SANJAY GHODAWAT UNIVERSITY KOLHAPUR

Sanjay Ghodawat University (SGU) is established in the Academic Year 2017-18, as a State Private University under Govt. of Maharashtra Act No. XL of 2017 dated 3rd May 2017, with the approval of the UGC and the state Government. "For the true measure of giving is giving without measure." Spread across 150 Acres, Sou. Sushila Danchand Ghodawat Charitable Trust's Sanjay Ghodawat University (SGU) is situated in serene atmosphere amidst idyllic hills and lush green meadows to study in harmony with Nature. The Institution aspires to run along the lines of best-in- the-world education and become a world-class institution where teaching-learning process gets a far deeper meaning. SGU always stands as the guiding star of brilliance, quality and deliverance beyond expectations. Innovativeness and Creativity are the hallmarks of a genius enterprise and SGU stands to be a stage where these qualities would be nurtured, encouraged and blossomed. The genius is incomplete without the sense of social responsibility and SGU's ultimate goal remains the development of an attitude of gratitude that freely gives back without expectations.

The Sanjay Ghodawat University stands as a beacon of light to guide the younger generation of the day on the right path to fulfillment in career and life. The USP of the University is its research based curriculum and academically oriented teaching staff. The world class ambience and infrastructure helps the students to easily accommodate themselves in an environment that is conducive to the teaching-learning process. Hands on experience, challenge based case studies, maximum participation of students in the classroom, use of modern digital technology, smart classrooms, solution oriented thinking promotion, stress on research and innovation, international tie ups, choice based credit system for flexibility in choosing areas of interest etc. are some of the features of the University.

The university will help students develop as a unique individual-to be educated as a whole person, intellectually, emotionally, socially, ethically, and spiritually. The educational program designs are worked out meticulously in line with best in class universities with special focus on:

- Flexible Choice Based Credit System
- OBE - Outcome Based Education System
- Experiential Learning
- Project Based Learning
- Case Based Learning

- Training need analysis based on Performance Appraisal System
- Active Learning tools for effective delivery
- Mentoring / Proctorship
- On line learning /Self learning platforms
- Flipped Classroom concept
- Effective Student Feedback Mechanism

VISION

Internationally recognized university of excellence in creating and disseminating knowledge through value-based quality education leading to betterment of mankind.

MISSION

- To prepare students for life-long learning and leadership in a global academic culture
- To create intellectual manpower relevant to the industry and society at large
- To collaborate with institutions of international repute for academic excellence
- To promote research and development through conducive environment
- To encourage entrepreneurship and skill development programs

CORE VALUES

- Integrity
- Transparency
- Accountability
- Equality
- Empathy
- Stewardship

QUALITY POLICY

Sanjay Ghodawat University is committed to establish high standards in value-based quality education to enhance and nurture young minds to excel in their chosen profession and develop into socially responsible citizens through resourceful collaboration, innovation and research

About School of Science

Since inception of Sanjay Ghodawat Institute in 2009, now Sanjay Ghodawat University has made constant efforts to provide quality education and a platform for development of students. School of Science currently offers BSc, MSc and PhD programs in but not limited to Physics, Chemistry and Mathematics. These programs have right blend of academia, research and industry providing an excellent opportunity for students to learn and flourish their career. Because of collaborations of School of Science with institutes, research laboratories and industries, students get number of opportunities of live projects, internships and placements. Our programs aim to provide skill based theoretical, practical and scientific knowledge to students. Our courses are focused towards development of following skills of students. Our courses are focused towards development of following skills of students.

Intellectual skills:

1. Ability to demonstrate understanding of a broad set of knowledge concerning the fundamentals in the basic areas of the discipline.
2. Ability to apply their knowledge to design, carries out, record and analyze the results of experiments.
3. Skills to communicate the results of their work.

Practical skills:

1. Skills in the monitoring of properties by observation and measurement, and the systematic and reliable recording and documentation.
2. Skills in the operation of standard instrumentation.
3. Skills required for the conduct of documented laboratory procedures involved.

Transferable skills:

1. Skills of both oral and written communication.
2. Problem solving skills.
3. Mathematical skills, correct use of units and data presentation.
4. Information retrieval skills.
5. IT skills.
6. Interpersonal skills such as interaction with others and team work.
7. Time management and organizational skills.
8. Skills related to ethical, social and professional understanding.

About Department of Physics

The Department of Physics is established in Academic Year 2017-18 under School of Science in the Sanjay Ghodawat University, Kolhapur. The department runs three courses under graduate, post graduate and Ph.D. The department consists of well-equipped laboratories and well qualified faculty members to handle the UG as well as PG courses. The department aims at developing the practical approach through skill enhancement courses, certifications course and project oriented learning. The research attitude is developed among students through research inclined courses and projects. The continuous development of quality research areas and exposure to research at reputed Institutes or Universities through internship would help in developing the careers of the next generation Physicists.

About Department of Chemistry

Chemistry is central science that deals with everyday life. Chemistry is all about knowing, measuring and making material. It can be making molecules, modifying and studying their properties. Department of Chemistry, Sanjay Ghodawat University aims to become world class teaching and Research Centre. Students can make their bright career in chemistry with our graduate, post graduate and PhD programs in chemistry. Deep understanding of chemistry can enable our graduates to take up new challenges in all aspects of chemistry that includes organic synthesis, chemical analysis, catalysis, nanotechnology, biochemistry etc. Our focused skill enhancement courses develop intellectual, practical and transferable skills of students.

About Department of Mathematics

The Department of Mathematics in Sanjay Ghodawat University was established in the year 2017. The Department offers Bachelor of Science (B.Sc.) and Master of Science (M.Sc.) in Mathematics with the major objective of developing a center of excellence especially in Mathematical Sciences and Applications.

The department offers opportunities for the education and research in a wide range of areas in Mathematics such as: Algebra and Analysis, Differential Equations and their applications, Discrete Mathematics and applications, Operations Research and Mathematical Software's etc.

The department has qualified and well experienced faculty members. Also the department has a computer lab where students can develop their programming skills by practicing in various software's viz. MATLAB, Sage, WxMaxima, C/C++, GAP, GeoGebra, LaTex etc. The department of Mathematics aims to prepare students who are oriented towards research and teaching in both fundamental and advanced areas of Mathematical Sciences.

CHOICE BASED CREDIT SYSTEM (CBCS)

The credit based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice based credit system provides a 'cafeteria' type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning.

University Grants Commission has come up with the Choice Based Credit System (CBCS) programme in which the students have a choice to choose from the prescribed courses, which are referred as core, elective or minor or soft skill courses and they can learn at their own pace and the entire assessment is graded-based on a credit system. The basic idea is to look into the needs of the students so as to keep up-to-date with development of higher education in India and abroad. CBCS aims to redefine the curriculum keeping pace with the liberalization and globalization in education. CBCS allows students an easy mode of mobility to various educational institutions spread across the world along with the facility of transfer of credits earned by students.

Where the students can choose the prescribed courses, as the core, and elective or soft skill courses, from a range of options, rather than to simply consume what the curriculum offers. They can learn at their own pace and the assessments are graded based on a credit system. It provides an opportunity for students to have a choice of courses or subjects within a programmed resembling a buffet, against the mostly fixed set of subjects now being offered (except for the limited choice of electives in professional degrees and postgraduate programmers) with the flexibility to complete the programmed by earning the required number of credits at a pace decided by the students.

The UGC has always initiated measures to bring efficiency and excellence in the Higher Education System of India. The basic motive is to expand academic quality in all aspects, right from the curriculum to the learning-teaching process to examination and evaluation systems. However, so far multiple methods are followed by different universities across the country towards examination, evaluation and grading system. Considering this diversity, the implementation of the choice based credit system seems to be a good system in assessing the overall performance of a student in a universal way of a single grading system.

OUTCOME BASED EDUCATION (OBE) MODEL

Sanjay Ghodawat University (SGU) has implemented OBE model of education, which is a learner centered approach. SGU has witnessed a sea change in the entire academic systems with implementation of all three components of OBE – Design, Delivery and Assessment. The SGU model of autonomy focuses on experiential learning which believes in learning by doing. This is achieved through hands on experience, industrial assignments, mini projects and live problem solving and collaboration with industries.

SGU is set in to dynamics of transformation and witnessing a shift in focus from teaching to learning and entire academic system of SGU is designed to provide multiple learning opportunities for students to acquire and demonstrate the Knowledge, Skills and Attitudes (KSA) for rewarding career.

The Vision and Mission of the Management, contribution from eminent BOG members and knowledgeable members of Academic Council and Board of Studies, the motivation and drive of the Director, the relentless efforts of the fellow Deans and Head of Departments and all teaching and non-teaching staff along with commitment to learning of students made it possible to successfully transform the institute and stand out to carve a niche for itself as an Institute of repute.

OBE is an approach of curriculum design and teaching that focuses on what students should be able to do (attained) at the end of course/ program. Outcome based education (OBE) is student-centered instruction model that focuses on measuring student performance through outcomes. Outcomes include knowledge, skills and attitudes (KSA). Its focus remains on evaluation of outcomes of the program by stating the knowledge, skill and behavior a graduate is expected to attain upon completion of a program and after 4 – 5 years of graduation. In the OBE model, the required knowledge and skill sets for a particular degree is predetermined and the students are evaluated for all the required parameters (Outcomes) during the course of the program.

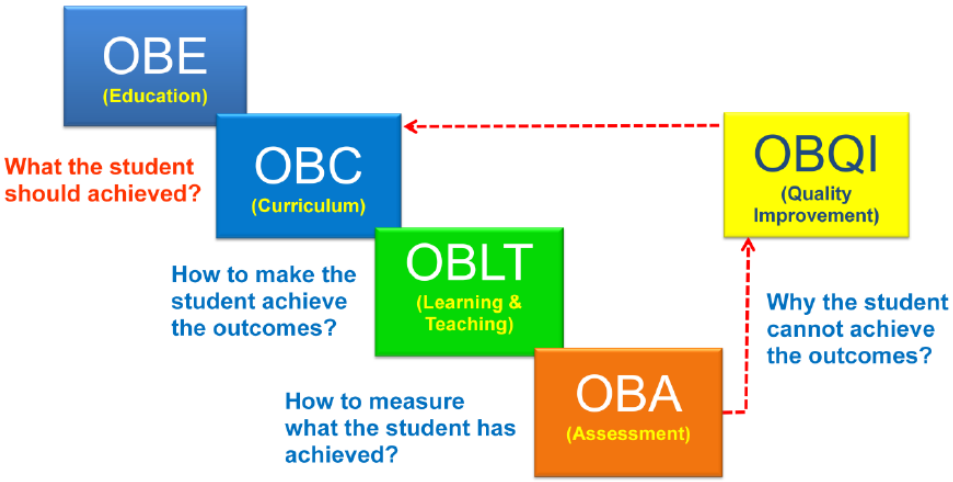
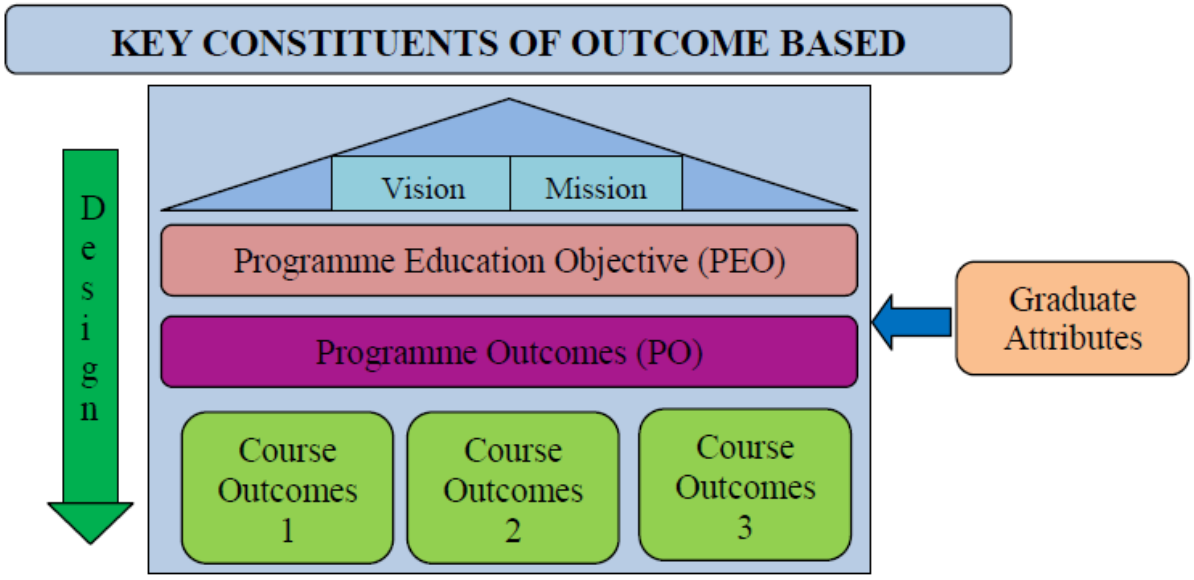


Figure 1: OBE flows and desciption

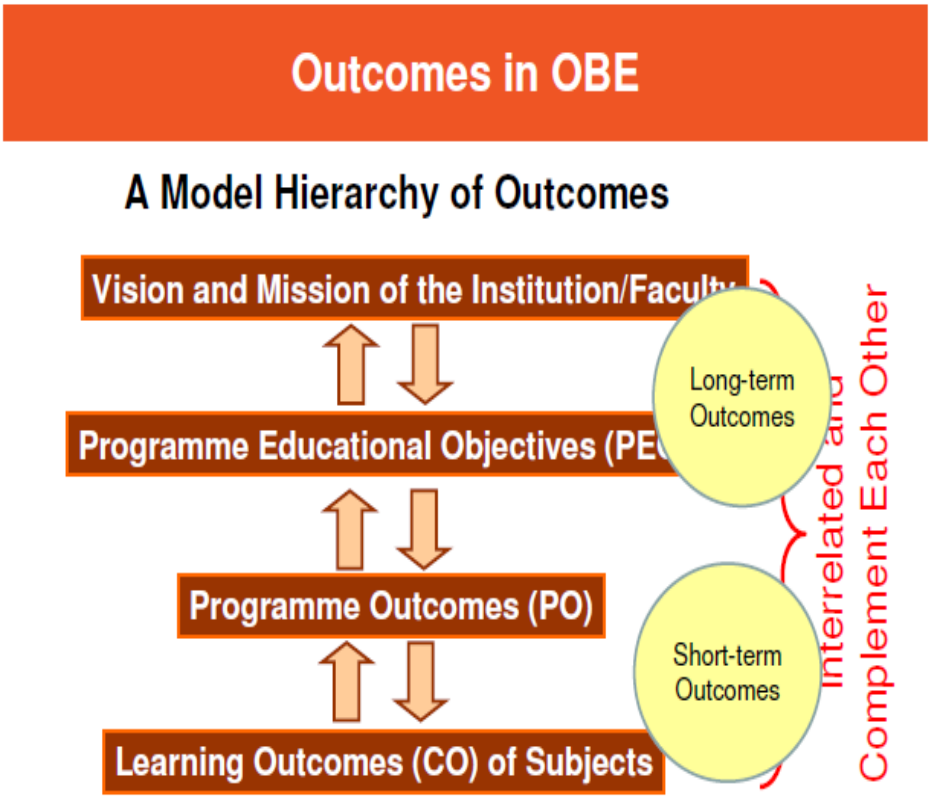


The OBE model measures the progress of the graduate in three parameters, which are

- Program Educational Objectives (PEO)
- Program Outcomes (PO)
- Course Outcomes (CO)

Program Educational Objectives (PEO) is broad statements that describe the career and professional accomplishments that the program is preparing the graduates to achieve. PEO's are measured 4-5 years after graduation. Program outcomes are narrower statements that describe what students are expected to know and be able to do by the time of graduation. They must reflect the Graduate attributes. Course outcomes are the measurable parameters which evaluates each student's performance for each course that the student undertakes in every semester.

