GOVT. NAGARJUNA PG COLLEGE OF SCIENCE, RAIPUR (CG)

B. Sc. I/II Semester -2022-23

Marking Scheme in Different Courses under Ordinance 197

S.N.	Course Type	Subject/Course	Theory				Practical		Credit (Th+Pr)	Signature of HOD
			ESE	IA	M.M.	P.M.	M.M.	P.M.		
1	DSC	Biochemistry	40	10	50	20	50	20	4+2	
2	DSC	Biotechnology	40	10	50	20	50	20	4+2	
3	DSC	Botany	40	10	50	20	50	20	4+2	
4	DSC	Chemistry	60	15	75	30	25	10	4+2	
5	DSC	Computer Science	40	10	50	20	50	20	4+2	
6	DSC	Defence Studies	40	10	50	20	50	20	4+2	
7	AEC	English Language	40	10	50	20	-	-	2	
8	DSC	Geology	40	10	50	20	50	20	4+2	
9	AEC	Hindi Language	40	10	50	20	-	-	2	
10	DSC	Information Technology	40	10	50	20	50	20	4+2	
11	DSC	Mathematics	60	15	75	30	-	-	5+1	
12	DSC	Microbiology	40	10	50	20	50	20	4+2	
13	DSC	Physics	40	10	50	20	50	20	4+2	
14	DSC	Zoology	40	10	50	20	50	20	4+2	
15	VAC	EVS	40	10	50	20	-	-	2	
16	VAC	EVS Project	-	-	-	-	50	20	2	

Note:-Minimum Passing Marks (P.M.) is **40%** of Maximum Marks (M.M.) in eachTheory/Practical/Project.

DSC- Discipline Specific Core, **AEC-** Ability Enhancement Course, **VAC-** Value Addition Course,

ESE- End Semester Examination,   **IA-** Internal Assessment, **M.M.** = ESE + IA.

Encls- Ordinance 197 issued by Pt. Ravishankar Shukla University, Raipur (C.G.)
 • Syllabus

Controller of Examination

Principal

क्रमांक : 971 /अका./2023   रायपुर, दिनांक : 11 /01/2023

|| अधिसूचना ||

विश्वविद्यालय कार्यपरिषद् की बैठक दिनांक 05.01.2023 के पूरक विषय सूची क्रमांक 02 में छत्तीसगढ़ शासन, उच्च शिक्षा विभाग, मंत्रालय, महानदी भवन, नवा रायपुर अटल नगर, रायपुर से प्राप्त पत्र क्रमांक एफ 3—17/2022/38—2 दिनांक 27.12.2022 के अनुक्रम में नवीन Ordinance No. 197- Four Year Undergraduate Program (FYUP), (Choice Based Credit System Semester Scheme in the Undergraduate Program) माननीय कुलाधिपति महोदय द्वारा अनुमोदित को अंगीकृत किए जाने का निर्णय लिया गया, जो निम्नांकित है –

Ordinance No. 197
for
Four Year Undergraduate Program (FYUP)

(Choice Based Credit System Semester Scheme in the Undergraduate Program)

1. **Short Title**
   1.1. This Ordinance shall be called "Ordinance for Four Years (Eight Semesters) Undergraduate Program (FYUP)".
   1.2. It shall apply to all undergraduate programs under semester system.
   - Bachelor of Arts (B.A.).
   - Bachelor of Arts (Classics) (B.A. Classics)
   - Bachelor of Science (B.Sc.).
   - Bachelor of Commerce (B.Com.)
   - Bachelor of Science [B.Sc. (H.Sc.)]

2. **Definition and keywords**
   2.1. **"Choice Based Credit System"** (CBCS)means a program that provides choice for students to select from the prescribed courses (Core, Elective, Ability Enhancement courses, etc.) as approved by the University from time to time.
   2.2. **"Course"**a plan of study in a particular subject means paper or subject through different modes of delivery and is a component of a program as detailed out in the respective program structure.
   2.3. **"Letter Grade"** means an index of the performance of students in a course and is denoted by letters O, A+, A, B+, B, C, P, Fand Ab.
   2.4. **"Credit"** means a unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture/tutorial) or two hours of practical work/field work/project per week One credit involves a minimum of 15 hours of teaching (lecture/ tutorial) or 30 hours of practical work/field work/projectin a semester. The number of credits for each course shall be defined in the respective examination scheme.
   2.5. **"Grade Point"** means points assigned to each course credit in accordance with the letter grade earned in the courses.

2.6. **"Credit Point"** means the product of grade point and number of credits for a course.

2.7. **"Semester Grade Point Average"(SGPA)** means the ratio of total credit points secured by a student in various courses registered in a semester and the total credits of all courses during the semester. It measuring the performance of a study. It shall be expressed up to two decimal places and shall be calculated as per **Appendix II.**

2.8. **"Cumulative Grade Point Average"** (CGPA)means a measure of overall cumulative performance of a student in all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all semesters. It is expressed up to two decimal places and shall be calculated as per **Appendix II.**

2.9. **"SWAYAM"** (Study Webs of Active-Learning for Young Aspiring Minds) means an Information Technology platform developed and made functional by the Government of India in the Ministry of Education, for the purpose of offering online learning courses/Massive Open Online Course (MOOC).

2.10. **"NHEQF Level"**meansNational Higher Education Qualification Framework (NHEQF)level,an instrument for the classification of qualifications according to a set of criteria for specified levels of learning achieved.

3. **Duration**

3.1. The duration of Four Year Undergraduate Program (FYUP) shall be of eight semesters (Four academic years). The maximum duration for completing the program shall be double the duration to complete a particular level of NHEQF as per **Appendix I.** If a student is unable to clear all the semesters of the program within the maximum duration, he/she will automatically exit from the program. Duration of different levels of program of study as per NHEQF level shall be as per **Appendix-I.**

3.2. The credit requirements of various levels of program of study along with stage of exit shall be as per**Appendix-I.**

3.3. The student after successful completion of the two, four, six and eight semesters of the program shall be awarded Certificate/Diploma/Degree/Research as per**Appendix-I** in the field of study/discipline for which he/she was enrolled.

4. **Eligibility for Admission**

4.1. Student seeking admission to the first semester of the program must have passed Higher Secondary (10+2) examination of C.G. Board of Secondary Education or any other Examination recognized by the University or C.G. Board of Secondary Education as equivalent thereto.

4.2. Eligibility for admission in a particular discipline will be as notified by the University/ Chhattisgarh Govt. from time to time.

4.3. Students who leave with a Certification, Diploma, or a Basic Bachelor's Degree will be eligible to re-enter the programme at the exit level to compete or progress to the next level.

5. **UndergraduateCurriculumFrameWork (UGCF)**

5.1. Courses/syllabus for Four Year Undergraduate Program (FYGP) shall be prepared incorporating following points:

i. The courses shall be based on credit system.

ii. It must consist Program Learning Outcome (PLO) and each course of the program shall consist Course Learning Outcome (CLO). PLO and CLO

iii. Actual credits in each semester may vary as per **Appendix-I.**The detailed structure of UGCF courses with credit shall be notified by the University through the Regulation from time to time.

5.2. Every discipline shall offer following categories of courses of study(Course means subject/ paper):

5.2.1. **"Discipline Specific Core" (DSC) course:** DSC is a course of study, which shall be pursued by a student as a mandatory requirement of his/her program of study. DSCsshall be the core credit course of that particular discipline which will be appropriately graded and arranged across the semesters of study, being undertaken by the student, with multiple exit options.

The DSCs shall comprise of core credit courses of more than one discipline. For example, in B.Sc. programme, a student shall study credit courses of three disciplines, e.g., Physics (say, discipline A), Chemistry (say, discipline B) and Mathematics (say, discipline C). However, the fourth year of such degree programme shall be devoted to the study of only one discipline and hence the DSC courses in the VII and VIII semesters shall be of Discipline A/B/C and not a combination of these three disciplines.

5.2.2. **"Discipline Specific Elective" (DSE) Course:** The DSEs shall be a pool of credit courses of that particular discipline, which a student chooses to study from his/her particular discipline(s). There shall be a pool of DSEs from which a student may choose a course of study.

5.2.3. **"Generic Elective" (GE):** GE shall be a pool of courses which is meant to provide multidisciplinary or interdisciplinary education to students. GEs shall consist of a pool of courses offered by various disciplines of study (excluding the GEs offered by the parent discipline), in groups of odd and even semesters, from which a student can choose.

In case a student opts for DSEs beyond his/her discipline specific course(s) ofstudy, such DSEs shall be treated as GEs for that student.

5.2.4. **"Ability Enhancement course" (AEC):** AEC courses are the courses intended to knowledge enhancement through various areas of study and Language Literature and Environmental Science and sustainable development which shall include mandatory for all disciplines

5.2.5. **"Skill Enhancement Course" (SEC):** SEC courses are skill-based courses in all disciplines and are aimed at providing hands-on-training, competencies, skills, etc. SEC courses may be chosen from a pool of courses designed to provide skill-based instruction.

5.2.6. **"Value Addition Course" (VAC):** VAC courses are value based courses which are meant to inculcate ethics, culture, constitutional values, soft skills, sports, education and such similar values to students which will help in all round development of students.

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

5.2.8. **"Internship":**A course requiring students to participate in professional employment- related activity or work experience, or cooperative education activity with an entity external to the education institution, normally under the supervision of an employee of the given external entity. A key aspect of the internship is induction into actual work situations. Internships involves working with local industry, businesses, artists, crafts persons, etc.. and opportunities for students to actively engage with the practical side of their learning.

5.3. **"Remote/blended learning modes":**Options will be available for students to earn credit by completing quality-assured remote learning modes, including SWAYAM:

(www.swayam.gov.in) or other equivalent online educational platform approved/notified by the University from time to time. Students may opt to earn credits from such courses up to 40% of the total credits required for the award of a certificate/Diploma/Degree.

6. Examination and Evaluation

6.1. The academic performance of a candidate shall be evaluated in respect of the courses of study prescribed for each semester through the evaluation. The evaluation of students admitted in the programshall be based on
   i. End Semester Examinations- 80% marks of totalmarks and
   ii. Continuous Internal Assessment- 20% of total marks

6.2. The end semester examinations will be held as per the academic calendar released by the Higher Education Department/as notified by the University and the duration of end semester examination (Theory and Practical) shall be of three hours.

6.3. The minimum percentage of marks to pass the program in each semester shall be40% in each course (including both internal and external marks) as well as consolidated in a semester.

6.4. A program shall have a specified number of credits in each semester. The number of credits along with grade points that the student has satisfactorily cleared shall measure the performance of the student.

6.5. Semester examination results shall have followings categories:
   i. **Passed**, i.e., those who have passed in all courses of the semester examination.
   ii. **Promoted (ATKT)**, i.e., those who have not passed in all the courses of the semester examination but have passed n-2 courses. Where n is total number of courses in a semester.
   iii. **Detained**, i.e., those who are not promoted as per the above provisions will be detained. Such students have to rejoin the course of study in regular mode by paying fee in the same semester in the next academic session subject to not crossing maximum duration of the program as defined in this ordinance.

6.6. However, a student of the first semester who has been detained/ not appeared in examination due to less attendance/ not applied for examination/ applied but not appeared shall be out from the program. Such a student has to take admission in the next session as an ex-student through the procedure adopted/notified by the University.

7. Continuous Internal Assessment

7.1. Continuous Internal assessment shall be of 20% marks of total marks allotted for the course.

7.2. The components for continuous internal assessments for each course are as follows:

Particular	Marks % of Total Marks
Internal test	10 %
Seminar/quiz/group discussion/ Assignment/Field study or any other similar activity	10 %
Total	20 %

7.3. Internal assessment shall not be there for a major project/project/dissertation/field work and shall be carried forward in case of ATKT students.

8. Promotion Rule

8.1. A student may take admission in the 2nd semester provisionally immediately after the 1st semester examinations and his/her admission in the 2nd semester shall be confirmed and she/he will be promoted to the 2nd semester provided he/she is carrying not more than two back papers in the 1st semester.

8.2. A student may take admission in the 3rd semester provisionally, immediately after the 2nd semester examination and his/her admission shall be confirmed and she/he will be promoted to the 3rd semester provided he/she is carrying not more than two back papers in the 1st semester and not more than two back papers in 2nd semester.

8.3. A student may take admission in the 4th semester provisionally, immediately after the 3rd semester examination and his/her admission shall be confirmed and she/he will be promoted to the 4th semester provided he/she is carrying not more than two back papers in the 2nd semester and not more than two back papers in the 3rd semester. Provided further that the student has cleared all the papers of the 1st semester.

8.4. A student may take admission in the 5th semester provisionally, immediately after the 4th semester examination and his/her admission shall be confirmed and she/he will be promoted to the 5th semester provided he/she is carrying not more than two back papers in the 3rd semester and not more than two back papers in the 4th semester. Provided further that the student has cleared all the papers of 2nd semester and 1st semester.

8.5. A student may take admission in the 6th semester provisionally, immediately after the 5th semester examination and his/her admission shall be confirmed and she/he will be promoted to the 6th semester provided he/she is carrying not more than two back papers in the 4th semester and not more than two back papers in the 5th semester. Provided further that the student has cleared all the papers of 3rd, 2nd and 1st semesters.

8.6. ATKT examination of even semesters shall be conducted along with even semesters similarly ATKT examination of odd semesters shall be conducted along with odd semester.

8.7. Further a special ATKT examination of the 5th semester shall be conducted along with the 6th semester for the students having not more than two back papers in the 5th semester as well in the 4th semester.

8.8. A special ATKT examination of the 6th semester shall be conducted soon after the declaration of semester results. Only those students who are having not more than two back papers only in the 6th semester shall be eligible to appear in this special ATKT examination.

8.9. A student may take admission in the 7th semester (Fourth year of UG) only after clearing all the semesters up to the 6th semester with CGPA 7.5 or higher or equivalent percentage.

8.10. A student may take admission in 8th semester (Fourth year of UG) provisionally, immediately after the 7th semester examination and his/her admission shall be confirmed and she/he will be promoted to the 8th semester provided he/she is carrying not more than two back papers in the 7th semester.

8.11. Further, a special ATKT examination of the 7th semester shall be conducted along with the 8th semester for the students having not more than two back papers in the 7th semester.

8.12. A special ATKT examination of the 8th semester shall be conducted soon after declaration of the semester results. Only those students who are having not more than two back papers in the 7th semester shall be eligible to appear in this special ATKT examination.

8.13. A student must choose honours course for the fourth year before the commencement of the fourth year, for which the department concerned shall ask the students to choose honours subject and the same shall be confirmed as per the availability of the seats and other criteria.

8.14. In case a student fails to clear the backlog, he/she will be held up till the backlog papers are cleared for which he/she can take attempt in the next appropriate examination as an ex-student subject to the completion of degree up to maximum duration allowed for the program. Internal marks of such ex-students will be carried forward for the corresponding course in which he/she is appearing as an ex-student.

