142**

Contact hours include work relatedto Lecture, Tutorial and Practical (LTP), where our institution will have flexibility to decide course wise requirements.

B. Choice Based Credit System (CBCS)

Choice Based Credit System (CBCS) is a versatile and flexible option for each student to achieve his target number of credits as specified by the UGC and adopted by our University.

The following is the course module designed for the B.Sc. (Int.) program:

Core Course (CC): Core courses of B.Sc. program will provide a holistic approach to basic science education, giving students an overview of the field, a basis to build and specialize upon. These core courses are the strong foundation to establish basic science knowledge and provide broadmulti-disciplined knowledge can be studied further in depth during the elective phase.

The core courses will provide more practical-based knowledge, case-based lessons andcollaborative learning models. It will train the students to analyze, decide, and lead-rather than merely know-while creating a common student experience that can foster deep understanding, develop decision-making ability and contribute to the basic education and community at large.

The integrated foundation isimportant for students because it will not only allow them to build upon existing skills, but they can also explorecareer options in a range of industries, and expand their understanding of various education field.

Ability Enhancement Compulsory Course (AECC):As per the guidelines of Choice Based Credit System (CBCS) for all Universities, including the private Universities, the Ability Enhancement Compulsory Course (AECC) is a course designed to develop the ability of students in communication (especially English) and other related courses where they might find it difficult to communicate at a higher level in their prospective job at a later stage due to lack of practice and exposure in the language, etc. Students are motivated to learn the theories, fundamentals and tools of communication which can help them develop and sustain in the corporate environment and culture.

Program/Discipline Specific ElectiveCourse (DSEC): The discipline specific elective courses chosen to make students specialist or having specialized knowledge of a specific domain like marketing, human resource, etc. It will be covered in 6 semester or in 3 year of the program relevant to chosen disciplines of core courses of the program. The student will have to choose any onespecialization out of the two specializations offered, i.e., PCM (Physics, Chemistry, Math's) and ZBC (Zoology, Botany, Chemistry).

Open Elective Course (OEC): Open Elective is an interdisciplinary additional subject that is compulsory in the fifth and sixth semester of the program. Each student has to do two MOOC courses of minimum eight weeks each as an Open Electives. The students can choose MOOC Course from SWAYAM/ E-Pathshala/ NPTEL or any other online learning portal.

Enhancing Professional Capacities (EPC):"Professional development refers to activities to enhance professional career growth". Such activities may include individual development, continuing education, and in service education, as well as curriculum writing, peer collaboration, study groups, and peer coaching or mentoring. it difficult to communicate at a higher level in their prospective job at a later stage due to lack of practice and exposure in the language, etc. Students are motivated to learn specific tools of profession which can help them develop and sustain in the corporate environment and culture.

Value Added Course (VAC):A value added course is a non-credit course which is basically meant to enhance general ability of students in areas like soft skills, quantitative aptitude and reasoning ability - required for the overall development of a student and at the same time crucial for industry/corporate demands and requirements. The student possessing these skills will definitely develop acumen to perform well during the recruitment process of any premier organization and will have the desired confidence to face the interview. Moreover, these skills are also essential in day-to-day life of the corporate world. The aim is to nurture every student for making effective communication, developing aptitude and a general reasoning ability for a better performance,as desired in corporate world. There shall be one course each in Semester III & Semester IV and will carry no credit, however,it will be compulsory for every student to pass these courses with minimum 45% marks to be eligible for the certificate. These marks will not be included in the calculation of CGPI. Students have to specifically be registered in the specific course of the respective semesters.

C. Programme Outcomes (POs)

The learning and abilities or skills that a student would have developedby the end of Four-yearB.Sc.-B.Ed. (Int.) programme**:**

POs -1	**Critical Thinking:** Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decision (intellectual, organizational, and personal) from different perspective.
POs -2	**Effective Communication:** Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books media and technology.
POs -3	**Social Interaction:** Elicit views of others, mediate disagreements and help reach conclusions in group setting.
POs -4	**Effective Citizenship:** Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
POs -5	**Ethics:** Recognize different value system including your own, understand the moral dimensions of your decision, and accept responsibility for them.
POs -6	**Environment and Sustainability:** Understand the issues of environmental contexts and sustainable development.
POs -7	**Self-directed and Life-long Learning:** Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes.

D. Programme Specific Outcomes (PSOs)

The learning and abilities or skills that a student would have developedby the end of Four-yearB.Sc.-B.Ed. (Int.) programme**:**

PSO – 1	Understanding concepts, theories, methods and techniques of Physics, Chemistry and Mathematics.
PSO – 2	Understanding concepts, theories, methods and techniques of Zoology andBotany.
PSO – 3	Applying the concepts of Physics, Chemistry and Mathematics.
PSO – 4	Applying the concepts of Zoology andBotany.
PSO – 5	Analyzing specific academic situations and selecting appropriate approaches, tools & techniques to deal with academic issues.
PSO – 6	Evaluating individual student's learning requirement and designing specific strategy for the improvement.

E. Pedagogy & Unique practices adopted: "Pedagogy is the method and practice of teaching, especially for teaching an academic subject or theoretical concept". In addition to conventional time-tested lecture method, the institute will **emphasize on experiential learning:**

1. Role Play&Simulation:Role-play and simulation are forms of experiential learning. Learners take on different roles, assuming a profile of a character or personality, and interact and participate in diverse and complex learning settings. Role-play and simulation function as learning tools for teams and groups or individuals as they "play" online or face-to-face. They alter the power ratios in teaching and learning relationships between students and educators, as students learn through their explorations and the viewpoints of the character or personality they are articulating in the environment. This student-centered space can enable learner-oriented assessment, where the design of the task is created for active student learning.

2. Video Based Learning (VBL)&Learning through Movies (LTM):These days' technology has taken a front seat and classrooms are well equipped with equipment and gadgets. Video-based learning has become an indispensable part of learning. Similarly, students can learn various concepts through movies. In fact, many teachers give examples from movies during their discourses. Making students learn few important theoretical concepts through VBL & LTM is a good idea and method. The learning becomes really interesting and easy as videos add life to concepts and make the learning engaging and effective. Therefore, our institute is promoting VBL & LTM,wherever possible.

3. Special Guest Lectures (SGL)&Extra Mural Lectures (EML): Some topics/concepts need extra attention and efforts as they either may be high in difficulty level or requires experts from specific domain to make concepts clear for a better understanding from the perspective of the institution. Hence, to cater to the present needs of institution we organize such lectures, as part of lecture-series and invite prominent personalities from academia time to time to deliver their vital inputs and insights.

4. Student Development Programs (SDP): Harnessing and developing the right talent for the institutions an overall development of a student is required. Apart from the curriculum teaching various student development programs (training programs) relating to soft skills, interview skills, Advanced excel training etc. that may be required as per the need of the student and institutions, are conducted across the whole program. Participation in such programs is solicited through volunteering and consensus.

5. Skill development programmes:Establishing collaborations with various institution partners to deliver the programme on sharing basis. The specific courses are to be delivered by education experts to provide practice based insight to the students.

6. Special assistanceprogramme for slow learners & fast learners: To write the note how would you identify slow learners, develop the mechanism to correct knowledge gap. Terms of advance topics and learning challenges will be provided to the fast learners.

7. Orientation programme:Student orientation programme plays an important role in a student transition to a university life. We offer 14 days' orientation programme that includes some visits to academic or historical places, motivational talk, extracurricular activities and games. Orientation programmes are aimed at familiarizing the students to an unknown campus environment, its faculties and infrastructure. It enables them to make essential connection with studies and develop network among other peers.

8.Mentoring scheme:Mentoring demonstrates organizational commitment to the individual's development, but is not as directive as other developmental approaches such as training courses. The mentor is effectively a person who is not directly involved with the mentee's job role but is backed by the organization to listen to, guide and advise the mentee, in full confidentiality.

9.Career & personal counseling:Career counseling is a specialization of personal counseling much like other specialty areas of counseling (i.e., school, family, rehabilitationcenters, etc.), which implies a particular emphasis, population, or setting for its practice. Counseling is a process that assists individuals in gaining helpful information about themselves, others, and the world around them as they solve problem or make decisions to improve their quality of life.

10.Competitive exam preparation:Competitive exams will enhance the skill of understanding of the application of concepts, which is required in a broader context when we appear for exams. We offer trial of many competitive exams such as SSC, GATE and CDS during the semester.

11.Extracurricular Activities: organization & participation in extracurricular activities will be mandatory to help students develop confidence & face audience with care.

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B.Sc.Curriculum

B.Sc.-Semester I

S.N	Category	Course Code	Course		Periods			Credit	Evaluation Scheme		
					L	T	P		Internal	External	Total
1	CC-1	BSC105	Physical Chemistry		4	0	0	4	40	60	100
2	CC-2	BSC152	Physical Chemistry (Lab)		0	0	4	2	50	50	100
3	AECC-1	BSC102	Samanya Hindi		4	0	0	4	40	60	100
4	AECC-2	TMUGE199	English Communication–I		2	0	2	3	40	60	100
PCM GROUP-1											
5	DSEC-1	BSC103	Discipline Specific ElectiveCourses	Trigonometry & differential calculus	4	0	0	4	40	60	100
6	DSEC-2	BSC104		Mechanics	4	0	0	4	40	60	100
7	DSEC-3	BSC151		Mechanics (Lab)	0	0	4	2	50	50	100
8	DSEC-4	BSC155		Skill Mathematics: Algebra	0	0	4	2	50	50	100
ZBC GROUP-1											
9	DSEC-1	BSC106	Discipline Specific ElectiveCourses	Diversity of Microbes and Cryptogams Part-1	4	0	0	4	40	60	100
10	DSEC -2	BSC107		Animal Diversity Part-I	4	0	0	4	40	60	100
11	DSEC -3	BSC153		Diversity of Microbes and Cryptogams Part-1 (Lab)	0	0	4	2	50	50	100
12	DSEC -4	BSC154		Animal Diversity Part-1 (Lab)	0	0	4	2	50	50	100
Total					**17**	**0**	**14**	**25**	**350**	**450**	**800**

B.Sc.-Semester II

S.N	Category	Course Code	Course		Periods			Credit	Evaluation Scheme		
					L	T	P		Internal	External	Total
1	CC-3	BSC205	Inorganic Chemistry		4	0	0	4	40	60	100
2	CC-4	BSC252	Inorganic Chemistry(Lab)		0	0	4	2	50	50	100
3	AECC-3	BSCX201	Environmental Studies		4	0	0	4	40	60	100
4	AECC-4	TMUGE299	English Communication–II		2	0	2	3	40	60	100
PCM GROUP – 2											
5	DSEC - 5	BSC203	Discipline Specific ElectiveCourses	Partial Differential Equations	4	0	0	4	40	60	100
6	DSEC - 6	BSC204		Electricity and Magnetism	4	0	0	4	40	60	100
7	DSEC - 7	BSC251		Electricity and Magnetism (Lab)	0	0	4	2	50	50	100
8	DSEC - 8	BSC255		Skill Mathematics: Algebra And Matrices	0	0	4	2	50	50	100
ZBC GROUP – 2											
9	DSEC - 5	BSC206	Discipline Specific ElectiveCourses	Diversity of Cryptogams Part-II	4	0	0	4	40	60	100
10	DSEC - 6	BSC207		Animal Diversity Part-II	4	0	0	4	40	60	100
11	DSEC - 7	BSC253		Diversity of Cryptogams Part-II(Lab)	0	0	4	2	50	50	100
12	DSEC - 8	BSC254		Animal Diversity Part-II (Lab)	0	0	4	2	50	50	100
Total					**18**	**0**	**14**	**25**	**350**	**450**	**800**

B.Sc.-Semester III

S.N	Category	Course Code	Course		Periods			Credit	Evaluation Scheme		
					L	T	P		Internal	External	Total
1	CC-5	BSC302	Organic Chemistry		4	0	0	4	40	60	100
2	CC-6	BSC352	Organic Chemistry(Lab)		0	0	4	2	50	50	100
3	AECC-5	TMUGE399	English Communication–III		2	0	2	3	40	60	100
4	AECC-6	BSCE303	Physical, Health and Yoga Education		2	0	4	4	40	60	100
PCM GROUP – 3											
5	DSEC – 9	BSC304	Discipline Specific ElectiveCourses	Optics	4	0	0	4	40	60	100
6	DSEC -10	BSC305		Real analysis	4	0	0	4	40	60	100
7	DSEC -11	BSC351		Optics(Lab)	0	0	4	2	50	50	100
8	DSEC -12	BSC355		Mathematical Skills: Integral calculus	0	0	4	2	50	50	100
ZBC GROUP – 3											
9	DSEC – 9	BSC306	Discipline Specific ElectiveCourses	Plant Taxonomy And Embryology	4	0	0	4	40	60	100
10	DSEC -10	BSC307		Chordata	4	0	0	4	40	60	100
11	DSEC -11	BSC353		Plant Taxonomy And Embryology(Lab)	0	0	4	2	50	50	100
12	DSEC -12	BSC354		Chordata (Lab)	0	0	4	2	50	50	100
Total					**16**	**0**	**18**	**25**	**350**	**450**	**800**

Value Added Course (VAC)										
Sr. N.	Course Type	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
13	VAC-1	TMUGS301	Managing Self	2	1	-	0	50	50	100

VAC is an Added course which will be compulsory to pass with 45% marks.However it will not be added towards overall result.

B.Sc.-Semester IV

S.N	Category	Course Code	Course		Periods			Credit	Evaluation Scheme		
					L	T	P		Internal	External	Total
1	CC-7	BSC402	Organic and Inorganic Chemistry		4	0	0	4	40	60	100
2	CC-8	BSC452	Organic and Inorganic Chemistry(Lab)		0	0	4	2	50	50	100
3	AECC-7	TMUGE499	English Communication–IV		2	0	2	3	40	60	100
4	AECC-8	BSC403	Computer Fundamentals, Internet & MS-Office		3	0	2	4	40	60	100
PCM GROUP – 4											
5	DSEC -13	BSC404	Discipline Specific ElectiveCourses	Oscillations and Wave	4	0	0	4	40	60	100
6	DSEC -14	BSC405		Complex Analysis	4	0	0	4	40	60	100
7	DSEC -15	BSC451		Oscillations and Wave(Lab)	0	0	4	2	50	50	100
8	DSEC -16	BSC455		Mathematical Skills: Ordinary Differential Equations	0	0	4	2	50	50	100
ZBC GROUP – 4											
9	DSEC -13	BSC406	Discipline Specific ElectiveCourses	Plant Physiology and Metabolism	4	0	0	4	40	60	100
10	DSEC -14	BSC407		Evolution and Developmental Biology	4	0	0	4	40	60	100
11	DSEC -15	BSC453		Plant Physiology and Metabolism(Lab)	0	0	4	2	50	50	100
12	DSEC -16	BSC454		Evolution and Developmental Biology (Lab)	0	0	4	2	50	50	100
Total					**17**	**0**	**16**	**25**	**350**	**450**	**800**

Value Added Course (VAC)

Sr.N.	**Value** Course Type	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
13	VAC-2	TMUGS 401	Managing Work and Others	2	1	-	0	50	50	100

VAC is an Added course which will be compulsory to pass with 45% marks. However it will not be added towards overall result.

B.Sc.-Semester V

S.N	Category	Course Code	Course		Periods			Credit	Evaluation Scheme		
					L	T	P		Internal	External	Total
1	CC-9	BSC502	Physical and Inorganic Chemistry		4	0	0	4	40	60	100
2	CC-10	BSC552	Physical and Inorganic Chemistry(Lab)		0	0	4	2	50	50	100
3	AECC-9	BSC503	Human Values and Ethics		3	0	0	3	40	60	100
PCM GROUP – 5											
4	DSEC -17	BSC504	Discipline Specific ElectiveCourses	Semiconductor and Solid StateDevices	4	0	0	4	40	60	100
5	DSEC -18	BSC505		Differential Geometry and Tensor	4	0	0	4	40	60	100
6	DSEC -19	BSC551		Semiconductor and Solid StateDevices(Lab)	0	0	4	2	50	50	100
7	DSEC -20	BSC555		Mathematical Skills : Statistics	0	0	4	2	50	50	100
ZBC GROUP – 5											
8	DSEC -17	BSC506	Discipline Specific ElectiveCourses	Economic Botany and Plant Biotechnology	4	0	0	4	40	60	100
9	DSEC -18	BSC507		Cell Biology and Genetics	4	0	0	4	40	60	100
10	DSEC -19	BSC553		Economic Botany and Plant Biotechnology(Lab)	0	0	4	2	50	50	100
11	DSEC -20	BSC554		Cell Biology and Genetics(Lab)	0	0	4	2	50	50	100
Total					**15**	**0**	**12**	**21**	**310**	**390**	**700**

Open Elective Course (OEC)										
Sr.N.	Course Type	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
12	OEC-1	-	MOOC Course	-	-	-	-	-	-	-

* OEC is a MOOC course of eight weeks. This course is mandatory to qualify for the award of degree. The students have to submit the certificate of the MOOC course to the university.

B.Sc.-Semester VI

S.N	Category	Course Code	Course		Periods			Credit	Evaluation Scheme		
					L	T	P		Internal	External	Total
1	CC-11	BSC602	Physical and Organic Chemistry		4	0	0	4	40	60	100
2	CC-12	BSC652	Physical and Organic Chemistry(Lab)		0	0	4	2	50	50	100
3	AECC-10	BSC603	Information and Communication Technology		3	0	0	3	40	60	100
PCM GROUP – 6											
4	DSEC -21	BSC604	Discipline Specific ElectiveCourses	Thermal Physics and Statistical Mechanics	4	0	0	4	40	60	100
5	DSEC -22	BSC605		Applied Statistics	4	0	0	4	40	60	100
6	DSEC -23	BSC651		Thermal Physics and Statistical Mechanics (Lab)	0	0	4	2	50	50	100
7	DSEC -24	BSC655		Mathematical Skills : Operation Research	0	0	4	2	50	50	100
ZBC GROUP – 6											
8	DSEC -21	BSC606	Discipline Specific ElectiveCourses	Environmental Biotechnology	4	0	0	4	40	60	100
9	DSEC -22	BSC607		Mammalian Physiology	4	0	0	4	40	60	100
10	DSEC -23	BSC653		Environmental Biotechnology (Lab)	0	0	4	2	50	50	100
11	DSEC -24	BSC654		Mammalian Physiology(Lab)	0	0	4	2	50	50	100
Total					**15**	**-**	**12**	**21**	**310**	**390**	**700**

Open Elective Course (OEC)											
Sr.N.	Course Type	Course Code	Course Name	Periods			Credit	Evaluation Scheme			
				L	T	P		Internal	External	Total	
12	OEC-2	-	MOOC Course	-	-	-	-	-	-	-	

* OEC is a MOOC course of eight weeks. This course is mandatory to qualify for the award of degree. The students have to submit the certificate of the MOOC course to the university.

B.Sc. Curriculum

B.Sc.-Semester I

S.N	Category	Course Code	Course		Periods			Credit	Evaluation Scheme		
					L	T	P		Internal	External	Total
1	CC-2	BSC105	Physical Chemistry		4	0	0	4	40	60	100
2	CC-3	BSC152	Physical Chemistry (Lab)		0	0	4	2	50	50	100
3	AECC-1	BSC102	Samanya Hindi		4	0	0	4	40	60	100
4	AECC-2	TMUGE199	English Communication–I		2	0	2	3	40	60	100
PCM GROUP-1											
5	DSEC-1	BSC103	Discipline Specific ElectiveCourses	Trigonometry & differential calculus	4	0	0	4	40	60	100
6	DSEC-2	BSC104		Mechanics	4	0	0	4	40	60	100
7	DSEC-3	BSC151		Mechanics (Lab)	0	0	4	2	50	50	100
8	DSEC-4	BSC155		Skill Mathematics: Algebra	0	0	4	2	50	50	100
ZBC GROUP-1											
9	DSEC-1	BSC106	Discipline Specific ElectiveCourses	Diversity of Microbes and Cryptogams Part-1	4	0	0	4	40	60	100
10	DSEC -2	BSC107		Animal Diversity Part-I	4	0	0	4	40	60	100
11	DSEC -3	BSC153		Diversity of Microbes and Cryptogams Part-1 (Lab)	0	0	4	2	50	50	100
12	DSEC -4	BSC154		Animal Diversity Part-1 (Lab)	0	0	4	2	50	50	100
Total					**17**	**0**	**14**	**25**	**350**	**450**	**800**

Course Code: BSC102	**Academic Enhancement Compulsory Course** **B.Sc. Semester-I** **SAMANYA HINDI**	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	fo|kFkhZLoj]O;atu]"kCnlajpukrFkkokD; lajpukdks le>ldsxsaA	
CO2.	fo|kFkhZorZuhrFkkys[kuhesaO;kdj.k ds fu;eksadkmi;ksxdjldsxsaA	
CO3.	fo|kFkhZ "kCn] okD;] dfork] dgkuh]ukVdrFkkfucU/k vkfndkfo"ys'k.kdjldsxsaA	
Course Content:		
Unit-1:	fgUnh /ofu;ksadkLo:i&LojvkSjO;atu] laKk] loZeku] fdz;k] fo"ks'k.k] fdz;kfo"ks'k.k] okD; lajpukA	**8 Hours**
Unit-2:	fgUnh "kCnlajpuk&Ik;kZ;okph] lekukFkZd] foyksekFkZd] vusdkFkZd] vusd "kCnksa ds LFkkuij,d "kCnlewgkFkZd "kCnksa ds iz;ksx] fudVkFkhZ "kCnksadslw{e vFkZ&Hksn] lekukFkZd "kCnksa ds Hksn] milxZ] izR;;	**10 Hours**
Unit-3:	orZuh] fojkefpUg ,oala"kks/kuorZuhlEc/khv"kqf);k¡] ek=kvksa dh v"kqf);k¡] orZuhlEc/khv"kqf);ks ds dkj.k] orZuhlEc/khv"kqf);ks ds lq/kkjusmik;A fojkefpUg&iw.kZfojke] iz"uokpdfpUglEcks/ku ;k vk"p;ZfpUg]funsZ"kdfpUg] vorj.kfpUg	**10 Hours**
Unit-4:	ys[kulEcU/khdkS"ky&fyf[krHkk'kkf"k{k.k ds mn~ns";ys[ku dh fofHkUufof/k;k¡] ys[ku ds nks'k**]** fucU/k ys[ku] dgkuhys[ku]	**12 Hours**
Unit-5:	fgUnhi=kpkj ,oays[ku • vkSipkfjdi=kpkj • vukSipkfjdi=kpkj • jk'Vªh;&vUrZjk'Vªh; rkRdkfyd ?kVukdzeksaijys[ku	**10 Hours**
Text Books:	01&jktHkk'k fgUnh&xksfoUnnkl&fgUnhlkfgR; lEesyu] iz;kxA	
Reference Books:	01 iz"kklfud ,oadk;kZy;hfgUnh&jkeizdk"k] jk/kkd``.k izdk"ku] fnYyhA 02 iz;kstuewyddkedkthfgUnh&dSyk"kpUnzHkkfV;k] r{kf"kykizdk"ku]fnYyh 03 iz"kklfudfgUnhfVli.k] izk:i.k ,oai= ys[ku&gfjeksgu] r{kf"kykizdk"ku] fnYyh 04&jk'VªHkk'kk vkUnksyu&xksikyij"kqjke&egkjk'Vª lHkkA 05&fojke fpUg&egsUnzjktktSu&fdrkc?kj] fnYyh	
E- Resources	https://youtu.be/maXoNNsOMdg https://lgandlt.blogspot.com/2018/06/blog-post_64.html https://youtu.be/vb_yuBFO10o https://gradeup.co/hindi-pedagogy-bhasha-kaushal-and-types-i http://hindigrammar.in/patr-lekhn.html	