The various assessment tools for measuring Course Outcomes include Tests and End Semester Examinations, Tutorials, Assignments, Project work, Labs, Presentations, Employer/Alumni Feedback etc. These course outcomes are mapped to Graduate attributes and Program outcomes based on relevance. This evaluation pattern helps Institutions to measure the Program Outcome. The Program Educational Objective is measure through Employer satisfaction survey (Yearly), Alumni survey (Yearly), Placement records and higher education records.



Special Features of OBE

- OBE is an educational process that focuses on what students **can do**or the **qualities** they should develop after they are taught.
- OBE involves the restructuring of curriculum, assessment and reporting practices in education to reflect the achievement of high order learning and mastery rather than accumulation of course credits.
- Both structures and curricula are designed to achieve those **capabilities** or **qualities**.
- Discourages traditional education approaches based on direct instruction of facts and standard methods.
- It requires that the students demonstrate that they have learnt the required skills and content.

Sanjay Ghodawat University Kolhapur

(Established as a State University under Government of Maharashtra Act No XL dated 3rd May 2017)

Academic and Examination Rules and Regulations

Approved in the sixth Academic Council Meeting held on 17th February, 2020
and to be implemented from academic year 2020-21. [Version R1]

Sanjay Ghodawat University Kolhapur

Kolhapur - Sangli Highway, A/p Atigre - 416 118,
Tal. - Hatkanangale, Dist. Kolhapur,
Maharashtra, India

(Implemented from Academic year 2020-21)

Academic and Examination Rules and Regulations

1.0 Preamble

The Sanjay Ghodawat University (SGU) stands as a beacon of light to guide the younger generation of the day on the right path to fulfillment in career and life. Outcome Based Education (OBE) model is adopted to enhance the effectiveness of teaching learning process and Credit Based semester system is implemented.

The focus of the University is its research based curriculum and academically oriented teaching staff. The world class ambience and infrastructure helps the students to easily accommodate themselves in an environment that is conducive to the teaching- learning process. Hands on experience, challenge based case studies, maximum participation of students in the classroom, use of modern digital technology, smart classrooms, solution oriented thinking promotion, stress on research and innovation, international tie ups, choice based credit system for flexibility in choosing areas of interest etc. are some of the features of the University.

Vision of SGU is internationally recognized university of excellence in creating and disseminating knowledge through value-based quality education leading to betterment of mankind. To achieve the vision SGU will develop state-of-the-art infrastructure that promotes conducive ambience promoting innovation and research. Create intellectual manpower relevant to the industry and society at large. Foster mutually beneficial partnership with alumni, industry and academia. Inculcate ethics and values to develop socially responsible citizens and promote entrepreneurship.

SGU is offering various programs through schools such as School of Technology, School of Commerce and Management, School of Sciences and School of Arts.

SGU has implemented the outcome based Education (OBE) system and Credit based Evaluation System in all the schools.

The rules and regulations mentioned in this document are applicable to all the Under Graduate (UG) and Post Graduate programs offered by the Sanjay Ghodawat University from the academic year 2018-19. The rules and regulations stated here under are subjected to revisions / refinements, updates and modifications and amendments by academic council (AC) from time to time and applicable to all batches including those already undergoing programs at different year and are binding on all stakeholders including students, faculty, parents and University authorities.

The academic programs of the University shall be governed by rules and regulations approved by the academic council from time to time. Academic council is the supreme and statutory academic body that governs all academic matters of the university and the decisions of the academic council are final and binding in the matters related to academics.

2.0 Definition of Terms

1. **University:** University means Sanjay Ghodawat University, Kolhapur
2. **Academic Year:** The period of the year during which students attend university for all academic activities, usually it starts from first of July and ends on 30th of June next year.
3. **Semester:** Academic Year is divided in to 2 parts called Semester, Odd Semester which starts from July and Even Semester which starts from January.
4. **Duration of Semester:** Total duration of semester is usually 20 weeks per semester including instructions, examination and evaluation. Total instructional days are 90 per semester.
5. **Course:** It is a Subject that is offered in a semester. The course may consist of Theory/Practical/Project/Seminar during semester. Usually taught by instructor in a class. e.g. Physics, Chemistry, Engineering Mechanics, Workshop etc.
6. **Program:** Collection of Courses is called Program. For example, B Tech in Mechanical Engineering, M Tech in Civil Engineering, Bachelor of Business Administration. Bachelor of Science etc.
7. **Department:** Department is a unit of the school which offers one or more programs.
8. **Contact Hours:** Time of students in class/laboratory with instructor. Usually in the range of 20-30 Hrs. /Week. For the purpose of uniformity one contact hour is measured as 60 minutes
9. **Academic Council (AC):** Means apex academic body governing the academic programs responsible for framing policy, rules and regulations.
10. **Board of Examination (BOE):** Central body responsible for framing policy, rules and regulations for Examination.
11. **Board of Studies (BOS):** Departmental academic body to govern the academics of programs (BOS) offered by department.

3.0 Curriculum:

Every program has a prescribed structure which, in general, is known as Curriculum. It prescribes courses to be studied in each semester. The booklet containing courses structure along with detail syllabus for each course of each program is updated periodically and made available on the website.

3.1 Semesters:

SGU implements a credit based semester system. The academic year is divided into two regular semesters. The semesters that begin in July are known as Odd semester and the semester that begin in January are known as even semesters. Total duration of each semester is generally of 20 weeks including the period of examination, evaluation and grade declaration.

3.2 Course Credit System/Structure:

In general, a certain quantum of work measured in terms of credits is laid down as the requirement for a particular program. Calculation of number of credits for a course in any semester is as per Table 3.1

Table 3.1: Calculation of number of credits for a course

Sr. No.	Course	Credits
1	Lecture of 1 hour/week	**1**
2	Tutorial of 1 hour/week	**1**
3	Practical / Laboratory / Drawing/mini-project of two hours/ week	**1**
4	Seminar (1 hour per week)	**1**

There are mainly two types of courses- viz. Theory courses and Laboratory courses. Generally a theory course consists of Lecture hours (L) and Tutorial hours (T). Tutorial hours may not be assigned to a particular theory course if it has a separate laboratory course. Laboratory course consists of practical hours (P) for which a student works in a Laboratory/Drawing Hall/Workshop. The other courses required to be taken by a student include seminar, mini project, and project at various levels of the program.

A student shall earn credits for a particular course by fulfilling the minimum academic requirements for attendance and evaluation. No credits shall be awarded if a student satisfies the minimum attendance requirements but fails to meet minimum evaluation requirements.

The total number of credits required for completing a program shall be mentioned in the course structure. The total number of credits in a semester which a student registers shall generally be 20--25. The maximum number of credits per semester shall not exceed 30

3.3 Audit Course:

3.3.1 A student may have to register for an audit course in a semester which could be institute requirement or department requirement.

3.3.2 An audit course may include either a) a regular course required to be done as per structure or required as pre-requisite of any higher level course or b) the programs like practical training, industry visits, societal activities etc.

3.3.3 Audit course shall not carry any credits but shall be reflected in Grade Card as "PP"/"NP" depending upon the satisfactory performance in the semester evaluation as per the course curriculum structure.

4.0 Course Registration:

4.1 Every student must register for the courses that he/she wants to study for earning credits at the beginning of each semester on the prescribed dates announced from time to time and shall be mandatory for every student till he/she completes the program. Only after registration his/her name shall appear in the roll list of each of such courses.

4.2 Students shall be required to fill up a Course Registration Form which shall be made available to them by the Student section of Administration office after payment of required fees.

4.3 Registration, according to rules, should be carried out as per the schedule given in academic calendar. Late registration may be permitted only for valid reasons and on payment of late registration fees. In any case, registration must be completed before the prescribed last date for registration, failing which his/her studentship shall be liable to be cancelled. Students having dues outstanding towards the institute or hostel shall be permitted to register only after clearing such dues.

4.4 In-absentia registration may be allowed only in rare cases at the discretion of the Dean Academics and with prior permission.

4.5 For registration in an odd semester, the student must have earned all the credits of the pre-previous year and at least 75% 2/3rd of the credits previous year. For example, for registration of the 5th semester courses (i.e. 3rd year of program), a student must have earned all the credits of the first year and 2/3rd of the credit second year. Similarly, for registration of the 7th semester courses (i.e. 4th year of program), a student must have earned all the credits of the second year and 2/3rd of the credits third year. However, if 2/3rd of the calculation turns out to be a mixed number (integer + fraction) then only the integer part of that number shall be considered for taking decision related with this clause.

4.6 A student registered in odd semester shall be eligible to register for the courses offered in the even semester of that year irrespective of his/her SGPA or the number of credits earned by him/her in that odd semester.

5 .0 Lateral Entry for B Tech Programs

Post diploma students in engineering and B.Sc. Graduates can have lateral entry at third semester of the program. Such admissions are governed by the rules of regulatory bodies like AICTE New Delhi and Directorate of Technical Education Maharashtra state and Sanjay Ghodawat University for Admission criteria and shall undergo all academic requirements as specified by the Academic council.

For such students there shall not be First Year Performance Index (FYPI). Semester Performance Index (SGPA) and Cumulative Performance Index (CGPA) shall be calculated from the third semester onwards taking into consideration the courses undergone by them at Sanjay Ghodawat University Kolhapur.

Registration of the students not covered by the cases mentioned above shall be decided by the Academic Council. Such students shall undergo the academic program as specified by the Academic Council. Such odd entry students shall not be eligible for any medals or awards instituted by the institute.

6.0 Change of Program:

This is applicable to B Tech Programs only. Students shall be eligible to apply for Change of Program after completing the first two semesters. The following rules/ guidelines shall be used for considering their applications for change:

6.1 The change of program shall be permitted strictly on merit basis subject to the rules of admissions prevailing at the time of such change.

6.2 Students without fail grades and/or backlogs shall be eligible to apply for change of program and can give their choices in the order of preference.

6.3 The request for change of program by a student from program A to program B shall be considered if number of students of program B does not exceed the sanctioned capacity of program B and also the minimum strength required to run the program as decided by Academic Council.

6.4 All such transfers can be effected only once at the beginning of the second academic year of the 4-year UG program. No application for change of program during subsequent academic years shall be entertained.

7. Facilitation to Students:

7.1 Faculty Advisor:

On joining the institute, a student or a group of students shall be assigned to a faculty advisor who shall be mentor for a student throughout his/her tenure in the institute. A student shall be expected to consult the faculty advisor on any matter relating to his/her academic performance and the courses he/she may take in various semesters / summer term. A faculty advisor shall be the person to whom the parents/guardians should contact for performance related issues of their ward. The role of a faculty advisor is as outlined below:

The role of the Faculty Adviser is outlined below:

a. Guide the students about the rules and regulations governing the courses of study for a particular degree.
b. Advise the students for registering courses as per curriculum given. For this purpose, the Faculty Adviser has to discuss with the student his/her academic performance during the previous semester and then decide the number and nature of the courses for which He / She can register during the semester as per the curriculum.
c. Approve the registration of the students.
d. Advice students to overload/ drop one or more courses/activities based on her/his academic performance as per the prescribed rules.
e. At the end of the first semester/year, the Faculty Adviser may even advise a reduced load program for a poorly performing student.

f. Pay special attention to weak students and carefully monitor performance of students recommended for slow track option.
g. Advice students for Course Adjustment / Dropping of courses during the Semester within the stipulated time frame given in the Academic calendar.
h. Advice students seeking semester drop either during the ongoing semester or before the commencement of the semester. FA has to ensure strict compliance of rules and regulations laid down for this purpose. Recommend the cases to the appropriate authorities for consideration.
i. Make revised plan of study for weak/bright students based on their semester wise performance.
j. Suggest modalities for course/credit requirements for the students recommended for exchange program.
k. Guidance and liaison with parents of students for their performance.
l. To ensure that students are not permitted to reregister for courses, which they have already passed.
m. Inform students that any academic activity (course / Lab. / seminar / project / noncredit requirement etc.) undergone without proper registration will not be counted towards the requirements of his/her degree.
n. Strictly warn students that if she/he fails to register during any semester without prior approval, his/her studentship is liable to be cancelled.
o. Keep the students updated about the Academic Administration of the University.

7 .2. Helping Weaker Students:

A student with backlog/s should continuously seek help from his/her faculty advisor, Head of the Department and the Dean of respective schools. Additionally, he/she must also be in constant touch with his/her parents/local guardians for keeping them informed about academic performance. The university also shall communicate to the parents/guardians of such student at-least once during each semester regarding his/her performance in in-in various tests and examination and also about his/her attendance. It shall be expected that the parents/guardians too keep constant touch with the concerned faculty advisor or Head of the Department, and if necessary - the Dean of the respective school.