8.15. For counting back papers both theory as well as practical courses shall be considered.

9. Results Preparation

A student who has passed in all the courses of each I, II, III, IV, V, VI, VII and VIII semesters and obtained a CGPA of at least 3.3 shall be declared as 'Passed'. The division shall be awarded after successful completion of each level of program of study as perAppendix-Iaccording to the following criteria:

i. First Division with distinction: CGPA≥ 7.50
ii. First Division : CGPA≥ 6.00, but < 7.50
iii. Second Division : CGPA≥ 4.5 but <6.00
iv. Third Division: CGPA≥ 4.0 but <4.5

10. Computation of SGPA,CGPAand Format of Transcript/ Mark sheet

10.1. The SGPA and CGPA can be calculated as per the formulae provided in the **Appendix –II.**

10.2. Based on the letter grades for corresponding percentage of marks shown in the **Appendix II,** the transcript or mark sheet shall be issued for each semester and a consolidated transcript indicating the performance in all the semesters. It should include the marks obtained, grade points, SGPA and CGPA along with other particulars of the student. The details of the letter grade and formulae of SGPA and CGPA shall be printed on the back side of transcript/mark sheet.

11. Conversion to Percentage

The conversion formula for converting the CGPA to the corresponding percentage (P) of marks will be as follows:

$$P = 10 \times CGPA.$$

12. General

12.1. There shall not be any provision for repeat or improvement of the program, once student has cleared it.

12.2. There shall not be any provision of revaluation. However, re-totalling is permissible as per the rule.

12.3. Exit options shall be available only at the end of even semesters and entry options shall be available only in the beginning of odd semesters with the prevailing syllabi.

12.4. If the candidate appears for II semester end examination and discontinued for III semester and wishes to take admission for IV semester in future, such candidates shall not be allowed for IV semester. Such candidate shall again seek admission to III semester as per University schedule. This is also applicable to other odd semesters.

12.5. Any points related to UGCF not covered under this ordinance shall be as prescribedby the University through its ordinance/regulation/guidelines from time to time.

13. Removal of Difficulties

If any difficulty arises in giving effect to the provisions of this Ordinance, the Kulapati may, by order, make such provisions not inconsistent with the Act, Statutes, Ordinances, or other regulations, as appears to be necessary or expedient to remove the difficulty. Every order made under this rule shall be subject to ratification by the appropriate University authorities

Appendix-I

Details of various levels of program of study along with stage of exit and credit requirements.

NHEQF LEVEL	TYPE OF AWARD/LEVEL OF PROGRAM	STAGE OF EXIT	Mandatory credits to be secured for the award
5	Undergraduate Certificate (in the field of Study)	After successful completion of Semester II	40-44
6	Undergraduate Diploma (in the field of Study)	After successful completion of Semester IV	80-88
7	Bachelor of (Field of Study)	After successful completion of Semester VI	120-132
8	Bachelor of (Field of Study/Discipline) (with Research)	After successful completion of Semester VIII	160-176
8	Bachelor of (Field of Study/Discipline) (Honours)	After successful completion of Semester VIII	160-176

Calculation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

$$SGPA = \Sigma(C_i \times G_i) / \Sigma C_i$$

where, C_i is the number of credits of the ith course and G_i is the grade point scored by the student in the ith course.

$$CGPA = \Sigma(C_i \times S_i) / \Sigma C_i$$

where, S_i is the SGPA of the ith semester and C_i is the total number of credits in that semester.

Table: Award of Grade based on absolute marks on a 10 point scale

Range of marks in %	Grade point	Letter grade	Grade
>90 to < =100	10	O	Outstanding
>80 to < =90	9	A+	Excellent
>70 to < =80	8	A	Very good
>60 to < =70	7	B+	Good
>50 to < =60	6	B	Above Average
>40 to < =50	5	C	Average
=40	4	P	Pass
<40	0	F	Fail
Absent	0	Ab	Fail

Description

(i) Letter grades **O, A+, A, B+, B, C,** and **P** in a course mean that the student has passed that course.

(ii) The grade **F** and **Ab** denote **FAIL**; a student fails in the course due to poor performance or non-appearance/incomplete appearance in the examination of the course. A student has to appear at subsequent examination(s), if provided under the ordinances in all such courses, until a passing grade is obtained.

आदेशानुसार,

कुलसचिव

पृ. क्रमांक : 9 72 /अका./2023   रायपुर, दिनांक : 11 /01/2023

प्रतिलिपि :-

01. माननीय राज्यपाल एवं कुलाधिपति महोदय के अवर सचिव, छत्तीसगढ़ राजभवन, रायपुर
02. सचिव, छत्तीसगढ़ शासन, उच्च शिक्षा विभाग, मंत्रालय, महानदी भवन, अटल नगर, नवा रायपुर
03. सचिव, छत्तीसगढ़ शासन, वित्त विभाग, मंत्रालय, महानदी भवन, अटल नगर, नवा रायपुर
04. आयुक्त, उच्च शिक्षा, ब्लॉक-सी-3, द्वितीय एवं तृतीय तल, इन्द्रावती भवन, अटल नगर, नवा रायपुर
05. अध्यक्ष, समस्त अध्ययनशाला/प्राचार्य, संबद्ध समस्त महाविद्यालय,
06. समस्त विभागीय अधिकारी,
07. कुलपति के सचिव/कुलसचिव के निजी सहायक,

पं. रविशंकर शुक्ल विश्वविद्यालय, रायपुर को सूचनार्थ एवं आवश्यक कार्यवाही हेतु अग्रेषित ।

उप-कुलसचिव (अका.)

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B. Sc. MICROBIOLOGY

(Semester System with CBCS)

Scheme and Syllabi of Examination

for

Session 2022-23

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B Sc. Microbiology

Programme Educational Objectives:

PEO 1: The graduating student shall become a professional assistant in the area of microbiology.

PEO 2: The graduating student shall become a researcher in the field of microbiology.

PEO 3: The graduating student will become an entrepreneur or a consultant or a freelancer in the area of microbiology

Programme Objectives

1. The programme has been designed in such a way so that the students get exposed to strong theoretical and practical background on various domains of Microbiology.

2. The programme includes details of important microorganisms of agricultural, medical and industrial importance, biomolecules, tools and techniques, immunology, molecular biology genetic engineering to make the study of microbiology for sustainabledevelopment of human society.

3. The practical courses have been designed to equip the students with the laboratory skills in microbiology. Students will able to design and conduct experiments, as well as to analyze and interpret scientific data

4. The programme will provide students with the knowledge and skill base that would enable them to undertake further studies in microbiology and related areas or in multidisciplinary areas.

5. The students will be exposed to a wide range of careers that combine microbiology, Environment, industry and medical.

Programme Learning Outcomes of B.Sc. Microbiology course:

A candidate who is confer. B.Sc. Degree in microbiology needs to have acquired/developed following competencies during the programme of the study

PO 1	Acquired knowledge and understanding of the microbiology concepts as applicable to diverse areas such as medical, industrial, environment, genetics, agriculture, food and others
PO2	Students will be adequately capable to utilize microbiology information and abilities to analyze problems involving microorganisms, articulate these with peers and undertake remedial measures.

PO3	Competent enough to use microbiology knowledge and skills to analyze problems involving microbes, articulate these with peers/ team members/ other stake holders, and undertake remedial measures/ studies etc.
PO4	Demonstrate key practical skills/competencies in working with microbes for study and use in the laboratory as well as outside, including the use of good microbiological practices
PO5	Developed a broader perspective of the discipline of Microbiology to enable him to identify challenging societal problems and plan his professional career to develop innovative solutions for such problems.
PO 6	An ability to apply the relevant knowledge and managerial skills to manage the project of multidisciplinary nature
PO 7	Recognition of the need for and an ability to engage in lifelong learning in the area of microbiology

Examination Scheme for theory Paper and Laboratory Course

Each theory paper and laboratory course of microbiology in all the Semester of graduation will carry maximum allotted marks of 50 for annual examinations. The examination pattern for theory and Laboratory course will be as follows.

Pattern of Question Paper Each theory paper will have questions divided into three sections, A, B, & C. Section A will have 5 MCQ, (1 from each unit) of 1 mark each covering whole syllabus. Section B will have 5 short answer questions, one from each unit with internal choice, of 2 marks each to be answered about 75 words. Section C will have 5 questions, one from each unit with internal choice, of 05 marks each. The question has to be answered in about 150 words. Internal marks will be given on the basis of internal exams.

Examination Scheme for Practical Max. Marks 50

S. no.	Exercises	Max. Marks
1	Major exercise	20
2	Minor exercise	15
3	Viva-voce	05
4	Sessional	10
5	**Total**	**50**

Part A- Introduction		
Programme - Certificate	**Class-B.Sc. Semester I**	**Session -2022-2023**
Subject-Microbiology		
Course code-S1-MB-1T	**Course title-Introduction to Microbiology and Diversity**	
Course type – Core-2A		
Pre-requisite- Minimum eligibility to study this course is a student must passed the class 12th with biology		
Course outcome- The student at the completion of the course will be able to: **CO 1**. Have developed a good knowledge of the development of the discipline of Microbiology and the contributions made by prominent scientists in this field. **CO 2**. Methods to organize/classify these into and basic tools to study these in the laboratory. **CO3**. Have developed a very good understanding of the characteristics of bacteria. **CO 4**. To gain knowledge of various type of virus microorganisms and gain skill of isolation, culturing and maintenance of pure culture **CO 5.**To understand the working of various microscopes and their applications		
Credits-4	**Max.Marks-50**	
Part B-Content of the course		
Total no. of lectures (in hrs)- 60		

Unit	Topics	Total no. of lectures
I	**Introduction** History and development of microbiology,Golden era of microbiology Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming,Martinus W. Beijerinck, Selman A. Waksman, Elie Metchnikoff and Edward Jenner, Scope of MicrobiologyBeneficial and harmful microbes and their role in daily life,	12
II	**Systems of classification**: Binomial nomenclature, principles of microbial classification, Whittaker's five kingdom and Carl Woese's three kingdom classification systems and their utility, classification of Bacteria, Virus (Baltimore classification), Fungi, Algae and Protozoa.	12
III	**Bacteria and Virus** Morphology and ultra structure of bacteria, Cell wall of Gram Positive & Gram Negative bacteria, Reproduction and economic importance of bacteria, archaebacterial cellwall, wall-less forms - MLO (mycoplasma and spheroplasts), Actinomycetes Structure, Multiplication and Economic importance of viruses (TMV, Influenza virus & T4-Phage). Viroids& Prions	12

IV	**Fungi**	12
	General characteristics of fungi, nutritional requirements, fungal cell ultra- structure, thallus organization and aggregation, asexual reproduction, sexual reproduction, representative members; *Mucor, Aspergillus, Yeast*, Economic importance of fungi with examples in agriculture, environment, Industry, medicine, food,	
V	**Algae& Protozoa**	12
	General characteristics of algae including occurrence, thallus organization, pigments, flagella, food reserves, vegetative, asexual and sexual reproduction, Applications of algae in agriculture, industry, environment and food. General characteristics of protozoa with special reference to *Amoeba, Paramecium, Plasmodium and Leishmania*	

Part C-learning resources

Suggested Readings:
1. Prescott, M.J.,Harley,J.P.andKlein,D.A.Microbiology. 5th Edition WCB Mc GrawHill, New York, (2002).
2. Tortora, G.J., Funke ,B.R. and Case, C.L. Microbiology : An Introduction. Pearson Education, Singapore, (2004).
3. Alcomo,I.E.FundamentalsofMicrobiology.VIEdition, JonesandBartlettPublishers.Sudbury.Massachusetts, (2001).
4. Black J.G.Microbiology-Principles and explorations.JohnWiley&SonsInc.NewYork, (2002).
5. Tom Besty,D.C Jim Koegh.Microbiology Demystified McGRAW-HILL.
6. Dubey .R.C. and D.K. Maheshwari,A text book of Microbiology,S.Chand Publication.
7. Stanier R.Y., Ingraham J.L., General Microbiology, Prentice Hall of India Private Limited, New Delhi.
8. Sharma P.D., Microbiology, Rastogi Publications

Suggestive digital platforms web links-
• https:/www.classcentral.com/tag/microbiology
  https://onlinecourses.swayam2.ac.in/cec19_bt11/preview

Part D-Assessment and Evaluation
Assessment and Evaluation (As per University and Autonomous Guideline)

Part A- Introduction		
Programme - Certificate	**Class- B. Sc SEMESTER –I**	**Session -2022-2023**
Subject-Microbiology		
Course code-S1-MB-IP	**Course title-Experiments in basic Microbiology**	
Course type – Core -2A		
Pre-requisite- Minimum eligibility to study this course is a student must passed the class 12th with biology		
Course learning outcome-The student at the completion of the course will be able to: **CO 1.** To understand the instruments, microbial techniques and good lab practices for working in a Microbiology laboratory. **CO2**. Practical skills in the laboratory experiments in microbiology. **CO3.**Develop skills for identifying microbes and using them for industrial, agricultural and environmental purpose. **CO4.** To prepare slides to see the microbial cell.		
Credits-2	**Max. marks- 50**	
PART B-Content of the course		
Total No. of Practical(in labs per week): 2		
List of practicals: 1. Microbiology Good Laboratory Practices and Bio-safety. 2. To study the principle and applications of important instruments (biological safety cabinets, autoclave, incubator, BOD incubator, hot air oven, light microscope, pH meter) used in the microbiology laboratory. 3. Preparation of culture media (Liquid & solid).for bacterial cultivation. 4. Observation of microorganisms - Bacteria, Cyanobacteria Protozoa, Fungi from natural habitat. 5. Observation of Algae from Natural habitats 6. Study of common fungi, algae and protozoan using temporary mounts 7. Sterilization of medium using Autoclave, Sterilization of glassware using Hot Air Oven and assessment for sterility.		
Part C-learning resources		
Suggested Readings: 1. Aneja K.R., Experiments in Microbiology, plant pathology, Tissue culture and Mushroom Cultiation, New Age International, New Delhi. 2. Dubey R.C.. and Maheshwari D.K., Textbook of practical microbiology, S Chand Publications. Lab Virtual links- • https://www.classcentral.com/course/basic-concepts-in-microbiology-and-clinical-pharm-32196 • https://www.labster.com/microbiology-virtual-labs/ • https://www.futurelearn.com/courses/basic-concepts-in-microbiology-and-clinicalpharmacology-of-antimicrobials		
PART D-Assessment and Evaluation Assessment and Evaluation (As per University and Autonomous Guideline)		