Course Code: BSC103	Discipline Specific Elective Courses **B.Sc. Semester-I** **TRIGONOMETRY & DIFFERENTIAL CALCULUS**	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the basic principles of trigonometry and differential calculus.	
CO2.	Applying trigonometry expansions.	
CO3.	Analyzingdifferent mathematical theorems.	
Course Content:		
Unit-1:	Circular and hyperbolic functions of complex quantities, Separation of real and imaginary parts of trigonometric, logarithmic, and exponential functions.	**8 Hours**
Unit-2:	Gregory's series, summation of series, Expansion of Functions .	**10 Hours**
Unit-3:	Successive differentiation, Leibnitz theorem (without proof), Euler's theorem, Mean value theorems, tangent and normal, maxima and minima, limit and its properties.	**10 Hours**
Unit-4:	Mac Laurin's and Taylor's expansion of functions, errors and approximation, Asymptotes and curvature of curves in Cartesian and polar coordinates, Partial differentiation.	**10 Hours**
Unit-5:	Tracing of curves in Cartesian, parametric and polar coordinates (conics, asteroid, Cycloid, Circle, Cardioids),Indeterminate forms, Envelop and Evolutes **.**	**12 Hours**
Text Books:	1. "Differential Calculus" by Gorakh Prasad, PothishalaPvt Ltd. 2. "Trigonometry" by A. K. Saxena, AeykayPrakashan.Bareilly	
Reference Books:	**1. "**Trigonometry" by J. C. Sharma, P. H. Sharma, Students Friends & Co. 2. "Trigonometry" by A.R. Vashistha and R. K. Gupta, Krishna PrakashanMandir. 3. "Differential Calculus" by N. Pishkunor, Peace Publishers Moscow 4. "Differential Calculus" by M. Ray, Shiv Lal Agarwal &Co Agra. 5. "Differential Calculus" by Khalil Ahmed, Anamya Publication, New Delhi 6. "Differential Calculus" by A. K. Saxena, Aeykay **Publication** *** Latest editions of all the suggested books are recommended.**	
E- Resources	https://youtu.be/Tz6marYxx_E https://youtu.be/VzGaWQ1LRf4 https://youtu.be/KijGLjxKlsY https://youtu.be/LEspaisjDFE https://youtu.be/CioY8ElsjO4	

Course Code: BSC104	Discipline Specific Elective Courses **B.Sc. Semester-I** **MECHANICS**	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the basic concepts and principles of mechanics.	
CO2.	Applying laws of motion, elasticity and forces in different physical experiments.	
CO3.	Analyzing the motion of objects in the context of linear, gravitational and central forces.	
Course Content:		
Unit-1:	Conservation of Energy and Linear Momentum Mechanics of a particle, work-energy theorem. Conservative and non-conservation forces and their examples. Conservation force as negative gradient of potential energy. Center of mass of a system of particles. Conservation of linear momentum and energy. Systems of variable mass, single and multistage rockets.	**12 Hours**
Unit-2:	Rotational Dynamics Rigid body motion. Rotation motion, torque and angular momentum. Moment of inertia and its calculations for disc, cylinder, spherical shell and solid sphere, Body rolling down on and inclined plane.	**12 Hours**
Unit-3:	Motion under Central Forces Concept of central force. Kepler's laws of planetary motion.Gravitational law, Gravitational Potential and fields due to spherical shell and solid sphere. Gravitational potential energy and escape velocity. Two particle central force problem and reduced mass	**10 Hours**
Unit-4:	Elasticity, small deformations, Hooke's law, Elastic constants and relation among them.Beam supported at the ends, cantilever.	**10 Hours**
Unit-5:	Streamline and turbulent flow, equation of continuity, viscosity, Poiseulie's law critical velocity, Reynolds's number. Surface tension and surface energy, pressure on a curved liquid surface.	**10 Hours**
Text Books:	1. An introduction to mechanics, D. Kleppner, R.J. Kolenkow, McGraw-Hill.	
Reference Books:	1. Mechanics, D.S. Mathur, S. Chand and Company Limited, University Physics. 2. J.W. Jewett, R.A. Serway, Cengage Learning Theoretical Mechanics, M.R. Spiegel, Tata McGraw Hill. 2. Mechanics, Berkeley Physics, vol.1, C. Kittel, W. Knight, et.al. Tata McGraw-Hill. Physics, Resnick, Halliday and Walker, Wiley. 3. Analytical Mechanics, G.R. Fowles and G.L. Cassiday. Cengage Learning. *** Latest editions of all the suggested books are recommended.**	
E-Resources	http://www.batesville.k12.in.us/physics/PhyNet/Mechanics/MechOverview.html https://www.youtube.com/watch?v=vQiIt-jX0BM&list=PL99EA5ECCC34949DB https://physics.info/viscosity/ https://www.youtube.com/watch?v=jmVEHMPfFmQ	

Course Code: BSC105	Core Courses **B.Sc. Semester-I** **PHYSICAL CHEMISTRY**	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the concepts and theories of chemical kinetics and surface chemistry.	
CO2.	Explaining the effect of temperature on catalyst.	
CO3.	Analyzing the defects of crystals and mechanism of rate of reaction.	
Course Content:		
Unit-1:	**Chemical Kinetics** • Definition of order and molecularity. Derivation of rate const. for zero first order reactions and example. • Effect of tem. Concentration, catalyst & Pressure on rate of reaction • Arhenius equation. • Pseudo order reaction • Simple Collision Theory & Transition State Theory For Reaction Rate.	**10 Hours**
Unit-2:	**Surface Chemistry** • Definition of colloids • Preparation purification & props. Of colloidal Solution (Solutions) • Hardy – Schulze law • Preparation. Properties& uses of emulsion • Preparation. Properties& uses of gel • Protective colloids	**12 Hours**
Unit-3:	**Solid State: -** • Unit cell, Lattice point (Def) • Defects in crystals- Stoichiometric and Nonstoichiometric defects • Bravis --- lattices & crystal system • Properties of solids • Types of solids	**10 Hours**
Unit-4:	**Liquid State:-** • Structural differences. between solids liquid & Gases • Properties of liquid – Surface tension Viscosity Vapourpressure • Liquid crystal & its classification in somatic &nematic type • Application of liquid crystal.	**10 Hours**
Unit-5:	**GaseousState:-** • Intermolecular attractive forces • Deviation of real gases from ideal behavior • The vanderwal's equation. • Maxwell's distribution of velocity & energies • Critical Phenomenon-Temperature, Pressure and Volume. • Andrew's isotherm of CO_2 • Calculation of root mean square vel.' Average. velocity, most probable vel. • Collision Diameter, Collision Number, Collision Frequency.	**08 Hours**
Text Books:	Prutton and Marron , teachings of teaching (classroom teaching). APH publishing, New Delhi.	

Reference Books:	1. Prutton and Marron , teachings of teaching (classroom teaching). APH publishing, New Delhi. *** Latest editions of all the suggested books are recommended.**	
E-Resources	https://www.toppr.com/content/concept/order-and-molecularity-of-a-reaction-203347/ https://www.slideshare.net/vksprasath/trasition-and-collision-theory https://www.toppr.com/guides/chemistry/surface-chemistry/preparation-of-colloids/ -:~:text=Chemical Methods of Preparation of,colloidal solution of arsenious chloride. https://www.infoplease.com/math-science/chemistry/chemistry-types-of-solids https://en.wikipedia.org/wiki/Surface_tension https://en.wikipedia.org/wiki/Intermolecular_force	

Course Code: BSC106	Discipline Specific Elective Courses **B.Sc. Semester-I** **DIVERSITY OF MICROBES AND CRYPTOGAMS PART-I**	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding diverse forms of lower life existence on earth.	
CO2.	Describing the general characters, classification and life cycle of micro-organisms and lower plants.	
CO3.	Explaining various methods of plant disease control.	
CO4.	Analyzing the process of evolution of life on earth.	
Course Content:		
Unit-1:	**Viruses and Bacteria :**General account of viruses and mycoplasma, bacteria-structure, nutrition. reproduction and economic importance, General account of Cyanobacteria, economic importance, Nostoc, Oscillatoria.	**10 Hours**
Unit-2:	**Algae:**General Characters, classification and economic importance, important features and life history of chlorophyceae: Volvox, Oedogonium, Coleochaete, Chara.	**12 Hours**
Unit-3:	**Algae:** General Characters, classification and economic importance, important features and life history of Xanthophyceae - Vaucheria, Phaeophyceae-EctocarpusSargassum, Rhodophyceae - Polysiphonia.	**10 Hours**
Unit-4:	**Fungi:**General characteristics, outline of classification, thallus organization, reproductioneconomic importance of fungi. Structure, reproduction and life history of Zygomycota :Rhizopus ; Ascomycota: Penicillium; Basidiomycota: Puccinia, Agaricus; Deuteromycota: Alternaria.	**10 Hours**
Unit-5:	Plant diseases and General account of Lichens, special studies about green ear disease, white rust, Stem rust disease of Wheat, Smut disease, Citrus canker, Tobacco mosaic disease, Little leaf disease of brinjal.	**10 Hours**
Text Books:	1. Pandey S.N. & others. 1995, A Text Book of Botany Vol. I, Vikas Publications Dehli	
Reference Books:	1. Vashistha, B.R. 1989, Algae, S. Chand and Co. Delhi. 2. Vashistha, B.R. 1989, Fungi, S. Chand and Co. Delhi. 3. Gupta P.K. 1999. GeneticsRastogi Publications Meerut. *** Latest editions of all the suggested books are recommended.**	
E-Resources	https://www.youtube.com/watch?v=s8jhJXgC-bk https://www.youtube.com/watch?v=uhZLswAB6ec https://www.youtube.com/watch?v=GCbVjkreJlQ&t=48s https://www.youtube.com/watch?v=VVuYGkk_I8s https://www.youtube.com/watch?v=05ITJlgPcR0	

Course Code: BSC107	Discipline Specific Elective Courses **B.Sc. Semester-I** **ANIMAL DIVERSITY PART-I**	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the taxonomy and life cycle of lower invertebrates.	
CO2.	Explaining the organization in the lower invertebrates.	
CO3.	Analyzing levels of organization in the lower invertebrates.	
Course Content:		
Unit-1:	**Taxonomy: -** Classification of Protozoa. Porifera, Coelenterata, Platyhelminthes and Nematoda up to order with examples. Fundamentals of body organization emphasizing symmetry, metamerism, coelome and levels of structural organization.	**10 Hours**
Unit-2:	**Protozoa: -** Study of structural organization and life history of Trypanosoma and paramecium, Parasitism, pathogenecity and control in protozoans with special reference to Entamoeba, Trichomonas and Plasmodium.	**12 Hours**
Unit-3:	**Porifera: -** Habit, habitat, structure and function of Sycon. Types of canal system. **Coelenterata: -** Habit, habitat, structure, function and life history of Aurelia. coral reef. **Ctenophora -** Structural organization and affinities.	**10 Hours**
Unit-4:	**Platyhelminthes: -** Structural organization and life history of Dugesia. Parasitic adaptation in Helminthes. **Nematyhelminthes:** - Study of structure and life history of Dracunculusmedinensis. Nematode parasites and human diseases.	**12 Hours**
Unit-5:	Classification of Annelida (up to subclass); metamerism and coelome in Annelida. structural organization and physiology of earthworm, Trochophore larva.	**10 Hours**
Text Books:	1. Gence, Cells, &BrainsHilary Rose & Steven Rose	
Reference Book:	1.Zoology Invertebrates (text book) R.L. kotbal E.L. Jordan & P.S. Varma *** Latest editions of all the suggested books are recommended**	
E-Resources	https://youtu.be/ySr_ERwK64Q https://youtu.be/aRINSaTDD8M https://youtu.be/AGzhYWa1aZ0 https://en.wikipedia.org/wiki/Trypanosoma https://en.wikipedia.org/wiki/Paramecium	

Course Code: BSC151	Discipline Specific Elective Courses **B.Sc. Semester-I** **MECHANICS LAB**	L-0 T-0 P-2 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Applying the concept of moment of inertia, elastic constant and viscosity of the liquid to different applications.	
CO2.	Analyzing the applications and working of moment of inertia and concept of elasticity in different physical experiments.	

Course Content:

LIST OF EXPERIMENTS

Note: Select any ten experiments from the following list

1. To determine length, radius of circular body by using screw gauge and Vernier calipers.
2. To determine modulus of rigidity of a wire by Maxwell's needle.
3. To determine moment of inertia of an irregular body by inertia table.
4. To determine Elastic constant of a wire by Searl's method.
5. To determine Moment of inertia of a Flywheel.
6. To determine Young's Modulus in case of Uniform bending using Scale, telescope and optic lever.
7. To determine Young's Modulus in case of Cantilever using Pin and Microscope
8. To determine Modulus of Rigidity by using Torsion pendulum.
9. To determine Viscosity by the Capillary flow (Radius using Mercury pellet).
10. To determine Surface tension by using Capillary rise (Radius using Vernier microscope).
11. To verify Bernoulli's theorem.
12. To determine viscosity by Poiseuille's method.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT (05 MARKS)	FILE WORK (10 MARKS)	ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	EXPERIMENT (05 MARKS)	VIVA (10 MARKS)	INTERNAL (50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

Course Code: BSC152	Core Course **B.Sc. Semester-I** **PHYSICAL CHEMISTRY LAB**	L-0 T-0 P-2 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Determine the concentration of unknown solution.	
CO2.	Identify unknown substance by measuring melting and boiling point.	
CO3.	Apply uses of titrations in pharma industry.	

Course Content:

LIST OF EXPERIMENTS

Inorganic

Analysis of simple salt containing an anion and cations

Anion --- CO_3^{-2}, SO_4^{-2},Cl^-,Br^-, CH_3COO^-,NO_3^- BO_3^{-3},PO_4^{-3}.

Cation – Lead, Copper, Iron, Aluminium, Zinc Nickel, Calcium, Potassium, & NH_4^+.

Organic Functional Gr. Reaction (At Least 4)

- Alcohol, Phenols, Aldehydes, ketones Clones, Carboxylic acids & Amides.

Titrimetric Analysis.

- Determination of Fe (II) using $KMnO_4$ with Oxalic Acid as Primary Acid Standerd.
- Determination of CU (II) using $Na_2S_2O_3$ with $K_2Cr_2O_7$ Acid as Primary Standard .

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT (05 MARKS)	FILE WORK (10 MARKS)	ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	EXPERIMENT (05 MARKS)	VIVA (10 MARKS)	INTERNAL (50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

Course Code: BSC153	Discipline Specific Elective Courses **B.Sc. Semester-I** **DIVERSITY OF MICROBES AND CRYPTOGAMS PART-ILAB**	L-0 T-0 P-2 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Recognizes information of specimen collection, slide preparation and microscopy.	
CO2.	Explaining plant diseases, causal organisms and their control measures	

Course Content:

LIST OF EXPERIMENTS

1. Microscopic preparations and study of the following algalmaterial:Nostoc, Oscillatoria,Chlamydomonas, Volvox, Coleochaete, Oedogonium, Vaucheria, Chara, EctocarpusSargassum and Polysiphonia
2. Staining of different types of Bacteria
3. Study of some locally available plant diseases caused by Viruses. Mycoplasma, Bacteria and Fungi in field/laboratory. TMV, Little leaf of Brinjal. Citrus canker, Green ear disease of Bajra.
4. *Rhizopus and Penicillium*: Asexual stage from temporary mounts and sexual structures through permanent slides.
5. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose)
6. *Agaricus*: Specimens of button stage and full grown mushroom; Sectioning of gills of*Agaricus.*

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT (05 MARKS)	FILE WORK (10 MARKS)	ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	EXPERIMENT (05 MARKS)	VIVA (10 MARKS)	INTERNAL (50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

Course Code: BSC154	Discipline Specific Elective Courses **B.Sc.-B.Ed.(Int.) Semester-I** **ANIMAL DIVERSITY PART-I LAB**	L-0 T-0 P-2 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the structure of lower invertebrates.	
CO2.	Recognizes information of specimen collection, slide preparation and microscopy.	
CO3.	Setup the permanent mounting of external structure of lower invertebrates	
CO4.	Analyzing the structure ofTS/LS of organs & developmental stages	

Course Content:

LIST OF EXPERIMENTS General survey of Invertebrate (Spot & Slides)

(A) **Protozoa: -** Entamoeba, Polystomella, Monocystis, Euglena, NoctilucaLeismania, Nyctotherus, Paramecium, Vorticella. **Porifera-** Sycon, Hyalonema, Euplectella, Spongilla and Euspongia. **Coelenterate-** Obelia colony (polyp & medusa) Physalia, Porpita, Aurelia, Rhizostom, Alcyonium, Corallium, Gorgonia, Pennatula, Madrepora.
Platyhelminthes-: Dugesia, Fasciola, Taenia, Schistosoma.**Nematode-** Filaria, Dracunculus, Wuchereria, Enterobius
Annelida: - Neries (Heroneries with parapodia) Aphrodite, Arenicola, Pontobdella, Hirudinaria, Peripatus.
(B) Study of TS/LS of organs & developmental stages.
(i) **Porifera: -** T.S. of Sycon. (ii) **Coelenterata-** Planula larva of jelly fish. (iii) **Platihelminthes-** T.S of Fasciola, scolex of Taenia, mature & gravid segment of Taenia, Hexacanth, bladderworm&cysticercus stage of Taenia, miracidium, sporocyst, redia, circaria larva of Fasciola. (iv) **Annelida-** T.S through different region of leach.

(C) Dissection Through chart / model / Photograph / CD. – Hirudinaria – Morphology, general anatomy, digestion, nervous & excretory and reproductive system.
Earthworm – Anatomy, morphology, digestive and nervous system.
(D) Mounting- (Permanent)
Protozoa – Euglena, Paramecium,PolystomelaPorifera- Spicules, fibres, gemmuleCoelenterata- Obelia medusa
Platyhelminthes – Taenia (proglotid) Annelida – Nereis (parapodia)

Evaluation Scheme of Practical Examination:
Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT (05 MARKS)	FILE WORK (10 MARKS)	ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	EXPERIMENT (05 MARKS)	VIVA (10 MARKS)	INTERNAL (50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

Course Code: BSC155	Discipline Specific Elective Courses **B.Sc. Semester-I** **MATHEMATICAL SKILL: ALGEBRA**	L-0 T-0 P-4 C-2
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding of isomorphism, homomorphism and automorphism of a group.	
CO2.	Applying the fundamental theorems of algebra such as Cayley's theorem and Lagrange's theorem.	
CO3.	Analyzing vector space and properties of vector space.	
Course Content:		
Unit-1:	Groups, sub-groups, Costes, Lagranges theorem, permutation group, Cayley's theorem, Isomorphism of groups.	**8 Hours**
Unit-2:	Basic concepts of Rings, Subrings, Integral domain and fields	**10 Hours**
Unit-3:	Automorphism, Normaliser, Centre of a group, Syllabus theorem	**10 Hours**
Unit-4:	Homomorphism of rings and its properties, Rings of Polynomials etc.	**8 Hours**
Unit-5:	Vector Space, properties and theorem of vector space.	**8 Hours**
Text Books:	**1.** "Algebra" by I. N. Hertein, Wiley and Company. **2.** "Modern Algebra" by Shanti Narayan, S.Chand and Company. 3. "Algebra" J. K. Goyal and K. P. Gupta, PragatiPrakashan	
Reference Books:	**1. "**Algebra" by M. Jacobson, Banz, W.H.Erconma New Delhi. **2.** "Abstract Algebra" by D. S. Malic, J. N Mordesas and M. K. Sen, PragatiPrakashan **3.** "Modern Algebra" by Saran and Goyal, Pothishala Publication **4.** "Modern Algebra" by A. R. Vasistha, KrishanaPrakashanMandir. *** Latest editions of all the suggested books are recommended.**	

Evaluation Scheme

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT (05 MARKS)	FILE WORK (10 MARKS)	ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	EXPERIMENT (05 MARKS)	VIVA (10 MARKS)	INTERNAL (50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

Course Code: TMUGE199	**Academic Enhancement Compulsory Course** **B.Sc. Semester-I** **English Communication – 1**	L-2 T-0 P-2 C-3
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the importance of English language and communication in daily life.	
CO2.	Applying the concepts of communication, vocabulary & grammar in spoken English.	
CO3.	Applying etiquette & manners in interpersonal communication.	
CO4.	Developing and making effective presentation.	
CO5.	Developing written communication skills & applying appropriate formats of written communication	
Course Content:		
Unit-1:	Introductory Sessions • Self-Introduction • Building Self Confidence: Identifying strengths and weakness, reasons of Fear of • Failure, strategies to overcome Fear of Failure Importance of English Language in present scenario• (Practice: Self-introduction session)	**10 Hours**
Unit-2:	Basics of Grammar (12 hours) • Parts of Speech • Tense • Subject and Predicate • Vocabulary: Synonym and Antonym (Practice: Conversation Practice)	**10 Hours**
Unit-3:	Basics of Communication • Communication: Process, Types, 7Cs of Communication, Importance & Barrier • Language as a tool of communication • Non-verbal communication: Body Language • Etiquette & Manners • Basic Problem Sounds (Practice :Pronuciation drill and building positive body language)	**10 Hours**
Unit-4:	Application writing 1. Format•& Style of Application Writing 2. Practice of Application writing on common issues.	**10 Hours**
Unit-5:	Value based text reading: Short Story (Non- detailed study) 1. Gift of Magi – O. Henry•	**8 Hours**
Text Books:	1. Singh R.P., An Anthology of Short stories, O.U.P. New Delhi. For undergraduate	
Reference Books:	1. Kumar, Sanjay. &PushpLata. "Communication Skills" New Delhi: Oxford University Press. 2. Carnegie Dale. "How to win Friends and Influence People" New York: Simon & Schuster. 3. Harris, Thomas. A. "I am ok, You are ok" New York: Harper and Row. 4. Goleman, Daniel. "Emotional Intelligence" Bantam Book. 5. Communication skills Second Edition Sanjay Kumar , Pushp Lata Oxford University *** Latest editions of all the suggested books are recommend**	

E- Resources	https://7esl.com/introduce-yourself/ https://7esl.com/introduce-yourself https://www.speexx.com/it/speexx-blog/good-manners/ https://www.mindtools.com/pages/article/Body_Language.htm https://www.slideshare.net/mobile/debaleenadutta2/language-as-a-tool-of-comunication https://youtu.be/unC19VT3LRk https://youtu.be/pozpbLVSs4g https://youtu.be/dclbuEdKXW0 https://edexec.co.uk/the-seven-cs-of-communication http://www.eastoftheweb.com/short-stories/UBooks/GifMag.shtml	

Evaluation Scheme

Internal Evaluation			**External Evaluation**		**Total Marks**
40 Marks			**60 Marks**		
20 Marks (Best 2 out of Three CTs) ***(From Unit- II, IV & V)***	10 Marks (Oral Assignments) ***(From Unit I & III)***	10 Marks (Attendance)	40 Marks (External Written Examination) ***(From Unit II, IV & V)***	20 Marks (External Viva)* ***(From Unit - I & III)***	**100**

*Parameters of External Viva

Content	**Body Language**	**Confidence**	**Question Responsiveness**	**TOTAL**
05 Marks	05 Marks	05 Marks	05 Marks	20 Marks

***Note**:External Viva will be conducted by 2-member committee comprising*
***a)**One Faculty teaching the class*
***b)**One examiner nominated by University Examination cell.*
Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.