8. 0 Discipline and Conduct:

8.1 Every student shall be required to observe discipline and decorous behavior both inside and outside the campus and not to indulge in any activity, which shall tend to bring down the prestige of the university.

8.2 Any act of indiscipline of a student reported to the Dean, Student Development, shall be discussed in a Disciplinary Action Committee of the institute. The Committee shall enquire into the charges and recommend suitable punishment if the charges are substantiated.

8.3 If a student while studying in the university is found indulging in anti-national activities

contrary to the provisions of acts and laws enforced by Government, he/she shall be liable to be expelled from the institute without any notice.

8.4 If a student is involved in any kind of ragging, the student shall be liable for strict action as per provisions in the Maharashtra anti-ragging act.

8.5 If any statement/information supplied by the student in connection with his/her admission is found to be false/ incorrect at any time, his/ her admission shall be cancelled and he/she shall be expelled from the university and fees paid shall be forfeited.

8.6 If a student is found guilty of malpractice in examinations, then he/she shall be punished as per the recommendations of the Grievance Redressed Committee (CRC) constituted by Board of Examinations.

8.7 Every admitted student shall be issued photo identification (ID) card which must be retained by the student while he/she is registered at Sanjay Ghodawat University Kolhapur. The student must have valid ID card with him/her while in the University Campus.

8.8 Any student who alters or intentionally mutilates an ID card or who uses the ID card of another student or allows his/her ID card to be used by another, student shall be subjected to disciplinary action.

8.9 The valid ID card must be presented for identification purpose as and when demanded by authorities. Any student refusing to provide an ID card shall be subjected to disciplinary action.

8.10 Students should switch off the Mobiles during the Instructional hours and in the academic areas of university Building, Library, Reading room etc. Strict action will be taken if students do not adhere to this.

8.11 During the conduct of any Tests and Examination students must not bring their mobiles. A student in possession of the mobile whether in use or switched off condition will face disciplinary action and will be debarred from appearing for the Test / Examination.

9.0 Academic Calendar

The academic activity of the University are regulated by Academic Calendar and is made available to the student's/ faculty members and all other concerned in electronic form or hard copy. It shall be mandatory for students / faculty to strictly adhere to the academic calendar for completion of academic activities.

10. Attendance:

10.1 Regular 100% attendance is expected from all students for every registered course in lectures, tutorial, laboratory, projects, mini-projects and other courses mentioned in program curriculum. Hence, attendance is compulsory and shall be monitored during the semester rigorously. Students shall be informed at the end of every month if they are failing short of attendance requirements.

10.2 A Maximum of 25% absence for the attendance may be permitted only on valid grounds such as illness, death in family of blood relations (Father, Mother, Sister, and Brother) and

any other emergency reason which is beyond the control of the student and shall be approved by the authorities in respective departments.

10.3 If a student fails to put up 75% attendance individually in each course, the student will be put under X grade category and student will be debarred form attending the End Semester Examination (ESE) and Re-Exam for that semester in that course. However, student has an option to re-register for the course whenever it is offered next time or he can appear for 100% examination for which he will be awarded two grade penalties. Student's FET, CAT1 and CAT2 marks are treated as null and void.

10.4 The maximum number of days of absence for students participating in Co-curricular activities /Sports/ Cultural events during a semester shall not exceed 10. Any waiver in this context shall be on the approval of the Academic council only after the recommendation by Dean Academics of the university.

The HOD and Dean of the respective school shall report and recommend to Academic council the cases of students not having 75% attendance as per the records of course instructor. After rigorously analyzing these cases AC may take a decision to debar such student from End-Semester Examination (ESE) for that course. Such a student shall re-register for that course as and when it is offered next. ISE and MSE evaluations of such a student for this course during regular semester shall be treated as null & void.

10.5 A student remaining absent during ESE of a course either on medical ground (Accident and/or hospitalization of a student) or any other emergency circumstances (death of immediate close relative i.e. father, mother, brother and sister) or due to representing University at university/state level in sports/co-curricular activities shall be treated as per the rules of Sec 13.6.2 and 12.1.2

The critical cases of absenteeism which are not covered by any of the above clauses shall be reported by concerned Head of Department to Academic dean and all such cases the decision of Academic council is final.

11. Modes of Assessment:

11.1Assessment of Theory Courses:

11.1.1 A student shall be evaluated for his/her academic performance in a theory course through Faculty Evaluation Theory (FET), Continuous Assessment Tests (CAT1 and CAT2) and End Semester Examination (ESE).

11.1.2 The relative weightage for the theory courses having ESE shall be generally as shown in the Table 11.1.2

Table 11.1.2: Weightage for the theory courses in %

Exam→ / Credits↓	FET	CAT1	CAT 2	ESE
4	20	15	15	50
2	20	-----	30	50

The details of the weightage of each course shall be listed in the structures of each program

11.1.3 FET shall be based on student's performance in assignments, quizzes, seminars, Course projects and field assignments, term papers, etc. The mode of FET shall be decided and announced by the Course Instructor at the beginning of the course.

11.1.4 CAT1 shall generally be of one-hour duration for each course and shall be held as per the schedule declared in the Academic calendar for that Semester.

11.1.5 CAT2 shall generally be of one-hour duration for each course and shall be held as per the schedule declared in the Academic calendar.

11.1.6 ESE is of three hours' comprehensive examination for 4 credits course. ESE is of two hours' comprehensive examination for 2creditscourse.

Table 11.1.6: Unit wise distribution in exams will be based on following table.

Total Number of Units	Units for CAT1	Units for CAT 2	Mark weightage for units in ESE
6	1 & 2	3 & 4	Equal weightage for all unit
5	1	2 & 3	Equal weightage for all unit
4	1	2	Equal weightage for all unit
3	Nil	1	Equal weightage for all unit
2	Nil	1	Equal weightage for all unit

11.1.7 All examinations and evaluations shall be compulsory. Credits for a course shall be awarded only if a student satisfies evaluation criteria and acquires the necessary minimum grade.

11.1.8 There shall be no re-examination for CAT1 and CAT2 of the courses having all the three components of evaluation viz. FET, CAT1 CAT2 and ESE. However, a student remaining

absent for CAT1 and CAT2 for representing the University in state level or university level sports/co-curricular activities. (on prior recommendation and approval) or on valid grounds such as illness, death in family or other emergency reason which is beyond control of a student (on approval by the head of department and dean of respective school shall be considered for Make- up examinations).

11.1.9 A student remaining absent for ESE of a course either due to medical reason (Accident and/or hospitalization of a student) or other emergency circumstances (death of immediate close relative i.e. father, mother, brother and sister) or due to representing Sanjay Ghodawat University at University/State/National/International level in sports/co-curricular activities shall be awarded with grade "I". Such a student shall be allowed to appear for make-up examination scheduled along with re-examinations of other courses. The student shall apply to COE with proper documentary evidence to appear for make-up examination. After make-up examination, a student shall be entitled to an appropriate grade as per Table I of Sec. 11.1.2 based on his/her performance during the regular semester and in make-up examination.

11.2 Assessment of Laboratory Courses:

11.2.1 The assessment of laboratory course shall be continuous and based on turn-by-turn supervision of the student's work and the quality of his/her work as prescribed through laboratory journals and his/her performance in viva-voce examinations uniformly distributed throughout the semester. Where ESE for the laboratory course is specified ESE shall be based on performing an experiment followed by an oral examination. The relative weightage for FEP and ESE for assessment of laboratory courses shall be 50% each for FEP and ESE and a minimum performance of 40% in both ISE and ESE separately shall be required to get the passing grade.

11.2.2 ESE for laboratory course shall normally be held before the ESE for theory courses and shall be conducted by a panel of examiners appointed by COE from the panel of experts approved by BOS. This activity shall be coordinated by Department Examination Coordinator (DEC) in consultation with HOD of the respective department.

11.2.3 Student failed in ESE of a laboratory course in a regular semester shall be eligible to appear for 100% examination conducted along with ESEs of laboratory courses of the subsequent semester. Such examination shall be fairly comprehensive (generally of 3 hours similar to POE i.e. Practical-Oral-Examinations) to properly judge his/her practical skill and theoretical knowledge for that laboratory course. He / She shall suffer one grade penalty.

12.0 The Grading System:

Absolute Grading System (AGS) is adopted based on absolute numerical marks obtained by the student during all stages of evaluation for a course.

12.1 Award of Grade (Regular Semester):

12.1.1 For every course registered by a student in a semester, he/she shall be assigned a grade based on his/her combined performance in all components of evaluation scheme of a course as per the structure. The grade indicates an assessment of the student's performance and shall be associated with equivalent number called a grade point.

12.1.2 The academic performance of a student shall be graded on a ten-point scale. The Absolute Grading System is followed. Letter grades, the guidelines for conversion of marks to letter grades and their equivalent grade points are as given in Table.

Table 12.1.2: Grade Table for Regular Semester

Marks Obtained	Grade Letter GL	Grade Point GP	Performance Description
90-100	**O**	**10**	Outstanding
80-89	**A+**	**09**	Excellent
70-79	**A**	**08**	Very Good
60-69	**B+**	**07**	Good
50-59	**B**	**06**	Above Average
45-49	**C**	**05**	Average
40-44	**P**	**04**	Pass
00-39	**F**	**00**	Fail
-	**Ab**	**00**	Absent
-	**X**	**00**	Detained (Failed)
-	**Satisfactory**	**-**	Pass in Non-Credit Courses
-	**Un Satisfactory**	**-**	Failed in Non-Credit Courses

12.1.3 A student shall pass the course if he/she gets any grade in the range "O" to “P".

12.1.4 “FF" grade shall be awarded to a student in a course if he/she gets less than 40% marks jointly in the FET, CAT1, and CAT2 & ESE for a theory course and in FEP& ESE for a

laboratory course. A course shall then be eligible to apply for re-examination. A student failed in laboratory course shall be eligible to apply only for 100% examination conducted with the laboratory examinations of the subsequent semester. In both cases, a student has to suffer one grade penalty.

13 Assignment of X Grade

Grade "X" in a regular course shall be given to a student if he/she falls in any of the following categories.

13.1 A student does not maintain the minimum 75% attendance in any of the theory or laboratory courses.

13.2 A student has not completed most of the Evaluations like FET, CAT1 and CAT2 due to non-medical reasons (for example when a student has missed all or most of the components of internal evaluation conducted by the instructor in that semester).

13.3 The performance of a student is less than 40% in FET, CAT1 and CAT2 Combined.

13.4 A student is guilty of any academic malpractice during semester (Such cases shall be dealt by Grievance Redressed and Discipline Committee).

In above four cases grade "X" shall be declared one week before ESE and intimated to the Academic Office and COE immediately thereafter. Such a student shall not be permitted to take the ESE of that course.

13.5 Grade "X" may be given to a student if

13.5.1 A student eligible for ESE remains absent for ESE of a course with no written intimation to Exam Cell within four days after the respective ESE is over.

13.5.2 A student is guilty of any academic malpractice during examination. (Such cases shall be dealt by Grievance Redressal Committee).

In 13.5.2 grade "X" in that course shall be declared after Grievance Redressed Committee confirms the academic malpractice.

In above two cases when a student gets "X " grade in a course, then this shall be treated as "FF" for the purpose of calculation of Semester Performance Index (SGPI) and First Year Performance Index (FYPI) or Cumulative Performance Index (CGPI).

13.6 Following rules apply to the student who has obtained grade "X" in a regular semester:

13.6.1 A student obtaining grade "X" in a course in a regular semester or during examination shall be not be allowed to appear for End semester examination and also Re ESE conducted before the beginning of the next semester. His/her FET, CAT1 and CAT2 evaluations for all courses shall be treated as null and void. His/her needs to re-register for courses of that semester in the next academic year whenever they are offered and undergo all evaluations along with fresh regular students for which he will get one grade penalty.

13.6.2 Grade "I" shall be declared in a theory/laboratory course if a student has satisfactory performance FET, CAT1, CAT2 and has fulfilled the 75% attendance requirement, but has not appeared for ESE due to genuine reasons. Such students shall be eligible for the make-up examination of ESE only on medical grounds/valid reasons and on production of authentic medical certificate or other supporting document/s (as required by the University) to the COE within ten days after the respective examination is over. The application form with requisite amount of fees must be submitted to the Exam Cell before the last date of filling such application forms for make-up examinations. These examinations shall be based on 100% syllabus and shall be scheduled before the commencement of the subsequent semester for theory courses and along with ESEs of laboratory courses of the subsequent semester. A student with "I" grade when appears for the make-up examination shall be eligible to obtain a regular performance grade ("O" to "F") as per Table 11.1.2 depending on his/her overall performance in FET, CAT 1, CAT 2 and make-up examination. If a student fails to appear for make-up examination too, a grade "XX" shall be awarded to him/her. Thus "I" is only a temporary grade and shall be replaced by a valid grade only after make-up examination.

13.6.3 There shall be a few audit courses as per the policies of the institute or as decided by DPC of respective program. The grade "PP" (Passed)/ "NP" (Not Passed) shall be awarded for such courses depending upon the performance of a student evaluated by the faculty in-charge. No grade points shall be associated with these grades and performance in these courses shall be not taken into account in the calculation of the performance indices (SGPI, CGPI). However, the award of the degree shall be subject to obtaining a "PP" grade in all such courses.

14. Award of Grades for Re-Examination:

14.1 A student who has obtained grade "F" in regular semester shall be eligible to appear for re-examination conducted before the commencement of the next regular semester. In such cases FET, CAT1 and CAT2 marks are carried forward and a student has to suffer one grade penalty

14.2 A student shall apply for re-examination before the last date of such application and shall appear for re-examination.

14.3 50% weightage similar to ESE shall be given to re-examination and there is one grade penalty.

14.4 A student who has obtained "F" grade in ESE of a regular semester and has not availed re-examination option or a student who has obtained "F" grade in both ESE and re-examination shall be eligible to choose one of the two options below to clear his/her backlog:

- Re-registration for the next regular semester course whenever that course is offered.
- Appearing for ESE of the course when conducted...