PartA- Introduction		
Programme - Certificate	**Class-B.Sc Semester II**	**Session -2022-2023**
Subject-Microbiology		
Course code-S2-MB-2T	**Course title- Microbial physiology and Biochemistry**	
Course type –Core 2B		
Pre-requisite-minimum eligibility to study this course is a student must		
Course outcome-The student at the completion of the course will be able to: **CO1**. Will be conversant with the structures of carbohydrates and proteins **CO2**. Will be conversant with the structures of lipid and Nucleic Acid. **CO3**. Will comprehend the basic concepts of enzyme and will become aware of different variants of enzymes found in living cells. **CO4**. Describing the growth characteristics of the microorganisms. **CO 5**.Differentiating concepts of aerobic and anaerobic respiration and how these aremanifested in the form of different metabolic pathways in microorganisms		
Credits-4	**Max.marks-50**	
PART B-Content of the course		
Total no.of lectures (in hrs)- 60		

Unit	Topics	Total no. of lectures
I	**Carbohydrate**; Structure & classification, carbohydrates metabolism:glycolysis, , Pentose phosphate pathway (PPP), Entner Doudoroffpathway, Krebs Cycle, Electron transport chain (ETC), fermentation **Proteins Structure & Classification-** Protein structure: primary, secondary- peptide unit ,salient features, α helix, β sheet,	12
II	**Amino acids**: structure, classification and functions **Lipid** :Structure and classification. Metabolism of lipids- Alpha and betaoxidation of lipids **Nucleic acids**:Structure of purine and pyrimidine bases, nucleoside and nucleotide; DNA structure and types : A, B, Z form; RNA - Structure, types and functions	12
III	**Enzymes:**Concepts of holozymes, apoenzyme, cofactors, prosthetic group, coenzyme,metal cofactors; Classification of enzymes; Active site and activation energy;Lock and key hypothesis, induced fit hypothesis; AllostericEnzymes, Enzyme inhibition: competitive and noncompetitive, Effect of pH and temperature on enzyme activity.	12
IV	**Microbial growth:** Measurement of microbial growth, Batch culture, Continuous culture, generation time, synchronous growth, diauxic growth curve. Environmental factors affecting the Microbial growth. **Microbial nutrition:** Autotroph/Phototroph, heterotrophy, Chemolithoautotroph, Chemolithoheterotroph, Chemoheterotroph, Chemolithotroph,photolithoautotroph, Photoorganoheterotroph. Passive and facilitated diffusion. Primary and secondary active transport, concept of uniport, symport and antiport Group translocation.	12

V	**Introduction to aerobic and anaerobic chemolithotrophy**; Hydrogen oxidation and methanogenesis, **phototrophic metabolism** - groups of phototrophic microorganisms, anoxygenic vs. oxygenic photosynthesis with reference to photosynthesis in green bacteria, purple bacteria and Cyanobacteria, Biological nitrogen fixation, Assimilatory nitrate reduction, dissimilatory nitrate reduction, denitrification.	12
	PART C-learning resources	

Suggested Readings:
1. Madigan MT, and Martinko JM (2014). Brock Biology of Microorganisms. 14th edition. Prentice Hall International Inc
2. Biochemistry by Lehninger
3. Biochemistry by U. Satyanarayan
4. General biochemistry By A C Deb
5. Moat and Foster, Microbial Physiology. Wiley.
6. Umbreit. Essentials of Bacterial Physiology.
7. Skokatch. Bacterial Physiology and Metabolism.
8. Kushner, D.J. Microbial life in Extreme Environments.
9. Pawar. C.B. Cell Biology.
10. Philipp. G. Mannual of Methods for General Bacteriology.
11. David T. Plummer. An Introduction to Practical Biochemistry.

Part D-Assessment and Evaluation

Assessment and Evaluation (As per University and Autonomous Guideline)

PART A- Introduction			
Programme - Certificate	**Class-B.Sc**	**Semester -II**	**Session -2022-2023**
Subject-Microbiology			
Course code-S2 MB 2P		**Course title-Experiments in Biochemistry and Physiology**	
Course type –Core 2B			
Pre-requisite-minimum eligibility to study this course is a student must complete I sem with microbiology			
Credits-2		**Max.marks- 50**	

PART B-Content of the course
Total No. of Practical (in labs per week): 2
List of practical: 1.Properties of water, concept of pH and buffers, preparation of buffers and Numerical problems to explain the concepts 2.Qualitative/Quantitative tests for carbohydrates, reducing sugars, non-reducing sugars 3.Qualitative/Quantitative tests for lipids and proteins 4.Study effect of temperature, pH and on enzyme activity. 5.Study and plot the growth curve of *E.coli* by turbidometric and standard plate count methods. 6.Calculations of generation time and specific growth rate of bacteria from the graph plotted with the given data 7.Effect of temperature on growth of bacteria. 8.Effect of pH on growth of bacteria. 9.Effect of carbon and nitrogen sources on growth of bacteria. 10.Effect of salt on growth of bacteria.

PART D-Assessment and Evaluation	
Pattern	**Marks**
1. Major experiment	20
2. Minor experiment	15
3.Viva voce	05
4. Sessional	10
Total	**50**

Bachelor of Science (B.Sc.) in Biotechnology
(Semester System with CBCS)
The syllabus with the paper combination is as under
Semester I

S. NO.	COURSE TYPE	COURSE CODE	TITLE OF PAPER	MAX. MARKS			CREDIT
				ESE	INT	TOTAL	
1.	CORE-1A	S1-BT-1T	Biochemistry, Metabolism & Instrumentation	40	10	50	4
2	CORE-1A	S1-BT-1P	Biotechnology Lab Course-I	50	--	50	2
			Total			100	6

Semester II

S. NO.	COURSE TYPE	COURSE CODE	TITLE OF PAPER	MAX. MARKS			CREDIT
				ESE	INT	TOTAL	
1.	CORE-1A	S2-BT-2T	Cell Biology, Genetics and Microbiology	40	10	50	4
2	CORE-1A	S2-BT-2P	Biotechnology Lab Course-II	50	--	50	2
			Total			100	6

Program Outcomes

Upon completion of the B. Sc Biotechnology program, students will achieve the following outcomes-

1. Understand and efficiently apply the scientific method by developing valid hypotheses, designing experiments, gathering relevant data using current technology, and interpreting quantitative and qualitative data.

2. Prepare written and oral scientific communications that use tables and graphs to report results, that describe detailed experimental procedures, and that clearly explain conclusions.

3. Critically evaluate contributions to science reported in all forms of media, and be able to identify valid approaches to scientific problem solving and reporting.

4. Exhibit growth in academic performance and personal and professional responsibility.

5. Exhibit an ability to work independently and collaboratively.

6. Demonstrate proficiency in basic laboratory skills common to clinical and non-clinical research laboratories, including aseptic technique, making accurate and precise measurements using balances and macro- and micro-pipetting, using a microscope, preparing solutions, operating current instrumentation, preparing samples for various analyses, and maintaining a proper scientific laboratory notebook.

7. Design, perform, and analyze results of experiments using basic molecular biology methodologies and recombinant DNA techniques, including agarose and polyacrylamide gel electrophoresis, restriction enzyme digestion, bacterial transformations, plasmid DNA protein expression, PCR, and tissue culture.

DEPARTMENT OF BIOTECHNOLOGY

GOVT. Nagarjuna PG COLLEGE OF SCIENCE, RAIPUR

B. Sc. in Biotechnology

First Semester

S. NO.	COURSETYPE	COURSECODE	TITLE OF PAPER	MAX. MARKS			CREDIT
				ESE	INT	TOTAL	
1.	CORE-1A	S1-BT-1T	Biochemistry, Metabolism & Instrumentation	40	10	50	4
2	CORE-1A	S1-BT-1P	Biotechnology Lab Course-I	50	--	50	2
			Total			100	6

B.Sc. in Biotechnology
First Semester
Theory Paper- I

Part A: Introduction			
Program: **Certificate Course**	Class: **B.Sc. I Sem**	Year: **2022**	Session:**2022-2023**
Subject: Biotechnology			
1	Course Code	**S1-BT-1T**	
2	Course Title	**Biochemistry, Metabolism & Instrumentation**	
3	Course Type	Core course	
4	Pre-requisite (if any)	To study this course, a student must have completed Biology at 12th class.	
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to: - Understand the fundamentals of biological molecules and chemical bonds. - Understand the concept of amino acids, Proteins & enzymes. - Understand the various metabolic processes, hormones & vitamins. - Know the importance of Biophysics & its various techniques - Know about radioisotopes & techniques based on them	
6	Credit Value	Theory: 4	
7	Total Marks	**Max. Marks:** 50	

Part B: Content of the Course		
Total No. of Lectures: 60		
Unit	**Topics**	**No. of Lectures**
1	1. Introduction to Biochemistry: History, Scope and Development. 2. Carbohydrates: Classification, Structure and Function of Mono, Oligo and Polysaccharides. 3. Lipids: Structure, Classification and Function. 4. Concept of pH, pK,acid, bases &buffer. Types of bond in biological system	12
2	1. Amino acids and Proteins: Classification, Structure and Properties of amino acids, Types of Proteins and their Classification and Function. 2. Enzymes: Nomenclature and Classification of enzyme, Mechanism of enzyme action, Enzyme Kinetics and Factors affecting the enzymes action. Immobilization of enzyme and their application. 3. Enzyme inhibition: Competitive and non-competitive, feedback mechanism	12

3	1. Carbohydrates, Proteins and Lipid Metabolism - Glycolysis, Gluconeogenesis, Glycogenesis, , Glycogenolysis and Krebs cycle. Electron Transport Chain, β-oxidation of Fatty acids and Urea cycle 2. Vitamins - Structure, Classification and Function 3. Hormones- Classification & Function	12
4	1. Principle, instrumentation & applications of following- a. Microscopy b. Colorimeter and Spectroscopy c. Electrophoresis d. Centrifugation e. Chromatography	12
5	1. Radioisotopes techniques: Measurement of radioactivity, Ionization chambers, Geiger Muller and Scintillation counter. 2. Autoradiography & DNA fingerprinting 3. Biosensor	12

Part C - Learning Resource
Text Books, Reference Books, Other Resources
Suggested Readings: 1. Lehninger Principles of Biochemistry (4th Ed.) Nelson, D., and Cox, M.; W.H. Freeman and Company, New York, 2005 2. Todd and Howards Mason (2004) Text book of Biochemistry, Fourth Edition 3. Lubert Stryer and Berg ((2004) Biochemistry, Fifth Edition 4. L.Y. Kun (2003) Microbial Biotechnology: Principles and applications 5. Biochemistry(2007) D. M. Vasudevan, S. Sreekumari 6. Harper's Illustrated Biochemistry 7. Biochemistry, U.Sayanarayan,4th edition 8. Wilson & Walker: Principle & Techniques of Biotechnology & molecular biotechnology. 9. Upadhya & Upadhya:Biophysical Chemistry 10. Bioinstrumentation L.Veerakumari

E-learning Resources

1. https://ncert.nic.in/textbook/pdf/lech205.pdf
2. https://www.pdfdrive.com/biomolecules-books.html
3. https://swayam.gov.in/
4. https://www.edx.org/search?q=biomolecules&tab=course
5. https://britannica.com
6. https://en.wikibooks.org/wiki/Biochemistry
7. https://nptel.ac.in

Assessment	Mode	Max. Marks
CCE	Class Test/Assignment/Presentation	10
ESE	University Exam	40
	Total Marks	**50**

B.Sc. in Biotechnology
First Semester
LAB Course - I

Part A: Introduction				
Program: **Certificate Course**	Class: **B.Sc. I Sem**		Year: **2022**	Session:**2022-2023**
Subject: Biotechnology				
1	Course Code	S1-BT-1P		
2	Course Title	**Lab Course I- Biochemistry, Metabolism & Instrumentation**		
3	Course Type	Core course Practical		
4	Pre-requisite (if any)	To study this course, a student must have completed Biology at 12th class.		
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to: - Understand the fundamentals of qualitative analysis of carbohydrates, Lipids and protein. - Understand the use of biotechniques for study of biomolecules.		
6	Credit Value	Practical- 2		
7	Total Marks	**Max. Marks:** 50		

Part B: Content of the Course	
Total Lectures: 30	
Tentative Practical List	1. Introduction to safety measures in laboratories. 2. Preparation of buffers & solutions (normal, molar, ppm, %). 3. Estimation of sugar in given solution. 4. Extraction & separation of lipids. 5. Determination of peroxide value of oil. 6. Estimation of protein – Folin Lowry's method. 7. Effect of pH and temperature on amylase activity. 8. Principle and working of a colorimeter and spectrophotometer . 9. Determination of λmax of a given compound. 10. Experiment based on paper chromatography.

Part C -Learning Resource
Text Books, Reference Books, Other Resources

Suggested Readings:

1. Lehninger Principles of Biochemistry (4th Ed.) Nelson, D., and Cox, M.; W.H. Freeman and Company, New York, 2005
2. Todd and Howards Mason (2004) Text book of Biochemistry, Fourth Edition
3. Lubert Stryer and Berg ((2004) Biochemistry, Fifth Edition
4. L.Y. Kun (2003) Microbial Biotechnology: Principles and applications
5. Biochemistry(2007) D. M. Vasudevan, S. Sreekumari
6. Harper's Illustrated Biochemistry
7. Biochemistry, U.Sayanarayan,4th edition
8. Wilson & Walker: Principle & Techniques of Biotechnology & molecular biotechnology.
9. Upadhya & Upadhya:Biophysical Chemistry
10. Bioinstrumentation L.Veerakumari

E-learning Resources

1. https://ncert.nic.in/textbook/pdf/lech205.pdf
2. https://www.pdfdrive.com/biomolecules-books.html
3. https://swayam.gov.in/
4. https://www.edx.org/search?q=biomolecules&tab=course
5. https://britannica.com
6. https://en.wikibooks.org/wiki/Biochemistry
7. https://nptel.ac.in

DEPARTMENT OF BIOTECHNOLOGY

GOVT. Nagarjuna PG COLLEGE OF SCIENCE, RAIPUR

B. Sc. in Biotechnology

Second Semester

S. NO.	COURSETYPE	COURSECODE	TITLE OF PAPER	MAX. MARKS			CREDIT
				ESE	INT	TOTAL	
1.	CORE-1A	S2-BT-2T	Cell Biology, Genetics and Microbiology	40	10	50	4
2	CORE-1A	S2-BT-2P	Biotechnology Lab Course-II	50	--	50	2
			Total			**100**	**6**

B.Sc. in Biotechnology
Second Semester
Theory Paper- II

Part A: Introduction				
Program: **Certificate Course**		Class: **B.Sc. II Sem.**	Year: **2023**	Session:**2022-2023**
Subject: Biotechnology				
1	Course Code	**S2-BT-2T**		
2	Course Title	**Cell Biology, Genetics and Microbiology**		
3	Course Type	**Core Course**		
4	Pre-requisite (if any)	To study this course, a student must have completed B.Sc I Sem.		
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to: • Understand on fundamentals of cellular organization, cell structure and types. • Understandings of the functions of various sub cellular organelles, various cellular events and cell cycle. • Understand the concept of genetics and chromosome variation and inheritance. • Understand the microbial fundamentals and various microbes. • Understand the microbial reproduction and classification.		
6	Credit Value	**4**		
7	Total Marks	**Max. Marks:** 50		