B.Sc.-Semester II

S.N	Category	Course Code	Course		Periods			Credit	Evaluation Scheme		
					L	T	P		Internal	External	Total
1	CC-3	BSC205	Inorganic Chemistry		4	0	0	4	40	60	100
2	CC-4	BSC252	Inorganic Chemistry(Lab)		0	0	4	2	50	50	100
3	AECC-3	BSCX201	Environmental Studies		4	0	0	4	40	60	100
4	AECC-4	TMUGE299	English Communication–II		2	0	2	3	40	60	100
PCM GROUP – 2											
5	DSEC - 5	BSC203	Discipline Specific ElectiveCourses	Partial Differential Equations	4	0	0	4	40	60	100
6	DSEC - 6	BSC204		Electricity and Magnetism	4	0	0	4	40	60	100
7	DSEC - 7	BSC251		Electricity and Magnetism (Lab)	0	0	4	2	50	50	100
8	DSEC - 8	BSC255		Skill Mathematics: Algebra And Matrices	0	0	4	2	50	50	100
ZBC GROUP – 2											
9	DSEC - 5	BSC206	Discipline Specific ElectiveCourses	Diversity of Cryptogams Part-II	4	0	0	4	40	60	100
10	DSEC - 6	BSC207		Animal Diversity Part-II	4	0	0	4	40	60	100
11	DSEC - 7	BSC253		Diversity of Cryptogams Part-II(Lab)	0	0	4	2	50	50	100
12	DSEC - 8	BSC254		Animal Diversity Part-II (Lab)	0	0	4	2	50	50	100
Total					**18**	**0**	**14**	**25**	**350**	**450**	**800**

Course Code: BSCX 201	**Academic Enhancement Compulsory Course** **B.Sc. Semester-II** **ENVIRONMENTALSTUDIES**	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Remembering the facts, terms, basic concepts and scopes related toenvironmental studies	
CO2.	Applying the control measures of different types of pollution	
CO3.	Analyzing the effects of global warming	
Course Content:		
Unit-1:	Definition and Scope of environmental studies, multidisciplinary nature of environmental studies, Concept of sustainability & sustainable development. **Ecology andEnvironment**:ConceptofanEcosystem-its structure andfunctions, Energy Flow in an Ecosystem,FoodChain,FoodWeb, Ecological Pyramid& Ecological succession, Study of following ecosystems: Forest Ecosystem, Grass land Ecosystem & Aquatic Ecosystem & Desert Ecosystem.	**10 Hours**
Unit-2:	**Natural Resources:** Renewable & Non-Renewable resources;Landersources and land use change;Land degradation, Soil erosion & desertification. **Deforestation**: Causes & impacts due to mining, Dam building on forest biodiversity & tribal population. **Energy Resources**: Renewable & Non-Renewable resources, Energy scenario & use of alternate energy sources, Case studies. **Biodiversity:** Hot SpotsofBiodiversityinIndiaandWorld,Conservation,ImportanceandFactorsResponsibleforLossofBiodiversity, Biogeographical Classification ofIndia	**12 Hours**
Unit-3:	**Environmental Pollutions:** Types, Causes, Effects & control; Air, Water, soil & noise pollution, Nuclear hazards & human health risks, Solid waste Management; Control measures of urban & industrial wastes, pollution case studies**.**	**10 Hours**
Unit-4:	**Environmental policies & practices: Climate change & Global** Warming (GreenhouseEffect),Ozone Layer -Its Depletion andControl Measures,PhotochemicalSmog,AcidRain Environmental laws: Environment protection Act; air prevention & control of pollution act, Water Prevention & Control of Pollution Act, Wild Life Protection Act, Forest Conservation Acts, International Acts; Montreal & Kyoto Protocols & Convention on biological diversity, Nature reserves, tribal population & Rights & human wild life conflicts in Indian context	**10 Hours**
Unit-5:	**Human Communities & Environment:** Human population growth;impacts on environment, human health & welfare, Resettlement & rehabilitation of projects affected person: A case study, Disaster Management; Earthquake, Floods & Droughts, Cyclones & Landslides, Environmental Movements; Chipko, Silent Valley, Vishnoi's of Rajasthan, Environmental Ethics; Role of Indian & other regions & culture in environmental conservation, Environmental communication &public awareness; Case studies.	**8 Hours**
Text Books:	1. Environmental Chemistry", De, A. K., New AgePublishersPvt.Ltd.	
Reference Books:	**1.** "BiodiversityandConservation",Bryant, P. J., HypertextBook **2.** "Textbook of Environment Studies", Tewari, Khulbe&Tewari,I.K. Publication **3.** "Fundamentals of Ecology",Odem, E. P., W. B. Sannders Co. *** Latest editions of all the suggested books are recommended.**	

Course Code: BSC203	Discipline Specific Elective Courses **B.Sc. Semester-II** **PARTIAL DIFFERENTIAL EQUATIONS**	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the concepts of partial differential equations of first order and second order.	
CO2.	Applying different methods to solve partial differential equation.	
Course Content:		
Unit-1:	Partial differential equation of I order and I degree, Origin of partial differential equation, Lagranges method for P.p +Q.q = R.	**10 Hours**
Unit-2:	Partial differential equation of II order, Linear partial differential equation, its complete integral, particular integral and general solution, general solution of linear partial differential equation with constant coefficients.	**12 Hours**
Unit-3:	Monge's form of solution of form Rr + Ss + Tt = V	**10 Hours**
Unit-4:	Classification of Partial differential Equation	**8 Hours**
Unit-5:	Application of Partial differential Equation	**8 Hours**
Text Books:	1. "Partial differential Equation" by M. D. Raisinghania, S.Chand&Company	
Reference Books:	1. "Partial differential Equation" by I. N. Sneddon, Mc grawHill&Company 2. "Partial Differential With Boundary value Problems" S Singh ,J .P.ChauhanShikahaSahitiyaPrakashan 3. "Partial differential Equation" by P. P. Gupta, G. S. Malik and S. K. Mittal, PragatiPrakshan *** Latest editions of all the suggested books are recommended.**	
E- Resources	https://youtu.be/vZEN4NXhmag https://youtu.be/N9P5i7aJ88c https://youtu.be/vZEN4NXhmag https://youtu.be/b9_0pxy_MOQ https://youtu.be/qenO7wTXo4E	

Course Code: BSC204	Discipline Specific Elective Courses **B.Sc. Semester-II** **ELECTRICITY AND MAGNETISM**	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the concepts of electric circuits, electric field, magnetic field and electromagmatic induction.	
CO2.	Explaining various laws and theorems of electric field, magnetic field and electro magmatic induction.	
Course Content:		
Unit-1:	Electric Circuits AC Circuits: - Complex Reactance and Impedance. Series LCR Circuit: Resonance, Power Dissipation, Quality Factor and Band Width; Parallel LCR Circuit; Network Theorems: Thevenin theorem, Norton theorem, Superposition theorem, Reciprocity theorem, and Maximum Power Transfer theorem	**10 Hours**
Unit-2:	**Electric Field**: Electric Field and Lines. Electric Field E due to a Ring of Charge. Electric Flux. Gauss's law. Gauss's law in Differential form. Applications of Gauss's Law: E due to an Infinite Line of Charge, a Charged Cylindrical Conductor, an Infinite Sheet of Charge and Two Parallel Charged Sheets,	**12 Hours**
Unit-3:	**Dielectric Properties of Matter** **Dielectrics**:- Electric Field in Matter. Dielectric Constant. Parallel Plate Capacitor with a Dielectric. Polarization, Polarization Charges and Polarization Vector. Electric Susceptibility. Gauss's law in Dielectrics. Displacement vector D. Relations between the three Electric Vectors.	**10 Hours**
Unit-4:	Magnetic Field Magnetic Effect of Currents:- Magnetic Field B. Magnetic Force between Current Elements and Definition of B. Magnetic Flux. Biot-Savart's Law,Magnetic Dipole and its Dipole Moment Ampere's Circuital Law Gauss's law of magnetism. Relative Permeability of a Material. Magnetic Susceptibility.B-H Curve and Energy Loss in Hysteresis.	**10 Hours**
Unit-5:	Electromagnetic induction:-Faraday's law (Differential and Integral forms). Lenz's Law. Self and Mutual Induction. Energy stored in a Magnetic Field Ballistic Galvanometer Potential Energy of a Current Loop. Ballistic Galvanometer: Current and Charge sensitivity & Damping.	**10 Hours**
Text Books:	1. Electricity and Magnetism By Edward M. Purcell (McGraw-Hill Education, 1986)	
Reference Books:	1. Electricity and Magnetism. By D C Tayal (Himalaya Publishing House,1988). 2. David J. Griffiths, Introduction to Electrodynamics, 3rd Edn, (Benjamin Cummings,1998). 3. Fundamentals of Electricity and Magnetism By Arthur F. Kip (McGraw-Hill, 1968) 4. Electricity and Magnetism by J.H.Fewkes& John Yarwood. Vol. I (Oxford Univ. Press, 1991). *** Latest editions of all the suggested books are recommended.**	
E-Resources	https://www.youtube.com/watch?v=wbuPlbOBJJ4 https://www.britannica.com/science/electric-field https://www.khanacademy.org/science/physics/magnetic-forces-and-magnetic-fields https://www.youtube.com/watch?v=jm6iMX_4-DI	

Course Code: BSC205	Core Courses **B.Sc. Semester-II** **INORGANIC CHEMISTRY**	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the concepts of Inorganic Chemistry.	
CO2.	Explaining the atomic structures and properties & periodicity of elements.	
CO3.	Applying the periodic property of element to find out their position in periodic table.	
Course Content:		
Unit-1:	**Atomic Structure:**Bohr's theory, its limitations and atomic spectrum of hydrogen atom. Wave mechanics: de Broglie equation, Heisenberg's uncertainty principle and its significance, Schrodinger's wave equation, significance of ψ and ψ2. Quantum numbers and their significance. Shapes of *s, p, d* and *f* orbitals.	**10 Hours**
Unit-2:	Pauli's exclusion principle, Hund's rule of maximum multiplicity, Aufbau'sprinciple and its limitations, Variation of orbital energy with atomic number.	**12 Hours**
Unit-3:	**Classification of Elements based on their electronics structure** The long form of periodic table *s, p, d, f* block elements. Their position in periodic table and general properties related to their electronic structures.	**10 Hours**
Unit-4:	**Periodicity of Elements** Detailed discussion of the following properties of the elements, with reference to *s*&*p*-block. (a) Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table. (b) Atomic radii (Vander Waals) (c) Ionic and crystal radii. (d) Covalent radii (octahedral and tetrahedral) (e) Ionization enthalpy, Successive ionization enthalpies and factors affecting ionization energy. Applications of ionization enthalpy. (g) Electro negativity, Pauling's/ Mullikan's/ Electro negativity scales.	**12 Hours**
Unit-5:	Chemistry of Hydrogen, Hydrogen peroxide including manufacturing and structure, Heavy Hydrogen, Heavy water, ortho and Para Hydrogen. Hardness of water, removal of hardness, estimation of hardness of water.	**08 Hours**
Text Books:	.1. Inorganic Chemistry Gurtu & Khera Pragati Prakashan.	
Reference Books:	1. Basic Inorganic Chemistry, F.A. Cotton, G. Wilkinson. 2. Inorganic Chemistry, WW Porterifield. Addision-Wesley. *** Latest editions of all the suggested books are recommended.**	
E-Resources	https://en.wikipedia.org/wiki/Bohr_model https://en.wikipedia.org/wiki/Aufbau_principle https://www.topperlearning.com/answer/explain-s-p-d-f-block-elements/759j0uff https://en.wikipedia.org/wiki/Ionization_energy https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Modules_and_Websites_%28Inorganic_Chemistry%29/Descriptive_Chemistry/Elements_Organized_by_Block/1_s-Block_Elements/Group__1%3A_The_Alkali_Metals/Z001_Chemistry_of_Hydrogen_%28Z1%29	

Course Code: BSC206	Discipline Specific Elective Courses **B.Sc. Semester-II** **DIVERSITY OF CRYPTOGAMS(BRYOPHYTA, PTERIDOPHYTA AND PALEOBOTANY)**	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the general characters, classification and life cycles of Bryophytes, Pteridophytes and Gymnosperms.	
CO2.	Explaining Paleobotany, types of fossils and geological time scale.	
Course Content:		
Unit-1:	**Bryophyta:** General characteristics, classification and economic importance of Bryophyta, alternation of generation	**10 Hours**
Unit-2:	Structure, reproduction and life cycle of Hepaticopsida- Riccia, Marchantia and Pellia, Anthoceratopsida-Anthoceros, Bryopsida-Sphagnum, Polytrichum.	**10 Hours**
Unit-3:	Pteridophyta : General characteristics, classification and economic importance.Structure, reproduction and life history ofLycopodium, Selaginella, Equisetum, Adiantum and Marsilea.Heterospory and seed habit. Types of Stelar Systems and its Evolution in Pteridophytes.	**10 Hours**
Unit-4:	Elementary Palaeobotany: general account, types of fossils, techniques of fossil study, fossilization theories, methods of fossilization and geological time scale.	**08 Hours**
Unit-5:	Gynosperm:-General characteristics, classification and economic importance.Morphology, anatomy, reproduction and life history of Cycas, Pinus, Ephedra.	**10 Hours**
Text Books:	1. Pandey S.N. & others. 1995, A Text Book of Botany Vol. I, Vikas Publications Dehl	
Reference Books:	1. Pandey S.N. & others. 1995, A Text Book of Botany Vol. I, Vikas Publications Dehli *** Latest editions of all the suggested books are recommended.**	
E-Resources	https://www.youtube.com/watch?v=s8jhJXgC-bk https://www.youtube.com/watch?v=vcYPI6y-Udo https://www.youtube.com/watch?v=GCbVjkreJlQ&t=48s https://www.youtube.com/watch?v=kqceWL9Jskg&t=7s https://www.youtube.com/watch?v=bKQTYdzPZOU https://www.youtube.com/watch?v=bKQTYdzPZOU	

Course Code: BSC207	Discipline Specific Elective Courses **B.Sc. Semester-II** **ANIMAL DIVERSITY: PART-II**	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the general characters and life cycle of higher invertebrates.	
CO4.	Analyzing the structure and function of cell and cell organelles.	
Course Content:		
Unit-1:	**Texonomy:** Classification of Arthropoda, Mollusca & Echinodermata, Mouth parts of Insects, Economic Importance of Insects, Pearl Formation.	**10 Hours**
Unit-2:	**Arthropoda**: Habit, habitat, morphology, physiology, reproduction, development of ***Palaemon***(Prawn).	**10 Hours**
Unit-3:	**Mollusca**: Habit, habitat, morphology, physiology, reproduction, development of ***Pila***(Apple snail).	**10 Hours**
Unit-4:	**Echinodermata**: Habit, habitat, morphology, physiology, reproduction, development of ***Pentacerous***(Sea star).	**8 Hours**
Unit-5:	**CellBiology**: Structure and function of cell, structure and function of cell organelles viz: mitochondria, Golgi bodies, nucleus, ribosome and endoplasmic reticulum.	**10 Hours**
Text Books:	1. Biology of non-chordates: H.C. Nigam. 2. Invertebrate Zoology: E.L. Jordan and P.S. Verma 3. A text book of Zoology Invertebrate: R.L. Kotpal	
Reference Books:	4. Cell Biology P.S. Verma & V K Agarwal, Publisher: S. Chand 5. Cytology, Genetics, Evolution & Ecology**,** P. K. Gupta, RastogiPublications *** Latest editions of all the suggested books are recommended.**	
E-Resources:	https://youtu.be/UOmAiF7P0ng https://youtu.be/RTKx9Q-UZ6I https://en.wikipedia.org/wiki/Pila_(gastropod) https://youtu.be/PXz0TaXcEb4 https://youtu.be/CVs4WLdQDco	

Course Code: BSC251	Discipline Specific Elective Courses **B.Sc. Semester-II** **ELECTRICITY AND MAGNETISM LAB**	L-0 T-0 P-2 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Applying elementary ideas of electricity and magnetism to determine current, resistance and galvanometer sensitivity.	
CO2.	Analyzing the applications and working ofBallistic Galvanometer,electromagnetic induction, network theorem, Hysteresis loop etc.	

Course Content:

LIST OF EXPERIMENTS

Note : Select any ten experiments from the following list

1. Verify network theorem (i) Superposition Theorem (ii) Thevinen Theorem (iii) Norten Theorem.
2. Use multimeter for measuring (a) Resistance (b) AC and DC Voltage (c) DC current.
3. Calibration of ammeter by Potentiometer.
4. Calibration of Voltmeter by Potentiometer.
5. To determine a Low Resistance by Carey Foster's Bridge.
6. To determine resistance of galvanometer by Kelvin's method.
7. To determine the (a) Charge Sensitivity and (b) Current Sensitivity of a B.G.
8. To plot graph showing the variation of magnetic field with diastance along the axis of circular coil.
9. To determine internal resistance of a leclanche cell by Mance's method using post office Box.
10. To determine Self Inductance of a Coil by Rayleigh's Method.
11. Conversion of Galvanometer in ammeter of given range.
12. To verify Ohm's law in electricity.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT (05 MARKS)	FILE WORK (10 MARKS)	ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	EXPERIMENT (05 MARKS)	VIVA (10 MARKS)	INTERNAL (50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

Course Code: BSC252	Core Course **B.Sc. Semester-II** **INORGANIC CHEMISTRY LAB**	L-0 T-0 P-2 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Analyze the concentration of oxidizing agents in water samples in ecological studies	
CO2.	Apply the process of aromatic nitration in industrial chemistry.	

Course Content:

LIST OF EXPERIMENTS

1. Estimation of Cu (II) and $K_2Cr_2O_7$ Using sodium thiosulphate solution (Iodimetrically).
2. Estimation of available chlorine in bleaching powder iodometrically.
3. Preparation of Aluminium Potassium sulphate$KAl(SO4)_2.12H_2O$ (Potash alum) or Chrome alum.
4. Acetylation of one of the following compounds: amines (aniline, o-,m- ,p- toluidines) and phenols (β-naphthol, salicylic acid)
5. Benzolyation of one of the following compounds: amines (aniline, o-,m-,p- toluidines) and phenols (β-naphthol, resorcinol) by Schotten- Baumann reaction

6. Nitration of one the following compounds: nitrobenzene, chlorobenzene, bromobenzene

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT (05 MARKS)	FILE WORK (10 MARKS)	ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	EXPERIMENT (05 MARKS)	VIVA (10 MARKS)	INTERNAL (50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

Course Code: BSC253	Discipline Specific Elective Courses **B.Sc. Semester-II** **DIVERSITY OF CRYPTOGAMS(BRYOPHYTA, PTERIDOPHYTA AND PALEOBOTANY)LAB**	L-0 T-0 P-2 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Demonstrate the general characters, morphological and anatomical features of pteridophytes through specimens and slides.	
CO2.	Analyzing the evolution of bryophytes, pteridophytes and gymnosperms on earth.	

Course Content:

LIST OF EXPERIMENTS

1. Study of External morphology and microscopic preparations of following bryophytes :Riccia, Marchantia, Anthoceros, Sphagnum and Polytrichum.
2. Microscopic temporary, double stained preparations and study of stem/cone/sporocarp of Lycopodium, Selaginella, Equisetum, Adiantum and Marsilea.
3. Study of External morphology and microscopic preparations of following gymnosperm: Cycas. Pinus and Ephedra.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT (05 MARKS)	FILE WORK (10 MARKS)	ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	EXPERIMENT (05 MARKS)	VIVA (10 MARKS)	INTERNAL (50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

Course Code: BSC254	Discipline Specific Elective Courses **B.Sc. Semester-II** **ANIMAL DIVERSITY PART-II LAB**	L-0 T-0 P-2 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Explain the general characters, morphological and anatomical features of higher invertebrates.	
CO2.	Applying knowledge of Mitosis and Meiosis by preparation of slides.	
CO3.	Analyzing the structure of Cell, Cell division and chromosome with slides.	

Course Content:

LIST OF EXPERIMENTS

Observation of the following slides / spotters / models

Arthropoda: *Palaemon, Lepas, Crab, Lobester, Squilla, Balanus, Apis, Lepisma, Apis, Limulus,* Scolopendra, Peripleneta.

Mollusca: Lamellidense, Pila,Chiton,Teredo,Doris,Aplysia,Detalium,Nautilus,Sepia.

Echinodermata: Pentacerous,Echinis,Ophiothrix,Holothuria,Antidon.

Slides:
Mouth parts of Anopheles (male and female), Culex (male and female), Cyclops, Dephnia, Zoea larva.
Cell structure, Cell division,chromosome.

Activity:
Preparation of onion root tip for the stages of mitosis.