A student detained in a regular semester due to either a) by obtaining "X" grade or b) by involvement in academic malpractice or c) by breaking the institute code of conduct and discipline can re-register for the course when offered next.

Following rules apply for these cases:

14.5 In first case i.e. Re- registration the earlier performance of a student in all the evaluations of that course shall be treated as null and void. The student has to undergo all the evaluations after re-registration.

15. Grades for Third and Subsequent attempts:

If A student opts for ESE or Re ESE who previously had obtained grade "F" in a course in two attempts, his/her FET, CAT1 and CAT2 performance of the regular semester shall be considered for evaluation and His/her has to suffer two grade penalty for the third attempt and for 4th and subsequent attempts shall be awarded a grade "P" or "F" or "X" based on his/her performance. However, if a student takes more than three chances (regular examination being the first chance, re-examination being the second chance, to clear a course, then the maximum passing grade that he/she can get shall be only "P". Thus a student has to suffer a grade penalty by accepting a lower grade than that obtained in the regular examination, re-examination, or examination for a re-registered course.

16. CALCULATION OF PERFORMANCE INDICES:

16.1. Semester Grade Point Average (SGPA)

The performance of a student in a one specific semester is indicated by SGPA. SGPA is a weighted average of the grade points obtained in all courses registered by the students during the semester. SGPA can be calculated by following equation.

$$SGPA = S_i = \frac{\sum_{i=1}^{n} C_i P_i}{\sum_{i=1}^{n} C_i}$$

Where, i = 1, 2, 3……. n is number of courses during semesters. C = No of credits associated with that course and P = Grade point earned in that course. SGPA will be rounded off to two decimal places.

16.2 Cumulative Grade Point Average (CGPA)

The total cumulative performance of a student at the end of specific semester is indicated by CGPA. An up-to-date assessment of the overall performance of a student for the courses from the first semester onwards till completion of the program shall be obtained by calculating Cumulative Grade Point Average (CGPA).

CGPA is a weighted average of the SGPA obtained in all semesters by the students during the semesters. CGPA can be calculated by following equation.

$$CGPA = \frac{\sum_{j=1}^{n} C_j S_j}{\sum_{j=1}^{n} C_j}$$

Where, j = 1, 2, 3……. n is number of semester during program. C = Total No of credits in the semester for which CGPA is to be calculated.

CGPA will be rounded off to two decimal places.

Conversion of CGPA to percentage marks for CGPA ≥ 4.5 can be obtained using equations. Percentage marks = (CGPA x 10) – 7.5.

16.3 For the students acquiring "I" grade (which is only a temporary grade) in any of the courses, SGPA, CGPA shall be calculated only after make-up examination.

17. First Year Performance Index (FYPI): (Applicable for B. Tech Programs Only)

17.1 For a student registered in Sanjay Ghodawat University Kolhapur right from the First semester, First-Year-Performance-Index (FYPI) shall be calculated as weighted average of the grade points obtained in all the courses registered by him/her in semesters I and II only.

$$\text{FYPI} = \frac{\sum_{i} C_i g_i}{\sum_{i} C_i}$$

Where summation is for all the courses registered by a student in first two semesters. FYPI shall be calculated when for the second semester is calculated. FYPI shall be rounded off to two decimal places.

17.2 FYPI shall reflect all the courses undergone by a student in the first year including the courses in which he/she has failed. FYPI may get modified in the subsequent semesters whenever a student clears his/her first year backlog courses.

17.3 If a student has been awarded "I" grade in the regular semester course of the first year then, FYPI shall be calculated after the make-up examination on the basis of the grade obtained by that student in a make-up examination.

17.4 If a student has obtained grade "F" or "X" at any time in any of the courses registered by him, then zero grade points corresponding to these grades shall be taken into consideration for calculation of FYPI.

18 Maximum Duration for Completing the Program

Maximum duration for completing any program UG/PG offered by Sanjay Ghodawat University is respective program duration plus two additional years.

Maximum duration for getting the B. Tech degree for students admitted in the first semester of UG program is, program duration plus two additional years (i.e. 12 Semesters and 6 academic years) For lateral entry student academic admitted in the third semester shall be (10 Semester and 5 Years).

The maximum duration of the program includes the period of withdrawal, absence and different kind of leaves permission to student but excludes the period of rustication of the student from the university however genuine case a confidential of valid reason may be referred to academic council for extending this limit by additional criteria

19 NFTE (Not Fit for Technical Education) (Applicable to B Tech program only)

It is mandatory for the student to earn all credits of first year specified for semester I & II or eligible for ATKT as per the rules to seek admission to semester III of second year in three years from the date of admission to avoid NFTE. If a student fails to become eligible for admission to Semester III in three year form the date of his admission, he shall be declared as "Not Fit for Technical Education" leading to discontinuation of his/her registration with the university. Such cases should be put up in the academic council.

20. Academic Progress Rules (ATKT Rules):

20.1 A student shall be allowed to register for the courses of the next year's odd semester only if he/she has earned all the credits of the previous year and has earned at least 2/3rd credits of the current year. If 2/3rd calculation turns out to be a mixed number (integer + fraction) then only the integer part of that number shall be considered for deciding the eligibility for ATKT.

(a) At the end of 1st year a student shall be allowed to keep terms (ATKT) to 2nd year of study provided he/she attends course work prescribed for 1st year with prescribed attendance and successfully earned at least 2/3rd of the total credits specified for 1st year program.

For Example: Total credits for B. Tech first year 2017-18, are 45 (Total of Semester I and II). A Student should earn minimum 2/3rd of the 45 Credits i.e. A student can go to next higher class with a maximum backlog of 1/3rd credits of semester I & II of the first year.

Student, who fails to earn those credits, cannot register for next semester, either it can re-registrar for the course and credits or can use the next opportunity to earn the credits when exams are conducted.

(b) At the end of 2nd year a candidate shall be allowed to keep terms to 3rd year of study provided he/she attends course work prescribed for 2nd year with prescribed attendance, and successfully cleared 1st year program and at least 2/3rd of total credits prescribed for 2nd year program.

(c) At the end of 3rd year a candidate shall be allowed to keep terms to final year of study provided he/she attendants course work prescribed for 3rd year with prescribed attendance, and should have completed 2nd year program and 2/3rd of total credits prescribed for 3rd year program.

All such candidates fulfilling the above criteria shall be declared as FAILED, ATKT.

A student shall be allowed to take admission for odd semester of next academic year only if he/ she have earned all the credits of the previous year and 2/3rd happens to be a decimal, it is rounded to only integer part.

21. Semester Grade Report:

21.1 Semester grade report reflects the performance of a student in that semester (SGPI) and also his/her cumulative performance for the first year (FYPI) and also the cumulative performance since the third semester of his/her study (CGPA).

21.2 The semester grade card issued at the end of each semester/ summer term to each student shall contain the following.

- The credits for each course registered for that semester.
- Any audit course/s undertaken by a student in a Semester.
- The letter grade obtained in each course.
- The total number of credits earned by a student for the first year separately.
- The total number of credits earned by a student since the 3rd semester onwards.
- SGPI, FYPI, CGPI.
- A list of backlog courses, if any.
- Remarks regarding eligibility of registration for the next semester.

21.3 Semester grade card shall not indicate class or division or rank however a conversion from grade point index to percentage based on CGPI shall be indicated on the final grade card of the program.

22 Award of Degree:

Following rules prevail for the award of degree.

- A student has registered and passed all the prescribed courses under the general institutional and departmental requirements.
- A student has obtained CGPI ≥ 4.75.
- A student has paid all the institute dues and satisfied all the requirements prescribed.
- A student has no case of indiscipline pending against him/her.
- Academic Council shall recommend the award of degree to a student who is declared to be eligible and qualified for above norms.

23 Grace Marks

- Maximum total grace marks will be 1 % of the total theory credit courses x 100 subjected
- To maximum 6 marks in that semester.
- Grace marks will be given candidate for change in grades for theory credit courses.
- Fail to pass grade only and will be reflected in final ESE marks.
- The grace marks are applicable only for maximum 1/3rd courses (rounded to higher Integer part i.e. if there are 4 theory courses then 4/3 = 1.33 = 2 courses).
- Maximum grace marks will be distributed in maximum courses
- Benefit of grace marks is not applicable for any medal/award.
- Applicable to theory and (Theory + Practical Courses). If is not applicable for Practical courses.
- Scheme for grace marks only can be used when the student will pass in all courses of that semester.

24. CGPA Improvement Policy for Award of Degree:

An opportunity shall be given to a student who has earned all the credits required by the respective program with CGPA greater than or equal to 4.00 but less than 4.75 to improve his/her grade by allowing him/her to appear for ESE examinations of maximum two theory courses of seventh semester. Such examinations shall be scheduled along with re-examinations/make-up examinations. However, CGPA shall be limited to 4.75 even though the performance of a student as calculated through modified CGPA becomes greater than 4.75.

Conclusions:

The academic policies regarding conduct of programs in Sanjay Ghodawat University Kolhapur are published in this document. The Academic Council shall reserve the right to modify these policies as and when required from the point of view of achieving academic excellence. In special and abnormal cases (i.e. the cases not covered through above rules) the decision of the (Chairman, Academic Council shall be final and shall be binding on all concerned.

Chairman
Academic Council

First Year B.Sc.: Semester I										
Course Code	**Course Title**	**L**	**T**	**Pr**	**C**	**Evaluation Scheme**				
						Component	**Exam**	**WT**	**Min Passing (%)**	
PHS101 (PC|SS)	Physics I	4	-	-	4	Theory	FET	20	40	40
							CAT I	15		
							CAT II	15		
							ESE	50	40	
CHS101 (PC|SS)	Chemistry I	4	-	-	4	Theory	FET	20	40	40
							CAT I	15		
							CAT II	15		
							ESE	50	40	
MTS101/ BOS101 (PC|SS)	Mathematics I / Botany-I	4	-	-	4	Theory	FET	20	40	40
							CAT I	15		
							CAT II	15		
							ESE	50	40	
AES101 (UC|SA)	English Communication	1	-	-	1	Theory	FET	100	40	40
AES103 (UC|SA)	English Communication Lab	-	-	2	1	Practical	FEP	50	40	40
							POE	50	40	
PHS103 (PC|SS)	Physics Lab I	-	-	4	2	Practical	FEP	50	40	40
							POE	50	40	
CHS103 (PC|SS)	Chemistry Lab I	-	-	4	2	Practical	FEP	50	40	40
							POE	50	40	
MTS103/ BOS103 (PC|SS)	Mathematics Lab I / Botany Lab I	-	-	4	2	Practical	FEP	50	40	40
							POE	50	40	
Total		13	00	14	20	Total Hrs.: 27, Total Credits: 20				

L: Lecture, T: Tutorial, Pr: Practical, C: Credits, Th.: Theory, WT: Weightage PC: Program Core, PE: Program Elective, UC: University Core, UE: University Elective ST: School of Technology, SS: School of Sciences, SC: School of Commerce, SM: School of Management, SA: School of Arts; FET: Faculty Evaluation Theory, FEP: Faculty Evaluation Practical's; CAT: Continuous Assessment Test, ESE: End Semester Examination for theory. ESE: University Evaluation Practical.

First Year B.Sc.: Semester II										
Course Code	**Course Title**	**L**	**T**	**Pr**	**C**	**Evaluation Scheme**				
						Component	**Exam**	**WT**	**Min Passing (%)**	
PHS102 (PC|SS)	Physics II	4	-	-	4	Theory	FET	20	40	40
							CAT I	15		
							CAT II	15		
							ESE	50	40	
CHS102 (PC|SS)	Chemistry II	4	-	-	4	Theory	FET	20	40	40
							CAT I	15		
							CAT II	15		
							ESE	50	40	
MTS102/ BOS102 (PC|SS)	Mathematics II / Botany-II	4	-	-	4	Theory	FET	20	40	40
							CAT I	15		
							CAT II	15		
							ESE	50	40	
AES102 (UC|SS)	Environmental Studies	1	-	-	1	Theory	FET	100	40	40
AES104 (UC|SS)	Environmental Studies Project	-	-	2	1	Practical	FEP	50	40	40
							POE	50		
PHS104 (PC|SS)	Physics Lab II	-	-	4	2	Practical	FEP	50	40	40
							POE	50	40	40
CHS104 (PC|SS)	Chemistry Lab II	-	-	4	2	Practical	FEP	50	40	40
							POE	50	40	
MTS104/ BOS 104 (PC|SS)	Mathematics Lab II/ Botany Lab II	-	-	4	2	Practical	FEP	50	40	40
							POE	50	40	
	Total	13	00	14	20	Total Hrs.: 27, Total Credits: 20				

Semester III										
Course Code	**Course Title**	**L**	**T**	**Pr**	**C**	**Evaluation Scheme**				
						Component	**Exam**	**WT**	**Min passing (%)**	
PHS 201 (PC|SS)	Physics III	4	-	-	4	Theory	FET	20	40	40
							CAT I	15		
							CAT II	15		
							ESE	50	40	
CHS 201 (PC|SS)	Chemistry III	4	-	-	4	Theory	FET	20	40	40
							CAT I	15		
							CAT II	15		
							ESE	50	40	
MTS 201/ BOS 201 (PC|SS)	Mathematics III / Botany-III	4	-	-	4	Theory	FET	20	40	40
							CAT I	15		
							CAT II	15		
							ESE	50	40	
(PC|SS)	Skill Enhancement course-I	2	-	-	2	Theory	FET	20	40	40
							CAT	30		
							ESE	50	40	
PHS 205 (PC|SS)	Physics Lab III	-	-	4	2	Practical	FEP	50	40	40
							POE	50	40	
CHS 205 (PC|SS)	Chemistry Lab III	-	-	4	2	Practical	FEP	50	40	40
							POE	50	40	
MTS 205 / BOS 205 (PC|SS)	Mathematics Lab III/ Botany Lab III	-	-	4	2	Practical	FEP	50	40	40
							POE	50	40	
(PC|SS)	Skill Enhancement course Lab-I	-	-	2	1	Practical	FEP	50	40	40
							POE	50	40	
CIS 201 (UC|SA)	Constitution of India & Professional Ethics	-	-	-	NC	Theory	ESE	100	40	40
AES201 (UC|SS)	Computer skills lab			2	1	Practical	FEP	50	40	40
							POE	50	40	
Total		14	00	16	22	Total Hrs.: 30, Total Credits: 22, Audit: 01				