Part B: Content of the Course		
Total No. of Lectures (in hours) : 60		
Unit	**Topics**	**No. of Lectures**
1	1. Concept of Life, Cell as a basic unit of living system and cell theory. 2. Diversity of cell shape and size. 3. Prokaryotic cell structure: Function and ultra structure of cell (Gram positive and Gram negative bacteria), Plasma membrane, flagella, Pilli, Endospore and Capsule. 4. Eukaryotic cell; Plant Cell wall, Plasma membrane- Chemical components of biological membranes, organization and Fluid Mosaic Model, Cytoplasm.	12
2	1. Structure and Functions of Endoplasmic reticulum, Ribosome, Golgi complex, Lysosomes, Nucleus, Mitochondria, Chloroplast and Chromosomes 2. Cytoskeleton: Microtubules, Microfilaments and Intermediate filaments. 3. Cell division: Mitosis and Meiosis. Cell cycle control.	12

	4. Programmed Cell Death, Cancer	
3	1. Mendel's Laws of Inheritance. Non-mendelian inheritance 2. Linkage and Crossing over. 3. Chromosome variation in number and structure: Deletion, Duplication, Translocation, Inversion and Aneuploidy, Euploidy (Monoploidy, Polyploidy and its importance). 4. Extra chromosomal inheritance	12
4	1. History, Scope and Development of Microbiology. 2. Basic techniques of Microbial Culture 3. Microbial Growth & Nutrition of Bacteria: Isolation, media sterilization- physical and chemical agents, pure culture- pour plate method, streak plate method and spread plate method. 4. General features and Economic importance of Fungi, bacteria and cyanobacteria.	12
5	1. Bacterial Reproduction: Conjugation, Transduction and Transformation. 2. Mycoplasma – History, Classification, Structure reproduction & Diseases. 3. Viruses – Basic features, Structure, Classification, Multiplication and Bacteriophages (Morphology, life cycle, infection and medicinal importance) 4. Control of Microorganisms: By physical, chemical and chemotherapeutic Agents	12

Part C - Learning Resource
Text Books, Reference Books, Other Resources
Suggested Readings: 1. C.B. Power- Cell biology, First Edition (2005), Himalaya Publishing House.   2. Gereld Karp - Dell and molecular biology, 4th Edition (2005)   3. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition.Lippincott Williams and Wilkins, Philadelphia.   4. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASMPress & Sunderland, Washington, D.C.; Sinauer Associates, MA.   5. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009. The World of the Cell. 7thedition. Pearson Benjamin Cummings Publishing, San Francisco.   6. P.K. Gupta - Cell and molecular biology, Second Edition (2003), Rastogi publications.   7. C.B., Oowar - Cell biology, Third Edition (2005) Himalaya Publishing Hosue.   8. S.S. Purohit - Microbiology : Fundamentals and Applications, 6th Edition (2004)   9. R.C. Dubey and D.K. Maheshwari: Practical Microbiology. S.Chand Publication.   10. R.C. Dubey and D.K. Maheshwari, Microbiology (2006). S.Chand Publication.   11. Tortora, Funke and Case - Microbiology, An introduction, sixth Edition (1995), Benjamin/Cummings Publishing Company.   12. Prescott, Harlyey and Klein - Microbiology, Third Edition, Wm. C. Brown Publishers (1996).   13. P. Chakraoborthy - Textbook of microbiology, Second Edition (2007).

14. Prescott, Harley and Klein - Microbiology. Third Edition. Wm. C. Brown.
15. Microbial Genetics, David Freifelder, John F Cronan, Stanley R Maloy, Jones and Bartlett Publishers.

learning Resources

1. https://www.easybiologyclass.com/topic-genetics/

2. https://freebookcentre.net/medical_text_books_journals/genetics_ebooks_online_texts_download.html

3. https://britannica.com

4. https://en.wikibooks.org/wiki/Biochemistry

5. https://nptel.ac.in

Assessment	Mode	Max. Marks
CCE	Class Test/Assignment/Presentation	**10**
ESE	University Exam	**40**
	Total Marks	**50**

Structure of Syllabus
B.Sc. Semester -I Defence Studies

Part A- Introduction
Part B- Content of the Course
Part C- Learning Resources
Part D- Assessment and Evaluation

Part A- Introduction

Program : Certificate	Class : B.Sc. I Sem	Year: 2022	Session : 2022-23
Subject : Defnce Studies			

1.	Course Code	S1 DS -1T	
2.	Course Title	**Indian Military History**	
3.	Course Type	**Core Course**	
4.	Pre- requisite (if any)	**12ᵗʰ Class**	
5.	Course Learning Outcome (CLO)	After undergoing this course a student will be in a position to – 1. Will be familiar with the definition, importance and relation with other subjects of Defence Studies. 2. Know the period of Indian Military History. 3. Know about different Indian military system. 4. Will know about the historical war of India's. 5. Information about the Indian army of the British era.	
6.	Credit Value	**4**	
7.	Marks	**Max. Marks 10+40**	

Part B- Content of the Course

Total Number of Lectures (in Hours) : 60		
Unit	**Topic**	**Number of Lecture**
I	1. The definition and scope of Defence Studies and its relationship With other subjects. 2. Art of war Epic and Puranic period. 3. Comparative study of Indo-Greek art of war with special Reference to the Battle of Hydaspus (326 B.C.). 4. Maurya Military system and art of war.	**12**
II	1. Kautilya's philosophy of war. 2. Gupta's military system and art of war. 3. Military system of Harshvardhan. 4. Decline of Chariots and importance of Elephant and Cavalry.	**12**
III	1. Mugal military system.	**12**

	2 .Rajput and Turk pattern of warfare with reference to Battle of Somnath and Battle of Tarain . 3. Causes of the fall of Rajput military system. 4. Army organization during Sultanate period. 5. Battle of Panipat (1526 AD) and Battle of Haldighati (1576AD)		
IV	1. Maratha military system. 2. Warfare of Shivaji Maharaj. 3. Battle of Assai (1803AD). 4. Sikh military system. 5. Battle of Soberaon (1846 AD).	**12**	
V	1 1857 Liberation movement. 2 Reorganisation of Indian army under the Crown. 3 Nationalisation of Indian army after Independence. 4 Military reforms of Lord Kitchner's.	**12**	

Part C- Learning Resources

Text Books, Reference Books, Other resources

1.	Military System of Ancient India	: B.K. Majumdar
2.	Generalship of Alexander the Great	: J.F.C. Fuller
3.	Kautilya Arthashastra	: K.P. Kanbley
4	Military History of India	: J.N. Sarkar
5.	N P Tewari	: Bhartiya Sainya Itihaas
6.	Lallan ji Singh	: Bhartiya Sainya Itihaas aur Yudh Ke Siddhant
7.	F.S. Bajwa	: Military system of sikh
8.	R .P. Tripathi	: Rise and fall of the mugal
9.	N. R. Gupta	: Marathas and Panipat
10.	Y. K. Sharma	: Military science part 1
11.	Jadunath Sarkar	: Military history of India
12.	B.K. Majumdar	: Bhartiya sena ka itihas

Suggested equivalent online course : https://www.wikipidia.com, www.mod.gov.in

Part D- Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE)+External Assessment (ESE)			
Assessment	**Mode**	**Max. Marks**	**Pattern**
Continuous and Comprehensive Evaluation(CCE)	Class Test / Assignment/ Presentation	10	Offline Mode
Exceptional Students Education(ESE)	University/Autonomous Exam	40	Offline Mode
	Total Marks	**50**	

Structure of Syllabus
B.Sc. Semester -I Defence Studies

Part A- Introduction
Part B- Content of the Course
Part C- Learning Resources
Part D- Assessment and Evaluation

Part A- Introduction

Program : Certificate	Class : B.Sc. I Sem	Year: 2022	Session : 2022-23
Subject : Defnce Studies			
1.	**Course Code**	**S1 DS -1P**	
2.	**Course Title**	**Practical -1**	
3.	**Course Type**	**Core Course**	
4.	**Credit Value**	**2**	
5.	**Marks**	**Max. Marks - 50**	

Part B- Content of the Course

Total Period of Practical (in Hours) : 30	
Topic	
1. Maps- Definition, type, Marginal Information. 2. Conventional signs- Military and Geographical. 3. Direction and cardinal points. 4.Types of North, Angle of Convergence. 5. Study of Liquid compass, its parts, various tactical uses and preparation of night navigation chart. 6.Service Protractor and its uses.	

Part C- Learning Resources

Text Books, Reference Books, Other resources		
1. M.P.Verma	:	Sainik manchitra vigyan
2. Y.K. Sharma	:	Map reading
3. Balwant Singh	:	An easy approach to map reading
4. Gale and Porden	:	A complete guide to military map reading
5. J.M. Srivastava	:	Practical military science part 1
6. B.N. Maliwal	:	Military science practical
Suggested equivalent online course : https://www.wikipidia.com, www.mod.gov.in		

Structure of Syllabus
B.Sc. Semester -II Defence Studies

Part A- Introduction
Part B- Content of the Course
Part C- Learning Resources
Part D- Assessment and Evaluation

Part A- Introduction

Program : Certificate	Class : B.Sc. II Sem	Year: 2022	Session : 2022-23
Subject : Defnce Studies

1.	**Course Code**	**SI1 DS -2T**
2.	**Course Title**	**Defence Mechanism of the India**
3.	**Course Type**	Core Course
4.	**Pre- requisite (if any)**	**B.Sc. I sem**
5.	**Course Learning Outcome (CLO)**	After undergoing this course a student will be in a position to – 1. Will be familiar with Indian defence policy, Foreign policy and Economic policy. 2. Know the higher defence organization of India. 3. Understand the role of President, Parliament and various Defence committees in defence system. 4. Armed forces headquarters will have information. 5. There will be information about Central armed police forces And intelligence agencies. 6 . Understand civil defence.
6.	**Credit Value**	4
7.	**Marks**	Max. Marks 10+40

Part B- Content of the Course

Total Number of Lectures (in Hours) : 60
Unit	Topic	Number of Lecture
---	---	---
I	1. Evaluation of national defence policy. 2. Interdependence of defence, foreign and economic policies. 3. Military organization – definition and principles. 4. Military administration framework.	**12**
II	1. Higher defence organization of India. 2. Power of President with respect to the armed forces. 3. Parliament and armed forces.. 4. Political affair committee (Defence) of the Cabinet – Organisation and role. 5. National Security Council and its role.	**12**
III	1. Organisation of Ministry of Defence. 2 . Organisation of Army headquarter.	**12**

	3. Organisation of Naval headquarter. 4. Organisation of Air force headquarter.	
IV	1. Organisation and role of Central armed police force and Paramilitary forces. 2. Organisation and role of Indian Intelligence agencies. 3. Military Intelligence. 4. Role of NCC in preparing youth for defence services.	12
V	1. Civil Defence – definition, meaning and organization. 2 .Importance and role of civil defence during war and peace. 3. Air-raid signal and precaution before and after bombarding. 4The role of armed forces assistance to civil authorities.	12

Part C- Learning Resources

Text Books, Reference Books, Other resources		
1.	Indian Army, A Sketch of its History & Organization :	E.H.E. Choen
2.	Defence Organization in India :	Venkateshwarm
3.	J.F.C. Fuller :	Armament and History
4.	B.K.Tandon :	Pashchaty a Yodhan Sambhar.
5.	N.P.Tewari :	Yodhan Sambhar
6.	M.P.Verma :	Yodhan Sambhar
7.	Arther Birnie :	Art of War
8.	A.P.J. Abdul Kalam :	Mere Sapno ka Bharat

Suggested equivalent online course : https://www.wikipidia.com, www.mod.gov.in

Part D- Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE)+External Assessment (ESE)			
Assessment	**Mode**	**Max. Marks**	**Pattern**
Continuous and Comprehensive Evaluation(CCE)	Class Test / Assignment/ Presentation	10	Offline Mode
Exceptional Students Education(ESE)	University/Autonomous Exam	40	Offline Mode
	Total Marks	**50**	

Structure of Syllabus
<u>B.Sc. Semester -II Defence Studies</u>

Part A- Introduction
Part B- Content of the Course
Part C- Learning Resources
Part D- Assessment and Evaluation

Part A- Introduction

Program : Certificate	Class : B.Sc. II Sem	Year: 2022	Session : 2022-23
Subject : Defnce Studies			
1.	**Course Code**	S1 DS 2P	
2.	**Course Title**	**Practical- 2**	
3.	**Course Type**	**Core Course**	
4.	**Credit Value**	2	
5.	**Marks**	**Max. Marks - 50**	

Part B- Content of the Course

Total Period of Practical (in Hours) : 30	
Topic	
1.	Equivalent Rank and Badges of Indian Army, Navy, and Air Force.
2.	Famous Armored vehicles used in war.
3.	Weapons used in Infantry.
4.	Various Ships of Indian Navy.
5.	Famous Air-Crafts used by Air-Force.
6.	To find North by Compass, Watch, Sun, Stars, etc.
7.	Bearing and Interconversion of bearing.