Rexene Charts

1. Prawn nervous system.
2. Prawn digestive system.
3. *Pila* nervous system.
4. *Unio* nervous system.
5. Starfish water vascular system.
6. Anatomy of *Pheritima*.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT (05 MARKS)	FILE WORK (10 MARKS)	ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	EXPERIMENT (05 MARKS)	VIVA (10 MARKS)	INTERNAL (50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

<table>
<tr><td><u>Course Code:</u>
BSC255</td><td colspan="2">Discipline Specific Elective Courses
B.Sc. Semester-II
MATHEMATICAL SKILL: ALGEBRA AND MATRICES</td><td>L-0
T-0
P-4
C-2</td></tr>
<tr><td>Course Outcomes:</td><td colspan="3">At the end of this course, the students will be-</td></tr>
<tr><td>CO1.</td><td colspan="3">Understanding the concepts of algebra and matrices.</td></tr>
<tr><td>CO2.</td><td colspan="3">Applying the fundamental theorems of algebra such as Cayley’s theorem and Lagrange’s theorem.</td></tr>
<tr><td>CO3.</td><td colspan="3">Analyzing vector space, properties of vector space and Eigen values and Eigen vectors.</td></tr>
<tr><td colspan="4">Course Content:</td></tr>
<tr><td>Unit-1:</td><td>Matrices and determinants, Elementary row and column transformation, Linear transformations, Rank of matrix.</td><td>08 Hours</td></tr>
<tr><td>Unit-2:</td><td>Consistency of linear system of equations, Linear dependence and independence, Hermitian and skew Hermitian matrices, general form of matrices.</td><td>10 Hours</td></tr>
<tr><td>Unit-3:</td><td>Inverse of matrix by elementary operations, Solutions of simultaneous equations, Characteristic equation, Caley-Hamilton theorem (without proof), Eigen values and Eigen vectors, Diagonalization.</td><td>12 Hours</td></tr>
<tr><td>Unit-4:</td><td>Sets, Relations, Functions, Binary operations, permutation, Groups and subgroup its elementary properties.</td><td>8 Hours</td></tr>
<tr><td>Unit-5:</td><td>Isomorphism and Homomorphism of Groups, Caley’s theorem, Order of an element, Rings, Fields and integral domains.</td><td>06 Hours</td></tr>
<tr><td><u>Text Books:</u></td><td colspan="3">1. “Matrices” by Dr. J.K.Goel and K.P.Gupta, Students Friends & Co.
2. “Modern Algebra” by A. R. Vashisth, KrishanaPrakshanMandir</td></tr>
<tr><td>Reference Books:</td><td colspan="3">1. “Matrices” by Shanti Narain, S Chand &Co.
2. “Matrices” by N. Saran and J. K. Goyal, PragatiPrakashan
* Latest editions of all the suggested books are recommended.</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="3">Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.
Evaluation scheme:
<table>
<tr><th colspan="4">PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)</th><th colspan="2">ON THE DAY OF EXAM (15 MARKS)</th><th>TOTAL</th></tr>
<tr><th>EXPERIMENT (05 MARKS)</th><th>FILE WORK (10 MARKS)</th><th>ATTENDANCE (10 MARKS)</th><th>VIVA (10 MARKS)</th><th>EXPERIMENT (05 MARKS)</th><th>VIVA (10 MARKS)</th><th>INTERNAL (50 MARKS)</th></tr>
</table>
External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.
<table>
<tr><td>Experiment</td><td>File work</td><td>Viva</td><td>Total</td></tr>
<tr><td>(20 MARKS)</td><td>(10 MARKS)</td><td>(20 MARKS)</td><td>(50 MARKS)</td></tr>
</table></td></tr>
</table>

Course Code: TMUGE299	**Academic Enhancement Compulsory Course** **B.Sc. Semester-II** **English Communication –II**	L-2 T-0 P-2 C-3
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the importance of four skills of English communication: Listening, Speaking, Reading and Writing in daily life.	
CO2.	Applying the concepts of LSRW, vocabulary & grammar in speaking English language effectively.	
CO3.	Analyzing the process, types and barriers to Listening for the effective learning.	
Course Content:		
Unit-1:	**Functional Grammar** Prefix, suffix and One words substitution ·Modals ·Concord	**10 Hours**
Unit-2:	**Listening Skills** ·Difference between listening & hearing, Process and Types of Listening ·Importance and Barriers to listening	**04 Hours**
Unit-3:	**Writing Skills** Official letter and email writing ·Essentials of a paragraph, ·Developing a paragraph: Structure and methods ·Paragraph writing (100-120 words)	**12 Hours**
Unit-4:	**Strategies & Structure of Oral Presentation** ·Purpose, Organizing content, Audience & Locale, Audio-visual aids, Body language ·Voice dynamics: Five P's - Pace, Power, Pronunciation, Pause, and Pitch. ·Modes of speech delivery and 5 W's of presentation	**08 Hours**
Unit-5:	**Value based text reading: Short Essay (Non- detailed study)** How should one Read a book? – Virginia Woolf	**06 Hours**
Text Books:	1. Singh R.P., An Anthology of Short stories, O.U.P. New Delhi.	
Reference Books:	**1.**Nesfield J.C. "*English Grammar Composition & Usage*" Macmillan Publishers **2.**Sood Madan "*The Business letters"* Goodwill Publishing House, New Delhi **3.**Kumar Sanjay &Pushplata "*Communication Skills*" Oxford University Press, New Delhi. *** Latest editions of all the suggested books are recommended.**	
E-Resources:	http://www.indianhills.edu/_myhills/courses/SPC101/documents/lu05_listening.pdf https://www.enchantedlearning.com/grammar/prefixsuffix/index.shtml https://byjus.com/govt-exams/list-one-word-substitution-pdf/ https://youtu.be/Wmq54xqlDvg https://www.mindtools.com/pages/article/Body_Language.htm	

Evaluation Scheme

Internal Evaluation			External Evaluation		Total Marks
40 Marks			60 Marks		
20 Marks (Best 2 out of Three CTs) ***(From Unit- II, IV & V)***	10 Marks (Oral Assignments) ***(From Unit I & III)***	10 Marks (Attendance)	40 Marks (External Written Examination) ***(From Unit II, IV & V)***	20 Marks (External Viva)* ***(From Unit - I & III)***	**100**

*Parameters of External Viva

Content	Body Language	Confidence	Question Responsiveness	TOTAL
05 Marks	05 Marks	05 Marks	05 Marks	20 Marks

Note*:External Viva will be conducted by 2-member committee comprising*
a)*One Faculty teaching the class*
b)*One examiner nominated by University Examination cell.*
Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.

B.Sc.-Semester III

S.N	Category	Course Code	Course		Periods			Credit	Evaluation Scheme		
					L	T	P		Internal	External	Total
1	CC-5	BSC302	Organic Chemistry		4	0	0	4	40	60	100
2	CC-6	BSC352	Organic Chemistry(Lab)		0	0	4	2	50	50	100
3	AECC-5	TMUGE399	English Communication–III		2	0	2	3	40	60	100
4	AECC-6	BSCE303	Physical, Health and Yoga Education		2	0	4	4	40	60	100
PCM GROUP – 3											
5	DSEC – 9	BSC304	Discipline Specific ElectiveCourses	Optics	4	0	0	4	40	60	100
6	DSEC -10	BSC305		Real analysis	4	0	0	4	40	60	100
7	DSEC -11	BSC351		Optics(Lab)	0	0	4	2	50	50	100
8	DSEC -12	BSC355		Mathematical Skills: Integral calculus	0	0	4	2	50	50	100
ZBC GROUP – 3											
9	DSEC – 9	BSC306	Discipline Specific ElectiveCourses	Plant Taxonomy And Embryology	4	0	0	4	40	60	100
10	DSEC -10	BSC307		Chordata	4	0	0	4	40	60	100
11	DSEC -11	BSC353		Plant Taxonomy And Embryology(Lab)	0	0	4	2	50	50	100
12	DSEC -12	BSC354		Chordata (Lab)	0	0	4	2	50	50	100
Total					**16**	**0**	**18**	**25**	**350**	**450**	**800**

Value Added Course (VAC)										
Sr. N.	Course Type	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
13	VAC-1	TMUGS301	Managing Self	2	1	-	0	50	50	100

VAC is an Added course which will be compulsory to pass with 45% marks. However it will not be added towards overall result.

Course Code: BSC302	Core Course B.Sc. Semester-III **ORGANIC CHEMISTRY**	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the concepts of Organic Chemistry.	
CO2.	Applying the concept of Organic Chemistry to find hybridisation and shapes of molecules.	
CO3.	Analysing the various chemical reactions and their mechanism	
Course Content:		
Unit-1:	**Basics of Organic Chemistry**Organic Compounds: Classification, and Nomenclature, Hybridization, Shapes of molecules, Influence of hybridization on bond properties. Electronic Displacements: Inductive, electromeric, resonance and mesomeric effects, hyperconjugation and their applications; Dipole moment. Homolytic and Heterolytic fission with suitable examples. Electrophiles and Nucleophiles; Nucleophlicity and basicity; Types, shape and their relative stability of Carbonations, Carbanions, Free radicals and Carbenes. Introduction to types of organic reactions and their mechanism: Addition, Elimination and Substitution reactions.	**12 Hours**
Unit-2:	**Stereo chemistry:**Fischer Projection, Newmann and Sawhorse Projection formulae and their interconversions; Geometrical isomerism: cis–trans and, syn-anti isomerism E/Z notations with C.I.P rules. Relative and absolute configuration: D/L and R/S designations**.**	**12 Hours**
Unit-3:	**Chemistry of Aliphatic Hydrocarbons Carbon-Carbon sigma bonds**Chemistry of alkanes: Formation of alkanes, Wurtz Reaction, Wurtz- Fittig Reactions, Free radical substitutions: Halogenation - relative reactivity and selectivity.	**10 Hours**
Unit-4:	**Carbon-Carbon pi bonds:** Formation of alkenes and alkynes by elimination reactions, Mechanism of E1, E2, reactions. Saytzeff eliminations. Reactions of alkenes: Electrophilic additions, their mechanisms (Markownikoff/ Anti Markownikoff addition), mechanism of oxymercuration-demercuration, hydroboration- oxidation, ozonolysis, reduction (catalytic and chemical), syn and anti hydroxylation (oxidation).	**10 Hours**
Unit-5:	**Aromatic Hydrocarbons**: Aromaticity: Huckel's rule, aromatic character of arenes, cyclic carbocations/carbanions and heterocyclic compounds with suitable examples. Electrophilic aromatic substitution: halogenation, nitration, sulphonation and Friedel-Craft's alkylation/acylation with their mechanism. Directing effects of the groups**.**	**10 Hours**
Text Books:	1.Morrison, R. N. & Boyd, R. N. *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).	
Reference Books:	1. Finar, I. L. *Organic Chemistry* (*Volume 2: Stereochemistry and the Chemistry of NaturalProducts*), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education). 2. Eliel, E. L. & Wilen, S. H. *Stereochemistry of Organic Compounds*; Wiley: London, 1994. 3. Finar, I. L. *Organic Chemistry* (*Volume 1*), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education). *** Latest editions of all the suggested books are recommended.**	
E-Resources:	https://en.wikipedia.org/wiki/Resonance_%28chemistry%29 https://en.wikipedia.org/wiki/Stereochemistry http://10upon10.com/gen/chemistry/g2chemistry-alkanes-1.html http://www.organicmystery.com/Hydrocarbons/preparation-of-alkenes.php https://en.wikipedia.org/wiki/Aromatic_hydrocarbon	

Course Code: BSCE303	**Academic Enhancement Compulsory Course** **B.Sc. Semester-III** **PHYSICAL, HEALTH AND YOGA EDUCATION**	L-2 T-0 P-4 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Remembering the concept of health, Physical fitness & Yoga Education.	
CO2.	Understanding school health programs, health problems and benefits of physical fitness.	
CO3.	Demonstrating and applying various yogic practices for health and stressmanagement.	
Course Content:		
Unit-1:	**Health** • Introduction, Definition and Meaning of health & health education • Dimensions of health & Determinants of health • Meaning & Importance of balanced diet • School health programme and role of teacher in development of health	**12 Hours**
Unit-2:	**Physical Fitness** • Definition, Meaning and Types of physical fitness • Factors affecting physical fitness • Benefits of Physical Fitness • Importance of physical activities at school level • Principles of physical fitness	**10 Hours**
Unit-3:	**Health Problems in India** • Communicable and Non Communicable Diseases • Obesity, Malnutrition, Explosive Population. • Personal and Environmental Hygiene for schools • Objectives of school health services, Role of health education in schools	**10 Hours**
Unit-4:	**Yoga** • Introduction, Meaning and mis-concepts of Yoga • Introduction to Ashtang Yoga • Classification of Yoga • Importance of Yogasanas, Pranayama and Shudhikriya	**8 Hours**
Unit-5:	**Meditation & Stress Management** • Meditation: Meaning, Nature & Relationship with mind. • Importance of Meditation at school level • Stress: Meaning, Nature, Types and Factors • Role of Meditation in Stress Management.	**10 Hours**
Text Books:	1.Environmental Chemistry", De, A. K., New AgePublishersPvt.Ltd. 2. "Introduction to Environmental EngineeringandScience", Masters, G. M., PrenticeHallIndia Pvt. Ltd. 3. "Fundamentals of Ecology",Odem, E. P., W. B. Sannders Co.	
Reference Books:	1. "BiodiversityandConservation",Bryant, P. J., HypertextBook 2. "Textbook of Environment Studies", Tewari, Khulbe&Tewari,I.K. Publication	

Course Code: BSC304	**Discipline Specific Elective Course** **B.Sc. Semester-III** **OPTICS**	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the concepts of ray and wave optics.	
CO2.	Applying different laws and concepts of understand optic instruments like grating, telescope etc.	
CO3.	Analyzing the applicationsof interference and diffraction andpolarization of light waves.	
Course Content:		
Unit-1:	**Geometrical Optics:** Fermat's Principle, General theory of Image formation: Cardinal points of an optical system, general relationship, thick lens, combination of two thin lenses, nodal slide and Newton's formula, Huygens and Ramsden's eyepieces.	**12 Hours**
Unit-2:	**Physical Optics I:** Interference of Light: The principle of super position, two slide interferences, coherence requirement of the sources, optical path retardation, lateral shift of fringes, Thin films, application for precision measurement for displacements. Interference in thin films, Newton's ring, its application in determination of wave length, refractive index of liquid.	**10 Hours**
Unit-3:	**Physical Optics-II Interference.** Michelson interferometer: Its application for a precision determination of wave length, wave length deference refractive index of thin transparent film and width of spectral lines. Intensity distribution in multiple bean interference, Fabry - Perot interferometer &elaton.Rayleigh refractometer and other applications.	**10 Hours**
Unit-4:	**Physical Optics-III Diffraction**. Diffraction of Light: Fresnel diffraction, intensity due to cylindrical wavefront by Fresnel half period method, zone plate, Diffraction at straight edge.Fraunhofer Diffraction: Diffraction at a slit, Diffraction at N-parallel slits, its intensity distribution, plane diffraction grating, Resolution of images, Rayleigh criterion, resolving power of grating, telescope.	**12 Hours**
Unit-5:	**Physical Optics-IV Polarization**. Double refraction and Optical Rotation: Refraction in uniaxial crystal, its electromagnetic theory, Phase retardation, Quarter waveplate and half waveplate, Rotation of plane of polarization. Fresnel explanation of rotation.	**8 Hours**
Text Books:	Optics by AjoyGhatak, Tata Mc Graw Hill.	
Reference Books:	Engineering Physics by V S Yadav, Tata Mc Graw Hill. *** Latest editions of all the suggested books are recommended.**	
E-Resources:	https://www.youtube.com/watch?v=ShQWwobpW60 https://www.youtube.com/watch?v=fsHkTBG0KJQ https://www.fisica.net/optica/optics_textbook.pdf http://www.physics.ucc.ie/mvaughan/lecturing/PY3101/Optics.pdf	

Course Code: BSC305	**Discipline Specific Elective Course** **B.Sc.-B.Ed.(Int.) Semester-III** **REAL ANALYSIS**	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the basic of real analysis.	
CO2.	Applying various theorems such as Darboux's theorem and fundamental theorem of real analysis.	
CO3.	Analyzing convergence Weirstrass test and M-test.	
Course Content:		
Unit-1:	Limits, left and right hand limit, Theorems on limit, Concept of Continuity and discontinuity, Types of continuity and discontinuity, properties of continuous function, A necessary and sufficient conditions of discontinuity, Darboux's theorem, Mean Value theorems, differentiability.	**10 Hours**
Unit-2:	Sequence of real numbers convergent and non-convergent, Sequence algebra of sequences, Theorem on limit on limit of sequence, Monotone Sequence, Real sequence, Bounded sequence, convergent sequence,least upper bound and greatest lower bound, limit of a sequence, theorem on convergent sequence, Subsequence.	**12 Hours**
Unit-3:	Infinite Series and its convergences, Test for convergences of positive term series, comparison test, Ratio test, Cauchy's Root test, Raab's test, Logarithmic test, Integral test.	**10 Hours**
Unit-4:	Definition existence and properties of Riemann integral of a bounded function, Darboux theorem, Condition of integrability, Integral as limit of sum, Fundamental Theorem of Calculus.	**8 Hours**
Unit-5:	Definition of uniform convergence, Cauchy's criterion for uniform convergence Weirstress test, M-test, Uniform convergence and continuity, Definition of improper integral and convergence of improper integral.	**10 Hours**
Text Books:	1. "A course of Mathematical Analysis" by Shanti Narayan, S.Chand.& Co.	
Reference Books:	1. "Real Analysis" by P. K. Mittal, S.J.Prakashan. 2. "Real Analysis" by P. K. Gupta and Sharada Gupta, S. Chand &Co 3. "Mathematical Analysis" by S. C. Malik, Willy. Eastern Co. 4. "Real Analysis" by M. L. Khanna and L. S. Varshney, Jay Prakash Nath & Co. *** Latest editions of all the suggested books are recommended.**	
E-Resources:	https://youtu.be/SUeHGIUSqc8 https://youtu.be/P_FG-p8C6-s https://youtu.be/eeli_G2Klk0 https://youtu.be/vGwurRO3b-c https://youtu.be/HyWagR_7x-o	

Course Code: BSC306	**Discipline Specific Elective Course** **B.Sc. Semester-III** **PLANT TAXONOMY AND EMBRYOLOGY**	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the concept,aim, scope and classification of plant taxonomy.	
CO2.	Appling the microsporogenesis, megasporogenesis, pollination, fertilization and endosperm development process in plants	
CO3.	Identifying the plants on the basis oftheir habitat, leaf, flower and fruit structures.	
Course Content:		
Unit-1:	**Introduction To Plant Taxonomy** • Fundamental components of taxonomy (identification, nomenclature, classification) • Taxonomic resources: Herbarium- functions& important herbaria, Botanical gardens, Flora, • Botanical Nomenclature- Principles and rules of ICBN (ranks and names; principle of priority, binomial system; type method, author citation, valid-publication)	**12 Hours**
Unit-2:	**Classification** • Types of classification- Artificial, Natural and Phylogenetic. • Bentham & Hooker's system of classification- merits and demerits. • Engler &Prantle's system of classification- merits and demerits	**12 Hours**
Unit-3:	**Systematic Taxonomy-I** Systematic study and economic importance of the following families: Annonaceae, Brassicaceae, Rutaceae, Curcurbitaceae, and Apiaceae	**10 Hours**
Unit-4:	**Systematic Taxonomy-II** Systematic study and economic importance of plants belonging to the following families: Asteraceae, Asclepiadaceae, Lamiaceae, Ephorbiaceae,Arecaceae, and Poaceae.	**8 Hours**
Unit-5:	**Embryology** • Anther structure, microsporogenesis and development of male gametophyte. • Structure and types of ovules; Types of embryo sacs, organization and ultrastructure of mature embryo sac. • Pollination and Fertilization (out lines), Endosperm development and types. • Development of dicot and monocot embryos, Polyembryony.	**10 Hours**
Text Books:	1. Porter, C.L. (1982): Taxonomy of flowering Plants, Eurasia Publishing House, New Delhi.	
Reference Books:	1. Bhojwani, S.S.& Bhatnagar, S.P. (2000) : The Embryology of Angiosperms (4th Edition) Vikas Publishing House(P)Ltd., UBS Publisher's Distributors, New Delhi. 2. Maheswari,P(1963) :Recent Advances in the Embryology of Angiosperms(Ed.,) International Society of Plant Morphologists- University of Delhi. 3. Lawrence, G.H.M. (1953): Taxonomy of Vascular Plants, Oxford & IBH Publishers, New Delhi. *** Latest editions of all the suggested books are recommended.**	
E-Resources:	https://www.youtube.com/watch?v=s1mBkNsJY-4 https://www.youtube.com/watch?v=TTIGRcd_ju0 https://www.youtube.com/watch?v=s_x_f68e27U https://www.youtube.com/watch?v=s_x_f68e27U https://www.youtube.com/watch?v=D9fWcSNMjys	

Course Code: BSC307	**Discipline Specific Elective Course** **B.Sc. Semester-III** **CHORDATA**	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the taxonomy of chordate and their classes	
CO2.	Appling the physiology, structure and life history ofchordata animals like fishes, amphibians, aves, reptiles and mammals.	
CO3.	Analyzing the difference between of Poisonous and non- poisonous snakes.	
Course Content:		
Unit-1:	1- **Urochordat**: Classification and detailed study (Habit, Morphology, anatomy, Physiology,) of Herdmaina 2- **Cephalochordata**: Classification and detailed study of Branchiostoma (Amphioxus)	**10 Hours**
Unit-2:	1. **Pisces**: General characters and classification of Pisces (up to orders with examples) Parental care in fishes. 2. **Amphibia:** General characters and classification of amphibia (up to orders with examples) Parental care in amphibia.	**12 Hours**
Unit-3:	**Reptilia**: General characters and classification of Reptilia (up to orders with examples) Identification of Poisonous and non- poisonous snakes. Biting mechanism of poisonous snakes	**08 Hours**
Unit-4:	**Aves**: General characters and classification of Aves (up to orders with examples) Characters of Archaeopteryx, Flight adaptation in Birds.	**10 Hours**
Unit-5:	**Mammalis**: General characters and classification of Mammalia up to orders. Dentition in Mammals.	**08 Hours**
Text Books:	1- Young, J. Z, The life of Vertebrates III^{ed} edition oxford University press. London.	
Reference Books:	1- A text book of Zoology vertebrate: R.L. Kotpal Rastogi publication 2- vertebrate Zoology, Publisher: S. Chand 3- Vertebrate Zoology: E.L. Jordan and P.S. Verma. *** Latest editions of all the suggested books are recommended.**	
E-Resources	https://www.biologydiscussion.com/animals-2/phylum-chordata/herdamania-structure-locomotion-and-systematic-position/40492 https://youtu.be/k53zKfK-8v4 https://www.biologydiscussion.com/zoology/reptiles/poisonous-snakes-biting-mechanism-effect-and-treatment-reptiles/41077 https://www.biologydiscussion.com/zoology/reptiles/poisonous-snakes-biting-mechanism-effect-and-treatment-reptiles/41077 https://en.wikipedia.org/wiki/Bird	

Course Code: BSC351	**Discipline Specific Elective Courses** **B.Sc. Semester-III** **OPTICS LAB**	L-0 T-0 P-4 C-2
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Applying elementary ideas of interference and diffraction to determine the wavelength by Newton's rings, Fresnel's biprism and polarimeter.	
CO2.	Analyzing the applications and working of Laser, telescope, photocell and Interferometer.	

Course Content:

LIST OF EXPERIMENT

Note: Select any ten experiments from the following list

1. To determine the wavelength of Sodium light by Newton's rings.
2. To determine the wavelength of Sodium light by Fresnel's biprism.
3. To determine the specific rotation of the cane sugar solution with the help of Polarimeter.
4. To determine the resolving power and dispersive power by a prism.
5. To determine the resolving power of grating.
6. To study the elliptically polarised light.
7. To determine slit width using He-Ne laser.
8. To determine the Flashing & Quenching of Neon bulb.
9. To determine the Resolving power of a telescope
10. To determine the wavelength of the sodium lamp by Michelson interferometer.
11. To study characteristics of Photo-cell.
12. Familiar with Schuster's focusing, determination of angle of Prism.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks) Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT	FILE WORK	VIVA	ATTENDANCE	EXPERIMENT	VIVA	INTERNAL
(05 MARKS)	(10 MARKS)	(10 MARKS)	(10 MARKS)	(05 MARKS)	(10 MARKS)	(50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

Latest editions of all the suggested books are recommended.

Course Code: BSC352	Core Course B.Sc. Semester-III ORGANIC CHEMISTRY LAB	L-0 T-0 P-4 C-2
Course Outcomes:	At the end of this course, the students will be-	
CO1.	Analyze the chemical behavior of unknown substance.	
CO2.	Determine the physical and chemical properties of different unknown organic compound by functional group analysis.	

Course Content:

LIST OF EXPERIMENTS

1. Estimation of Fe (II) and oxalic acid solutions using standardized $KMnO_4$ solution.
2. Estimation of Fe (II) solutions with $K_2Cr_2O_7$ using external indicator.
3. Determination of the melting points of organic compounds and unknown organic compounds (electrically heated melting point apparatus).
4. Effect of impurities on the melting point – mixed melting point of two unknown organic compounds.
5. Determination of boiling point of liquid compounds. (Boiling point lower than and more than 100° C).

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks) Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT	FILE WORK	VIVA	ATTENDANCE	EXPERIMENT	VIVA	INTERNAL
(05 MARKS)	(10 MARKS)	(10 MARKS)	(10 MARKS)	(05 MARKS)	(10 MARKS)	(50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

Reference text:

1. Vogel, A.I. *A Textbook of Quantitative Inorganic Analysis*, ELBS

* **Latest editions of all the suggested books are recommended.**

Course Code: BSC353	Discipline Specific Elective Courses B.Sc. Semester-III **PLANT TAXONOMY AND EMBRYOLOGYLAB**	L-0 T-0 P-4 C-2
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Demonstrate the general characters, floral formula, floral diagram and economic importance of different families of flowering plant.	
CO2.	Analyzing the Bentham& Hooker's system of classification in systematic study of local flora.	
CO3.	Developing the structure of anther, plant embryo.	