Semester IV										
Course Code	**Course Title**	**L**	**T**	**Pr**	**C**	**Evaluation Scheme**				
						Component	**Exam**	**WT**	**Min passing (%)**	
PHS 202 (PC|SS)	Physics IV	4	-	-	4	Theory	FET	20	40	40
							CAT I	15		
							CAT II	15		
							ESE	50	40	
CHS 202 (PC|SS)	Chemistry IV	4	-	-	4	Theory	FET	20	40	40
							CAT I	15		
							CAT II	15		
							ESE	50	40	
MTS 202/ BOS 202 (PC|SS)	Mathematics IV/ Botany IV	4	-	-	4	Theory	FET	20	40	40
							CAT I	15		
							CAT II	15		
							ESE	50	40	
(PC|SS)	Skill Enhancement course-II	2	-	-	2	Theory	FET	20	40	40
							CAT	30		
							ESE	50		
PHS 206 (PC|SS)	Physics Lab IV	-	-	4	2	Practical	FEP	50	40	40
							POE	50	40	
CHS 206 (PC|SS)	Chemistry Lab IV	-	-	4	2	Practical	FEP	50	40	40
							POE	50	40	
MTS 206 BOS 206 (PC|SS)	Mathematics Lab IV/ Botany Lab IV	-	-	4	2	Practical	FEP	50	40	40
							POE	50	40	
(PC|SS)	Skill Enhancement course Lab-II	-	-	2	1	Practical	FEP	50	40	40
							POE	50	40	
AES202 (UC|SS)	Entrepreneurship	1			1	Theory	FET	100	40	40
Total		15	00	14	22	Total Hrs.: 29, Total Credits: 22 Audit: 01				

Semester V										
Course Code	**Course Title**	**L**	**T**	**Pr**	**C**	**Evaluation Scheme**				
						Component	**Exam**	**WT**	**Min passing (%)**	
(PC|SS)	Elective I	4	-	-	4	Theory	FET	20	40	40
							CAT I	15		
							CAT II	15		
							ESE	50	40	
(PC|SS)	Elective II	4	-	-	4	Theory	FET	20	40	40
							CAT I	15		
							CAT II	15		
							ESE	50	40	
(PC|SS)	Elective III	4	-	-	4	Theory	FET	20	40	40
							CAT I	15		
							CAT II	15		
							ESE	50		
(UC|SS)	Skill Enhancement Course III	2	-	-	2	Theory	FET	20	40	40
							CAT	30		
							ESE	50		
(PC|SS)	Elective Lab IV	-	-	4	2	Practical	FEP	50	40	40
							POE	50	40	
(PC|SS)	Elective Lab V	-	-	4	2	Practical	FEP	50	40	40
							POE	50	40	
(PC|SS)	Elective Lab VI	-	-	4	2	Practical	FEP	50	40	40
							POE	50	40	
(PC|SS)	Skill Enhancement Course Lab III	-	-	2	1	Practical	FEP	50	40	40
							POE	50	40	
(PC|SS)	Mini Project Phase I	-	-	2	1	Practical	FEP	50	50	50
							POE	50	50	
AES301 (UC|SS)	Data analytics	1			1	Theory	FET	100	40	40
	Total	15	00	16	23	Total Hrs.: 31, Total Credits: 23				

Semester VI										
Course Code	**Course Title**	**L**	**T**	**Pr**	**C**	**Evaluation Scheme**				
						Component	**Exam**	**WT**	**Min passing (%)**	
(PC|SS)	Elective IV	4	-	-	4	Theory	FET	20	40	40
							CAT I	15		
							CAT II	15		
							ESE	50	40	
(PC|SS)	Elective V	4	-	-	4	Theory	FET	20	40	40
							CAT I	15		
							CAT II	15		
							ESE	50	40	
(PC|SS)	Elective VI	4	-	-	4	Theory	FET	20	40	40
							CAT I	15		
							CAT II	15		
							ESE	50	40	
(UC|SS)	Skill Enhancement Course IV	2	-	-	2	Theory	FET	20	40	40
							CAT	30		
							ESE	50	40	
(PC|SS)	Elective Lab I	-	-	4	2	Practical	FEP	50	40	40
							POE	50	40	
(PC|SS)	Elective Lab II	-	-	4	2	Practical	FEP	50	40	40
							POE	50	40	
(PC|SS)	Elective Lab III	-	-	4	2	Practical	FEP	50	40	40
							POE	50	40	
(PC|SS)	Skill Enhancement Course Lab IV	-	-	2	1	Practical	FEP	50	40	40
							POE	50	40	
(PC|SS)	Mini Project Phase II	-	-	2	1	Practical	FEP	50	50	50
							POE	50	50	
AES302 (UC|SS)	Financial Management	1			1	Theory	FET	100	40	40
	Total	15	00	16	23	Total Hrs.: 31, Total Credits: 23				

Note: Student should complete at least one NPTEL/SWAYAM/MOOC course for the completion of UG degree.

Total credits: 130

Sanjay Ghodawat University Kolhapur

School of Science Program: B. Sc.

Syllabus Structure for First Year B. Sc. R1

PHS101: Physics -I (Mechanics)

(Version: 1.0, Program Core, School of Science)

Lect.	Tut.	Pract.	Credits	Evaluation Scheme				
				Component	Exam	WT	Min Pass (%)	
4	-	-	4	Theory	FET	20	40	40
					CAT-I	15		
					CAT-II	15		
					ESE	50	40	

Course Description: This course is at odd semester of first year of BSc. It is a foundation course in Chemistry and may be pre-requisites for other courses. It covers fundamental concepts of organic and inorganic chemistry

Course Outcomes: At the end of this course students will able to:

CO1	Use[3] vector algebra and differential equations to solve equations' of motions.
CO2	Understand[2] how intermolecular forces relate to the states of matter and determine the structure of matter.
CO3	Understand[2] the fundamental laws of classical mechanics.
CO4	Apply[3] laws of motion to study the motion of objects.

Syllabus

Units	Description	Hours
I	**Vectors:** Vector algebra, Scalar and vector products, Derivatives of a vector with respect to a parameter. **Ordinary Differential Equations:** Introduction to differential equation, 1st order homogeneous differential equations, 2nd order homogeneous differential equations with constant coefficients. **Laws of Motion:** Frames of reference, Newton's Laws of motion (statement with proof).	15

II **Momentum and Energy:** 15

Conservation of linear and angular momentum, work and energy theorem, conservation of energy for single particle, center of mass, dynamics of a system of particles (linear momentum, angular momentum and energy), motion of rockets (qualitative only).

Rotational Motion:

Angular displacement, angular velocity, angular acceleration, angular momentum, torque of rotating body, kinetic energy and moment of inertia of a spherical shell (about diameter), moment of inertia of solid cylinder (own axis of symmetry).

III **Gravitation:** 15

Newton's law of gravitation, gravitational potential and field of spherical shell, motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant), Kepler's laws (statement only), satellite and its applications, basic idea of global positioning system (GPS).

Oscillations:

Simple harmonic motion, differential equation of SHM and its solutions, kinetic and potential energy of harmonic oscillator, total energy and their time averages, forced oscillations, damped and undamped oscillations.

IV **Elasticity:** 15

Hooke's law - stress-strain diagram, Elastic constants and relation between them, Expression for Poisson's ratio in terms of elastic constants, bending of beam, bending moment, cantilever (without considering weight of cantilever), Young's modulus for beam supported at both ends (without considering weight of beam), Torsional oscillations and work done in twisting a wire, Torsional pendulum-determination of modulus of rigidity and moment of inertia.

Surface Tension:

Surface tension and surface energy (definition and units), angle of contact and wettability, relation between excess of pressure, surface tension and radius of curvature, Jaeger's method- determination of surface tension of liquid.

Fluid Dynamics:

Fluid, types of fluid, equation of continuity, Bernoulli's theorem and its applications, viscosity, flow of liquid through capillary tube and Poiseuille's formula.

Reference Books:

1. Elements of properties of matter- D. S. Mathur, Shamlal Charitable Trust New Delhi.
2. University Physics. FW Sears, MW Zemansky and HD Young13/e, 1986. Addison-
3. Wesley
4. Mechanics Berkeley Physics course, v.1: Charles Kittel, et. Al. 2007, Tata McGraw-
5. Hill.
6. Physics – Resnick, Halliday & Walker 9/e, 2010, Wiley eastern Ltd, New Delhi.
7. Engineering Mechanics, Basudeb Bhattacharya, 2nd edn., 2015, Oxford University
8. Press
9. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
10. Concepts of Physics-Vol. 1. H.C. Verma-Bharti Publishers.

CHS 101: Chemistry-I

(Version: 1.0, Program Core, School of Sciences)

Lect.	Tut.	Pract.	Credits	Evaluation Scheme				
				Component	Exam	WT	Min Pass (%)	
4	-	-	4	Theory	FET	20	40	40
					CAT-I	15		
					CAT-II	15		
					ESE	50	40	

Course Description: It is a foundation course in Chemistry and may be pre-requisites for other courses. It covers some fundamental concepts of organic and inorganic chemistry.

Course Outcomes: At the end of this course students will able to,

CO1	Describe[2] atomic structure and mole concept
CO2	Discribe[2] concepts in organic chemistry and Stereochemistry.
CO3	Explain[2] the nature of Chemical Bonding and Molecular Structure
CO4	Identify[1] properties of aliphatic hydrocarbons.

Syllabus (Theory)

Units	Description	Hours
I	**Atomic Structure:** Review of Bohr's theory and its limitations, Dual behavior of matter and radiation, de Broglie's relation, Heisenberg uncertainty principle. Hydrogen atom spectra. Shapes of atomic orbitals, Quantum number. **Mole Concept**-Determination of molecular weight by gram molecular volume relationship, Problems based on mole concept. Methods of expressing concentrations, strength, normality, molarity, molality, %w/v, %v/v, ppm, Standardization of solutions, Primary and secondary standards. **Oxidation and Reduction**-Definitions to relate terms like oxidation, reduction, oxidizing agent, reducing agent, oxidation number, Balancing of redox reactions using oxidation number method and ion-electron method.	15
II	**Fundamentals of Organic Chemistry** Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyper-conjugation. Cleavage of Bonds: Homolysis and Heterolysis. Structure, Shape and reactivity of organic molecules: Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals. Aromaticity: Benzenoids and Hückel's rule. **Stereochemistry** Conformations with respect to ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds). Threo and erythro; D and L; cis – trans nomenclature; E / Z Nomenclature (for upto two C=C systems).	15

III Chemical Bonding and Molecular Structure

Ionic Bonding*:* General characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character. 15

Covalent bonding*:* VB Approach: Shapes of some inorganic molecules and ions on the basisof VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonalbipyramidal and octahedral arrangements. MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their characteristics for *s-s*, *s-p* and *p-p* combinations of atomic orbitals, nonbonding combination 10 of orbitals, MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including idea of *s-p* mixing) and heteronuclear diatomic molecules such as CO, NO and NO+. Comparison of VB and MO approaches.

IV Aliphatic Hydrocarbons

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure. 15

Alkanes: (Upto 5 Carbons).

Preparation: Catalytic hydrogenation, Wurtz reaction, Grignard reagent.

Reactions: Free radical Substitution: Halogenation.

Alkenes: (Upto 5 Carbons)

Preparation: Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (Partial catalytic hydrogenation) and trans alkenes.

Reactions: cis-addition (alkaline $KMnO_4$) and trans-addition (bromine), Addition of HX (Markownikoff's and anti-Markownikoff's addition), Hydration, Ozonolysis, oxymecuration-demercuration, Hydroboration-oxidation, addition of thiol to terminal alkene (thiol-ene click reaction)

Alkynes: (Upto 5 Carbons)

Preparation: Acetylene from CaC_2 and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides.

Reactions: formation of metal acetylides, addition of bromine and alkaline $KMnO_4$, ozonolysis and oxidation with hot alkaline $KMnO_4$, azide-alkyne click reaction.

Reference Books:

1. R.L. Madan, *Chemistry for degree students* S. Chand and company ltd.
2. Lee, J.D. *Concise Inorganic Chemistry* ELBS, 1991.
3. Cotton, F.A., Wilkinson, G. &Gaus, P.L. *Basic Inorganic Chemistry*, 3rd ed., Wiley.
4. Douglas, B.E., McDaniel, D.H. & Alexander, J.J. *Concepts and Models in Inorganic Chemistry*, John Wiley & Sons.
5. Huheey, J.E., Keiter, E.A., Keiter, R.L. &Medhi, O.K. *Inorganic Chemistry:*
6. *Principles of Structure and Reactivity*, Pearson Education India, 2006.
7. Graham Solomon, T.W., Fryhle, C.B. &Dnyder, S.A. *Organic Chemistry*, John

Wiley & Sons (2014).
8. McMurry, J.E. *Fundamentals of Organic Chemistry*, 7th Ed. Cengage Learning India.
9. Sykes, P. *A Guidebook to Mechanism in Organic Chemistry*, Orient Longman, New Delhi (1988).
9. Eliel, E.L. *Stereochemistry of Carbon Compounds*, Tata McGraw Hill education. 2000.
10. Finar, I.L. *Organic Chemistry* (Vol. I & II), E.L.B.S.
11. Morrison, R.T. & Boyd, R.N. *Organic Chemistry*, Pearson, 2010.
12. Bahl, A. &Bahl, B.S. *Advanced Organic Chemistry*, S. Chand, 2010.

MTS101: Mathematics I (Calculus)

(Ver.1.0, Program Core, School of Science)

Lect.	Tut.	Pract.	Credits	Evaluation Scheme				
				Component	Exam	WT	Min Pass (%)	
4	-	-	4	Theory	FET	20	40	40
					CAT-I	15		
					CAT-II	15		
					ESE	50	40	

Course Description: This course is at odd semester of first year B.Sc. It is a fundamental course from calculus. It covers limit, continuity, and differentiation, expansion of function, indeterminate forms and complex numbers.