Part C- Learning Resources

Text Books, Reference Books, Other resources		
1. M.P.Verma	:	Sainik manchitra vigyan
2. Y.K. Sharma	:	Map reading
3. Balwant Singh	:	An easy approach to map reading
4. Gale and Porden	:	A complete guide to military map reading
5. J.M. Srivastava	:	Practical military science part 1
6. B.N. Maliwal	:	Military science practical

Suggested equivalent online course : https://www.wikipidia.com, www.mod.gov.in

Department of geology

Syllabus (B.Sc. Geology)

THEORY	**Part A – Introduction**	**SEM I**

Program: Certificate	**Class:** B.Sc.-- Sem-I	**Year:**2023	**Session:**2022-23

	Subject: Geology		
1.	**Course Code**	S1-GEO-1T	
2.	**Course Title**	**Physical Geology and Geomorphology (Paper I)**	
3.	**Course Type**	**Core Course Theory**	
4.	**Pre-requisite (if any)**	To study this course, a student must have had passed in the subject of **Mathematics Group** or **Biology Group** in the12th class	
5.	**Course Learning Outcomes (CLO)**	At the end of this course, the students will be able to 1.Understand basics of Geology, Solar system, Origin and age of the earth. 2. Understand the internal structure of the earth, causes and effect of earthquakes, volcanism, weathering and its product. 3.Understand the processes of soil formation, geological work of river, wind, underground water, glaciers and ocean 4.Understand the basic concept of geomorphic processes and relation of tectonics, climate with landform development 5.Understand the fluvial and volcanic landforms.	
6.	**Credit Value**	4	
7.	**Marks**	Max. Marks- 10 + 40	

Part B – Content of the Course

Total numbers of Lectures (in hours):60		
Unit	**Topics**	**Number of Lectures**
I	General Geology: Introduction to Geology and its relation to Earth science; Its scope and subdisciplines; Geology and its relation with other branches of science; Earth and solar system; Asteroids and meteorites; Theories regarding origin and age of the Earth; Radioactivity and its application in determining age of the Earth; Shape and structure of the Earth;	**12**

II	Interior of the Earth; Convections in the Earth's mantle; Earthquakes - causes, geological effects, nature of seismic waves, their intensity and magnitude, seismic zones of India, distribution of seismic belts; Tsunami; Volcanoes - types, causes, landforms,products and geological effects, distribution of volcanic belts; Relationship of earthquakes with volcanic belts. Earth Surface Processes: Significance of geological processes; Weathering (physical, chemical and biological) and its products; Factors and processes of soil formation, soil profile	12
III	Geological work of river - river erosion; sediment transport; erosional and depositional landforms of rivers; Geological work of wind and underground water - wind as a transport agent; erosional and depositional landforms of wind and underground water; Formation and types of glaciers,erosional, transportational and depositional landforms of glaciers and oceans. Karstification and related land form. Springs	12
IV	Basic Concepts of Geomorphology: Definition, scope and development of fundamental concepts; tools and techniques, applications; Relief, types of profile; hypsometry; physiographic subdivisions of India; paleogeomorphology; Constructional and destructional geomorphic processes; evolution of hill slopes; Controlling Factors in Geomorphic Processes, Uplift, denudation, exhumation, Isostasy, relationship of tectonics and climate with landform development .	12
V	Major landscape elements along convergent, divergent and conservative plate boundaries; seis mites; Volcanic landforms, impact craters; Evolution of river channels and drainage patterns; Terraces, flood plains and alluvial fans, longitudinal and transverse profiles, Morphometry; River grading; Drainage basins of India; Wind action in hot deserts and its stages; Types of coasts; Tides, waves and currents; Sea-level change; Erosional and depositional features of coasts	12

Part C – Learning Resources

Text Books, Reference Books, Other resources
Suggested Readings: **1-** Holmes, A. Doris L Holmes Edit, Principles of Physical Geology, Van Nostrand Reinhold, 1978   **2-** Mahapatra, G.B., Text book of Physical Geology, CBS, INDIA, 1991   **3-**Miller, William J., Physical Geology; An Introduction,   **4-** Mookerjee, P K, Text book of Geology. World press private Ltd, 2013   **5-**Structural Geology. M.P. Billings   **6-**Theory of structural Geology; Gokhale , N W CBS   **7-**Exercise on Geological maps and dip-strike: Gokhle, N. W. CBS.   **8-**Outlines of structural Geology. E.S. Hills   **9-**Geological maps- Chiplonkar
Suggested equivalent online courses: 1https://opentextbc.ca/physicalgeology2ed/front-matte/rdownload-a-pdf   2.https://archive.org/detail/in.ernet.dli.2015.233340/page/n15/mode/2up   3.http://www.tulane.edu/sanelson/eensl 110/index.htenl[for introduction to folds,faults…]

Part D – Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE)+ External Assessment (ESE)				
Assessment	**Mode**	**Max. Marks**		**Pattern**
CCE	Class Test/ Assignment/Presentation	10		Unit wise class test
ESE	University Exam	40		Objective 10 Question. Compulsory, 5-5 short ans. and long ans. type questions with choice within units.
	Total Marks	50		

PRACTICAL   (GEOLOGY)
SEM I

PART A - Introduction

Program: Certificate	Class: B.Sc. I Sem	Year:2023	Session:2022-23
Subject: Geology			
1.	Course Code	S1-GEO-1P	
2.	Course Title	**Physical Geology and geomorphology (Paper-I)**	
3.	Course Type	**Core Course (Practical)**	
4.	Pre-requisite (if any)	This Practical course is related to theory course **S1-GEO-1T**	
5.	Course Learning Outcomes (CLO)	Describe and interpret the earth processes, and geological work.	
6.	Credit Value	2	
7.	Marks	Max. Marks- 50	

PART B – Content of the Course

Total numbers of Lectures (in hours):30		
	List of experiment	
1	**Preparation of diagram showing layered structure of earth interior.**	
2	**Preparation of seismic zonation map of India**	
3	**Reading topographical maps of the survey of India.**	
4	**Identification of important geomorphic features from block models associated with arid landform, fluvial landform, glacial landform, karstification**	
5	Field based exercise.	

B.Sc.-s (Geology)

THEORY   Part A – Introduction   SEM II

Program: Certificate	Class: B.Sc. II Sem	Year:2023	Session:2022-23
Subject: Geology			

1.	**Course Code**	S II-GEO-2T
2.	**Course Title**	**Crystallography, Mineralogy and Economic Geology (Paper II)**
3.	**Course Type**	**Core Course Theory**
4.	**Pre-requisite (if any)**	To study this course, a student must have had passed the preceding semester with Geology.
5.	**Course Learning Outcomes (CLO)**	On completion of course, the students should be able to 1 Explain about the basics of crystallography, various crystal form, crystallographic axes and symmetry elements 2 Describe various forms of normal classes of crystal systems 3 Classify the minerals in various silicate groups and explain their varieties 4 Describe the physical properties of various minerals 5 Describe the optical characteristics of various minerals
6.	**Credit Value**	4
7.	**Marks**	Max. Marks- 10 + 40

Part B – Content of the Course

Total numbers of Lectures (in hours):60		
Unit	**Topics**	**Number of Lectures**
I	Basic Concepts of Crystallography: Crystals and their characters; Parts of crystal-face, edge,solid angle, zone and zone axis; Interfacial angle and their measurements; Crystal forms; Crystal Parameters; Axial ratios; Miller system of notations; Laws of crystallography; Crystallographic axes and angles	**12**
II	Centre, plane and axis of symmetry; Symmetry elements and description of various forms of normal class of Isometric, Tetragonal, Hexagonal, Trigonal, Orthorhombic, Monoclinic and Triclinic crystal systems.	**12**
III	Mineralogy: Definition and characters of minerals and their physical properties; classification of minerals in to economic mineral and rock forming silicate minerals, different group of silicate minerals, structural classification of silicates, chemical composition and diagnostic physical properties of minerals such as Olivine, Garnet, Augite, Hypersthene, Hornblende, Muscovite, Biotite, Orthoclase, Plagioclase, Microcline, Quartz, Nepheline, Chlorite,	**12**

	Epidote, Kyanite, Calcite.	
IV	Optical Mineralogy: Polarizing microscope - its parts and functioning; Ordinary and polarised lights; Optical properties under ordinary, polarised light and crossed nicols; Optical propertiesof rock forming minerals such as Quartz, Orthoclase, Plagioclase, Microcline, Olivine, Augite, Hypersthene, Hornblende, Muscovite, Biotite, Garnet, Calcite.	12
V	Economic Geology: Ore and ore deposits, ore minerals and gangue minerals; Tenor of ores;Metallic and non-metallic ore minerals; Strategic, critical and essential minerals; Processes of ore formation - magmatic, hydrothermal, contact metamorphic and sedimentary; Study of important metallic (Cu, Pb, Zn, Mn, Fe, Au, Al), Industrial (gypsum, magnesite, mica) and building materials; Origin, occurrence and distribution of coal and petroleum in India.	12

Part C – Learning Resources

Text Books, Reference Books, Other resources
Suggested Readings: 1 Gribble, c.d.; Rutley's elements of mineralogy, CBS, 2005   2 Ford W.E.; Dana's text Book of mineralogy. CBS, 2006   3 Perkins D; Mineralogy, prentice Hall India, 2012   4 Economic geology by Umeshwar Prasad   5 Economic mineral deposits by Mead L. Jensen and Alan M. Bateman
Suggested equivalent online courses: **1 https://www.mindat.org**   **2 https://www.mooc-list.com/tags/minerals**   **3 https://epgp.inflibnet.ac.in/Home**

Part D – Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE)+ External Assessment (ESE)			
Assessment	**Mode**	**Max. Marks**	**Pattern**
CCE	Class Test/ Assignment/Presentation	10	Unit wise class test
ESE	University Exam	40	Objective 10 Ques.compulsory, 5-5 short ans. and long ans. type questions with choice within units.

	Total Marks	50	

PRACTICAL   SEM II

Part A – Introduction

Program: Certificate	Class: B.Sc. Sem-II	Year:2022	Session:2022-23
Subject: Geology		
1.	Course Code	S II-GEO-2P	
2.	Course Title	Crystallography, Mineralogy and Economic Geology (Paper II)	
3.	Course Type	Core Course (Practical)	
4.	Pre-requisite (if any)	This practical is related to theory course S II-GEO-2T	
5.	Course Learning Outcomes (CLO)	On completion of course, the students should be able to describe symmetry classes, forms present in particular symmetry class, able to define physical and optical properties of given mineral, able to describe origin, occurrence, distribution of economic minerals in India.	
6.	Credit Value	2	
7.	Marks	Max. Marks- 10 + 40	

Part B – Content of the Course

Total numbers of Lectures (in hours):30	
List of experiments	
1	Study of symmetry elements of normal class of Isometric and Tetragonalsystems.	
2	Study of symmetry elements of normal class of Hexagonal, Trigonal andTriclinic systems	
3	Study of symmetry elements of normal class of Orthorhombic and Monoclinicsystems	
4	Use of polarising microscope	
5	Study of physical properties of common rock forming minerals.	
6	Study of 0ptical properties of common rock forming minerals.	
7	Study of ore and economic minerals in hand specimen	
8	Preparation of maps showing distribution of important metallic and non-metallic deposits	
9	Preparation of maps showing important coal and oil fields of India.	

Program-U.G. Certificate Course in Science	Class- SEMESTER-II	YEAR-2022-23		SESSION-2022-23
	Subject- Botany			
1.	Course code	S2-BOT-2 P		
2.	Course Title	Instrumentation, Lower plants, and Plant pathology		
3.	Course Type	Practical		
4.	Prerequisite (if any)	I semester Appeared		
5.	Course Learning outcome (CLO)	The students will be able to learn about • Identification of lower plants Bryophyta on the basis of morphology and anatomy. • Identification of Pteridophyta on the basis of morphology and anatomy. • Identification of lower plants Gymnosperm on the basis of morphology and anatomy. .		
6.	Credit Value	02(15 Hours/Credit)		
7.	Marks	10+40 =50, Minimum marks-17		

PART-B CONTENT OF THE COURSE

TOTAL NUMBER OF LECTURES (in Hours)		
Exercise	TOPICS (30 Hours)	NUMBER OF LECTURES
		45
	Bryophyta: Study of morphology and anatomy of : 1. *Riccia* 2. *Marchantia* 3. *Anthoceros* 4. *Polytrichum* **Pteridophyta:** Study of morphology and anatomy of : 1. *Lycopodium* 2. *Selaginella* 3. *Equisetum* 4. *Marselia*	

| **Gymnosperm:**
Study of morphology and anatomy of :
1. *Cycas*
2. *Pinus*
3. *Ephedra* |

PART-C-LEARNING RESOURCES

Suggested Readings:
1. Practical Botany (Part I) ISBN #:81-301-0008-8 Sunil D Purohit, Gotam K Kukda & Anamika Singhvi Edition:2013 Apex Publishing House Durga Nursery Road, Udaipur, Rajasthan (bilingual).
2. Pandey S.K. (2012). Quick Concept of Botany. Publisher LAP LAMBERT Academic Publishing GmbH & Co. KG, Germany (ISBN: 978-3-8484-3104-5).
3. Dubey, R. C. and Maheshwari. D.K. 2012. Practical Microbiology, S. Chand & Company, Pvt. Ltd., New Delhi.
4. Pandey. B.P. 2014 Modern Practical Botany, (Vol-I) S. Chand and Company Pvt. Ltd., New Delhi.

PART-D- ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods: -Internal (CCE) + EXTERNAL ASSESSMENT (ESE)					
Assessment	Mode	Max. Marks.	Min.Marks	Practical	Minimum Marks
CCE	Class Test Assignment /Presentation	10		10	
ESE	Autonomous Exam.	40		40	
		50	17	50	17

Signature H.O.D.

External Subject Experts: 1.   Representative from Industry

                           2.

                           3.

Departmental Members: Student Member

                     1.   1.

                     2.   2.

                     3.

                     4.

                     5.

                     6.

DEPARTMENT OF BIOCHEMISTRY

GOVT. NAGARJUNA PG COLLEGE of SCIENCE, RAIPUR

B. Sc. BIOCHEMISTRY

(Semester System with CBCS)

Scheme and Syllabi of Examination

For

Session 2022-23, 2023-24 and 2024-25

The syllabus for B.Sc. (Semester System with CBCS and) Bio-Chemistry is hereby approved for the session 2022-23 to 2024-25. In case any change or modification is prescribed by Central Board of Studies or Higher Education Department, Govt. of Chhattisgarh with respect to content or distribution of marks for undergraduate syllabi, it will be implemented accordingly.

| CHAIRPERSON/H.O.D | SUBJECT EXPERT (University Nominee) | SUBJECT EXPERT (Academic Council) | SUBJECT EXPERT (Academic Council) | REPRESENTATIVE (Industry) | REPRESENTATIVE (Alumni) | SENIOR FACULTY 1. 2. 3. |

B. Sc. BIOCHEMISTRY
(Semester System with CBCS)

The syllabus with the paper combinations is as under

S. NO	COURSE TYPE	COURSE CODE	TITLE OF PAPER	MAX MARKS						CREDIT
				ESE	INT	TOTAL				
SEMESTER- I										
1.	**CORE-2A**	S1-BCH-1T	Biomolecules	40	10	50				4
2	**CORE-2A**	S1-BCH-1P	LAB 1: Biomolecules	50	----	50				2
SEMESTER- II										
3	**CORE-2B**	S2- BCH -2T	Bioanalytical Techniques	40	10	50				4
4	**CORE-2B**	S2- BCH -2P	LAB 2: Bioanalytical Techniques	50	----	50				2
Exit after successful completion of I and II Semester student will be able to earn a certificate										
SEMESTER- III										
5	**CORE-2C**	S3- BCH -3T	Enzymology	40	10	50				4
6	**CORE-2C**	S3- BCH -3P	LAB3: Enzymology	50	----	50				2
SEMESTER- IV										
7	**CORE-2D**	S4- BCH -4T	Intermediary Metabolism	40	10	50				4
8	**CORE-2D**	S4- BCH -4P	LAB4: Metabolism	50	----	50				2
9	**SEC-1**	S4 SEC-1P	Biostatistics (Skill Enhancement Course)	50	----	50				2
Exit after successful completion of I to IV Semester student will be able to earn a Diploma										
SEMESTER- V										
10	**DSE2A or DSE2B**	S5- BCH -5T (Elective)	Gene replication, expression and regulation **Or** Biotechnology	40	10	50				4
		S5- BCH -5P	LAB 5: Elective Gene replication, expression and regulation **Or** LAB5: Biotechnology	50	----	50				2
SEMESTER- VI										
11	**DSE2C or DSE2D**	S6- BCH -6T (Elective)	Biochemistry and Function of Hormones **Or** Plant Biochemistry	40	10	50				4
		S6- BCH -6P	LAB6: Biochemistry and Function of Hormones **Or** LAB6: Plant Biochemistry	50	----	50				2
12	**SEC-2**	S6 SEC-2P	Clinical biochemistry (Skill Enhancement Course)	50	----	50				2
Exit after successful completion of I to VI Semester student will be able to earn a Degree										

CHAIRPERSON/H.O.D   SUBJECT EXPERT   SUBJECT EXPERT   SUBJECT EXPERT   REPRESENTATIVE   REPRESENTATIVE   SENIOR FACULTY
(University Nominee) (Academic Council) (Academic Council) (Industry)   (Alumni)   1.
2.
3.