Course Content:

LIST OF EXPERIMENTS

1. Systematic study of locally available plants belonging to the families prescribed in theory syllabus.
2. Demonstration of herbarium techniques.
3. Structure of pollen grains using whole mounts (*Catharanthus, Hibiscus, Acacia*, Grass).
4. Demonstration of Pollen viability test using *in- vitro* germination (*Catharanthus*).
5. Study of ovule types and developmental stages of embryo sac using permanent slides /Photographs.
6. Structure of endosperm (nuclear and cellular); Developmental stages of dicot and monocotEmbryos using permanent slides /Photographs
7. Isolation and mounting of embryo (using *Symopsis / Senna* / *Crotalaria*)
8. Field visits. Study of local flora and submission of Field Note Book.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks) Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT	FILE WORK	VIVA	ATTENDANCE	EXPERIMENT	VIVA	INTERNAL
(05 MARKS)	(10 MARKS)	(10 MARKS)	(10 MARKS)	(05 MARKS)	(10 MARKS)	(50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

* **Latest editions of all the suggested books are recommended.**

Course Code: BSC354	**Discipline Specific Elective Courses** **B.Sc. Semester-III** **CHORDATALAB**	L-0 T-0 P-4 C-2
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Explaining the characteristic, classification andeconomic importance of chordata	
CO2.	Demonstrating the structure of Balanoglossus sections through probossiss,collar,branchiogenital and hepatic region.	
CO3.	Analysing placoid , cycloid and ctenoid scales via Temporary unstained preparation.	

Course Content:

LIST OF EXPERIMENTS

Study of Specimens

Urochordata– Herdmania,salpa, doliolum

Cephalochordata– Amphioxus

Cyclostomata –petromyzon,myxine

Pisces –Pristis, torpedo, notopterus, exocoetus, clarius, ophiocephalus,catla, rohu,mrigal

Amphibia– Ichthyophis,bufo, salamander, uraeotyphlus, necturus, hyla, rhacophorus

Study of permanent slide

Balanoglossus sections through probossiss,collar,branchiogenital and hepatic region

Amphioxus – oral hood, whole mount section through pharyngea, intestinal & caudal region,

Temporary unstained preparation of placoid, cycloid and ctenoid scales

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks) Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT	FILE WORK	VIVA	ATTENDANCE	EXPERIMENT	VIVA	INTERNAL
(05 MARKS)	(10 MARKS)	(10 MARKS)	(10 MARKS)	(05 MARKS)	(10 MARKS)	(50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

* **Latest editions of all the suggested books are recommended.**

Definite integration (Miscellaneous Examples), integration as the limit of sum, Reduction Formula.

Course Code: BSC355	**Discipline Specific Elective Courses** **B.Sc.-B.Ed.(Int.) Semester-III** **MATHEMATICAL SKILL: INTEGRAL CALCULUS**	L-0 T-0 P-4 C-2
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the concepts of integral calculus, definite and multiple integration and reduction formula.	
CO2.	Applying the beta and gamma function and its application.	
CO3.	Analyzing first order differential equation and miscellaneous differential equation.	
Course Content:		
UNIT-I	Definite integration (Miscellaneous Examples), integration as the limit of sum, Reduction Formula.	
Unit II	Multiple integration, Beta and gamma functions and applications, length of curves, Areas bounded by the curves.	
Unit III	Drichlet's integral, Volume and surfaces of revolutions.	
Unit IV	Differential equation of first order and first degree, Differential equation of first order but not of first degree. Miscellaneous differential equations.	
Unit V	Linear differential equation of second order with constant coefficient, Linear differential equation of other types.	
Text Books:	1. "Integral Calculus" by Gorakh Prasad, Pothishala Pvt. Ltd. 2. "Integral Calculus" by M. Ray, Shiv Lal Agarwal & Co Agra.	
Reference Books:	1. "Integral Calculus" by Shanti Narayan and P.K Mittal, S.Chand& Company Ltd 2. "Integral Calculus by" Shani Narayan, S.Chand& Company Ltd.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks) Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT	FILE WORK	VIVA	ATTENDANCE	EXPERIMENT	VIVA	INTERNAL
(05 MARKS)	(10 MARKS)	(10 MARKS)	(10 MARKS)	(05 MARKS)	(10 MARKS)	(50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

* **Latest editions of all the suggested books are recommended.**

Course Code: TMUGE399	**Academic Enhancement Compulsory Course** **B.Sc. Semester-III** **English Communication – III**	L-2 T-0 P-2 C-3
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the importance of English language and communication in daily life.	
CO2.	Applying the concepts of communication, vocabulary & grammar in spoken English.	
CO3.	Developing written communication skills & applying appropriate formats of written communication	
Course Content:		
Unit-1:	**English Grammar & Vocabulary** Correction of Common Errors (with recap of English Grammar with its usage in practical context.) Synthesis : Simple , complex and compound sentence Commonly used Idioms & phrases (Progressive learning whole semester)	**14 Hours**
Unit-2:	**Speaking Skills** ·Art of public speaking ·Common coversation ·Extempore ·Power Point Presentation (PPt) Skills**:** Nuances of presenting PPTs	**10 Hours**
Unit-3:	**Comprehension Skills** ·Strategies of Reading comprehension: Four S's ·How to solve a Comprehension (Short unseen passage: 150-200 words)	**06 Hours**
Unit-4:	**Professional Writing** ·Preparing Notice,Agenda& Minutes of the Meeting	**3 Hours**
Unit-5:	**Value based text reading: Short story** ·The Barber's Trade Union – Mulk Raj Anand	**7 Hours**
Text Books:	1. Singh R.P., An Anthology of Short stories, O.U.P. New Delhi. For undergraduate	
Reference Books:	1. Allen, W. *"Living English Structure*" Pearson Education, New Delhi. **2.** Joseph, Dr C.J. & Myall E.G. "*A Comprehensive Grammar of Current English*" Inter UniversityPress, Delhi 3. Communication skills Second Edition Sanjay Kumar , Pushp Lata Oxford University * Latest editions of all the suggested books are recommended. * **Latest editions of all the suggested books are recommended.**	
E-Resources	https://prowritingaid.com/art/335/What-are-simple%2C-compound%2C-and-complex-sentences.aspx https://englishlive.ef.com/blog/language-lab/15-common-english-idioms-and-phrases/amp/ https://www.inc.com/brent-gleeson/20-tips-for-mastering-art-of-public-speaking.html http://jagmohan-spokenenglish.blogspot.com/2012/12/extempore-speaking.html?m=1 https://slite.com/learn/meeting-minutes https://en.wikipedia.org/wiki/Agenda_(meeting) http://sittingbee.com/the-barbers-trade-union-mulk-raj-anand	

Evaluation Scheme

Internal Evaluation			External Evaluation		Total Marks
40 Marks			60 Marks		
20 Marks (Best 2 out of Three CTs) ***(From Unit-II, IV & V)***	10 Marks (Oral Assignments) ***(From Unit I & III)***	10 Marks (Attendance)	40 Marks (External Written Examination) ***(From Unit II, IV & V)***	20 Marks (External Viva)* ***(From Unit - I & III)***	**100**

*Parameters of External Viva

Content	Body Language	Confidence	Question Responsiveness	TOTAL
05 Marks	05 Marks	05 Marks	05 Marks	20 Marks

Note*:External Viva will be conducted by 2-member committee comprising*
a)*One Faculty teaching the class*
b)*One examiner nominated by University Examination cell.*
Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.

Course Code: TMUGS301	**Value Added Course** **B.Sc. Semester-III** **Managing Self**	L-2 T-1 P-0 C-0
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Utilizing effective verbal and non-verbal communication techniques in formal and informal settings	
CO2.	Understanding and analyzing self and devising a strategy for self-growth and development.	
CO3.	Adapting a positive mindset conducive for growth through optimism and constructive thinking.	
CO4.	Utilizing time in the most effective manner and avoiding procrastination.	
CO5.	Making appropriate and responsible decisions through various techniques like SWOT, Simulation and Decision Tree.	
CO6.	Formulating strategies of avoiding time wasters and preparing to-do list to manage priorities and achieve SMART goals.	
Course Content:		
Unit-1:	**Personal Development** Personal growth and improvement in personality Perception Positive attitude, Values and Morals High self motivation and confidence, Grooming	**10 Hours**
Unit-2:	**Professional Development** Goal setting and action planning Effective and assertive communication Decision making Time management Presentation Skills Happiness, risk taking and facing unknown	**08 Hours**
Unit-3:	Resume Building, Occupational Research Group discussion (GD) and Personal Interviews	**12 Hours**
Evaluation Scheme	**Faculty led Continuous Evaluation** • Students will be evaluated on the score of 100 in every course. • Evaluation of soft skill will follow continuous evaluation method. Details are as follows: 1) Total Marks for each semester 100 a) **Internal:** 50 marks for Class Performance and class attendance. b) **External:** 50 marks for External evaluation at the time of external exams (Based on GD and PIs).	
Reference Books:	• Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18th ed., Pearson Education • Tracy, Brian, Time Management (2018), Manjul Publishing House • Hill, Napolean, Think and grow rich (2014), Amazing Reads • Scott, S.J., SMART goals made simple (2014), Createspace Independent Pub • https://www.hloom.com/resumes/creative-templates/ • https://www.mbauniverse.com/group-discussion/topic.php • Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan • Burne, Eric, Games People Play (2010), Penguin UK • https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression	

B.Sc.-Semester IV

S.N	Category	Course Code	Course		Periods			Credit	Evaluation Scheme		
					L	T	P		Internal	External	Total
1	CC-7	BSC402	Organic and Inorganic Chemistry		4	0	0	4	40	60	100
2	CC-8	BSC452	Organic and Inorganic Chemistry(Lab)		0	0	4	2	50	50	100
3	AECC-7	TMUGE499	English Communication–IV		2	0	2	3	40	60	100
4	AECC-8	BSC403	Computer Fundamentals, Internet & MS-Office		3	0	2	4	40	60	100
PCM GROUP – 4											
5	DSEC -13	BSC404	Discipline Specific ElectiveCourses	Oscillations and Wave	4	0	0	4	40	60	100
6	DSEC -14	BSC405		Complex Analysis	4	0	0	4	40	60	100
7	DSEC -15	BSC451		Oscillations and Wave(Lab)	0	0	4	2	50	50	100
8	DSEC -16	BSC455		Mathematical Skills: Ordinary Differential Equations	0	0	4	2	50	50	100
ZBC GROUP – 4											
9	DSEC -13	BSC406	Discipline Specific ElectiveCourses	Plant Physiology and Metabolism	4	0	0	4	40	60	100
10	DSEC -14	BSC407		Evolution and Developmental Biology	4	0	0	4	40	60	100
11	DSEC -15	BSC453		Plant Physiology and Metabolism(Lab)	0	0	4	2	50	50	100
12	DSEC -16	BSC454		Evolution and Developmental Biology (Lab)	0	0	4	2	50	50	100
Total					**17**	**0**	**16**	**25**	**350**	**450**	**800**

Value Added Course (VAC)

Sr.N.	**Value** Course Type	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
13	VAC-2	TMUGS 401	Managing Work and Others	2	1	-	0	50	50	100

VAC is an Added course which will be compulsory to pass with 45% marks. However it will not be added towards overall result.

Course Code: BSC402	**Core Course** **B.Sc. Semester-IV** **ORGANIC AND INORGANIC CHEMISTRY**	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the concepts and theories of chemical bonding and the concept of Organic,Inorganic Chemistry.	
CO2.	Analyzing the p block elements.	
CO3.	Evaluating the different types of Alcohol and amino acids.	
Course Content:		
Unit-1:	**Chemical Bonding:** Valence Bond Theory., Molecular orbital Theory., Construction of Mo. Diagrams for homo nuclear &heleronulear diatomic unbleules (N_2,O_2,CO,no), Types of bond (Ionic covalent, Coordinate, metallic), Concept of Hybridization, Definition Types, Prediction of Hybridization ($BeCl_2$, CH_4, ClF_4, $POCl_3$, NH_4^+, $H_3O^+CO_3^{-2}$, Cl_4^-)	**10 Hours**
Unit-2:	**P-Block Element (I)** Group13- Synthesis & structure of diborane, higher borane (B_4H_{10}) (B_5H_9), Boron nitrogen compounds. ($B_4HN_3H_6$) (BN), Group14- Preparation & Application of silane & Silicones. Group15-Preparation & Reaction of hydrazine and hydroxylamine. Group16-Classification of oxides based on 1- Chemical behaviour 2- Oxygen content. Group17-Inter halogen compounds(Hydro and oxy acids of Chlorine, Structure and comparison of acid strength.) Preparation, properties & Applications of alkyls of Lithium.	**12 Hours**
Unit-3:	Hydrogen Bonding and Vanderwal Forces, Hydrogen bonding and Vanderwals forces **Hydrogen Bonding**- Definition,types, effects of H-bonding on properties of substances, applications brief discussion of various types of vanderwals forces. Metallic Bond, Bond Theory of metallic bond, Semiconductors Types of Applications.	**10 Hours**
Unit-4:	**Alcohols Phenols &Ether:** **Alcohols**: Preparation, Physical Props, Reaction of Alcohol, Industrial sources of ethyl alcohol Proof Spirit, Denatured Spirit, absolute alcohol. **Phenols**: Preparation. cCumene Hydroperoxide method, from dizonium salts, Reaction-Electrophilic Substitution. Nitration, halogenation &salphonation, Reimer-Tiemann Reaction, Gattarmann-Koch Reaction, Houben-Hoesch condensation. **Ether**:Nomenclature, Physical Properties, Laboratory Preparation, Williamsons Synthesis, Diazomethane method, Reactions of ether.	**10 Hours**
Unit-5:	Amino acids, Peptides & proteins Preparation of Amino Acids • Strecker synthesis using Gabriels phthalimide synthesis, Zwitterion, Isoelectric Point & Electrophoresis. • Reactions of Amino acid. • Nin Hydrin test • Overview of primary, secondary & Tertiary &quaterneryst. of protein • Determination of Primary St. of peptides by Edmann degradation of (N Terminal) & (C-Terminal) • Synthesis of simple Peptides (up to dipeptides) By N- Protection (t butyloxycarbonyl&phtholoye), Merrifield Solid phase synthesis.	**12 Hours**
Text Books:	1. Inorganic Chemistry Gurtu & Khera Pragati Prakashan. 2. Inorganic Chemistry Gurtu & Khera Pragati Prakashan.	
Reference Books:	1. Basic Inorganic Chemistry F.A. Cotton, G. Wilkinson. 2. Organic Chemistry Morrison & Boyd Prentice Hall.	

	***Latest editions of all the suggested books are recommended.**
E-Resources:	https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Modules_and_Websites_(Inorganic_Chemistry)/Chemical_Compounds/Introduction_to_Chemical_Bonding https://www.toppr.com/guides/chemistry/the-p-block-elements/introduction-to-p-block-elements/ https://en.wikipedia.org/wiki/Hydrogen_bond https://www.toppr.com/guides/chemistry/alcohols-phenols-and-ethers/introduction-and-classification-of-alcohols-phenols-and-ethers/ https://en.wikipedia.org/wiki/Amino_acid

Course Code: BSC403	**Academic Enhancement Compulsory Course** **B.Sc. Semester-IV** **Computer Fundamentals, Internet & MS-Office**	L-3 T-0 P-2 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understand the fundamental hardware components that make up a computer's hardware and the role of each of these components	
CO2.	Applying the concept of operating system, application program, and what each is used for in a computer.	
CO3.	Accomplish creating basic documents, worksheets, presentations with their properties.	
Course Content:		
Unit-1:	**Introduction and Definition of Computer:** Computer Generation, Characteristics of Computer, Advantages and Limitations of a computer, Classification of computers, Functional components of a computer system (Input, CPU, Storage and Output Unit), Types of memory (Primary and Secondary) Memory Hierarchy. Hardware: a) Input Devices- Keyboard, Mouse, Scanner, Bar Code Reader b) Output Devices – Visual Display Unit (VDU), Printers, Plotters etc. Software: Introduction, types of software with examples, Introduction to languages, Compiler, Interpreter and Assembler. Number System: Decimal, Octal, Binary and Hexadecimal Conversions, BCD, ASCII and EBCDIC Codes.	**12 Hours**
Unit-2:	**MS – DOS:** Getting Started on DOS with Booting the System, Internal Commands: CHDIR(CD),CLS, COPY, DATE, DEL(ERASE), DIR, CHARACTER, EXIT,MKDIR(MD), REM, RENAME(REN), RMDIR(RD), TIME, TYPE, VER, VOL, External Commands: ATTRIB, CHKDSK, COMMAND, DOSKEY, EDIT, FORMAT,HELP, LABEL, MORE, REPLACE, RESTORE, SORT, TREE, UNDELETE, UNFORMAT,XCOPY. **Introduction of Internet:** History of internet, Web Browsers, Searching and Surfing, creating an E-Mail account, sending and receiving E-Mails.	**12 Hours**
Unit-3:	**MS Word:** Starting MS WORD, Creating and formatting a document, changing fonts and point size, Table Creation and operations, Autocorrect, Auto text, spell Check, Word Art, inserting objects, Page setup, Page Preview, Printing a document, Mail Merge.	**10 Hours**
Unit-4:	**MS Excel:** Starting Excel, Work sheet, cell inserting Data into Rows/ Columns, Alignment, Text wrapping,Sorting data, Auto Sum, Use of functions, Cell Referencing form,generating graphs, Worksheet data and charts with WORD, Creating Hyperlink to a WORD document, Page set up, Print Preview, Printing Worksheets.	**10 Hours**
Unit-5:	MS Power Point: Starting MS–Power Point, creating a presentation using auto content Wizard, Blank Presentation, creating, saving and printing a presentation, adding a slide to presentation, navigating through a presentation, slide sorter, slide show, editing slides, Using Clipart, Word art gallery, Adding Transition and Animation effects, setting timings for slide show, preparing note pages, preparing audience handouts, printing presentation documents. MS – Access: creating table and database. pages, preparing audience handouts, printing presentation documents.	**10 Hours**
Text Books:	1. Sinha P.K., Computer Fundamentals, BPB Publishing.	
Reference Books:	1. Peter Norton_s, Introductions to Computers, Tata McGraw Hill. 2. Price Michael, Office in Easy Steps, TMH Publication. ***Latest editions of all the suggested books are recommended.**	
E-Resources:	https://www.youtube.com/watch?v=-AP1nNK3bRs&list=PLWPirh4EWFpF_2T13UeEgZWZHc8nHBuXp. https://www.youtube.com/watch?v=ME_F9yypzsw https://www.youtube.com/watch?v=Ko-RvwM2ADw&list=PL7WYUFDtCahBmV4m67WthsiIBbsuEhY3K https://www.youtube.com/watch?v=ZDnl-0xPuQs&list=PL5BEE99D00E1503DA	

Course Code: BSC404	Discipline Specific Elective Courses B.Sc. Semester-IV **OSCILLATIONS AND WAVE**	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the concepts and idea of geometrical oscillations including the wave motion.	
CO2.	Applying the properties of simple harmonic motion.	
CO3.	Analyzing the applications of SHM like pendulum & Mass spring System.	
Course Content:		
Unit-1:	**Oscillations SHM:** Simple Harmonic Oscillations. Differential Equation of SHM and its Solution. Amplitude, Frequency, Time Period and Phase. Velocity and Acceleration. Kinetic, Potential and Total Energy and their Time Average Values. Reference Circle. Rotating Vector Representation of SHM.	**10 Hours**
Unit-2:	**Free Oscillations of Systems with One Degree of Freedom:** (1) Mass-Spring system, (2) Simple Pendulum, (3) Torsional Pendulum, (4) Oscillations in a U-Tube, (5) Compound pendulum: Centres of Percussion and Oscillation	**12 Hours**
Unit-3:	**Superposition of Two Collinear Harmonic Oscillations :-** Linearity and Superposition Principle. (1) Oscillations having Equal Frequencies and (2) Oscillations having Different Frequencies. Superposition of Two Mutually Perpendicular Simple Harmonic Motions with Frequency Ratios 1:1 and 1:2.	**10 Hours**
Unit-4:	**System with Two Degrees of Freedom :** Free Oscillations. Damped Oscillations, Forced oscillation, Transient and Steady States, Amplitude, Phase, Resonance,Power Dissipation and Quality Factor. Coupled Oscillators. Normal Coordinates and Normal Modes.	**8 Hours**
Unit-5:	**Wave Motion:** Longitudinal and Transverse Wave Equation. Particle and Wave Velocities. Velocity of Transverse Vibrations of Stretched Strings. Velocity of Longitudinal Waves in a Fluid in a Pipe. Newton's Formula for Velocity of Sound. Laplace's Correction.	**10 Hours**
Text Books:	1- Vibrations and Waves by A. P. French.(CBS Pub. & Dist., 1987)	
Reference Books:	1- An Introduction to Mechanics by Daniel Kleppner, Robert J. Kolenkow (McGraw-Hill, 1973). 2- Waves: BERKELEY PHYSICS COURSE (SIE) by Franks Crawford (Tata McGraw-Hill, 2007). 2- .The Physics of Waves and Oscillations by N.K. Bajaj (Tata McGraw-Hill, 1988) 3- Fundamentals of Waves & Oscillations By K. Uno Ingard (Cambridge University Press, 1988) . *** Latest editions of all the suggested books are recommended.**	
E-Resources:	https://www.augusta.k12.va.us/cms/lib01/VA01000173/Centricity/Domain/396/Simple_Harmonic_Motion_(SHM).pdf http://hyperphysics.phy-astr.gsu.edu/hbase/oscda.html https://www.youtube.com/watch?v=BX4QPdP7fT8 https://www.youtube.com/watch?v=BX4QPdP7fT8	

Course Code: BSC405	**Discipline Specific Elective Courses** **B.Sc. Semester-IV** **COMPLEX ANALYSIS**	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the concepts of complex analysis, analytic function and complex integration.	
CO2.	Applying the taylor's theorem, Laurent's theorem and Liouville's theorem.	
CO3.	Analyzing zero's and singularity of a complex function.	
Course Content:		
Unit-1:	Analytic functions, conjugate function, Harmonic function, N.S.C. for Cauchy Remann equations, construct conjugate analytic functions.	**10 Hours**
Unit-2:	Complex Integration, Complex line integral, Cauchy integral function, Poisson integral, Lioville's theorem taylor theorem, Lorentz theorem.	**12 Hours**
Unit-3:	Zero's & Singularity, Zero's of a function, singular point, poles and different types of singularities, limiting point of zero's and poles, Weirstress theorem	**10 Hours**
Unit-4:	The Calculus of Residue, Residue of a pole at infinity Residue theorem Integration around $\int_{-\infty}^{\infty} f(z)\,dz$ unit circle, evaluation of integral .	**10 Hours**
Unit-5:	Conformal mappings, transformation w = z2, w = z1/2 , z = c sin w	**10 Hours**
Text Books:	1. "Complex Variable" by T Pati, Pothishala Pvt Ltd	
Reference Books:	1. "Complex Variable" by L. V. Alfors, Mc-GrawHill&Co, 2. "Complex Variable" by R. K. Gupta, R. V. Churchiland J. W. Browin, Mc-GrawHill&Co, 3. Complex Variable by Shanti Narayan, S.Chand&Company 4. "Complex Variable" by J. K. Goyal and K. P. Gupta, Pragati Prakashan 5. "Complex Variable" by J. C. Chaturvedi and S.S. Seth, Student Friends & Co. *** Latest editions of all the suggested books are recommended.**	
E-Resources:	https://youtu.be/t9xW7UaZwZ0 https://youtu.be/OQQqbV32b78 https://youtu.be/ywQVarOaA60 https://youtu.be/ywQVarOaA60 https://youtu.be/xgnQTqMc6A4	