Course Outcomes: At the end of this course students will able to

CO1:	Find[3] limits of functions.
CO2:	Test[4] differentiability of functions at a point.
CO3:	Use[3] Leibnitz theorem to find n^{th} derivative of functions.
CO4:	Obtain[2] series expansion of functions at $x=0$ and $x=a$
CO5:	Find[3] limits of indeterminists form by LHospital rule
CO6	Solve[3] the problems of Complex number by De-Moivre's theorem.

Syllabus (Theory)

Units	Description	Hours
I	Limits and Continuity: Introduction tolimits, computation of limits, limits at infinity, continuity, continuity of functions (trigonometric, exponential, inverse functions).	10
II	Differentiability: Introduction, Differentiable function, Rolle's theorem, Lagranges mean value theorem, Cauchy's mean value theorem.	10
III	Successive Differentiation: Introduction, nth order derivative of standard functions, Leibnitz's theorem and its applications, examples.	10
IV	Series Expansions: Series representations, Taylor and Maclaurin Series, Taylor polynomials, Taylor's theorem, Maclaurin theorem.	10
V	Indeterminate Forms: Introduction, L'Hôpital's rule (Without Proof), Indeterminate forms of the type 0/0, ∞/∞, ∞ - ∞, 00, ∞0 and 1∞.	10
VI	Complex Number:De Moivre′s theorem, roots of complex number, circular and hyperbolic functions, relation between circular and hyperbolic functions, properties of hyperbolic functions, inverse hyperbolic functions.	10

Textbook:

1. **H. Anton, I. Birens and S. Davis**: Calculus , John Wiley and Sons
2. **Shanti Narayan**: Differential Calculus – S. Chand & Co. publication

References:

1. **G.B. Thomas and R.L. Finney**: Calculus , Pearson Education
2. **James Ward Brown and Ruel V. Churchill**: Complex variables and applications 8^{th} McGraw-Hill international edition 2009.

BOS 101: Botany-I

(Version: 1.0, Program Core, School of Sciences)

Lect.	Tut.	Pract.	Credits	Evaluation Scheme				
				Component	Exam	WT	Min Pass (%)	
4	-	-	4	Theory	FET	20	40	40
					CAT-I	15		
					CAT-II	15		
					ESE	50	40	

Course Description: This course is at odd semester of first year of BSc. It is a foundation course in Botany and may be pre-requisites for other courses. It covers fundamental concepts of Botany.

Course Outcomes: At the end of this course students will able to

CO1	Describe[1] general characteristics of virus and bacteria.
CO2	Explain[2] morphology and lifecycle of algae and fungi.
CO3	Discribe[2] morphology anatomy and reproduction of Bryophytes.
CO4	Discribe[2] morphology anatomy and reproduction of Pteridophytes and Gymnosperms.

Syllabus (Theory)

Units	Description	Hours
I	**Microbes** Viruses – Discovery, general structure, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Economic importance; Bacteria – Discovery, General characteristics and cell structure; Reproduction – vegetative, asexual and recombination (conjugation,transformation and transduction); Economic importance. **Introduction of Algae** General characteristics; Ecology and distribution; Range of thallus organization and reproduction.	15
II	**Algae and Fungi** Classification of algae; Morphology and life-cycles of the following: *Nostoc*, *Chlamydomonas,Fucus, Polysiphonia*. Economic importance of algae. Introduction of fungi- General characteristics, ecology and significance, range of thallus organization, cell wall composition, nutrition, reproduction and classification; True Fungi- General characteristics, ecology and significance, life cycle of *Rhizopus*(Zygomycota) *Penicillium,* (Ascomycota), *Puccinia,* (Basidiomycota); Symbiotic Associations- Lichens: General account, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance.	15
III	**Introduction to Archegoniate** Unifying features of archegoniates, Transition to land habit, Alternation of generations.	15

Bryophytes

General characteristics, adaptations to land habit, Classification, Range of thallus organization. Classification (up to family), morphology, anatomy and reproduction of *Marchantia*and *Funaria*. (Developmental details not to be included). Ecology and economic importance of bryophytes with special mention of *Sphagnum*.

IV Pteridophytes 15

General characteristics, classification, Early land plants (*Cooksonia*and*Rhynia*). Classification (up to11family), morphology, anatomy and reproduction of *Selaginella*, *Equisetum* and *Pteris*. (Developmental details not to be included). Heterospory and seed habit, stelar evolution. Ecological and economic importance of Pteridophytes.

Gymnosperms

General characteristics, classification. Classification (up to family), morphology, anatomy and reproduction of *Cycas*and*Pinus*. (Developmental details not to be included). Ecological and economic importance.

Reference Books:

1. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.
2. Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10th edition.
3. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.
4. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition.
5. Raven P.H., Johnson, G.B., Losos, J.B., Singer, S.R., (2005). Biology. Tata McGraw Hill, Delhi, India.
6. Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi, India.
7. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
8. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.

AES101: English Communication

(Version: 1.0, Program Core, School of Sciences)

Lect.	Tut.	Pract.	Credits	Evaluation Scheme			
				Component	Exam	WT	Pass
2	-	-	2	Theory	FET	30	Min 40
					CAT	20	
					ESE	50	

Course Outcomes: After the end of this course students will able to:

CO1	Illustrate the process, types, levels and barriers of communication
CO2	Use appropriate grammar rules and vocabulary in oral and written communication
CO3	Apply techniques of reading and listening, speaking and writing
CO4	Write/Draft business letters and e-mails
CO5	To comprehend scientific and other texts

Syllabus (Theory)

Units	Description	Hours
I	**Communication Theory** Communication: meaning and definition, process of communication, Elements of communication, Levels of communication, Flows of communication, Types of communication, Barriers to communication Ways to eradicate barriers	4
II	**Grammar and Vocabulary** Parts of Speech, Use of Tenses, changes the voice, Direct indirect speech, Antonyms, Synonyms, One-word Substitution, Homonyms, Homophones	8
III	**Listening, Speaking and Writing Skills** Situational Conversations, Debates, Public speeches (Extempore and Prepared) Dialogue writing, Business letter writing (Leave application, Resume writing and Job application letter, Enquiry, Reply to enquiry, order) and Email writing.	8
IV	**Reading Skills** Close Reading, Comprehension, Summary Writing, Analysis and Interpretation, Translation (from Indian language to English and vice-versa)	6

Following texts can be referred

1. Sudha Murthy,*Three Bright Young Men* from Wise and Otherwise
2. SatyaNadella,Letter to employees.
3. Mr. AjimPremji,Tete –a-tete
4. Albert Einstien-1879-1955- A Biographical Memoir by Johan A. Wheeler Vol. V (1980)
5. Rachel Carson,Surface Waters and Underground Seas (A chapter from her Book *Silent Spring*)
6. Stephen Hawking,Our Picture of the Universe (A *Brief History of Time* Chapter.1)
7. Thomas Hager, the Alchemy of Air Chapter 1.

AES103: English Communication Lab

(Version: 1.0, Program Core, School of Sciences)

Lect.	Tut.	Pract.	Credits	Evaluation Scheme				
				Component	Exam	WT	Min. Pass (%)	
-	-	4	2	Practical	FEP	50	40	40
					POE	50	40	

Course Outcomes: After the end of this course students will able to:

CO1	Illustrate[3] the process of Morphological Analysis of Words
CO2	Use[3] appropriate Parts of Speech andvocabulary in oral and written communication
CO3	Apply[3] Basic Grammar
CO4	Apply[3] tenses to Sentence formation

Practical

No	Description
1	Morphological analysis of words and identification of word from the sentence given
2	Parts of speech and usage and vocabulary
3	Phrases and Elements of clauses and sentence analysis
4	Sentence formation; types of sentence, tenses, change the voice
5	Sentence formation; Direct and Indirect Speech
6	Situational Conversation on given topic
7	Business Correspondence: Letter Writing
8	Read and comprehend the given passages.

Reference Books

1. Meenakshi Raman &Sangita Sharma, Technical Communication; Principles and Practice, Oxford University Press.
2. Raymond Murphy, Essential English Grammar: A Self-Study Reference and Practice Book for Elementary Students of English with Answers, Cambridge University Press
3. Green, David. Contemporary English Grammar –Structures and Composition. MacMillan India. 2014 (Print)
4. Ajmani, J. C. *Good English: Getting it Right*. New Delhi: RupaPublications, 2012.
5. Fitikides, T. J. *Common Mistakes in English*. London: Orient Longman, 1984.
6. M Ashraf Rizvi, Effective Technical Communication, Tata McGraw-Hill Education
7. Andrea J. Rutherford, Basic Communication Skills for Technology, Person Education Asia
8. Pease, Allan. *Body Language.* Delhi: Sudha Publications, 1998.
9. Adair, John. *Effective Communication*. London: Pan Macmillan Ltd., 2003.

10. Moore, Ninja-Jo, et al. *Nonverbal Communication: Studies and Applications*. New York: Oxford University Press, 2010.
11. National Academy of Sciences. 1980. *Biographical Memoirs V.51*. Washington, DC: The National Academies Press. https://doi.org/10.17226/574.
12. Rachel Carson, *Silent Spring* Houghton Mifflin Company; Anniversary edition (October 22, 2002)
13. Stephen Hawking, A *Brief History of Time* Random House, 10-Nov-2009
14. Thomas Hager, The Alchemy of Air, Harmony Books, New York

PHS 103: Physics Lab I

MECHANICS AND PROPERTIES OF MATTER

(Version: 1.0, University Core, School of Science)

Lect.	Tut.	Pract.	Credits	Evaluation Scheme				
				Component	Exam	WT	Min. Pass (%)	
-	-	4	2	Practical	FEP	50	40	40
					POE	50	40	

Course Outcomes: At the end of the course, students will be able to:

CO1	**Use**[3] vernier calliper, micrometer screw gauge and travelling microscope.
CO2	**Demonstrate**[3] the properties of elasticity through different experiments.
CO3	**Understand**[2] the concept of gravitation and properties of matter to calculate acceleration due to gravity, surface tension and viscosity.

Practical Syllabus

1. Measurements of length (or diameter) using Vernier caliper, screw gauge and travelling microscope.
2. Moment of inertia of a disc using auxiliary annular ring.
3. Young's modulus of material of bar (wooden) by vibration.
4. Modulus of rigidity of material of wire by torsional oscillations.
5. Elastic constants of wire by Searle's method.
6. Bar pendulum – determination of acceleration due to gravity (g).
7. Kater's Pendulum- determination of acceleration due to gravity (g).
8. Viscosity of liquid by Stokes method.
9. Motion of a spring-determine spring constant and acceleration due to gravity (g).
10. Surface tension of liquid – Jaegers method.
11.

Reference Books:

1. Advanced Practical Physics for students, B. L. Flint and H. T. Worsnop, 1971, Asia Publishing House.
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
3. Engineering Practical Physics, S. Panigrahi & B. Mallick, 2015, Cengage Learning India Pvt. Ltd.
4. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
5. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
6. Practical Physics – Gupta and Kumar (Pragati Prakation Meerat)

CHS 103: Chemistry Lab-I

(Version: 1.0, Program Core, School of Sciences)

Lect.	Tut.	Pract.	Credits	Evaluation Scheme				
				Component	Exam	WT	Min. Pass (%)	
-	-	4	2	Practical	FEP	50	40	40
					POE	50	40	

Course Description: It is a foundation course in Chemistry laboratory and it covers basic skills of organic and inorganic chemistry laboratory.

Course Outcomes: At the end of this course students will able to

CO1:	Examine[3] chemical components of Soap and Bordomixture.
CO2:	Estimate[2] Oxalic acid, water of crystallization in Mohr's salt, Ferrous ion, Cupric ion
CO3:	Identify[2] extra element in organic compound.
CO4:	Differentiate[2] mixture of organic compound by Chromatography

S.N. **Description (Bring experiment to relevant to theory)**

1 Analysis of Soap solution: Estimation of sodium carbonate and d sodium hydrogen carbonate present in a mixture).
2 Estimation of oxalic acid by titrating it with $KMnO_4$.
3 Estimation of water of crystallization in Mohr's salt by titrating with $KMnO_4$.
4 Estimation of Fe (II) ions by titrating it with $K_2Cr_2O_7$ using internal indicator.
5 Estimation of Cu (II) ions iodometrically using $Na_2S_2O_3$.
6 Analysis of fungicides: Estimation of Copper in Bordomixture
7 Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing up to two extra elements).
8 Separation of mixtures by Chromatography: Measure the Rf value in each case (combination of two compounds to be given) 12
(a) Identify and separate the components of a given mixture of 2 amino acids (glycine, aspartic acid, glutamic acid, tyrosine or any other amino acid) by paper chromatography
(b) Identify and separate the sugars present in the given mixture by paper chromatography.
9 **Estimation**
1. Estimation of Vitamin C by iodometric titration or by CAN.
2. Estimation of Phenol and aniline by bromination with potassium bromate-potassium bromide method.

Books & References:

1. Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012.
2. Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.
3. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., Textbook of Practical Organic Chemistry, Prentice-Hall, 5th edition, 1996.
4. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960.

MTS 103: Practical-I (Maxima-I)

(Ver 1.0, Program Core, School of Science)

Lect.	Tut.	Pract.	Credits	Evaluation Scheme				
				Component	Exam	WT	Min Pass (%)	
-	-	4	2	Practical	FEP	50	40	40
					POE	50	40	

Course Description: This course is at odd semester of first year B.Sc. Maxima is open source software and during practical's students has to find the solution of numerical and verify the solutions with Maxima software.

Course Outcomes: At the end of this course students will able to

CO1:	Choose[3] appropriate function and variable for arithmetic calculations.
CO2:	Contrast[4] a Maxima code to draw 2D and 3D graphs.
CO3:	Find[3] limit derivative, integration by Maxima.

List of Experiments

S.N.	Description
1)	To study installation process of Maxima on window.
2)	To study Arithmetic operations on Maxima.
3)	To study different Functions and Variables.
4)	To study Plotting (Graphing) of Functions.
5)	To study 3D Plotting.
6)	To study computation of a Partial Fraction Decomposition.
7)	To find the Limits.
8)	To find Derivatives.
9)	To find Differentials.
10)	To find Integration.
11)	To study Mathematical Functions in Maxima.