Programme Educational Objectives:

PEO 1: The graduating student shall become a professional assistant in the area of biochemistry.

PEO 2: The graduating student shall become a researcher in the field of biochemistry.

PEO 3: The graduating student will become an entrepreneur or a consultant or a freelancer in the area of biochemistry.

Program Outcome:

On Successful completion of this program the graduates shall have:

PO 1: Ability to apply the fundamental knowledge of Biomolecules, protein, biochemical techniques in the area of biochemistry.

PO 2: Ability to conduct experiment, analyze and interpreted the results.

PO 3: An ability to learn a system with its component, or process to meet desired need within realistic constraints.

PO 4: Ability to function in a multidisciplinary team.

PO 5: Ability to identify, formulate and solve the problems in the area of biochemistry.

PO 6: An understanding of professional and ethical responsibilities

PO 7: Ability to communicate effectively.

PO 8: The broad education necessary to understand the impact of Business solutions in a global, economic, environmental and societal context.

PO 9: Recognition of the need for and an ability to engage in lifelong learning in the area of biochemistry.

PO 10: Knowledge of contemporary issues in the area of biochemistry.

PO 11: An ability to use the techniques, skills and modern professional tools necessary for professional practice and for research.

PO 12: An ability to apply the relevant knowledge and managerial skills to manage the project of multidisciplinary nature.

Program Specific Objectives:

PSO 1- Students shall be able to identify, formulate and solve the problems of general metabolic disorders and able to establish correlation among social, health, food and environmental problems and way to find out its solutions with the knowledge of biochemistry.

PSO 2- Students shall be able to conduct the clinical biochemistry, Diagnostic biochemistry experiments as well as to analyze and interpret the results.

PSO 3- Students shall be able to use the biochemical techniques, Genetic Engineering & Biotechnology skills and modern pathological tools necessary for professional practice and for research.

CHAIRPERSON/H.O.D	SUBJECT EXPERT (University Nominee)	SUBJECT EXPERT (Academic Council)	SUBJECT EXPERT (Academic Council)	REPRESENTATIVE (Industry)	REPRESENTATIVE (Alumni)	SENIOR FACULTY
						1.
						2.
						3.

Examination Scheme for theory Paper and Laboratory Course

Each theory paper and laboratory course of Biochemistry in all the Semester of graduation will carry maximum allotted marks of 50 for annual examinations. The examination pattern for theory and Laboratory course will be as follows.

Pattern of Question Paper

Each theory paper will have questions divided into four sections, A, B, & C. Section A will have 5 MCQ, (1 from each unit) of 1 mark each covering whole syllabus. Section B will have 5 short answer questions, one from each unit with internal choice, of 3 marks each to be answered about 75 words. Section C will have 5 questions, one from each unit with internal choice, of 05 marks each. The question has to be answered in about 150 words.

 Internal marks will be given on the basis of internal exams.

Section	Type of Question	Word Limit	No. of Questions	Marks in each question	Marks in Question
Section A	Objective Type / MCQ	-	05 (1From Each Unit)	1	05
Section B	Short Answer Type	75-100 words	5 (From Each Unit with internal Choice)	2	10
Section C	Long Answer Type	150 - 250 Words	5 (From Each Unit with internal Choice)	05	25
Total Marks					**40**

Examination Scheme for Practical Max. Marks 50

	Exercises	Max. Marks
1.	Major exercise -1	20
2.	Major exercise- 2	20
3.	Viva-voce	10
	Total	**50**

Multiple Entry Exit System (MEES) – Students may allow to multiple exits in this three year UG program depending on the completion years within this period, one will be able to earn a certificate after successful completion of I and II semester, diploma after successful completion of I to IV semester or degree after successful completion of I to VI semester.

CHAIRPERSON/H.O.D   SUBJECT EXPERT   SUBJECT EXPERT   SUBJECT EXPERT   REPRESENTATIVE   REPRESENTATIVE   SENIOR FACULTY
                        (University Nominee)   (Academic Council)   (Academic Council)   (Industry)   (Alumni)   1.
                                                                                                                              2.
                                                                                                                              3.

Part A- Introduction

Program: Certificate		Semester: I	Year: (Jul-Dec) 2022	Session: 2022-23
1.	Course Code	S1-BCH-1T		
2.	Course Title	Biomolecules		
3.	Course Type	CORE- 2A Theory		
4.	Pre-requisite (if any)	To study this course, a student must have completed Biology at 12TH class or intermediate		
5.	Course learning Outcome (CLO)	*After completion of the course, the students would be able:* 1. Students will be exposed to the history of Biochemistry and key contributions of scientists such as Hans Kreb, G. N. Ramachandran, Melvin Calvin, Louis Pasteur, HarGobind Khorana, Watson and Crick and VenkyRamakrishnan. 2. They will study the properties of carbohydrates, proteins, lipids, cholesterol, DNA, RNA, glycoproteins and glycolipids and their importance in biological systems. 3. They will understand the process of fermentation and manufacture of Biodiesel. 4. They will understand the methods of determination of amino acid and nucleotide sequence of proteins and DNA respectively. 5. They will understand the methods of estimation of vitamins and porphyries.		
6.	Credit Value	4		
7.	Marks	Max. Marks-10+40		

Part B- Content of the Course

Total numbers of Lectures (in hours):60		
Unit	**Topics**	**Numbers of Lectures**
I	**Carbohydrates:** Definition, empirical formulae, classification, biological importance. **Monosaccharides:** Configuration relationship of D-aldoses, D-ketoses. General properties of aldoses and ketoses. Oxidation, reduction, reducing property, formation of glycosides, acylation, methylation, condensation – phenyl hydrazine, addition – HCN. Inter-conversion of aldoses and ketoses by chemical method. Ascending and descending the series by chemical methods. Stereochemistry of monosaccharides, (+) and (-), D and L, epimers, anomers, and diastereoisomers. Structure and biological importance of amino sugars, deoxy sugars, sugar acids, neuraminic and muramic acid. **Disaccharides:**Establishment of structures of sucrose and lactose, biological importance and structure of isomaltose, trehalose and maltose. **Polysaccharides:** Partial structure, occurrence and importance of starch, glycogen, inulin, cellulose, chitin, and pectin. **Glycosaminoglycans:** Occurrence, importance and the structure of the repeating units of heparin, hyaluronic acid, teichoic acid and chondroitin sulphate. Bacterial cell wall polysaccharide, peptidoglycans.	12
II	**Amino acids:** Structure and classification of amino acids based on polarity. Reactions of the amino groups with HNO2, LiAlH4, ninhydrin, phenyl isothiocyante, dansylchloride, flurodinitrobenzene. Zwitterionic properties. Pka values. Reaction of carboxyl group – Hydrazine. Any method for the chemical synthesis of amino acids D & L notation. **Peptides:** Peptide bond, structure and biological importance of glutathione, valinomycin, leuenkaphelin, synthetic peptides- polyglutamic acid, polylysine. Chemicalsynthesis of dipeptides. **Proteins:**Isolation, methods of purification-dialysis salting out, pH precipitation and Solvent precipitation. Classification of proteins based on solubility, structure and functions with examples. Primary Structure of proteins, methods of determining N- and C- terminal aminoacids, amino acid composition.Sequencing by Edman's degradation method. Secondary Structure – α Helix. β-sheet, β-bend. Tertiary of myoglobin and quaternary structure of hemoglobin, denaturation and renaturation of proteins. Anfinsen's experiment.	12

CHAIRPERSON/H.O.D   SUBJECT EXPERT   SUBJECT EXPERT   SUBJECT EXPERT   REPRESENTATIVE   REPRESENTATIVE   SENIOR FACULTY
                      (University Nominee)   (Academic Council)   (Academic Council)   (Industry)   (Alumni)   1.
                                                                                                                                    2.
                                                                                                                                    3.

III	**Lipids:**Classification and biological role. Fatty acids – Nomenclature of saturated and unsaturated fatty acids. Physiological properties of fatty acids. Acylglycerols:Mono, di and triglycerols. Saponification, saponification value, iodine value, acid value and significance. **Phosphoglycerides:** Structure of lecithin, cephalins, phosphotidylinosital, plasmalogens, and cardiolipin. Biological role of phosphoglycerides. **Sphingolipids**: Structure and importance of sphingomyelin. **Glycosphingolipids:** Structure and importance of gangliosides and cerebrosides. **Eicosanoids:** Structure of PGE2, and PGF2α importance of prostaglandins. Biological roles of thromboxane, leukotrienes and prostaglandins.	12
IV	**Nucleic acids:**Isolation of DNA and RNA. Composition of DNA. Nucleosides and nucleotides. Chargaff's rule. Watson and Crick model of DNA. Melting of DNA (Tm). **RNA:** Composition, types (mRNA, tRNAandrRNA), secondary structures of tRNA – clover leaf model. Chemical reactions of RNA and DNA with acid and alkali, colour reactions of DNA and RNA.	12
V	**Vitamins:** Structure and active form of water- and fat-soluble vitamins, Coenzymes, Deficiency diseases and symptoms. **Porphyrins:** Porphyrin nucleus and classification of porphyrins. Important Metalloporphyrin'soccurring in nature, Detection of porphyrins, Bile pigments-chemical and their physiological significance.	12

Key Words: Biomolecules, Carbohydrate, Lipids, Fatty acids, Nucleotides, Nucleosides, Nucleic acids, Vitamins, Porphyrins

Part C- Learning resources

Text Books, Reference Books, Other resources
Books Recommended: 1. Nelson, Cox and Lehninger Principles of Biochemistry, 7th Edition   2. G. Zubay Biochemistry   3. Stryer Biochemistry   4. Garrett and Grosham Biochemistry   5. West, Tood, Mason &Bbruglen Text book of biochemistry   6. White, Handler & Smith Biochemistry-clinical application   7. D. Voet and J C Voet Biochemistry   8. Physical Biohemistry (2009) Sheehan, Wiley-Blackwell, 2nd Edition   **E-learning Resources**   https://www.britannica.com/   https://en.wikibooks.org/wiki/Biochemistry   https://www.pdfdrive.com/biomolecules-books.html   https://ncert.nic.in/textbook.php   https://www.edx.org/course/biochemistry-biomolecules-methods-and-mechanisms   https://nptel.ac.in/   https://www.mdpi.com/journal/biomolecules   https://byjus.com/biology/biomolecules/   https://www.sciencedirect.com/topics/engineering/biomolecule   https://www.vedantu.com/biology/biomolecules

Part D- Assessment and Evaluation (As per University and Autonomous Guideline)

Suggested Continuous Evaluation Methods: Internal (CCE) + External Assessment (ESE)				
Assessment	**Mode**	**Max. Marks**		**Pattern**
CCE	Class Test/ Assignment/Presentation	10		
ESE	University Exam	40		

CHAIRPERSON/H.O.D   SUBJECT EXPERT   SUBJECT EXPERT   SUBJECT EXPERT   REPRESENTATIVE   REPRESENTATIVE   SENIOR FACULTY
                      (University Nominee)   (Academic Council)   (Academic Council)   (Industry)   (Alumni)   1.
                                                                                                                          2.
                                                                                                                          3.

	Total Marks	50		

Part A- Introduction

Program: Certificate	**Semester: I**	**Year: (Jul-Jun) 2022**	**Session: 2022-23**	

1.	**Course Code**	**S1-BCH-1P**	
2.	**Course Title**	LAB1: Biomolecules	
3.	**Course Type**	CORE-2A Practical	
4.	**Pre-requisite (if any)**	To study this course, a student must have completed Biology at 12TH class or intermediate	
5.	**Course learning Outcome (CLO)**	**Course Outcomes (COs)** *On successful completion of the course, the student shall be able to:* CO1 – Describe the basic lab requirements and their uses. CO2 – Examine various instruments using in separation and isolation of various analytical compounds. CO3 – Analyze the characteristics of the compound on the basis of their pH. CO4 – Prepare normal, molar and stock solution. CO5 - To estimate biomolecules in mixture.	
6.	**Credit Value**	2	
7.	**Marks**	Max. Marks- 50	

Part B- Content of the Course

Total Lectures: 30	
Tentative Practical List	1. Safety measures in laboratories. 2. Preparation of normal, molar and stock solution. 3. Preparation of buffers. 4. Determination of pKa of acetic acid and glycine. 5. Qualitative tests for carbohydrates, lipids, amino acids, proteins and nucleic acids. 6. Separation of amino acids/ sugars/ bases by thin layer chromatography. 7. Estimation of vitamin C. 8. Determination of saponification value and iodine number of fats. 9. Estimation of Carbohydrate by anthrone method. 10. Estimation Blood glucose by the methods (a) Folin-Wu (b) Nelson-Somogyi 11. Estimation of amino acids by ninhydrin method. 12. Estimation of food adulterant. **Note:** This is tentative list; the teachers concern can add more program as per requirement.