Course Code: BSC406	Discipline Specific Elective Courses B.Sc. Semester-IV **PLANT PHYSIOLOGY AND METABOLISM**	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the concepts,aim and scope of Plant Physiology.	
CO2.	Applying the properties and importance of water in plant metabolism	
CO3.	Demonstrating the basic concept of mineral nutrition, photosynthesis and respiration in plants.	
CO4.	Describing the role of enzymes in plant metabolic activities.	
Course Content:		
Unit-1:	**Plant-water relations** Importance of water, water potential and its components; Transpiration and its significance; Factors affecting transpiration; Root pressure and guttation.	**08 Hours**
Unit-2:	**Mineral nutrition and Translocation** Essential elements, macro and micronutrients; Criteria of essentiality of elements; Role of essential elements, Transport of ions across cell membrane, active and passive transport, carriers, channels and pumps. Translocation in phloem. : Composition of phloem sap, girdling experiment; Pressure flow model; Phloem loading and unloading.	**12 Hours**
Unit-3:	**Photosynthesis and Respiration** Photosynthetic Pigments (Chl a, b, xanthophylls, carotene); Photosystem I and II, reaction center, antenna molecules; Electron transport and mechanism of ATP synthesis; C3, C4 and CAM pathways of carbon fixation. Respiration: **g**lycolysis, anaerobic respiration, TCA cycle; Oxidative phosphorylation.	**10 Hours**
Unit-4:	**Enzymes and Nitrogen metabolism:** Structure and properties; Mechanism of enzyme catalysis and enzyme inhibition. Nitrogen metabolism **:** Biological nitrogen fixation; Nitrate and ammonia assimilation.	**8 Hours**
Unit-5:	**Plant growth regulators and Plant response to light and temperature** Discovery and physiological roles of auxins, gibberellins, cytokinins, ABA, ethylene. Plant response to light and temperature: Photoperiodism (SDP, LDP, Day neutral plants); Phytochrome (discovery and structure), red and far red light responses on photomorphogenesis; Vernalization	**10 Hours**
Text Books:	1. Hopkins, W.G., Huner, N.P., (2009). Introduction to Plant Physiology. John Wiley & Sons, U.S.A. 4th Edition.	
Reference Books:	Taiz, L., Zeiger, E., MØller, I.M. and Murphy, A (2015). Plant Physiology and Development. Sinauer Associates Inc. USA. 6th edition. Bajracharya, D., (1999). Experiments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi. *** Latest editions of all the suggested books are recommended.**	
E-Resources:	https://www.youtube.com/watch?v=ZuUJ9QYAViw https://www.youtube.com/watch?v=0HWkDCRMj-o https://www.youtube.com/watch?v=v-G-d27C1TU https://www.youtube.com/watch?v=9zNMpavpET8 https://www.youtube.com/watch?v=8Ji3g4yp4VE	

Course Code: BSC407	Discipline Specific Elective Courses B.Sc. Semester-IV **EVOLUTION AND DEVELOPMENT BIOLOGY**	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the concept and theories of the evolution and embryology.	
CO2.	Applying the knowledge of process of Gametogenesis in further studies.	
CO3.	Analyzing the process of process of blastulation,gastrulation and placentation.	
Course Content:		
Unit-1:	1. Concept of evolution. evidences of evolution 2. Theory of evolution (including Neo-Lamarckism Darwin – Wallace theory of natural selection, Neo- Darwinism modern synthetic theory.	**10 Hours**
Unit-2:	1- Gametogenesis: spermatogenesis and oogenesis, vitellogenesis egg membrane. 2- Fertilization, Parthenogenesis.	**10 Hours**
Unit-3:	1- Types of animal eggs: structure of eggs 2- Types and patterns of cleavage.	**10 Hours**
Unit-4:	1- Process of blastulaion and gastrulation 2- Development of chick up to the formation of primitive streak and extra embryonic membrane.	**8 Hours**
Unit-5:	1- Development of extra embryonic membrane in mammals 2- Placentation and types of placenta.	**8 Hours**
Text Books:	1. Gilbert, S.F. (2006) , development biology , VIII edition , sinauer associates inc publishers, sunder land, Massachusetts, USA.	
Reference Books:	1. Kalthoff,(2000) Analysis of biological development ,II edition, mc graw hill professional 2. Verma P.S. & V.K. agrawal , chordate embryology, s. Chand & co. 3. Berril& crop development biology. Mc graw hill book company ,m,c,new York 4. Jain P.C. 1998, elements of development biology .vishalpublication , new delhi 5. Balinsky, B.I. (2008) An introduction to embryology, international Thomson computer press. 6. Kalthoff,(2000) Analysis of biological development ,II edition, mc graw hill professional 7. *** Latest editions of all the suggested books are recommended.**	
E-Resources	https://en.wikipedia.org/wiki/Parthenogenesis https://youtu.be/Ed3BI8swtHg https://youtu.be/MSh2L70ipJQ https://en.wikipedia.org/wiki/Extraembryonic_membrane https://youtu.be/-zsS-SRsuxo	

Course Code: BSC451	Discipline Specific Elective Courses B.Sc. Semester-IV **OSCILLATIONS AND WAVELAB**	L-0 T-0 P-4 C-2
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Applying elementary ideas of oscillation and wave motion to determine the gravitational constant, spring constant and AC frequency.	
CO2.	Analyzing the applications and working of Lissajous figures, oscillators and CRO.	

Course Content:

LIST OF EXPERIMENT

Note: Select any ten experiments from the following list

1. To determine acceleration due to gravity (g) by Bar Pendulum.
2. To determine acceleration due to gravity (g) by Kater's Pendulum.
3. To study the Motion of a Spring and calculate (a) Spring Constant (b) acceleration due to gravity and(c)Modulus of Rigidity
4. To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's experiment
5. To determine frequency of A.C. mains by mean of sonometer.
6. To determine the motion of coupled oscillator.
7. To determine frequency of A.C. mains by electric vibrator.
8. To study Lissajous figures.
9. To study AF and RF oscillator.
10. To stuy simple harmonic motion of a body.
11. To determine gravity (g) and velocity of freely falling body using digital technique.
12. To determine the wave form, voltage and frequency of a given signal using C.R.O.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks) Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT	FILE WORK	VIVA	ATTENDANCE	EXPERIMENT	VIVA	INTERNAL
(05 MARKS)	(10 MARKS)	(10 MARKS)	(10 MARKS)	(05 MARKS)	(10 MARKS)	(50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

* **Latest editions of all the suggested books are recommended.**

Course Code: BSC452	Discipline Specific Elective Courses B.Sc. Semester-IV ORGANIC AND INORGANIC CHEMISTRY LAB	L-0 T-0 P-4 C-2
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Applying the knowledge of viscosity measurement in food industry	
CO2.	Analyze the chemical properties of an unknown substance.	
CO3.	Measure surface tension to improve quality of different products.	

Course Content:

LIST OF EXPERIMENTS

Inorganic Chemistry Preparation of inorganic compounds

a) Microcosmic Salt

b) Potassium Permangnate

Oraganic

- Detection of Special Elements
  (N, S, CL, Br, I&P)

Physical

- Determination of Surface tension of liquid
- Determination of Viscosity of liquid

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks) Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT	FILE WORK	VIVA	ATTENDANCE	EXPERIMENT	VIVA	INTERNAL
(05 MARKS)	(10 MARKS)	(10 MARKS)	(10 MARKS)	(05 MARKS)	(10 MARKS)	(50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

* **Latest editions of all the suggested books are recommended.**

Course Code: BSC453	Discipline Specific Elective Courses B.Sc. Semester-IV PLANT PHYSIOLOGY AND METABOLISMLAB	L-0 T-0 P-4 C-2
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Applying the knowledge of preparation of different types of solutions	
CO2.	Analyzing the techniques of chromatography in separation and identification of plant pigments.	
CO3.	Demonstrating the role of external and internal factors in plant growth and development	

Course Content:

LIST OF EXPERIMENTS

1. Determination of osmotic potential of plant cell sap by plasmolytic method.
2. To study the effect of two environmental factors (light and wind) on transpiration by excised twig.
3. Calculation of stomatal index and stomatal frequency of a mesophyte and a xerophyte.
4. Demonstration of Hill reaction.
5. Demonstrate the activity of catalase and study the effect of pH and enzyme concentration.
6. To study the effect of light intensity and bicarbonate concentration on O2 evolution in photosynthesis.
7. Comparison of the rate of respiration in any two parts of a plant.
8. Separation of amino acids by paper chromatography.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks) Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT	FILE WORK	VIVA	ATTENDANCE	EXPERIMENT	VIVA	INTERNAL
(05 MARKS)	(10 MARKS)	(10 MARKS)	(10 MARKS)	(05 MARKS)	(10 MARKS)	(50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

Course Code: BSC454	Discipline Specific Elective Courses B.Sc. Semester-IV EVOLUTION AND DEVELOPMENT BIOLOGYLAB	L-0 T-0 P-4 C-2
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Explaining the morphology of reptiles, birds and Mammals	
CO2.	Demonstrating the role of developmental stage primitive streak in embryonic growth and development of chick and frog	
CO3.	Analyzing the Animal cell structure and function at embryonic level	

Course Content:

LIST OF EXPERIMENTS

1- **Reptiles –** study of chamelon,varanus, pharynosoma, draco, tortoise, cobra, krait, russel's, viper, sea snake testuda,
2- Hemidactytus, uromastix,ophiosaurus, hydrophis, crocodiles
3- **Birds –** study of owl, woodpecker, king fisher, kite, duck, parrot, study of dozen birds of delhi
4- **Mammals –** study of squirrel, mangoose, bat, loris, rabbit,

Development biology

1- **Frog-** study of developmental stage w.m&section through permanent slides cleavage, stage, blastula, gastrula, neurula tadpole
2- **Chick –** study of developmental stage primitive streak, - 21h, 24h, 28h, 33h, 36h, 48h, 72h.
3- Section of testis and ovary (mammalian)
4- Slides of mammalion sperm and ovum

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks) Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT	FILE WORK	VIVA	ATTENDANCE	EXPERIMENT	VIVA	INTERNAL
(05 MARKS)	(10 MARKS)	(10 MARKS)	(10 MARKS)	(05 MARKS)	(10 MARKS)	(50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

Latest editions of all the suggested books are recommended.

Course Code: BSC455	Discipline Specific Elective Courses B.Sc. Semester-IV MATHEMATICAL SKILL:ORDINARY DIFFERENTIAL EQUATIONS	L-0 T-0 P-4 C-2

Course Outcomes:	At the end of this course, the students will be-	
CO1.	Understanding the concepts of linearand ordinary differential equation.	
CO2.	Applying the integration in series.	
CO3.	Analyzing Picard's iteration method and uniqueness and existence theorems.	
Course Content:		
Unit-1:	Linear Equation of second order finding general solution of $\frac{d^2y}{dx_2} + p\frac{dy}{dx}$ + Qy = 0 by removing first derivative; changing Independent variable; Method of Variation of parameters, Normal form and Method of operational operators.	6 Hours
Unit-2:	Ordinary Simultaneous linear differential Equation. Linear differential Equation of the form dx = dy = dz PQ R	12 Hours
Unit-3:	Pfaffian differential forms and equations. Necessary and sufficient condition for Inerrability of Pdx + Qdy + Rdz = 0	10 Hours
Unit-4:	Integration in series	8 Hours
Unit-5:	Picards' Iteration method. Uniqueness and existence theorems.	8 Hours
Text Books:	1. "Differential Equation" by Zill, Cengage Learning. 2. "Differential Equation" by R. K. Gupta and J. N. Sharma, KrishanaPrakashan Mandir 3. "Differential Equation" by Zafar Ahsan, Prentice Hall of India.	
Reference Books:	1. "Differential Equation" by M. D. Raisinghania, S .Chand& co. 2. "A Treatise on diff. Equation" by A. R. Forsyth, Macmillan & company Ltd. *** Latest editions of all the suggested books are recommended.**	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks) Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT	FILE WORK	VIVA	ATTENDANCE	EXPERIMENT	VIVA	INTERNAL
(05 MARKS)	(10 MARKS)	(10 MARKS)	(10 MARKS)	(05 MARKS)	(10 MARKS)	(50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

Course Code: TMUGE499	**Academic Enhancement Compulsory Course** **B.Sc. Semester-IV** **ENGLISH COMMUNICATION – IV**	**L-2** **T-0** **P-2** **C-3**
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the essence of effective listening and speaking, about proposal and report writing and acquiring the adequate knowledge of grammar and vocabulary	
CO2.	Applying the acquired knowledge of grammar and vocabulary in the practice of professional writing and interview.	
CO3.	Analyzing the effect of applied knowledge of grammar and job oriented skills in the presentation	
CO4.	Evaluating the role and relevance of the story reading in the inculcation of professional ethics as well as the value of effective listening and speaking in modifying the job-oriented skills.	
CO5.	Designing impressive proposals and resume by using the skill of professional writing and developing good presentation skills for interviews to maximize their opportunity of job as well as to fulfill corporate expectations	
Course Content:		
Unit – I	Homophones and Homonyms Correction of Common Errors (with recap of English Grammar with its usage in practical context.) Transformation of sentences.	**6 Hours**
Unit – II	**Essence of Effective listening & speaking** Listening short conversation/ recording (TED talks / Speeches by eminent personalities) *Critical Review of these abovementioned* ·Impromptu	**10 Hours**
Unit – III	**Professional Writing** ·Proposal: Significance, Types, Structure & AIDA ·Report Writing: Significance,Types, Structure& Steps towards Report writing	**12 Hours**
Unit – IV	**Job Oriented Skills** ·Cover Letter ·Preparing Rèsumè and Curriculum-Vitae ·Interview: Types of Interview, Tips for preparing for Interview and Mock Interview ·Corporate Expectation & Professional ethics: Skills expected in corporate world	**10 Hours**
Unit – V	**Value based text reading: Short story** A Bookish Topic – R.K. Narayan	**8 Hours**
Text Books:	Singh R.P., An Anthology of Short stories, O.U.P. New Delhi.	
Reference Books:	**1.** Raman Meenakshi & Sharma Sangeeta, "Technical Communication-Principles & Practice" OxfordUniversity Press, New Delhi. **2.** Mohan K. & Sharma R.C., "Business Correspondence of Report Writing",TMH, New Delhi. **3.** Chaudhary, Sarla "Basic Concept of Professional Communication" Dhanpat Rai Publication, NewDelhi. **4.** Kumar Sanjay &Pushplata "Communication Skills" Oxford University Press, New Delhi. **5.** Agrawal, Malti "Professional Communication" KrishanaPrakashan Media (P) Ltd. Meerut.	

E-Resources:	https://youtu.be/JOxSiyAI4-o https://youtu.be/vB4sB_5_bkg https://www.livecareer.com/resources/resumes/how-to/write/curriculum-vitae https://www.slideshare.net/tulikapaul524/report-writingtypes-format-structure-and-relevance https://www.slideshare.net/sahikomal/types-of-interviews-44125845

1. The content will be conveyed through Real life situations, Pair Conversation, Group Talk and Class Discussion.
2. Language Lab software.
3. Sentence transformation on daily activities and conversations.
4. Conversational Practice will be effectively carried out by Face to Face & Via Media(Audio Video Clips)
5. Modern Teaching tools (PPT Presentation & Motivational videos with sub-titles) will be utilized.

Note:

·Class (above 30 students) will be divided in to two groups for effective teaching.

·For effective conversation practice, groups will be changed weekly.

Evaluation Scheme

Internal Evaluation			*External Evaluation*		*Total Marks*
40 Marks			*60 Marks*		
20 Marks (Best 2 out of Three CTs) *(From Unit – I, III,IV& V)*	*10 Marks (Oral Assignments)* *(From Unit –II & IV)*	*10 Marks (Attendance)*	*40 Marks (External Written Examination)* *(From Unit –I, III, IV & V)*	*20 Marks (External Viva)** *(From Unit –II & IV)*	*100*

*Parameters of External Viva

Content	Body Language	Communication skills	Confidence	TOTAL
05 Marks	05 Marks	05 Marks	05 Marks	20 Marks

***Note**:External Viva will be conducted by 2-member committee comprising*

***a)**One Faculty teaching the class*

***b)**One examiner nominated by University Examination cell.*

Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.

Course Code: TMUGS401	**Value Added Course** **B.Sc.- Semester-IV** **Managing Work and Others**	L-2 T-1 P-0 C-0
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Communicating effectively in a variety of public and interpersonal settings.	
CO2.	Applying concepts of change management for growth and development by understanding inertia of change and mastering the Laws of Change.	
CO3.	Analyzing scenarios, synthesizing alternatives and thinking critically to negotiate, resolve conflicts and develop cordial interpersonal relationships.	
CO4.	Functioning in a team and enabling other people to act while encouraging growth and creating mutual respect and trust.	
CO5.	Handling difficult situations with grace, style, and professionalism.	
Course Content:		
Unit-1:	**Intrapersonal Skills** Creativity and Innovation Understanding self and others (Johari window) Stress Management, Managing Change for competitive success Handling feedback and criticism	**08 Hours**
Unit-2:	**Interpersonal Skills** Conflict management Development of cordial interpersonal relations at all levels Negotiation Importance of working in teams in modern organisations Manners, etiquette and net etiquette	**12 Hours**
Unit-3:	**Interview Techniques** Job Seeking, Group discussion (GD), Personal Interview	**10 Hours**
Evaluation Scheme	**Faculty led Continuous Evaluation** • Students will be evaluated on the score of 100 in course. • Evaluation of soft skill will follow continuous evaluation method. Details are as follows: 2) Total Marks 100 a) **Internal:** 50 marks for Class Performance and Class Attendance. b) **External:** 50 marks for External evaluation at the time of external exams (Based on GD and PIs).	
Reference Books:	1. Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18th ed., Pearson Education 2. Burne, Eric, Games People Play (2010), Penguin UK 3. Carnegie, Dale, How to win friends and influence people (2004), RHUK 4. Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan 5. Steinburg, Scott, Nettiquette Essentials (2013), Lulu.com 6. https://www.hloom.com/resumes/creative-templates/ 7. https://www.mbauniverse.com/group-discussion/topic.php 8. https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression *** Latest editions of all the suggested books are recommended.**	

B.Sc.-Semester V

S.N	Category	Course Code	Course		Periods			Credit	Evaluation Scheme		
					L	T	P		Internal	External	Total
1	CC-9	BSC502	Physical and Inorganic Chemistry		4	0	0	4	40	60	100
2	CC-10	BSC552	Physical and Inorganic Chemistry(Lab)		0	0	4	2	50	50	100
3	AECC-9	BSC503	Human Values and Ethics		3	0	0	3	40	60	100
PCM GROUP – 5											
4	DSEC -17	BSC504	Discipline Specific ElectiveCourses	Semiconductor and Solid StateDevices	4	0	0	4	40	60	100
5	DSEC -18	BSC505		Differential Geometry and Tensor	4	0	0	4	40	60	100
6	DSEC -19	BSC551		Semiconductor and Solid StateDevices(Lab)	0	0	4	2	50	50	100
7	DSEC -20	BSC555		Mathematical Skills : Statistics	0	0	4	2	50	50	100
ZBC GROUP – 5											
8	DSEC -17	BSC506	Discipline Specific ElectiveCourses	Economic Botany and Plant Biotechnology	4	0	0	4	40	60	100
9	DSEC -18	BSC507		Cell Biology and Genetics	4	0	0	4	40	60	100
10	DSEC -19	BSC553		Economic Botany and Plant Biotechnology(Lab)	0	0	4	2	50	50	100
11	DSEC -20	BSC554		Cell Biology and Genetics(Lab)	0	0	4	2	50	50	100
Total					**15**	**0**	**12**	**21**	**310**	**390**	**700**

Open Elective Course (OEC)										
Sr.N.	Course Type	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
12	OEC-1	-	MOOC Course	-	-	-	-	-	-	-

* OEC is a MOOC course of eight weeks. This course is mandatory to qualify for the award of degree. The students have to submit the certificate of the MOOC course to the university.

Course Code: BSC502	**Core Course** **B.Sc. Semester-V** **PHYSICAL AND INORGANIC CHEMISTRY**	**L-4** **T-0** **P-0** **C-4**
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the concepts of physical andInorganic chemistry.	
CO2.	Analyzing the different environmental problems.	
CO3.	Evaluating the chemistry of various type of substances.	
Course Content:		
Unit-1:	Specific Conductance, Equivalent Conductance, Kohlrausch's law, Arhenius Theory of electrolyte dissociation &Limitations,Oswald's dilution law, Debye Huckel – onsagar^{S}equationSeq^{n} for Strong. Electrolyte, Definition of Transport Number, Determination by Hittorf's Method.	**10 Hours**
Unit-2:	**Thermodynamics** Types of System, Intensive and Extensive Properties, Zeroth Law & First Law of thermodynamics, Enthalpy & Internal Energy (def), Heat capabilities & their relationship, Second Law of Thermodynamics, Concept of entropy, Entropy Change during Phase transitions, Carnot cycle & its efficiency, Gibbs free energy, Joule thomson effect.	**12 Hours**
Unit-3:	**Ionic Equilibria** Strong, moderate weak electrolytes, Degree of Ionization, Ionization Constant, Ionic product of water, Common ion effect, PH Scale, Salt Hydrolysis, Calculation of hydrolysis Constant. and degree of hydrolysis, Buffer solution, Buffer Action, Solubility Product of Sparingly Soluble salt, application of Solubility product.	**10 Hours**
Unit-4:	**Environmental Chemistry** Importance of environment now-a-days, Natural resources (Renewable Resources), Non renewable resources, Photochemical Smog, Biological Oxygen demand, COD, Pesticides & its Biochemical effects, toxicity of Lead, Mercury, arsenic & cadmium..	**8 Hours**
Unit-5:	**Coordination Chemistry** IUPAC Nomenclature, Werner's Theory, Valence bond Theory, Crystal field theory, Isomerism in coordinate compounds (structural and stereo Isomerism), Importance of co-ordination compounds.	**10 Hours**
Text Books:	. Inorganic Chemistry Gurtu & Khera Pragati Prakashan. Physical Chemistry Gurtu & Khera Pragati Prakashan.	
Reference Books:	**Inorganic Chemistry Vol.3 Dr. S.K. Agarwal, Dr. Keemti Lal, Jai Prakash Nath & Co.** **Physical Chemistry Dr. P. Bhagchandani, Sahitya Bhawan Publication Agra.** *** Latest editions of all the suggested books are recommended.**	
E-Resources:	https://www.toppr.com/content/concept/kohlrausch-law-203329/ https://courses.lumenlearning.com/introchem/chapter/the-three-laws-of-thermodynamics/ https://www.scribd.com/doc/62753335/Types-of-Electrolytes https://www.slideshare.net/chetansingh999/biochemical-oxygen-demand-bod-and-chemical-oxygen-demand-pdf-56488697 https://en.wikipedia.org/wiki/Natural_resource https://www.toppr.com/guides/chemistry/coordination-compounds/introduction-and-werners-theory-of-coordination-compounds/	