Textbook:

1. **Paulo Ney de Souza, Richard J. Fateman**: The Maxima Book, (19th September 2004)

Reference:

1. Maxima Manual Ver. 5.28.0

BOS 103: Botany Lab-I

(Version: 1.0, Program Core, School of Sciences)

Lect.	Tut.	Pract.	Credits	Evaluation Scheme				
				Component	Exam	WT	Min. Pass (%)	
-	-	4	2	Practical	FEP	50	40	40
					POE	50	40	

Course Outcomes: At the end of this course students will able to

CO1:	Describe[2] morphology of the plants.
CO2:	Distinguish[2]vegetative and reproductive structures
CO3:	Construct[2] Temporary slides

Syllabus

No	Description
1	EMs/Models of viruses – T-Phage and TMV, Line drawing/Photograph of Lytic and Lysogenic Cycle.
2	Types of Bacteria from temporary/permanent slides/photographs; EM bacterium; Binary Fission; Conjugation; Structure of root nodule.
3	Gram staining
4	Study of vegetative and reproductive structures of *Nostoc, Chlamydomonas*(electron micrographs), *Oedogonium, Vaucheria, Fucus* and Polysiphonia*through temporary Preparations and permanent slides. (* *Fucus*- Specimen and permanent slides)
5	*Rhizopus and Penicillium*: Asexual stage from temporary mounts and sexual structures through permanent slides.
6	*Alternaria:* Specimens/photographs and tease mounts.
7	*Puccinia*: Herbarium specimens of Black Stem Rust of Wheat and infected Barberry leaves; section/tease mounts of spores on Wheat and permanent slides of both the hosts
8	*Agaricus*: Specimens of button stage and full grown mushroom; Sectioning of gills of *Agaricus*.
9	Lichens: Study of growth forms of lichens (crustose, foliose and fruticose.
10	Mycorrhiza: ectomycorrhiza and endomycorrhiza (Photographs)
11	***Marchantia***- morphology of thallus, w.m. rhizoids and scales, v.s. thallus through gemma cup, w.m. gemmae (all temporary slides), v.s. antheridiophore, archegoniophore, l.s. sporophyte (all permanent slides).
12	***Funaria***- morphology, w.m. leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridial and archegonial heads, l.s. capsule and protonema.
13	***Selaginella***- morphology, w.m. leaf with ligule, t.s. stem, w.m. strobilus, w.m. microsporophyll and megasporophyll (temporary slides), l.s. strobilus (permanent slide).
14	***Equisetum***- morphology, t.s. internode, l.s. strobilus, t.s. strobilus, w.m. sporangiophore, w.m. spores (wet and dry) (temporary slides); t.s rhizome (permanent slide).
15	***Pteris***- morphology, t.s. rachis, v.s. sporophyll, w.m. sporangium, w.m. spores (temporary slides), t.s. rhizome, w.m. prothallus with sex organs and young sporophyte (permanent slide).
16	***Cycas***- morphology (coralloid roots, bulbil, leaf), t.s. coralloid root, t.s. rachis, v.s. leaflet, v.s.

microsporophyll, w.m. spores (temporary slides), l.s. ovule, t.s. root (permanent slide).

17 ***Pinus***- morphology (long and dwarf shoots, w.m. dwarf shoot, male and female), w.m. dwarf shoot, t.s. needle, t.s. stem, l.s./t.s. male cone, w.m. microsporophyll, w.m. microspores (temporary slides), l.s. female cone, t.l.s. &r.l.s. stem (permanent slide).

Books & References

1. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.
2. Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10th edition.
3. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.
4. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition.
5. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R., (2005). Biology. Tata McGraw Hill, Delhi, India.
6. Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi, India.
7. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
8. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.

PHS 102: Physics -II (Electricity and Magnetism)

(Version: 1.0, University Core, School of Science)

Lect.	Tut.	Pract.	Credits	Evaluation Scheme				
				Component	Exam	WT	Min Pass (%)	
4	-	-	4	Theory	FET	20	40	40
					CAT-I	15		
					CAT-II	15		
					ESE	50	40	

Course description: The course aims at introducing the basic concepts in electrostatics and helps in developing problem solving skills. A brief look at electrical measurements and circuits will help to understand how electromagnetic effects are observed, measured, and applied. Also how Maxwell's equations unify electric and magnetic effects and how the solutions to Maxwell's equations describe electromagnetic radiation. This will serve as the basis for understanding all electromagnetic radiation, from very low frequency, long wavelength radio waves to the most powerful astrophysical gamma rays.

Course Outcomes: After the end of this course students will able to:

CO1	Understand[2] the significance of gradient, divergence and curl of scalar or vector fields
CO2	Apply[3] gradient, divergence and curl of scalar or vector fields to derive various laws in electrostatics and magnetostatics.
CO3	Identify[2] the magnetic materials and solve problems in magnetism with the demonstration of concepts magnetic fields.
CO4	Describe[2] the basic concepts and principles of electromagnetic theory.

Syllabus (Theory)

Units	Description	Hours
I	**Vector Analysis and Electrostatics:** Review of vector algebra (Scalar and Vector product), gradient, divergence, curl and their significance, vector integration, line, surface and volume integrals of vector fields, Gauss-divergence theorem and Stoke's theorem of vectors (statement only). **Electrostatics:** Electrostatic field, electric flux, Gauss's theorem of electrostatics, electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere, calculation of electric field from potential, capacitance of an isolated spherical conductor, parallel plate, spherical and cylindrical condenser, energy per unit volume in electrostatic field, dielectric medium, polarisation, displacement vector, Gauss's theorem in dielectrics, parallel plate capacitor completely filled with dielectric.	15
II	**A.C. Circuits:** Complex numbers and their applications in solving a. c. series LCR circuit, complex impedance, Reactance, Admittance, and Susceptance, R-C circuit, L-C circuit,	15

Resonance in LCR series circuit, Sharpness of resonance (qualitative treatment only), Q-factor (definition only) A.C. Bridge - Owen's Bridge.

III **Magnetism:** 15

Magnetostatics: Biot - Savart's law & its applications- straight conductor, circular coil, solenoid carrying current, divergence and curl of magnetic field, magnetic vector potential, Ampere's circuital law, magnetic properties of materials: magnetic intensity, magnetic induction, permeability, magnetic susceptibility, magnetic dipole moment, brief introduction of dia-, para- and ferro-magnetic materials, types of magnetic materials, applications of magnetic materials.

IV **Electromagnetic Induction:** 15

Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils, energy stored in magnetic field.

Maxwell`s equations and Electromagnetic wave propagation:

Equation of continuity of current, displacement current, Maxwell's equations, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, polarization.

Reference books:

1. Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education.
2. Electricity and Magnetism, J. H. Fewkes& J. Yarwood. Vol. I, 1991, Oxford University Press.
3. Electricity and Magnetism, D. C. Tayal, 1988, Himalaya Publishing House.
4. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.11
5. D. J. Griffiths, Introduction to Electrodynamics, 3rd edition, 1998, Benjamin Cummings.

CHS 102: Chemistry-II

(Version: 1.0, Program Core, School of Sciences)

Lect.	Tut.	Pract.	Credits	Evaluation Scheme				
				Component	Exam	WT	Min Pass (%)	
4	-	-	4	Theory	FET	20	40	40
					CAT-I	15		
					CAT-II	15		
					ESE	50	40	

Course Description: This course is at even semester of first year of BSc. It is a foundation course in Chemistry and may be pre-requisites for other courses. It covers fundamental concepts of organic and physical chemistry.

Course Outcomes: After the end of this course students will able to

CO1	Understand[2] chemical energetics.
CO2	Discribe[2] functional group approach in reactions.
CO3	Explain[2] the chemical and ionic equilibria.
CO4	Discribe[2] properties of alcohols, phenols and ethers.

Syllabus (Theory)

Units	Description	Hours
I	**Chemical Energetics:** Review of thermodynamics and the Laws of Thermodynamics -Statement of Zeroth law, First law, and Second law of thermodynamics. Principles of thermochemistry. Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and effect of dilution. Calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data. Variation of enthalpy of a reaction with temperature – Kirchhoff's equation. Statement of Third Law of thermodynamics and calculation of absolute entropies of substances. **Chemical Equilibrium:** Free energy change in a chemical reaction. Thermodynamic derivation of the law of chemical equilibrium. Le Chatelier's principle. Relationships between Kp, Kc and Kx for reactions involving ideal gases.	15
II	**Functional group approach for the following reactions** (Preparations and reactions) to be studied in context to their structure. **Aromatic hydrocarbons** Preparation (Case benzene) from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid. Reactions: (Case benzene): Electrophilic substitution: nitration, halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation) (upto 4 carbons on benzene). Side chain oxidation of alkyl benzenes (upto 4 carbons on benzene). **Alkyl and Aryl Halides:** Alkyl Halides (Upto 5 Carbons) Types of Nucleophilic Substitution (S_N1, S_N2 and	15

S_Ni) reactions.
Preparation of **Alkyl Halides** from alkenes and alcohols.
Reactions: hydrolysis, nitrite & nitro formation, nitrile and isonitrile formation. Williamson's ether synthesis: Elimination vs substitution. Aryl Halides
Preparation: (Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer & Gattermann reactions.
Reactions (Chlorobenzene): Introduction, Aromatic nucleophilic substitution S_NAr (replacement by –OH group) and effect of nitro substituent. Benzyne Mechanism: KNH_2/NH_3 (or $NaNH_2/NH_3$).

III Chemical Kinetics

The concept of reaction rates. Factors affecting the reaction rates (with reference to Habers Process). Order and molecularity of a reaction. Derivation of integrated rate equations for zero, first and second order reactions (both for equal and unequal concentrations of reactants). Half–life of a reaction. Methods for determination of order of a reaction. **(Numerical problems)** 15

Ionic Equilibria:
Strong and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect. Salt hydrolysis and calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Solubility and solubility product of sparingly soluble salts. Applications of solubility product principle.
(Numerical problems)

IV Alcohols, Phenols and Ethers

Alcohols: 15
Preparation: Preparation of 1^o, 2^o and 3^o alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters.
Reactions: With sodium, HX (Lucas test), esterification, oxidation (alk. $KMnO_4$, conc. HNO_3 Jones reagent, acidic dichromate) Oppeneauer oxidation.
Diols*:* (Upto 6 Carbons) oxidation of diols. Pinacol-Pinacolone rearrangement.
Phenols: (Phenol case)
Preparation: Cumenehydroperoxide method, from diazonium salts.
Reactions: Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer-Tiemann Reaction, Gattermann-Koch Reaction, Houben–Hoesch Condensation, Schotten –Baumann Reaction.
Aldehydes and ketones (aliphatic and aromatic):
(Formaldehye, acetaldehyde, acetone and benzaldehyde)
Preparation: from acid chlorides and from nitriles.
Reactions: Reaction with HCN, ROH, $NaHSO_3$, NH_2-Gr. (-OH, NH2 etc.) derivatives, Gringnard reagent. Iodoform test. Aldol Condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation. Clemensen reduction and Wolff Kishner reduction. Meerwein-Pondorff-Verley reduction

Reference Books:

1. R.L. Madan, Chemistry for degree students S. Chand and company ltd.
2. Graham Solomon, T.W., Fryhle, C.B. &Dnyder, S.A. Organic Chemistry, John Wiley & Sons (2014).
3. McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition, 2013.
4. Sykes, P. A Guidebook to Mechanism in Organic Chemistry, Orient Longman, New Delhi (1988).
5. Finar, I.L. Organic Chemistry (Vol. I & II), E.L.B.S.
6. Morrison, R.T. & Boyd, R.N. Organic Chemistry, Pearson, 2010.
7. Bahl, A. &Bahl, B.S. Advanced Organic Chemistry, S. Chand, 2010.
8. Barrow, G.M. Physical Chemistry Tata McGraw-Hill (2007).
9. Castellan, G.W. Physical Chemistry 4th Ed. Narosa (2004).
10. Kotz, J.C., Treichel, P.M. & Townsend, J.R. General Chemistry Cengage Learning India Pvt. Ltd., New Delhi (2009).
11. Petrucci, R.H. General Chemistry 5th Ed. Macmillan Publishing Co.: New York (1985)

MTS 102: Mathematics II (Differential Equations)

(Ver. 1.0, Program Core, School of Science)

Lect.	Tut.	Pract.	Credits	Evaluation Scheme				
				Component	Exam	WT	Min Pass (%)	
4	-	-	4	Theory	FET	20	40	40
					CAT-I	15		
					CAT-II	15		
					ESE	50	40	

Course Description: This course is at even semester of first year B.Sc. It is a fundamental course from calculus. It covers solution of differential equation of 1st order and 1st degree, linear differential equations, Ordinary simultaneous differential equation and partial differentiation.

Course Outcomes: At the end of this course students will able to

CO1:	Classify[2] the differential equations.
CO2:	Solve[3] linear differential equations.
CO3:	Solve[3] homogeneous and non-homogeneous Differential Equations.
CO4:	Solve3 differential equation by different methods.
CO5:	Find[3] partial derivatives of functions of two or more variables.
CO6:	Solve[3] the partial differential equations**.**

Syllabus (Theory)

Units	Description	Hours
I	**Exact Differential Equation:** Introduction, classification of differential equation, exact differential equation, equation reducible to exact differential equation, integrating factor of exact differential equation, linear differential equation, Bernoulli's differential equation, special integrating factor.	10
II	**Linear Differential Equation:** Introduction, basic theory of linear differential equation, homogeneous linear equation with constant coefficients, complementary function and particular integral, general solution of *f(D)y=X*, solution of equation *f(D)y=0*, The Symbolic function $\frac{1}{f(D)}$, to evaluate $\frac{1}{(D-a)}X$.	10
III	**Ordinary Simultaneous Differential Equations:** Ordinary simultaneous equations of first order and first degree, method of solving simultaneous differential equations,simultaneous linear equation of the form $\frac{dx}{P}=\frac{dy}{Q}=\frac{dz}{R}$, geometrical interpretation of $\frac{dx}{P}=\frac{dy}{Q}=\frac{dz}{R}$	10

IV	**Total Differential Equations:** Introduction, condition of inerrability, method of solving the integrable equation, treating one variable constant, method of inspection, method of substitution, geometrical interpretation of total differential equation.	10
V	**Partial Differentiation:** Function of two variable, Partial derivative of first order, Partial derivative of higher order, examples on partial derivative, homogeneous function of two variables, Euler's theorem on homogeneous function of two variables, Jacobian.	10
VI	**Partial Differential Equations:** Order and degree of Partial differential equations, Concept of linear and non-linear partial differential equation, Linear partial differential equation of first order, Lagranges method, Types of integral, Special types of solution of nonlinear partial differential equations.	10

Textbook:

1. **M.D. Raisinghania**: Ordinary and Partial Differential Equations, S. Chand, 19th Edition 2017.