Part C- Learning resources

Text Books, Reference Books, Other resources
1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H.Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-4292-3414-8.
2. Textbook of Biochemistry with Clinical Correlations (2011) 7th ed., Devlin, T.M., John Wiley & Sons, Inc. (New York), ISBN:978-0-470-28173-4.
3. E.E. Conn and P.K. Stumpf. OUTLINES OF BIOCHEMISTRY (1976) Wiley Eastern, New Delhi.
4. BIOCHEMISTRY by L. Stryer (1995) W.H. Freeman Press, San Francisco, USA.
5. Biochemistry, by Voet, D. and Voet, J.G. (2004). 3rd Edition, John Wiley & Sons, Inc.USA. Biochemistry by U. Sathyanarayana Books and Allied (P) Ltd. Kolkata, ISBN 0-87893- 214-3, (2014).
6. Text book of Biochemistry by J.L Jain (2016)
7. Medical Biochemistry by Ramakrishnan (2012)
8. Text Book of Biochemistry by D.M. Vasudevan (2018)
9. Text Book of Biochemistry by A.C. Deb, 9th revised edition (2017)
E-learning Resources

CHAIRPERSON/H.O.D	SUBJECT EXPERT (University Nominee)	SUBJECT EXPERT (Academic Council)	SUBJECT EXPERT (Academic Council)	REPRESENTATIVE (Industry)	REPRESENTATIVE (Alumni)	SENIOR FACULTY
						1. 2. 3.

https://www.labmanager.com/lab-health-and-safety/science-laboratory-safety-rules-guidelines-5727

https://www.weizmann.ac.il/safety/chemical-safety/chemical-laboratory-safety-measures

https://ehs.okstate.edu/general-laboratory-safety-rules.html

https://www.britannica.com/

https://en.wikibooks.org/wiki/Biochemistry

https://www.pdfdrive.com/biomolecules-books.html

https://ncert.nic.in/textbook.php

Part D- Assessment and Evaluation (As per University and Autonomous Guideline)

| CHAIRPERSON/H.O.D | SUBJECT EXPERT (University Nominee) | SUBJECT EXPERT (Academic Council) | SUBJECT EXPERT (Academic Council) | REPRESENTATIVE (Industry) | REPRESENTATIVE (Alumni) | SENIOR FACULTY 1. 2. 3. |

Part A- Introduction

Program: Certificate	Semester: II	Year: (Jan to Jun) 2023	Session: 2022-23
1.	**Course Code**	**S2-BIOC-2T**		
2.	**Course Title**	Bioanalytical Techniques		
3.	**Course Type**	CORE-2B Theory		
4.	**Pre-requisite (if any)**	To study this course, a student must have completed study in I semester in Biochemistry		
5.	**Course learning Outcome (CLO)**	*On successful completion of the course, the student shall be able to:* CO1 – Describe basic concepts of Spectroscopy. CO2 – Describe amino acids with application of chromatography. CO3 – Describe basic concepts of centrifugation. CO4 –Differentiate working principle, instrumentation and applications of various electrophoretic techniques. CO5- Describes principles and types of microscopy and types of immunological techniques		
6.	**Credit Value**	04		
7.	**Marks**	Max. Marks-10+40		

Part B- Content of the Course

Total numbers of Lectures (in hours):60		
Unit	Topics	Numbers of Lectures
I	**Spectroscopy -** Concepts of spectroscopy, Laws of photometry. Beer-Lambert's law, Principles and applications of colorimetry. Visible and UV spectroscopy, ORD, CD, X-ray diffraction, X-ray absorption and NMR.	12
II	**Chromatography** – Principles and applications of paper, thin layer, ion exchange, affinity, gel permeation, adsorption and partition chromatography. HPLC and FPLC.	12
III	**Centrifugation** – Principle of centrifugation, concepts of RCF, different types of instruments and rotors, preparative, differential and density gradient centrifugation, analytical ultra-centrifugation, determination of molecular weights and other applications, sub-cellular fractionation.	12
IV	**Electrophoretic techniques** – Principles of electrophoretic separation. Types of electrophoresis including paper, cellulose, acetate/nitrate and gel. PAGE and SDS-PAGE Electroporation, Pulse field gel electrophoresis, 2D Gel Electrophoresis, BN-PAGE, Isoelectric focussing.	12
V	**Microscopy** – Bright field, Dark field, Phase contrast and Fluorescence microscopy Transmission and scanning microscopy, freeze fracture techniques, specific staining of biological materials **Immunological Techniques:** Immunodiffusion, immunoelectrophoretic,radioimmunoassay, ELISA, Immunofluorescence.	12

Key Words: Spectroscopy, Chromatography, Centrifugation, Electrophoresis, Microscope, ELISA.

Part C- Learning resources

Text Books, Reference Books, Other resources
Recommended Books: 1. K Wilson and John Walker Practical Biochemistry: Principles & Techniques 2. RF Boyer Biochemistry Laboratory: Modern Theory & Techniques 3. S Carson, H Miller and D Scott Molecular Biology Techniques: A Classroom   Laboratory Manual 4. Physical biochemistry by D Friefelder, WH Freeman & Co., USA. 5. Outlines of biochemistry by Eric E Conn, PK Stumpf, G Bruening and Ray H Doi, John Wiley & sons NY 6. Chromatography: A laboratory handbook of chromatography and electrophoretic methods by Erich Heftman, van Nostrand Reinhold, NY. **E-learning Resources**

CHAIRPERSON/H.O.D   SUBJECT EXPERT   SUBJECT EXPERT   SUBJECT EXPERT   REPRESENTATIVE   REPRESENTATIVE   SENIOR FACULTY
                       (University Nominee)   (Academic Council)   (Academic Council)   (Industry)   (Alumni)   1.
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                                                                                                                           3.

https://www.atascientific.com.au/spectrometry/
https://www.britannica.com/science/spectroscopy
https://byjus.com/chemistry/differential-extraction-chromatography/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5206469/
https://www.fishersci.se/se/en/scientific-products/centrifuge-guide/centrifugation-theory.html
https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/centrifugation
https://link.springer.com/protocol/10.1007/978-1-0716-0134-1_7
https://experiments.springernature.com/articles/10.1007/978-1-0716-0134-1_7
https://analyticalsciencejournals.onlinelibrary.wiley.com/journal/15222683

Part D- Assessment and Evaluation (As per University and Autonomous Guideline)

Suggested Continuous Evaluation Methods: Internal (CCE) + External Assessment (ESE)				
Assessment	**Mode**	**Max. Marks**		**Pattern**
CCE	Class Test/ Assignment/Presentation	10		
ESE	University Exam	40		
	Total Marks	**50**		

Part A- Introduction

Program: Certificate	Semester: II	Year: (Jan-Jun) 2023	Session: 2022-23
1.	**Course Code**	**S2-BCH-2P**	
2.	**Course Title**	LAB2: Bioanalytical Techniques	
3.	**Course Type**	CORE-2B Practical	
4.	**Pre-requisite (if any)**	To study this course, a student must have completed I Semester in Biochemistry.	
5.	**Course learning Outcome (CLO)**	*On successful completion of the course, the student shall be able to:* CO1 – Examine different components present in the extract of radish leaves by using chromatography technique. CO2 – Analysis independently of various biomolecules in the laboratory. CO3 – Demonstrate the effect of inorganic compound and its percent purities in various types of samples. CO4 – Analyze characteristics of UV absorption spectra of by different methods in samples in different biomolecules. CO5– Examine quality of the lipids by different parameters. CO6 – Examine quantity of the nucleic acid present in the sample. CO7 – Analyze characteristics and quantity of protein by different methods.	
6.	**Credit Value**	02	
7.	**Marks**	Max. Marks-50	

Part B- Content of the Course

Total numbers of Lectures (in hours) : 30	
Tentative Practical List	1.Verification of Beer-Lambert's law. 2. Separation of sugars using paper chromatography. 3. Separation of amino acids by paper chromatography 4. Differential centrifugation of cell organelles 5. SDS-PAGE gel electrophoresis of protein 6. Separation of plant pigments by Paper chromatography 7. Estimation of DNA and RNA. **Note:** This is tentative list; the teachers concern can add more program as per requirement.

Part C- Learning resources

Text Books, Reference Books, Other resources
Recommended Books   1. Chromatography: A laboratory handbook of chromatography and electrophoretic methods by Erich Heftman, van Nostrand Reinhold, NY.   2. K Wilson and John Walker Practical Biochemistry: Principles & Techniques   3. RF Boyer Biochemistry Laboratory: Modern Theory & Techniques   **E-learning Resources**   https://www.sciencedirect.com/topics/engineering/beer-lambert-law   https://www.vedantu.com/physics/beer-lambert-law   https://www.penguinprof.com/uploads/8/4/3/1/8431323/261_labs_u1_paper_chromatography.pdf   https://www.ncbi.nlm.nih.gov/books/NBK26936/   https://pubmed.ncbi.nlm.nih.gov/18421739/   http://ncert.nic.in/ncerts/l/kelm314_23.pdf

Part D- Assessment and Evaluation (As per University and Autonomous Guideline)

| CHAIRPERSON/H.O.D | SUBJECT EXPERT (University Nominee) | SUBJECT EXPERT (Academic Council) | SUBJECT EXPERT (Academic Council) | REPRESENTATIVE (Industry) | REPRESENTATIVE (Alumni) | SENIOR FACULTY 1. 2. 3. |

Part A- Introduction

Program: Diploma Course		Semester: III	Year: (Jul-Dec) 2023	Session: 2023-24
1.	Course Code	S3-BCH-3T		
2.	Course Title	Enzymology		
3.	Course Type	CORE-2C Theory		
4.	Pre-requisite (if any)	To study this course, a student must have completed I & II Semester in biochemistry.		
5.	Course learning Outcome (CLO)	**Course Outcomes (COs)** *On successful completion of the course, the student shall be able to:* **CO1** – Describe the classification and nomenclature of enzymes on the basis of their action, specificity of enzyme action, mechanism of enzyme catalysis and regulatory enzymes. **CO2** – Explain the mechanism of enzymes and the role of vitamins as coenzyme precursors. **CO3**– Express the Michaelis-Menten equation, single and double reciprocal plots, and graphical representation of various inhibitors. **CO4** – Describe the principles and methods of enzyme immobilization. **CO5 -** Outline the knowledge of enzyme action, isolation and purification techniques.		
6.	Credit Value	04		
7.	Marks	Max. Marks-10+40		

Part B- Content of the Course

Total numbers of Lectures (in hours):60		
Unit	**Topics**	**Numbers of Lectures**
I	**Introduction to enzymes** Nature of enzymes - protein and non-protein (ribozyme). Cofactor and prosthetic group,apoenzyme, holoenzyme. IUBMB classification of enzymes. **Features of enzyme catalysis** Factors affecting the rate of chemical reactions, collision theory, activation energy andtransition state theory, catalysis, reaction rates and thermodynamics of reaction. Catalyticpower and specificity of enzymes (concept of active site), Fischer's lock and key hypothesis,Koshland's induced fit hypothesis	12
II	**Enzyme kinetics** Relationship between initial velocity and substrate concentration, steady state kinetics,equilibrium constant - Mon substrate reactions. Michaelis-Menten equation, Lineweaver-Burk plot, Eadie-Hofstee and Hanes plot. K_m and V_{max}, K_{cat} and turnover number. Effect ofpH, temperature and metal ions on the activity of enzyme. **Bi-Substrate reactions** Types of bi bi-reactions (sequential – ordered and random, ping pong reactions).Differentiating bi substrate mechanisms (diagnostic plots, isotope exchange).	12
III	**Enzyme inhibition** Reversible inhibition (competitive, uncompetitive, non-competitive, mixed and substrate).Mechanism based inhibitors - antibiotics as inhibitors. **Mechanism of action of enzymes** General features - proximity and orientation, strain and distortion, acid base and covalentcatalysis (chymotrypsin, lysozyme). Metal activated enzymes and metalloenzymes, transitionstate analogues.	12
IV	**Regulation of enzyme activity** Control of activities of single enzymes (end product inhibition) and metabolic pathways,feedback inhibition (aspartate transcarbomoylase), reversible covalent modificationphosphorylation (glycogen phosphorylase). Proteolytic cleavage- zymogen**.** Multienzymecomplex as regulatory enzymes. Occurrence and isolation, phylogenetic distribution andproperties (pyruvate dehydrogenase, fatty acyl synthase) Isoenzymes - properties andphysiological significance (lactate dehydrogenase).	12
V	**Coenzymes** TPP, FAD, NAD, pyridoxal phosphate, biotin, coenzyme A, tetrahydrofolate, lipoic acid. **Applications of enzymes** Application of enzymes in diagnostics (SGPT, SGOT, creatine kinase, alkaline and acidphosphatases), enzyme immunoassay (HRPO), enzyme therapy (Streptokinase). Immobilized enzymes	12

CHAIRPERSON/H.O.D   SUBJECT EXPERT   SUBJECT EXPERT   SUBJECT EXPERT   REPRESENTATIVE   REPRESENTATIVE   SENIOR FACULTY
(University Nominee)   (Academic Council)   (Academic Council)   (Industry)   (Alumni)   1.
                                                                                                          2.
                                                                                                          3.

Key Words: Coenzyme, Ribozyme, Cofactor, Apoenzyme, Michaelis-Menten equation.

Part C- Learning resources

Text Books, Reference Books, Other resources
Recommended Books:
1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H.Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-4292-3414-8.
2. Biochemistry (2011) 4th ed., Donald, V. and Judith G.V., John Wiley & Sons Asia Pvt.Ltd. (New Jersey), ISBN:978-1180-25024.
3. Fundamentals of Enzymology (1999) 3rd ed., Nicholas C.P. and Lewis S., OxfordUniversity Press Inc. (New York), ISBN:0 19 850229 X.
E-learning Resources
https://www.sciencedirect.com/topics/medicine-and-dentistry/enzymology
https://www.jbc.org/Enzymology
https://www.biologyonline.com/dictionary/coenzyme
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3770912/
https://www.eposters.net/redirect/?ID=16026&UID=0&Type=poster
https://link.springer.com/chapter/10.1007/978-0-387-35141-4_34
https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/enzyme-immobilization

Part D- Assessment and Evaluation (As per University and Autonomous Guideline)

Suggested Continuous Evaluation Methods: Internal (CCE) + External Assessment (ESE)				
Assessment	**Mode**	**Max. Marks**		**Pattern**
CCE	Class Test/ Assignment/Presentation	10		
ESE	University Exam	40		
	Total Marks	**50**		

Part A- Introduction

Program: Diploma Course		Semester: III	Year: (Jul-Dec) 2023	Session: 2023-24
1.	Course Code	S3-BCH-3P		
2.	Course Title	LAB3: Enzymology		
3.	Course Type	CORE-2C Practical		
4.	Pre-requisite (if any)	To study this course, a student must have completed I & II Semester in biochemistry		
5.	Course learning Outcome (CLO)	**Course Outcomes (COs)** On successful completion of the course, the student shall be able to: CO1- Explain purification of proteins by various methods. CO2- Estimate enzyme activity by different methods. CO3- Explain progress curve of enzyme. CO5- Practice the effect of physical parameters on enzyme activity. CO6- Practice the effect of inhibitors on enzyme activity. CO7- Demonstrate the continuous assay of an enzyme.		
6.	Credit Value	2		
7.	Marks	Max. Marks-50		

Part B- Content of the Course

Total numbers of Lectures (in hours):30	
Tentative Practical List	1. Partial purification of acid phosphatase from germinating mung bean. 2. Assy of enzyme activity and specific activity, e.g. acid phosphatase. 3. Effect of pH on enzyme activity and determination of optimum pH. 4. Determination of Km and Vmax using Lineweaver-Burk graph. 5. Enzyme inhibition- calculation of Ki for competitive inhibition. 6. Continuous assay of lactate dehydrogenase. 7. Coupled assay of glucose-6-phosphate dehydrogenase. 8. Isolation and purification of urease. 9. Assay of serum alkaline phosphatase activity. 10.Inhibition of alkaline phosphatase activity by EDTA 11. Effect of substrate concentration on alkaline phosphatase activityand determine of its Km value. 12.Effect of temperature of enzyme activity and determination of activation energy. 13. Effect of enzyme concentration on enzyme activity. **Note:** This is tentative list; the teachers concern can add more program as per requirement.