Course Code: BSC503	**Academic Enhancement Compulsory Course B.Sc. Semester-V HUMAN VALUES AND ETHICS**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the need and importance of value education.	
CO2.	Applying the different methods of value education.	
CO3.	Analyzing the process of value education.	
CO4.	Developing professional ethics in youths.	
Course Content:		
Unit-1:	**Ethics and Human Values** – Definition – Good Behavior, Conduct and Character; Importance, Respects for Elders, Use and Relevance in Present-day Society. Need of Values Education for a Teacher.	**10 Hours**
Unit-2:	**Indian Constitution and Values –** Fundamental Rights and Duties -Freedom, Equality, Fraternity, Justice; Directive Principles of State Policy; Our National Emblem.	**10Hours**
Unit-3:	**Religious and Cultural Values**–Values embedded in Hinduism, Islam, Christianity, Buddhism, Jainism, Sikhism; Religious Tolerance; Importance of a Family.	**10Hours**
Unit-4:	**Professional Ethics**–Need and Importance – Goals – Dignity of Labour – Ethical Values in Different Professions – Management, Teaching, Civil Services, Politics.	**8Hours**
Unit-5:	**Health and Nutrition**: Food Habits; Exercise; Communicable Diseases; Risk Behaviour - Substance Abuse – Drugs, Alcohol, Tobacco.	**8 Hours**
Text Books:	**1-** ik.Ms;] c`ts'k] ¼2002½] ewY;ijdf'k{kk % orZekuifjn`';] Hkkjrh; vk/kqfudf'k{kk-	
Reference Books:	**1-** Board of Education Fountain. (1999). Peace Education UNICEF. NY: UNICEF. **2-** Eisler, J. (1994). Comprehensive conflict result program (1993-94). New York: N. Y. City. **3-** Learning the Way of Peace: A Teacher's Guide to Peace Education ,UNESCO, New Delhi **2-** ik.Ms;] jke'kDy] ,oafeJk] d:.kk 'kadj] ¼2006½] ewY; f'k{k.k] fouksniqLrdeafnj] vkxjk **3-** feJk] js.kq] ewY;ijdf'k{kk] jktLFkkucksMZf'k{k.k if=dk] vad % 3&4] [k.M 44&45 **4-** yks<+k] egkohjey] ¼1996½] uSfrdf'k{kk ds fofo/k vk;ke] jktLFkkufgUnhxzUFkvdkneh] t;iqj. *** Latest editions of all the suggested books are recommended.**	
E-Resources:	https://en.wikipedia.org/wiki/Value_(ethics) https://en.wikipedia.org/wiki/Values_education **https://en.wikipedia.org/wiki/Fundamental_Rights,_Directive_Principles_and_Fundamental_Duties_of_India** **https://www.culturalindia.net/national-symbols/national-emblem.html** **https://en.wikipedia.org/wiki/Religious_values#:~:text=Religious%20values%20are%20usually%20based,which%20the%20religion%20originated%20from.** **https://simple.wikipedia.org/wiki/Religious_toleration#:~:text=Religious%20toleration%20is%20people%20allowing,This%20has%20become%20rare.** **https://family.lovetoknow.com/about-family-values/why-is-family-important** **http://ethics.iit.edu/teaching/professional-ethics**	

Course Code: BSC504	**Discipline Specific Elective Courses** **B.Sc. Semester-V** **SEMICONDUCTOR AND SOLID STATE DEVICES**	**L-4** **T-0** **P-0** **C-4**
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the concepts of semiconductor and solid state devices.	
CO2.	Appling the mechanism of drift and diffusion of charge carriers.	
CO3.	Analyzing the working of diodes like Varactor diode, photo diode, tunnel diode and solar cells.and Triodes like BJT, FET and MOSFET.	
Course Content:		
Unit-1:	**CRYSTAL AND LATTICE**: Crystal lattice, Packing fraction, Crystal planes and sections, Crystal structure of Ge, Si and GaAs, Band theory of semiconductors, Metals, semiconductors and insulators, Semiconductors crystals, Effective mass concept.	**12 Hours**
Unit-2:	**CARRIER CONCENTRATIONS**: The Fermi level, Quasi-Fermi levels, Electron and Hole concentration at equilibrium, Direct and Indirect recombination of electrons and holes, Hall effect, Steady-state carrier generation.	**12 Hours**
Unit-3:	**TRANSPORT PHENOMENA**: Drift and Diffusion of Carriers, Recombination, Continuity and Diffusion equations, Hynes-Shockley experiment. P-N JUNCTIONS: The Contact Potential, Space Charge at a junction, Steady state condition, Current at a junction, Junction breakdown, Time variation of stored charge, P-N junction capacitance, Graded junction.	**10 Hours**
Unit-4:	**JUNCTION DIODES**: Varactor Diode, Concept of negative resistance Devices, Tunnel Diode, Photo Diode, Solar Cells, Light Emitting Diode, PIN photo detector and Avalanche photodiode, Detector response time.	**8 Hours**
Unit-5:	**BIPOLAR JUNCTION TRANSISTOR (BJT)**: Charge transport and current in a BJT, Current transfer ratio, BJT switching, FET, MOSFET: Principle of Operation and I-V Characteristics of FET, MOSFET, MOS Capacitor, Threshold voltage in MOSFET.	**10 Hours**
Text Books:	1. "Solid State Electronic Devices" – B. G. Streetman, PHI	
Reference Books:	1. "Integrated Electronics" – Millman&Halkies, Tata McGraw. 2. "Physics of Semiconductor Devices" – S. M. Sze. *** Latest editions of all the suggested books are recommended.**	
E-Resources:	https://www.youtube.com/watch?v=RImqF8z91fU https://www.youtube.com/watch?v=0kaEO3WgUfw https://www.electronics-tutorials.ws/diode/diode_1.html http://cbseacademic.nic.in/web_material/Curriculum/Vocational/2018/Basic_Electronics_XI.pdf	

Course Code: BSC505	Discipline Specific Elective Courses **B.Sc. Semester V** **DIFFERENTIAL GEOMETRY AND TENSOR**	**L-4 T-0 P-0 C-4**
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the concepts of differential geometry and tensor.	
CO2	Applying the fundamental form and relation between E, F,G coordinates.	
CO3	Analyzing contra variant and covariant vectors and tensors.	
Course Content:		
Unit-1:	Curves in space, space curves, are lengths, tangent plane lines, osculating plane, normal plane, unit vectors t, n, b, serret fernet formula, curvature and torsion of curves helix, osculating circle and osculation sphere.	**10 Hours**
Unit-2:	Fundamentals of surfaces, definition of surface, class of a surface, regular and singular point, tangent and normal planes, fundamental form and relation between E, F, G, Fundamental magnitude of slandered surface	**12 Hours**
Unit-3:	Envelopes and Developable surfaces, characteristics envelop, edge of regression, developable surface, envelops of a plane etc.	**10 Hours**
Unit-4:	Contra variant & Covariant Vectors & Tensors, Contraction, Tensor algebra, Associated Vectors and Tensors.	**8 Hours**
Unit-5:	Christoffel Symbols, Tensor law of transformation, Covariant derivative of Tensors. Riemann Christoffel Tensor.	**8 Hours**
Text Books:	1."Differential Geometry" by A. R. Vasistha and J. N. Sharma, Kedarnath Ramnath 2. "Tensor Calculus" by G. C. Sharma and S.K. Singh Laxmi Narayan Publisher Agra	
Reference Books:	1. "Differential Geometry" by A.B. Chandra Moule and J. B. Chauhan, Siksha Sahitya Prakashan 2. "Differential Geometry" by P. P. Gupta and G. S. Malik, Pragati Prakashan 3. "Differential Geometry" by S. C. Mittal and D. C. Agarwal, Krishna Pracashan 4. "Differential Geometry" by T. J. Willmore Oxford University Press, New Delhi *** Latest editions of all the suggested books are recommended.**	
E-Resources:	https://youtu.be/l0BKPZNkgoI https://youtu.be/yyfB8ZSYon4 https://youtu.be/4c7lMA-AFlg https://youtu.be/Yzgx8VCiHx8 https://youtu.be/QbdGtUMBdAs https://youtu.be/CC4C7looM7Q	

Course Code: BSC506	Discipline Specific Elective Courses B.Sc. Semester-V ECONOMIC BOTANY AND PLANT BIOTECHNOLOGY	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Describing the origin and diversification of cultivated plants.	
CO2.	Describing botanical name, family, morphology and uses of economically important crop plants.	
CO3.	Appling basic techniques of plant biotechnology and genetic engineering in plant genetic improvement.	
CO4.	Assessing the scope of plant tissue culture techniques for multiplication and conservation of endangered plants species having medicinal, aromatic, agricultural and economic value.	
Course Content:		
Unit-1:	**Origin of Cultivated Plants:**Concept of centres of origin and diversity of cultivated plants, Vaviloviancentres. Cereals: Rice -Origin, morphology, uses Legumes: General account with special reference to Gram and soybean	**10 Hours**
Unit-2:	**Spices and Beverges:**General account with special reference to clove and black pepper (Botanical name, family, part used, morphology and uses) Beverages: Tea (morphology, processing, uses)	**12 Hours**
Unit-3:	**Fat and Fibre yielding plants:**General description with special reference to groundnutFibre Yielding Plants: General description with special reference to Cotton (Botanical name, family, part used, morphology and uses)**.**	**10 Hours**
Unit-4:	**Introduction to Biotechnology** **Plant tissue culture:** Micropropagation; haploid production through androgenesis and gynogenesis; briefaccount of embryo and endosperm culture with their applications	**8 Hours**
Unit-5:	**Recombinant DNA Techniques** Blotting techniques: Northern, Southern and Western Blotting, DNA Fingerprinting; Molecular DNA markers i.e. RAPD, RFLP, SNPs; DNA sequencing, PCR.Hybridoma and monoclonal antibodies, ELISA and Immunodetection.	**10 Hours**
Text Books:	1.Kochhar, S.L. (2011). Economic Botany in the Tropics, MacMillan Publishers India Ltd., New Delhi. 4th edition.	
Reference Books:	1. Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands. 2. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington. *** Latest editions of all the suggested books are recommended.**	
E-Resources:	**https://www.youtube.com/watch?v=6aAKIEiMQpo** **https://www.youtube.com/watch?v=ogwNfiu4nW8** **https://www.youtube.com/watch?v=5K06K4FPZJQ** **https://www.youtube.com/watch?v=CYCaET2hTy0** **https://www.youtube.com/watch?v=jIYDc6fR5iQ**	

Course Code: BSC507	Discipline Specific Elective Courses **B.Sc. Semester-V** **CELL BIOLOGY AND GENETICS**	**L-4 T-0 P-0 C-4**
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the concept of cell biology and genetics.	
CO2.	Appling the Structure and function of cell and other cell organelles.	
CO3.	Analyzing the Mendel's principles on genetics, Structure of chromosomes, DNA and RNA.	
Course Content:		
Unit-1:	Structure and function of cell Ultrastructure of Plasma membrane	**08 Hours**
Unit-2:	Structure and function of cell organelles with special emphasis on mitochondria, golgibodies, nucleus, ribosome and endoplasmicreticulum.	**12 Hours**
Unit-3:	Structure of Chromosomes, Watson & Crick Model of DNA, Differences Between DNA & RNA Cell Division:Mitosisand Meiosis.	**10 Hours**
Unit-4:	Mendels principles of heredity on chromosomal basis, Monohybrid cross, test cross, dihybrid cross, backcros, incomplete dominance, Multiple Alleles, Blood group inheritance.	**8 Hours**
Unit-5:	Linkageand crossingover, interaction of genes. Theory of DNA in heredity. Sex determination, sex differentiation, Sex-linked characters, Genetic diseases and abnormalities, chromosomal aberrations,	**10Hours**
Text Books:	1- De Robertis, E.D.P. and De Robertis, E.M.F. 2006 Cell and molecular Biology 8th edition-lippincottwillians and Wilkins, Philadelphia	
Reference Books:	1- Verma P.S.and V.K. Agarwal, Concept of cell Biology S chand& co. 2- Lodishetal :- molecular cell Biology (scientific American book) 3- Veer balarastogi . Introduction to Cell biology, rastogi publication merrut 4- Gupta P.K. Genetics Rastogi publication merrut . *** Latest editions of all the suggested books are recommended.**	
E-Resources:	https://en.wikipedia.org/wiki/Cell_(biology) https://youtu.be/JzIUeKcaQs https://youtu.be/_vCqQ_qk-3M https://youtu.be/NHdZT_IPoV8 https://youtu.be/Zq7L6lRdsd4	

Course Code: BSC551	Discipline Specific Elective Courses B.Sc. Semester-V SEMICONDUCTOR/ SOLID STATE DEVICES LAB	L-0 T-0 P-4 C-2
Course Outcomes:	At the end of this course, the students will be-	
CO1.	Applying elementary ideas of electronics to determine the characteristics of solar cell, photocell, Zener diode and LED.	
CO2.	Analyzing the applications of Hall Effect, Hystereises loop, logic gates and magnetic susceptibilty.	

Course Content:

LIST OF EXPERIMENTS

Note: Select any ten experiments from the following list

1. To determine Plank's constant using LEDs of at lest 4 different colors filter.
2. To determine Ionization Potential of a gas.
3. To draw forward and reverse bias characteristics of a semiconductor diode.
4. To study the characteristics of Zener Diode voltage regulation.
5. To verify the inverse square law by photo-cell.
6. To study the characteristics of a solar cell.
7. To measure the Resistivity of a Ge Crystal with Temperature by Four-Probe Method (from room temperature to 200^{o} C) and to determine the Band Gap Eg for it.
8. To determine the Hall Coefficient and the Hall angle of a Semiconductor.
9. To study the PE Hysteresis loop of a Ferroelectric Crystal.
10. To measure the Magnetic susceptibility of Solids and Liquids.
11. To determine wavelength of H-alpha emission line of hydrogen atom.
12. Study of logic gates.

Evaluation

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks) Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT	FILE WORK	VIVA	ATTENDANCE	EXPERIMENT	VIVA	INTERNAL
(05 MARKS)	(10 MARKS)	(10 MARKS)	(10 MARKS)	(05 MARKS)	(10 MARKS)	(50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

Course Code: BSC552	Core Courses Practical B.Sc. Semester-V PHYSICAL AND INORGANIC CHEMISTRY LAB	L-0 T-0 P-4 C-2
Course Outcomes:	At the end of this course, the students will be-	
CO1.	Identify and separate preservatives and additives added in food items by chromatography.	
CO2.	Apply the technique of conductometric titrations in drug industry	
CO3.	Analyze a unknown organic compound.	

Course Content:

LIST OF EXPERIMENTS

Inorganic

Sepration of mix of sugar solution. (glucose, Fructose & Sucrose) by paper Chromatography.

Organic

Analysis of an organic compounds through systematic qualitative procedure for functional gr. Identification including the determination of M.P & B.P (Alcohol, phenol, Aldehydes, kelons, carboxlic acid, aromatic pri amines.

Physical

Determination of $Conc^N$ of HClConductometrically using standard NaOH Soln.

Determination of $Conc^N$ of CH_3COOH Conductometrically using standard. NaOH Soln.

Evaluation

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks) Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT	FILE WORK	VIVA	ATTENDANCE	EXPERIMENT	VIVA	INTERNAL
(05 MARKS)	(10 MARKS)	(10 MARKS)	(10 MARKS)	(05 MARKS)	(10 MARKS)	(50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

Course Code: BSC553	Discipline Specific Elective Courses **B.Sc. Semester-V** **ECONOMIC BOTANY AND PLANT BIOTECHNOLOGY LAB**	L-0 T-0 P-4 C-2
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Explaining the knowledge of molecular techniques frequently used in plant biotechnology	
CO2.	Analyzing the plant tissue culture laboratory design and set up, cleaning and sterilization of glassware and preparation of plant tissue culture media.	

Course Content:

LIST OF EXPERIMENTS

1. Study of economically important plants: Wheat, Gram, Soybean, Black pepper, Clove Tea, Cotton, Groundnut through specimens, sections and microchemical tests
2. Familiarization with basic equipments in tissue culture.
3. Study through photographs: Anther culture, somatic embryogenesis, endosperm and embryo culture; micropropagation.
4. Study of molecular techniques: PCR, Blotting techniques, AGE and PAGE.

Evaluation

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks) Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT	FILE WORK	VIVA	ATTENDANCE	EXPERIMENT	VIVA	INTERNAL
(05 MARKS)	(10 MARKS)	(10 MARKS)	(10 MARKS)	(05 MARKS)	(10 MARKS)	(50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

Course Code: BSC554	Discipline Specific Elective Courses **B.Sc. Semester-V** **CELL BIOLOGY AND GENETICS LAB**	L-0 T-0 P-4 C-2
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Explaining the knowledge of Preparation and study of slides for mitosis using squash technique.	
CO2.	Demonstrating the structure of Axial skeleton and Appendicular skeleton of owl.	
CO3.	Analyzing thestructure of cell organelles through electron microscope.	

Course Content:

LIST OF EXPERIMENTS

1- Microscopy – Theoretical knowledge of light and electron microscope.
2- Study of structure of cell organelles through electron microscope.
3- Study of mitosis and meiosis from permanent slides
4- Preparation and study of slides for mitosis using squash technique (onion root tip)
5- Study of hardy – Weinberg law using simulations (seed)
6- Osteology – study of skeleton of fowl
I- Axial skeleton
II- Appendicular skeleton

Evaluation

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks) Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT	FILE WORK	VIVA	ATTENDANCE	EXPERIMENT	VIVA	INTERNAL
(05 MARKS)	(10 MARKS)	(10 MARKS)	(10 MARKS)	(05 MARKS)	(10 MARKS)	(50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

<table>
<tr><td>Course Code: BSC555</td><td>Discipline Specific Elective Courses
B.Sc. Semester-V
MATHEMATICAL SKILL: STATISTICS</td><td>L-0
T-0
P-4
C-2</td></tr>
<tr><td>Course Outcomes:</td><td colspan="2">At the end of this course, the students will be-</td></tr>
<tr><td>CO1.</td><td colspan="2">Understanding the concepts of linear and ordinary differential equation.</td></tr>
<tr><td>CO3.</td><td colspan="2">Applying the integration in series.</td></tr>
<tr><td>CO4.</td><td colspan="2">Analyzing Picard’s iteration method and uniqueness and existence theorems.</td></tr>
<tr><td colspan="3">Course Content:</td></tr>
<tr><td>Unit-1:</td><td>Methods of least squares, and its use for Curve Fitting and fitting of straight lines and parabola, Normal equations, Most plausible lines.</td><td>08 Hours</td></tr>
<tr><td>Unit-2:</td><td>Bivariate distribution, Karl’s Pearson’s coefficient of Correlation, Rank Correlation and Line of Regression, Proof of -1< r < 1.</td><td>10 Hours</td></tr>
<tr><td>Unit-3:</td><td>Consistency and Association of attributes, Theory of Attributes and their combination, class frequency. Association of datas, dependent and independent attributes</td><td>12 Hours</td></tr>
<tr><td>Unit-4:</td><td>Hypothesis Testing:Types of Hypothesis, level of significance, Critical Region, Power of a test, Types of Error, t-test, z-test, Anova.</td><td>10 Hours</td></tr>
<tr><td>Unit-5:</td><td>Properties of $\chi 2$ distribution, calculation of theorticalfreequences, problem of $\chi 2$ distribution at significant level.</td><td>10Hours</td></tr>
<tr><td><u>Text Books:</u></td><td colspan="2">1. "Statistics" by J.K. Goyal and J. N. Sharma, KrishanaPrakashan Mandir
2. "Statistics" by V. K. Kapur and S. C. Gupta, Sultan Chand & Sons</td></tr>
<tr><td><u>Reference Books:</u></td><td colspan="2">1. "Statistics" by J. N. Kapoor and H. C. Saxena, S.Chand& Company
2. "Statistics" by B. D. Gupta and O. P. Gupta, KrishanaPrakashan Mandir
* Latest editions of all the suggested books are recommended.</td></tr>
<tr><td><u>Evaluation Scheme of Practical Examination</u>:</td><td colspan="2">Internal Evaluation (50 marks) Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.
Evaluation scheme:
<table>
<tr><td colspan="4">PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)</td><td colspan="2">ON THE DAY OF EXAM (15 MARKS)</td><td>TOTAL</td></tr>
<tr><td>EXPERIMENT</td><td>FILE WORK</td><td>VIVA</td><td>ATTENDANCE</td><td>EXPERIMENT</td><td>VIVA</td><td>INTERNAL</td></tr>
<tr><td>(05 MARKS)</td><td>(10 MARKS)</td><td>(10 MARKS)</td><td>(10 MARKS)</td><td>(05 MARKS)</td><td>(10 MARKS)</td><td>(50 MARKS)</td></tr>
</table>
External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.
<table>
<tr><td>Experiment</td><td>File work</td><td>Viva</td><td>Total</td></tr>
<tr><td>(20 MARKS)</td><td>(10 MARKS)</td><td>(20 MARKS)</td><td>(50 MARKS)</td></tr>
</table></td></tr>
</table>

B.Sc.-Semester VI

S.N	Category	Course Code	Course		Periods			Credit	Evaluation Scheme		
					L	T	P		Internal	External	Total
1	CC-11	BSC602	Physical and Organic Chemistry		4	0	0	4	40	60	100
2	CC-12	BSC652	Physical and Organic ChemistryLab		0	0	4	2	50	50	100
3	AECC-10	BSC603	Information and Communication Technology		3	0	0	3	40	60	100
PCM GROUP – 6											
4	DSEC -21	BSC604	Discipline Specific ElectiveCourses	Thermal Physics and Statistical Mechanics	4	0	0	4	40	60	100
5	DSEC -22	BSC605		Applied Statistics	4	0	0	4	40	60	100
6	DSEC -23	BSC651		Thermal Physics and Statistical Mechanics Lab	0	0	4	2	50	50	100
7	DSEC -24	BSC655		Mathematical Skills : Operation Research	0	0	4	2	50	50	100
ZBC GROUP – 6											
8	DSEC -21	BSC606	Discipline Specific ElectiveCourses	Environmental Biotechnology	4	0	0	4	40	60	100
9	DSEC -22	BSC607		Mammalian Physiology	4	0	0	4	40	60	100
10	DSEC -23	BSC653		Environmental Biotechnology Lab	0	0	4	2	50	50	100
11	DSEC -24	BSC654		Mammalian PhysiologyLab	0	0	4	2	50	50	100
Total					**15**	**-**	**12**	**21**	**310**	**390**	**700**

Open Elective Course (OEC)											
Sr.N.	Course Type	Course Code	Course Name	Periods			Credit	Evaluation Scheme			
				L	T	P		Internal	External	Total	
12	OEC-2	-	MOOC Course	-	-	-	-	-	-	-	

* OEC is a MOOC course of eight weeks. This course is mandatory to qualify for the award of degree. The students have to submit the certificate of the MOOC course to the university.