References:

1. **Shepley L. Ross**: Differential Equations, 3rd Ed., John Wiley and Sons, 1984.

BOS 102: Botany-II

(Version: 1.0, Program Core, School of Sciences)

Lect.	Tut.	Pract.	Credits	Evaluation Scheme				
				Component	Exam	WT	Min Pass (%)	
4	-	-	4	Theory	FET	20	40	40
					CAT-I	15		
					CAT-II	15		
					ESE	50	40	

Course Outcomes: At the end of this course students will able to

CO1	Describe[1] plant ecology.
CO2	Explain[2] plant ecosystem.
CO3	Discribe[2] taxonomy.
CO4	Identify[1] botanical nomenclature.

Syllabus (Theory)

Units	Description	Hours
I	**Introduction of Plant Ecology and Taxonomy:** **Ecological factors:** Soil: Origin, formation, composition, soil profile. Water: States of water in the environment, precipitation types. Light and temperature: Variation Optimal and limiting factors; Shelford law of tolerance. Adaptation of hydrophytes and xerophytes. **Plant communities:** Characters; Ecotone and edge effect; Succession; Processes and types.	15
II	**Ecosystem:** Structure; energy flow trophic organization; Food chains and food webs, Ecological pyramids production and productivity; Biogeochemical cycling; Cycling of carbon, nitrogen and Phosphorous **Phytogeography:** Principle bio geographical zones; Endemism. **Introduction to plant taxonomy:** Identification, Classification, Nomenclature.	15
III	**Identification:** Functions of Herbarium, important herbaria and botanical gardens of the world and India; Documentation: Flora, Keys: single access and multi-access **Taxonomic evidences from palynology, cytology, phyto-chemistry and molecular data**. **Taxonomic hierarchy:** Ranks, categories and taxonomic groups.	15

IV **Botanical nomenclature:**

14 Principles and rules (ICN); ranks and names; binominal system, typification, author citation, valid publication, rejection of names, principle of priority and its limitations. 15

Classification:

Types of classification-artificial, natural and phylogenetic. Bentham and Hooker (upto series), Engler and Prantl (upto series).

Biometrics, numerical taxonomy and cladistics:

Characters; variations; OTUs, character weighting and coding; cluster analysis; phenograms.

Reference Books:

1. Kormondy, E.J. (1996). Concepts of Ecology. Prentice Hall, U.S.A. 4th edition.
2. Sharma, P.D. (2010) Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.
3. Simpson, M.G. (2006). *Plant Systematics.* Elsevier Academic Press, San Diego, CA, U.S.A.
4. Singh, G. (2012). *Plant Systematics:* Theory and Practice. Oxford & IBH Pvt. Ltd., New Delhi. 3rd edition.

AES102: Environmental Studies

(Version: 1.0, Program Core, School of Sciences)

Lect.	Tut.	Pract.	Credits	Evaluation Scheme				
				Component	Exam	WT	Min Pass (%)	
4	-	-	4	Theory	FET	20	40	40
					CAT-I	15		
					CAT-II	15		
					ESE	50	40	

Course Description: The course, Environmental Studies discusses basic concepts of ecology, pollution and biodiversity. It covers the fundamental knowledge of nature around us with special focus on natural resource management. The course also introduces environmental legislation to students along with different national and international environmental issues. The prime objective of this course is to make students aware and responsible in protection of environment at local to international level. **Course**

Outcomes: At the end of this course students will able to

CO1:	Describe[1] multidisciplinary nature and importance of Environmental Studies
CO2:	Explain[2] concept of ecosystem and natural recourses.
CO3:	Recognize[1] importance of biodiversity, threats and conservation practices
CO4:	Explain[2] concept of environmental pollution, causes, effects and control measures
CO5:	Describe[1] global environmental issues and lows.
CO6:	Associate[2] relationship between human community and environment

Syllabus (Theory)

Units	Description	Hours
I	**Introduction to environmental studies:** • Multidisciplinary nature of environmental studies; Scope and importance; Concept of sustainability and sustainable development. **Ecosystem:** • Concept of ecosystem, Structure and function of ecosystem; Energy flow in an ecosystem. • Food chains, food webs and ecological succession. • Structure and function of the following ecosystems: a) Forest ecosystem b) Desert ecosystem c) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).	8
II	**Natural Resources: Renewable and Non- Renewable Resources** • Land resources and land use change; Land degradation, soil erosion and desertification. • Deforestation: Causes and impacts due to mining, dam building on environment	8

and forests

- Water: Use and over-exploitation of surface and ground water, floods, droughts
- Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies

Biodiversity and Conservation 8

- Levels of biological diversity: genetic, species and ecosystem diversity;
- Global biodiversity hot spots. India as a mega-biodiversity nation; Endangered and endemic species of India
- Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions.
- Conservation of biodiversity In-situ and Ex-situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, Aesthetic and Informational value.

III Environmental Pollution

- Environmental pollution: types, causes, effects and controls; Air, water, Noise pollution 7
- Nuclear hazards and human health risks
- Solid waste management: Control measures of urban and industrial waste.

Environmental policies and practices

- Global issues: Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture. 8
  Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act.

IV Human Communities and the Environment

- Human population growth: Impacts on environment, human health and welfare 6
- Disaster management: floods, earthquake, cyclones and landslides.
- Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan.
- Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

AES104: Environmental Studies Project (Field Work)

(Version: 1.0, Program Core, School of Sciences)

Lect.	Tut.	Pract.	Credits	Evaluation Scheme				
				Component	Exam	WT	Min. Pass (%)	
-	-	2	1	Practical	FEP	50	40	40
					POE	50	40	

Course Description: This course exposes students to local environmental issues. It covers scientific interpretation of environmental issues and constructs possible systematic solution for problem. It includes exposure to local ecosystems, biodiversity and discuss about the fate of natural resources.

Course Outcomes: Course Outcomes: At the end of this course students will able to

CO1	Classify[2] natural recourses and their conditions in local area
CO2	Interpret[2] local environmental issues
CO3	Describe[1] local common biodiversity
CO4	Analyze[4] and modify[3] solution on local environmental issues

Field Work

Description

- Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.
- Visit to a local polluted Site-Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds and basic principles of identification.
- Study of simple ecosystems-pond, river, etc.

References

1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
2. Gadgil, M., &Guha, R. 1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge.
4. Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37.
7. McCully, P. 1996. Rivers no more: the environmental effects of dams (pp. 29-64). Zed Books.
8. McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
9. Deeksha Dave, S.S. Katewa, Textbook of Environmental Studies.

10. B.K. Sharma, Environmental Chemistry.
11. BharuchaErach, The Biodiversity of India, Mapin Publishing pvt.Ltd.,Ahmedabad 380013, India, Email:mapin@icenet.net (R)
12. De A.K., Environmental Chemistry, Wiley Wastern Ltd.
13. Trivedi R.K. Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, vol. I and II, Environmental Media (R)

PHS 104: Physics Lab II

(Version: 1.0, University Core, School of Science)

Lect.	Tut.	Pract.	Credits	Evaluation Scheme				
				Component	Exam	WT	Min. Pass (%)	
-	-	4	2	Practical	FEP	50	40	40
					POE	50	40	

Course Outcomes: At the end of the course, students will be able to:

CO1:	**Understand**[2] the principle and applications of half wave rectifier, full wave rectifier, filter circuits and verify the network theorems.
CO2:	**Apply**[3] the theoretical knowledge of resonance and waves to design the electronic circuits.
CO3:	**Calculate**[4] the figure of merit by constructing the circuit based on circuit diagram.

Practical Syllabus

S. N.	Description
1	To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses.
2	Ballistic Galvanometer: Measurement of charge and current sensitivity/ Measurement of CDR/ Determine a high resistance by Leakage Method/to determine self inductance by Rayleigh's Method
3	To compare capacitances using De'Sauty's bridge.
4	Measurement of field strength B and its variation in a Solenoid (Determine dB/dx).
5	To study the Characteristics of a Series RC Circuit.
6	To study a series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor
7	To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q
8	To determine a Low Resistance by Carey Foster's Bridge.
9	To verify the Thevenin and Norton theorem
10	To verify the Superposition, and Maximum Power Transfer Theorem
11	Open ended experiment: Study the effect of parallel and series resistance
12	Open ended experiment: To study charging and discharging of a capacitor.

References Books:

1. Advanced Practical Physics for students, B. L. Flint & H. T. Worsnop, 1971, Asia Publishing House.
2. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th edition, 2011, Kitab Mahal, New Delhi.
3. Engineering Practical Physics, S. Panigrahi& B. Mallick, 2015, Cengage Learning India Pvt. Ltd.
4. Advanced level Physics Practical's, Michael Nelson and Jon M. Ogborn, 4th edition, reprinted 1985, Heinemann Educational Publishers.

CHS 104: Chemistry Lab-II

(Version: 1.0, Program Core, School of Sciences)

Lect.	Tut.	Pract.	Credits	Evaluation Scheme				
				Component	Exam	WT	Min. Pass (%)	
-	-	4	2	Practical	FEP	50	40	40
					POE	50	40	

Course Description: This course is at odd semester of first year of BSc. It is a foundation course in Chemistry laboratory and it covers basic skills of organic and physical chemistry laboratory.

Course Outcomes: At the end of this course students will able to

CO1:	Discuss[2] thermochemistry of inorganic compound.
CO2:	Examine[3] pH of different consumer product.
CO3:	Discuss[2] purification technique of organic compound.
CO4:	Examine[1] Organic reaction.

List of Experiments

S. N. **Description**

Thermochemistry

1. Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide.
2. Determination of enthalpy of ionization of acetic acid.
3. Determination of integral enthalpy of solution of salts (KNO_3, NH_4Cl).
4. **Ionic equilibria:**
   pH measurements:
   Measurement of pH of different solutions like aerated drinks, fruit juices, shampoos and soaps (use dilute solutions of soaps and shampoos to prevent damage to the glass electrode) using pH-meter.
5. Preparation of buffer solutions:
   (i) Sodium acetate-acetic acid
   (ii) Ammonium chloride-ammonium hydroxide
   Measurement of the pH of buffer solutions and comparison of the values with theoretical values.
6. Preparations: Mechanism of various reactions involved to be discussed.
   Recrystallization, determination of melting point and calculation of quantitative yields.
   (a) Bromination of Phenol/Aniline
   (b) Benzoylation of amines/phenols
   (c) Oxime and 2,4-dinitrophenylhydrazone of aldehyde/ketone

Reference Books

1. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., Textbook of Practical Organic Chemistry, Prentice-Hall, 5th edition, 1996.
2. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960.
3. Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011).

MTS 104: Mathematics Practical-II (Maxima-II)

(Ver. 1.0, Program Core, School of Science)

Lect.	Tut.	Pract.	Credits	Evaluation Scheme				
				Component	Exam	WT	Min Pass (%)	
-	-	4	2	Practical	FEP	50	40	40
					POE	50	40	

Course Description: This course is at odd semester of first year B.Sc. This is extension of the course Maxima-I where students are going to study Linear Algebra, solution of differential equation, vector arithmetic and some advanced functions in Maxima.

Course Outcomes: At the end of this course students will able to

CO1:	Solve[3] the equations.
CO2:	Find[3] solution of Differential equations.
CO3:	Contrast[4] a Maxima code to find arithmetic operations on vectors.

List of Experiments

S.N.	Description
1.	To find solution of equations
2.	To study Matrices algebra and Linear Algebra
3.	To study Differential Equations
4.	To find Solution of First Order ODEs
5.	To find solution of Second Order ODEs
6.	To find solution of First and Second Order ODEs with IVPs, and BCs
7.	To find Partial Derivatives and Total Differentials
8.	To study Vector Arithmetic
9.	To study Vector Valued Functions
10.	To study advanced Functions in Maxima

Textbook:

1**. Richard J. Fateman**: The Maxima Book, Paulo Ney de Souza, (19th September 2004)

References:

1. Maxima Manual Ver. 5.28.0

BOS 104: Botany Lab-II

(Version: 1.0, Program Core, School of Sciences)

Lect.	Tut.	Pract.	Credits	Evaluation Scheme				
				Component	Exam	WT	Min. Pass (%)	
-	-	4	2	Practical	FEP	50	40	40
					POE	50	40	

Course Outcomes: At the end of this course students will able to

CO1:	Describe[2] morphology of the hydrophytes and xerophytes.
CO2:	Identify[1] vegetative and floral characters of the various families
CO3:	Discuss[2] Soil parameter for normal Plant growth.

List of Practical

S.N.	Description
1	Study of instruments used to measure microclimatic variables: Soil thermometer, anemometer, hygrometer, rain gauge and lux meter.
2	Determination of pH, and analysis of two soil samples for carbonates, chlorides, nitrates, sulphates, organic matter.
3	Comparison of bulk density, porosity and rate of infiltration of water in soil of three habitats.
4	(a) Study of morphological adaptations of hydrophytes and xerophytes (two each). (b)Study of biotic interactions of the following: Stem parasite (Cuscuta), Root parasite (Orobanche), Predation (Insectivorous plants)
5	Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law
6	Study of vegetative and floral characters of the following families (Description, V.S. flower, and section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification): Brassicaceae -Brassica, Asteraceae -Vernonia/Ageratum, Solanaceae -Solanumnigrum, Withania; Lamiaceae -Salvia, Ocimum; Liliaceae - Lilium / Allium.
7	Mounting of a properly dried and pressed specimen of any wild plant with Herbarium label (to be submitted in the record book).

Books & References:

1. Kormondy, E.J. (1996). Concepts of Ecology. Prentice Hall, U.S.A. 4th edition.
2. Sharma, P.D. (2010) Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.
3. Simpson, M.G. (2006). *Plant Systematics.* Elsevier Academic Press, San Diego, CA, U.S.A.
4. Singh, G. (2012). *Plant Systematics:* Theory and Practice. Oxford & IBH Pvt. Ltd., New Delhi. 3rd edition.

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