Course Code: BSC602	**Core Courses** **B.Sc. Semester-VI** Physical and Organic Chemistry	**L-4** **T-0** **P-0** **C-4**
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the concepts of physical chemistry and Organic Chemistry.	
CO2.	Applying the uses of various organic compounds.	
CO3.	Analyzing the chemistry of various chemical reactions	
CO4.	Evaluating the various colligative properties.	
Course Content:		
Unit-1:	**(a) <u>Halogen Compounds:</u>** • Nomenclature &Classification of alkyl (into Primary, Secondary & Tertiary) aryl, allyl, benzyl halides, • Nucleophilic aliphatic substitution reaction classification into SN^1&SN^2(reaction mechanism with Example) • Wurtz Fitting reaction, ulmann reaction. **(b)<u>Nitro Compounds</u>:** • Preparation of Nitro Alkanes and Nitro Arenes and their chemical reaction. • Mechanism of Electrophilic Substitution Reaction in Nitro Arenes and their reduction in acidic, neutral and alkaline medium.	**10 Hours**
Unit-2:	**<u>Carbonyl Comp.</u>** • Nomenclature of aliphalic& aromatic carbonyl Compounds. • Synthesis of aldehydes from acid Chlorides. • Synthesis of aldehydes Ketones using 1,3 dithianes. • Synthesis of aldehydes from nitriles, & from carboxylic acids. • Physical Properties. • Reactivity of carbonyl group in aldehydes & ketones. • Nucleophillic addition reaction with- (1) $NaHSO_3$ HCN, RMgX, NH_2OH. (Canizaro reaction, Perkin Reaction, Benzoin Condensation)(Knoevenenagel reaction, Clemmensen reaction,)(Wolf kishner reaction,) • Analysis of aldehydes &Keloneswith→Tollen reagent fehling test, Schiff test.	**12 Hours**
Unit-3:	**<u>Carboxylic acid & derivatives.</u>** • Nomenclature & Classification of Carboxlic acids. • Method of preparation by-: a) Hydrolysis of nitriles amides. b) Hydrolysis of esters by acids & bases c) Carbonation of Grignard reagent. **<u>Physical Properties</u>** • Acidity strength of acids with Example of trimethylacetic acid & trichloro acetic acids. • Relative differences in acidities of aromatic & aliphatic acids. • Chemical Properties. a) Salt formation b) Anhydride formation c) Acid Chloride formation d) Amide formation	**10 Hours**

	e) Esterification • Degradation of carboxlicacids byhunsdiecker reaction, decorboxylation by schimadt reaction. Arndt Eistert Synthesis.Hell Volhard Zelinsky reaction .	
Unit-4:	**Dilute Solution** • Colligative properties, Raoult's law Relative Lowering of vapour pressure, Its relation to molecular weight of non Volalite solute, Elevation in B.P & Depression of F.P • Derivation of relation between molecular weight & Elevation in B.P & Depression in F.P. • Osmosis, Osmotic, presure. • Theory of dilute Solution • Abnormal colligative properties. • Vant Hoff factor.	**8 Hours**
Unit-5:	**|Electro Chemistry II** • Single electrode potential sign convention. • Reversible & irreversible cells, Nernst equation. • Reference Electrode. • Standard Hydrogen electrode calomel electrode • Indicatore Electrode • Determination of EMF of All • Potentoimetric Titration. • Spectroscopy: Electromagnetic Radiation, Regions of Spectrum, Basic Features of spectroscopy, statement of Born-oppenheimer approximation, degree of freedom.	**12 Hours**
Text Books:	• Aggarwal, J. C., (2000). Educational & Vocational Guidance and Counseling, Jalandhar :Doaba House.	
Reference Books:	• Bhatnagar, R. P.; Rani. S. (2001); Guidance and Counseling in Education and Psychology. • Gibson, R.L. and Mitchell(2008). Introduction to counseling and Guidance. New Delhi: Bachelor of • Bhatia, K. K., (2002). Principles of Guidance and Counseling, Ludhiana: Vinod Publications. *** Latest editions of all the suggested books are recommended.**	
E-Resources:	https://www.sydney.edu.au/science/chemistry/~george/halides.html https://www.britannica.com/science/organohalogen-compound https://www.sciencedirect.com/topics/chemistry/carbonyl-compound https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Map%3A_Organic_Chemistry_(Smith)/Chapter_20%3A_Introduction_to_Carbonyl_Chemistry%3B_Organometallic_Reagents%3B_Oxidation_and_Reduction/20.02_General_Reactions_of_Carbonyl_Compounds https://www.britannica.com/science/carboxylic-acid https://en.wikipedia.org/wiki/Colligative_properties https://en.wikipedia.org/wiki/Electrochemistry https://byjus.com/jee/electrochemistry/	

Course Code: BSC603	**Core Courses** **B.Sc. Semester-VI** Information and Communication Technology	**L-4** **T-0** **P-0** **C-4**
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the concept, nature and scope of ICT in Education.	
CO2.	Applying ICT in enhancing professional competencies, curriculum enrichmentandEducational administration & management.	
CO3.	Analyzing the changes occurring due to implication of ICT in Education.	
CO4.	Evaluating ICT based support services	
CO5.	Developing the skills to operate computerand gadgets for e-learning.	
Course Content:		
Unit-1:	• ICT meaning, importance and tools of ICT. • Relevance of ICT in education [Radio, Television, Computer]. • Use of Audiovisual Media • Role of ICT in Construction of Knowledge	**10 Hours**
Unit-2:	• Educational Communication**:** Concept, elements, types and barriers. Components of effective Communication in teaching. • Enhancing professional competencies of teachers through the application of ICT such as Micro teaching, programmed instruction, CAI. • Multimedia: Electronic media, print media and mass media.	**12 Hours**
Unit-3:	• Online educational resources: Concept, features and application. • E- mail • Teleconferencing, • Social networking • E learning & Online classes	**10 Hours**
Unit-4:	• Computer- Definition, Main Units. • Characteristics, Classification of Computer. • Computer Hardware-input-output devices. • Functional knowledge of operating computer.	**10 Hours**
Unit-5:	• ICT and curriculum enrichment – child centered curriculum / activity centered curriculum, web based resources. • ICT in educational administration and management:-On-line admission. • E content,e magazine, e journal, edusat, e libraries • Concept of technology in education, Components- Hardware and Software , Difference between software and Hardware. • Select gadgets of ICT and their educational implication-CCTV, O.H.P.& L.C.D Projector	**10 Hours**
Text Books:	• Information and communication - Kishore, Chavan.	
Reference Books:	• National policies on ICT in School Education. • Computer and Communication Technology—Smita Srivastava • Information Technology - Dyne, Nandkishore. *** Latest editions of all the suggested books are recommended.**	
	https://www.youtube.com/watch?v=sEt2HpeoaXI https://www.youtube.com/watch?v=lWldaog5Ix8 https://www.youtube.com/watch?v=jcjaE5ax7So https://www.youtube.com/watch?v=0c6WB9O5y00 https://www.youtube.com/watch?v=rSQS_ouqjfA&t=2s	

Course Code: BSC604	Core Courses B.Sc. Semester-VI THERMAL PHYSICS AND STATISTICAL MECHANICS	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the laws of thermodynamics, entropy and relationship between thermodynamic variable & potential.	
CO2.	Appling the laws of radiation, low temperature physics, superconductor and probability of accessible & inaccessible states.	
CO3.	Analyzing the mechanism of real and ideal gases	
Course Content:		
Unit-1:	**Kinetic Theory of Gases:** Maxwell's speed distribution, Mean free path, flow and Thermal conduction in gases. Real gases, Andrew's curves, Equation of state, Van der Waals equation, JouleThomson effect, Inversion temperature, Thermodynamic equations for a Van der Waals gas.	**10 Hours**
Unit-2:	**Thermodynamics**: Reversible and irreversible processes, Carnot's cycle and Carnot's theorem. Second law of thermodynamics, Thermodynamic scale of temperature. Concept of entropy, Entropy change in reversible and irreversible processes. Entropy and disorder, Principle of increase of entropy, Entropy and unavailable energy, Entropy as a thermodynamic variable, S-T diagram.	**12 Hours**
Unit-3:	**Maxwell's Thermodynamics Equations and Radiation**: Maxwell's thermodynamical equations and their applications, Energy and heat capacity equations Clapeyron equations, The blackbody spectrum, Wien's displacement law, Rayleigh-Jean's law, Planck's quantum theory of radiation.	**10 Hours**
Unit-4:	**Some Systems at Low Temperatures:** Low temperature technique, liquified gases, Superfluidity in He II, Bose-Einstein Condensation in atomic clouds. Superconductivity, Soft and Hard superconductors, Specific Heat and energy band gap for superconductors, Applications and Examples of superconductors. Liquefaction of H_2 and He, Solidification of He. Liquid He II, Adiabatic demagnetization, Low temperature thermometry.	**12 Hours**
Unit-5:	**Statistical Mechanics:**Probability and thermodynamic probability, principle of equal a prior probabilities, probability distribution and its narrowing with increase in number of particles. . The expressions for average properties. Constraints; accessible and inaccessible states, distribution of particles with a given total energy into a discrete set of energy states.	**10 Hours**
Text Books:	**1.** Corbett Jenny- Supporting inclusive Education, Routledge falmer, 2001	
Reference Books:	**1.** Loreman, Tim; deppeler J. and Harrey D. (2005) Inclusive Education- A Practical guide to supporting diversity in the class. London: Ront Ledge Falmer. **2.** UNESCO (1994) The Salmanca Statement and Framework for Action on special needs education Paris, UNESCO **3.** Montgomary,D. (1990) Special need in ordinary school; children withlearning , difficulties, cassel Educational Ltd. London **4.** Hallahan and Kauffman J.M. (1984), Exceptional Children and youth ohio:Columbus Charles E Merril Publishing co. A Bell and Howell co *** Latest editions of all the suggested books are recommended.**	
E-Resources:	https://ncert.nic.in/ncerts/l/keph205.pdf http://www.physics.usyd.edu.au/~helenj/Thermal/PDF/thermal1.pdf https://www.reed.edu/physics/faculty/wheeler/documents/Thermo%20&%20Statistical%20Mechanics/Class%20Notes/Chapter%203.pdf https://physics.info/planck/	

Course Code: BSC605	Core Courses **B.Sc. Semester-VI** **APPLIED STATISTICS**	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the concepts of applied statistics.	
CO2.	Applying the theory of index number.	
CO3.	Analyzing different kind of decision theory, inventory control, CPM & PERT.	
Course Content:		
Unit-1:	**Statistical Quality control**: General theory of control charts, causes of variation in quality, control limits, sub-grouping, summary of out of control criteria, charts for attributes np chart, pchart, c chart, Chart for variables X R and sigma charts.	**10 Hours**
Unit-2:	**Time Series**: Introduction, components of time series, models of time series, measurement of Trend-graphic, semi-average, least square and moving average methods, Measures of seasonal variation –Simple average, Ratio to M. A., Ratio to trend, link relative method.	**12 Hours**
Unit-3:	Hypothesis Testing: Types of Hypothesis, level of significance, Critical Region, Power of a test, Types of Error, t-test, z-test, Anova.	**10 Hours**
Unit-4:	**Index Number:** Its definition, application of index numbers, price quantity and value relatives, link and chain relatives, problems involved in computation of index numbers, use of averages, simple and weighted aggregative and average methods, Laspeyre's Passche's, Marshall Edgeworth and Fisher's index numbers **.**	**8 Hours**
Unit-5:	**Decision Theory:** Different kind of decision theory, inventory control, CPM, PERT.	**08 Hours**
Text Books:	1. "Mathematical Statistics" by S.C. Gupta, S. Chand & co. 2. "Operation Research" by D. S. Hira, S. Chand & co.	
Reference Books:	1. "Operation Research" by Winston, Cengage Learning 2. "Operation Research" by H. A. Taha 3. "Statistics" by J. N. Kapoor and H. C. Saxena, S.Chand& Company. *** Latest editions of all the suggested books are recommended.**	
E-Resources:	https://youtu.be/KW3tboYsjUs https://youtu.be/Mpg1LnqdZS8 https://youtu.be/FPM6it4v8MY https://youtu.be/5T4mYt36iRM https://youtu.be/rppDVn_Nh7M https://youtu.be/WrAf6zdteXI	

Course Code: BSC606	Core Courses B.Sc. Semester-VI ENVIRONMENTAL BIOTECHNOLOGY	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the various global and regional environmental issues.	
CO2.	Remembering bio-techniques for monitoring, cleaning up oftoxic hazardous substances from the environment.	
CO3.	Explain different types of environmental pollutions and their impacts on diverse forms of life.	
CO4.	Describing the scopes of environmental biotechnology in order to protect the environment.	
Course Content:		
Unit-1:	**Introduction and Scope of Environmental Biotechnology** Definition, components and scopes of Environmental Biotechnology, Global environmental problems - global warming,ozone depletion, UV-B, greenhouse effect and acid rain, their impact and approaches for management.Environmental pollution - types of pollution, sources of pollution, measurement of pollution, methods of measurement of pollution,bioaccumulation, bioconcentration, biomagnification.	**10 Hours**
Unit-2:	**Microbiology of waste water treatmentand Xenobiotic compounds** Aerobic process - activated sludge, oxidation ponds, trickling filter, rotating drums, oxidation ditch. Anaerobic process - anaerobic digestion, anaerobic filters, upflow anaerobic sludge blanket reactors. Bioremediation: concept, methods and benefits of bioremediation.Xenobiotic compounds**:**biodegradation of xenobiotics in environment, degradation of pesticides and hydrocarbons.	**12 Hours**
Unit-3:	**Role of immobilized cells/enzymes in treatment of toxic compounds** Bioreactors, bioleaching, biomining, biosensors, biotechniques for air pollution abatement and odour control.	**10 Hours**
Unit-4:	**Role of Environmental Biotechnology in Sustainable Development** Basic concept, goals and importance of sustainable development, renewable and non-renewable energy resources, concept ofwaste and its types, concept of bioenergy and biofuels, Classification of biofuels, biofuels production from organic waste, bioethanol, biodiesel, Biogas, Biofertilisers, Biopesticides,	**10 Hours**
Unit-5:	**Public Participation for Environmental Protection** Environmental movement and people's participation with special references to Gandhamardan, Chilika and Narmada BachaoAndolan, Chipko and Silent valley Movement; Women and Environmental Protection, Role of NGO in bringing environmental awareness and education in the society.	**12 Hours**
Text Books:	• Waste water engineering - treatment, disposal and reuse, Metcalf and Eddy Inc., Tata McGraw Hill, New Delhi.	
Reference Books:	1. Introduction to Biodeterioration, D.Allsopp and K.J. Seal, ELBS / Edward Arnold. 2. Bioremidation, Baaker, KH and Herson D.S., 1994. Mc.GrawHill Inc,NewYork 3. Environmental Chemistry, AK. De, Wiley Eastern Ltd, New Delhi. *** Latest editions of all the suggested books are recommended.**	
E-Resources	https://www.youtube.com/watch?v=EnZYVnzekio https://www.youtube.com/watch?v=Q0BLswO6xhk https://www.youtube.com/watch?v=8CENcknqEXM https://www.youtube.com/watch?v=7V8oFI4GYMY https://www.youtube.com/watch?v=CkmBC1tyOgU	

Course Code: BSC607	Core Courses **B.Sc. Semester-VI** **MAMMALIAN PHYSIOLOGY**	L-4 T-0 P-0 C-4
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the concept of Mammalian Physiology.	
CO2.	Explain the process of physiology of respiration.	
CO3.	Analyzing the blood pressure and Electrocardiogram through the process of physiology of blood circulation.	
CO4.	Analyzing the Structure and function of major endocrine glands.	
Course Content:		
Unit-1:	Nutrition and digestion 1- Histology and function of gastrointestinal tract and its associated glands. 2- Digestion and absorption of proteins, carbohydrates &lipids. 3- Role of hormones in digestion.	**12 Hours**
Unit-2:	Respiration 1- Mechanism and regulation of breathing. 2- Transport of oxygen and carbon dioxide 3- Respiratory disorders and effects of smoking.	**12 Hours**
Unit-3:	Blood and circulation unctions of blood. d group and Rh factor. s regulation rdiogram .	**10 Hours**
Unit-4:	Excretion 1- Structure of urinoferous tubule mechanism of urine formation 2- Role of kidney in osmoregulation, kidney failure and dialysis. **Muscle:** Histology of different types of muscle, structure and mechanism of muscle contraction **Nervous system:** - conduction of nerve impulse, reflex action.	**8 Hours**
Unit-5:	Endocrinology Structure and function of major endocrine glands – (Pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, etc.) **Reproduction**: Male and female sex hormones & menstrual cycle	**10 Hours**
Text Books:	• Human physiology – chatterjee A.G. vol.- I&II	
Reference Books:	1- Guyton , A.C.& hall J.E. (2006). Textbook of medical physiology . XI edition ,hercourtasia PTE Ltd . W.B. saunderscompany . 2.Wood D.W. , 1983, principle of animal physiology 3rd edition 3. Introduction to animal physiology & related biotechnology – H.R.singh 4.Parameswaran ,Anantakrishnan and Ananta subramanyam, 1975, outline of Animal physiology . 5.Tortora G.J. &Grabowski , S (2006). *** Latest editions of all the suggested books are recommended.**	
E-Resources:	https://youtu.be/MhVsoAl7og0 https://youtu.be/B2FRdr4Ptms https://youtu.be/GSxXX5fpW70 https://youtu.be/tOluxtc3Cpw https://youtu.be/BLgwEFkUHH0	

Course Code: BSC651	Core Courses B.Sc. Semester-VI THERMAL PHYSICS AND STATISTICAL MECHANICS LAB	L-0 T-0 P-4 C-2
Course Outcomes:	At the end of this course, the students will be-	
CO1.	Applying various laws of thermodynamics to various processes and real systems.	
CO2.	Analyzing the working of resistance thermometer, Thermocouple and application of radiation.	

Course Content:

LIST OF EXPERIMENTS

Note: Select any ten experiments from the following list

1- To determine J by Callender and Barne's constant flow method.
2- To determine the Coefficient of Thermal Conductivity of Copper by Searle's Method.
3- To determine the Coefficient of Thermal Conductivity of Copper by Angstrom's Method.
4- To determine the Coefficient of Thermal Conductivity of a bad conductor by Lee and Charlton's disc method.
5- To determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer (PRT).
6- To calibrate a Resistance Temperature Device (RTD) to measure temperature in a specified range using Null Method/ Off-Balance Bridge with Galvanometer based measurement.
7- To study the variation of Thermo-Emf of a Thermocouple with Difference of Temperature of its Two Junctions.
8- To Calibrate a Thermocouple to measure Temperature in a Specified Range using Null Method.
9- Measurement of Plank's constant using blackbody radiation.
10- To determine the value of Boltzmann Constant by studying Forward Characteristics of a Diode.
11- To determine the value of Stefan's Constant.

Evaluation

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks) Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT	FILE WORK	VIVA	ATTENDANCE	EXPERIMENT	VIVA	INTERNAL
(05 MARKS)	(10 MARKS)	(10 MARKS)	(10 MARKS)	(05 MARKS)	(10 MARKS)	(50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

Course Code: BSC652	Core Courses B.Sc. Semester-VI ORGANIC CHEMISTRY LAB	L-0 T-0 P-4 C-2
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Apply the knowledge of Ph measurement in pharma, cosmetic industry.	
CO2.	Estimate water of crystallization in different compounds.	
CO3.	Prepare different types of buffer solutions	

Course Content:

LIST OF EXPERIMENTS

Qualitative Inorganic Analysis

Estimation of water of crystallization in mohrs salt by titrating with $KMNO_4$

Estimation of Sodium Carbonate & Sodium hydrogen Carbonate Present mixture.

Organic

Benzoic Acid, Cinnamic Acid, Phenol.

Physical

A)Measurement of ph of different solution like aerated drinks,fruit juices shampoos and soaps using ph meter

B) Preparation of Buffer Solution

1)Sodium acetate acetic acid 2)Ammonium chloride and ammonium hydroxide

Evaluation

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks) Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT	FILE WORK	VIVA	ATTENDANCE	EXPERIMENT	VIVA	INTERNAL
(05 MARKS)	(10 MARKS)	(10 MARKS)	(10 MARKS)	(05 MARKS)	(10 MARKS)	(50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

Course Code: BSC653	Core Courses B.Sc. Semester-VI ENVIRONMENTAL BIOTECHNOLOGYLAB	L-0 T-0 P-4 C-2

Course Outcomes:	At the end of this course, the students will be-
CO1.	Appling the knowledge of collection of water and soil samples for environmental monitoring.
CO2.	Analyzing the basic techniques used for environmental monitoring
CO3.	Demonstrating Isolating microbial strains from air, water, soil samples and the effect of pH and temperature on their growth.

Course Content:

LIST OF EXPERIMENTS

1. Water/Soil analysis - DO, salinity, pH, total hardness, alkalinity, acidity
2. Gravimetric analysis-Total solid, dissolved solid, suspended solid in an effluent
3. Isolation and pure culture of microbial strains from air, water and soil sample
4. Colony counting on nutrient agar media
5. Measurement and optimization of microbial growth and kinetics

Evaluation

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks) Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT	FILE WORK	VIVA	ATTENDANCE	EXPERIMENT	VIVA	INTERNAL
(05 MARKS)	(10 MARKS)	(10 MARKS)	(10 MARKS)	(05 MARKS)	(10 MARKS)	(50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

Course Code: BSC654	Core Courses **B.Sc. Semester-VI** **ORGANIC CHEMISTRY LAB**	L-0 T-0 P-4 C-2
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Explain the basic analytical techniques used for Test for amylase on starch, sugar, proteins and lipids	
CO2.	Applying the knowledge of Histology of mammals via slides.	
CO3.	Analysing the process of Osmosis, Muscle twitch by stimulating it with mechanical, chemical and thermalStimuli, Reflex action and Respiration.	

Course Content:

Experiments to be performed by candidates:-

1- Test for amylase on starch
2- Preparation of haemin crystals
3- Determination of Hb% in blood sample.
4- RBC count by haemocytometer in blood.
5- Test for sugar, proteins and lipids

Experiments for demonstration and comments

1- Osmosis
2- Muscle twitch by stimulating it with mechanical, chemical and thermal stimuli.
3- Reflex action
4- Respiration
5- Recording of blood pressure using a sphygnomanometer

Prepared slides:-Study of Histological slides of mammals –

1- T.S. salivary gland, T.S. pancreas, T.S. liver, T.S. Intesting,
2- T.S. kidney, T.S. lungs, T.S. stomach
3- Pituitary, gland, thyroid gland
4- Medulated and nonmedulated nervefibre
5- Smooth & striated muscle

Evaluation

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks) Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT	FILE WORK	VIVA	ATTENDANCE	EXPERIMENT	VIVA	INTERNAL
(05 MARKS)	(10 MARKS)	(10 MARKS)	(10 MARKS)	(05 MARKS)	(10 MARKS)	(50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

Course Code: BSC655	**Academic Enhancement Compulsory Course** **B.Sc. Semester-VI** **MATHEMATICAL SKILL:ORDINARY DIFFERENTIAL EQUATIONS**	**L-0** **T-0** **P-4** **C-2**
Course Outcomes:	**At the end of this course, the students will be-**	
CO1.	Understanding the concepts of linear andordinary differential equation.	
CO2.	Applying the integration in series.	
CO3.	Analyzing Picard's iteration method and uniqueness and existence theorems.	
Course Content:		
Unit-1:	History and Back ground of subject, Different meaning of O.R. and Phases, characteristic and Models of O.R.	**08 Hours**
Unit-2:	Linear Programming, Mathematical formation of LPP, Graphical solution of LPP, general linear programming problem, simplex methods, duality.	**10 Hours**
Unit-3:	Transportation Problem, Assignment Problem, matrix form of: Transportation Problem. Initial basic physible solution, Optimality and transportation algorithms, balanced and unbalanced transportation problem and assignment problem.	**12 Hours**
Unit-4:	Job sequencing, Replacement model, sequencing method of two machine three machine and n amachine problem, graphic solution, Replacement of item deterioting with time, Replacement of item that fails continuously, and general replacement problem.	**10 Hours**
Unit-5:	Game Theory, two persons zero sum game, sadle point maximin and minimax, game of type 2 · 2, n· 2 game graphic solution and with dominance property.	**08 Hours**
Text Books:	1. "Operation Research" by Winston, Cengage Learning 2. "Operation Research" by S. D. Sharma, KedarnathRamnath&Company 3. "Operation Research" by KantiSwroop, P. K. Gupta and Man Mohan, SultanChand& Sons	
Reference Books:	1. "Operation Research" by H.A Tata, Maemillar& Company 2. "Operation Research" by P. K. Gupta and D.S. Hira, S Chand & Company 3. "Operation Research" by R. K. Gupta, Krishna Prakasha *** Latest editions of all the suggested books are recommended.**	

Evaluation Scheme of Practical Examination :

Internal Evaluation (50 marks) Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT	FILE WORK	VIVA	ATTENDANCE	EXPERIMENT	VIVA	INTERNAL
(05 MARKS)	(10 MARKS)	(10 MARKS)	(10 MARKS)	(05 MARKS)	(10 MARKS)	(50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)