Part C- Learning resources

Text Books, Reference Books, Other resources
Recommended Books:
1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-4292- 3414-8.
2. Biochemistry (2011) 4th ed., Donald, V. and Judith G.V., John Wiley & Sons Asia Pvt. Ltd. (New Jersey), ISBN:978-1180-25024.
3. Fundamentals of Enzymology (1999) 3rd ed., Nicholas C.P. and Lewis S., Oxford University Press Inc. (New York), ISBN:0 19 850229 X.
E-learning Resources
https://www.thermofisher.com/in/en/home/references/protocols/cell-and-tissue-analysis/elisa-protocol/elisa-sample-preparation-protocols/plasma-and-serum-preparation.html
https://labmonk.com/determination-of-sgot-and-sgpt
https://www.labcorp.com/help/patient-test-info/total-protein-and-albuminglobulin-ag-ratio
https://link.springer.com/article/10.1007/s101570200005
https://jcp.bmj.com/content/jclinpath/6/3/173.full.pdf

Part D- Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE) + External Assessment (ESE)				
Assessment	**Mode**	**Max. Marks**		**Pattern**
CCE	Class Test/ Assignment/Presentation	10		
ESE	University Exam	40		
	Total Marks	**50**		

CHAIRPERSON/H.O.D   SUBJECT EXPERT   SUBJECT EXPERT   SUBJECT EXPERT   REPRESENTATIVE   REPRESENTATIVE   SENIOR FACULTY
                         (University Nominee)   (Academic Council)   (Academic Council)   (Industry)   (Alumni)   1.
                                                                                                                                            2.
                                                                                                                                            3.

Part A- Introduction

Program: Diploma Corse	Semester: IV	Year: (Jan-Jun) 2024	Session: 2023-24

1.	**Course Code**	**S4-BCH-4T**	
2.	**Course Title**	Intermediary Metabolism	
3.	**Course Type**	CORE-2D Theory	
4.	**Pre-requisite (if any)**	To study this course, a student must have completed I to III Semester in biochemistry	
5.	**Course learning Outcome (CLO)**	*On successful completion of the course, the student shall be able to:* **CO1** – Describe the fundamentals of thermodynamics in biochemical processes. **CO2** – Acquire the knowledge of energy production in living systems by the degradation of fatty acids. **CO3** – Explain the various pathways of fatty acid synthesis in living systems. **CO4** – Explain the mechanism of the machinery system involved in carbohydrate metabolism. **CO5** – Describe breakdown and synthesis of Amino acids and nucleotides in humans and recognize its relevance with respect to nutrition and human diseases.	
6.	**Credit Value**	4	
7.	**Marks**	Max. Marks-10+40	

Part B- Content of the Course

Total numbers of Lectures (in hours):60		
Unit	Topics	Numbers of Lectures
I	**Introduction to Metabolism** General features of metabolism, experimental approaches to study metabolism: Use of intact organism, bacterial mutants, tissue slices, stable and radioactive Isotopes. **Carbohydrate Metabolism** Reactions and energetics of glycolysis. Alcoholic and lactic acid fermentations. Entry of fructose, galactose, mannose etc. Reactions and energetic of TCA Cycle. Gluconeogenesis, glycogenesis and glycogenolysis. Reaction and Physiological significance of pentose phosphate pathway. Regulation of Glycolysis and TCA cycle Photosynthesis a brief review.	12
II	**Electron Transport Chain and Oxidative Phosphorylation** Structure of mitochondria, sequence of electron carriers, sites of ATP production, inhibitors of electron transport chain. Hypothesis of mitochondrial Oxidative phosphorylation. Transport of reducing potentials into mitochondria.	12
III	**Lipid Metabolism** Introduction, hydrolysis of triacylglycerols, transport of fatty acids into Mitochondria, B oxidation saturated fatty acids, ATP yield from fatty acid Oxidation. Biosynthesis of saturated and unsaturated fatty acids. Metabolism of Ketone bodies, oxidation of unsaturated and odd chain fatty acids. Biosynthesis of triglycerides and important phospholipids, glycolipids, sphingolipids and cholesterol. Regulation of cholesterol metabolism.	12
IV	**Amino acid Metabolism** General reactions of amino acid metabolism: transamination, oxidative Deamination and decarboxylation. Urea cycle. Degradation and biosynthesis of Amino acids. Glycogenic and ketogenic amino acids.	12
V	**Nucleotide Metabolism** Sources of the atoms in the purine and pyrimidine molecules. Biosynthesis and Degradation of purines and pyrimidines biosynthesis. **Porphyrin Metabolism** Biosynthesis and degradation of porphyrins. Production of bile pigments	12

CHAIRPERSON/H.O.D	SUBJECT EXPERT (University Nominee)	SUBJECT EXPERT (Academic Council)	SUBJECT EXPERT (Academic Council)	REPRESENTATIVE (Industry)	REPRESENTATIVE (Alumni)	SENIOR FACULTY
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Key Words: Glycolysis, TCA Cycle, Oxidative Phosphorylation, Electron Transport Chain, Oxidation, Urea cycle, Nucleotides, Porphyrins.

Part C- Learning resources

Text Books, Reference Books, Other resources
Recommended Books:
1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York), ISBN:13:978-1-4641-0962-1 / ISBN:10:1-4641-0962-1.
2. Textbook of Biochemistry with Clinical Correlations (2011) 7th ed., Devlin, T.M., JohnWiley & Sons, Inc. (New Jersey), ISBN:978-0-470-28173-4.
3. Biochemistry (2012) 7th ed., Berg, J.M., Tymoczko, J.L. and Stryer L., W.H. Freemanand Company (New York), ISBN:10:1-4292-2936-5, ISBN:13:978-1-4292-2936-4.
E-learning Resources
https://www.britannica.com/science/metabolism
https://www.sciencedirect.com/science/article/pii/S0009912013001677
https://pubmed.ncbi.nlm.nih.gov/23720291/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3243375/

Part D- Assessment and Evaluation (As per University and Autonomous Guideline)

Suggested Continuous Evaluation Methods: Internal (CCE) + External Assessment (ESE)				
Assessment	**Mode**	**Max. Marks**		**Pattern**
CCE	Class Test/ Assignment/Presentation	10		
ESE	University Exam	40		
	Total Marks	**50**		

Part A- Introduction

Program: Diploma Corse		**Semester: IV**	**Year: (Jan-Jun) 2024**	**Session: 2023-24**
1.	**Course Code**	S4-BCH-4P		
2.	**Course Title**	LAB 4: Intermediary Metabolism		
3.	**Course Type**	CORE-2D Practical		
4.	**Pre-requisite (if any)**	To study this course, a student must have completed I to III Semester in biochemistry		
5.	**Course learning Outcome (CLO)**	**Course Outcomes** CO1-To understand the importance of lipids as storage molecules and as structuralcomponent of biomembranes. CO2-Understanding the importance of high energy compounds,electron transport chain,synthesis of ATP under aerobic and anaerobic conditions. CO3-To acquire knowledge related to the role of TCA cycle in central carbon metabolism,importance of anaplerotic reactions and redoxbalance. CO4-Students will be exposed with the fact that perturbations in the carbon metabolism canlead to various disorders such as diabetes and cancer. CO5-Appreciation of the fact that differences in the properties of metabolic enzymes of thehost and pathogens can be exploited for the development of new drugs. CO6-To gain insights into metabolic engineering for the production of useful biomolecules.		
6.	**Credit Value**	02		
7.	**Marks**	Max. Marks-50		

Part B- Content of the Course

Total numbers of Lectures (in hours):30	

Tentative Practical List	1. To understand the concepts of preparation of buffers.
	2. To estimate biomolecules such as glucose, proteins,cholesterol in clinical samples.
	3. To isolate of lipids from egg.
	4. Estimation of salivary amylase
	5. Separation of Blood Plasma and Serum
	6. Estimation of proteins from serum by biuret and Lowry methods.
	7. Determination of albumin and A/G ratio in serum.
	8. Estimation of bilirubin (conjugated and unconjugated) in serum.
	9. Estimation of total lipids in serum by vanillin method.
	10. Estimation of cholesterol in serum.
	11. Estimation of lipoproteins in plasma.
	12. Estimation of lactic acid in blood before and after exercise.
	13. Estimation of blood urea nitrogen from plasma.
	14. Estimation of SGPT and SGOT in serum.
	15 Preparation of starch from potato and its hydrolysis by salivary amylase.
	   b. Determination of achromatic point in salivary amylase.
	   c. Effect of sodium chloride on amylases.
	Note: This is tentative list; the teachers concern can add more program as per requirement.

Part C- Learning resources

Text Books, Reference Books, Other resources
Recommended Books: 1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York), ISBN:13:978-1-4641-0962-1 / ISBN:10:1-4641-0962-1. 2. Textbook of Biochemistry with Clinical Correlations (2011) 7th ed., Devlin, T.M., JohnWiley & Sons, Inc. (New Jersey), ISBN:978-0-470-28173-4. 3. Biochemistry (2012) 7th ed., Berg, J.M., Tymoczko, J.L. and Stryer L., W.H. Freemanand Company (New York), ISBN:10:1-4292-2936-5, ISBN:13:978-1-4292-2936-4. **E-learning Resources** https://link.springer.com/article/10.1007/s00217-008-0998-4 https://www.cdc.gov/nchs/data/nhanes/nhanes_03_04/l13_c_met_lipids.pdf

Part D- Assessment and Evaluation (As per University and Autonomous Guideline)

Suggested Continuous Evaluation Methods: Internal (CCE) + External Assessment (ESE)				
Assessment	**Mode**	**Max. Marks**		**Pattern**
CCE	Class Test/ Assignment/Presentation	10		
ESE	University Exam	40		
	Total Marks	**50**		

Part A- Introduction

Program: B.Sc. Course	Semester: V	Year: (Jul-Dec) 2024	Session: 2024-25

1.	Course Code	S5- BCH 5T	
2.	Course Title	Gene Replication, Expression and Regulation	
3.	Course Type	DSE 2A	
4.	Pre-requisite (if any)	To study this course, a student must have completed I to IV Semester in biochemistry	
5.	Course learning Outcome (CLO)	*On successful completion of the course, the student shall be able to:* CO.1 – Distinguish the process of replication in prokaryotes as well as eukaryotes. CO.2 – Distinguish the process of transcription in prokaryotes as well as eukaryotes. CO.3 – Distinguish the process of translation in prokaryotes as well as eukaryotes. CO.4 – Discuss the process of transcriptional regulation in prokaryotes as well as eukaryotes. CO.5 – Explain the process of DNA damage and various DNA repair mechanisms.	
6.	Credit Value	4	
7.	Marks	Max. Marks-10+40	

Part B- Content of the Course

Total numbers of Lectures (in hours):60		
Unit	**Topics**	**Numbers of Lectures**
I	**Basic Concepts of Genetic Information** Salient features of Eukaryotic, prokaryotic and viral genomes; highly repetitive, moderately repetitive and unique DNA sequences. Tm and buoyant density and their relationship with G-C content in DNA. **Chirality of DNA, tertiary Structure of DNA.** Structure and properties of RNA: secondary and tertiary structures. Nucleic acid hybridization: Cot value and satellite DNA.	12
II	**DNA replication:** Features of replication, the chemistry of DNA synthesis, DNA polymerase, the replication fork, enzymes and proteins in DNA replication, E coli DNA polymerases, stages of replication initiation, elongation and termination. **Replication In Eukaryotes:** end replication problem, telomerase, various modes of replication. Comparison of replication in prokaryotes and eukaryotes. Inhibitors of DNA replication.	12
III	**Transcription in prokaryotes**: RNA polymerases, transcription cycle in bacteria, sigma factor, bacterial promoters, identification of DNA binding sites by DNA footprinting, various stages of RNA synthesis, initiation, elongation and termination, rho-dependent and rho-independent termination. Inhibitors of transcription and applications as antimicrobial drugs. **Transcription in eukaryotes**: Comparison between prokaryotic and eukaryotic transcription. The three classes of eukaryotic RNA polymerases, transcription by RNA polymerase II, RNA polymerase II core promoters, general transcription factors, transcription by RNA polymerase I and III. Inhibitors of eukaryotic transcription and their applications **RNA Processing**: Types of RNA processing- polyadenylation and capping, processing of rRNA and tRNA. Chemistry of RNA splicing, the spliceosome machinery, splicing pathways, group I and group II introns, alternative splicing, exon shuffling and RNA editing.	12
IV	**Translation:** Genetic code and its characteristics, triplet nature, degenerate, deciphering the genetic code, Wobble hypothesis. Suppressor tRNAs. Exceptions to the nearly universal genetic code. Messenger RNA, transfer RNA, charging of tRNA. The structure of ribosome. Three stages of translation-initiation, elongation and termination. Translation in eukaryotes. Regulation of translation. Comparison of prokaryotic and eukaryotic protein synthesis. Inhibitors of translation and their clinical importance.	12
V	**Regulation of gene expression in prokaryotes**: Principles of gene regulation, negative and positive regulation, concept of operons, regulatory proteins, activators, repressors, DNA binding domains, regulation of lac operon and trp operon. Regulatory RNAs in bacteria, small RNA and riboswitches. **Regulation of gene expression in eukaryotes**: Gene regulation by chromatin remodeling, regulation of galactose metabolism in yeast, action of enhancers and insulators, working of activators and repressors, concept of combinatorial control. Regulatory RNAs in eukaryotes: synthesis and mechanism of siRNA and miRNA.	12

CHAIRPERSON/H.O.D   SUBJECT EXPERT   SUBJECT EXPERT   SUBJECT EXPERT   REPRESENTATIVE   REPRESENTATIVE   SENIOR FACULTY
     (University Nominee)   (Academic Council)   (Academic Council)   (Industry)   (Alumni)   1.
     2.
     3.

Key Words: Chirality, DNA Replication, Transcription, Translation, Gene Expression, Operon.

Part C- Learning resources

Text Books, Reference Books, Other resources
1.Molecular Cell Biology (2013) 7th ed., Lodish, H., Berk, A., Kaiser, C.A., Krieger, M.,Bretscher, A.,Ploegh, H., Amon, A. and Scott, M.P., W.H. Freeman & Company (NewYork), ISBN:13:978-1-4641-0981-2.
2.Principles of Biochemistry (2008) 3rd ed., Voet, D.J., Voet, J.G. and Pratt, C.W., JohnWiley & Sons,Inc. (New York), ISBN:13: 978-0470-23396-2
3.Molecular Biology of the Gene (2008) 6th ed., Watson, J.D., Baker, T.A., Bell, S.P.,Gann, A., Levine, M. and Losick, R., Cold Spring Harbor Laboratory Press, Cold springHarbor (New York), ISBN:0-321-50781 / ISBN:978-0-321-50781-5.
4. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W. H. Freeman & Company (New York), ISBN:13: 978-1-4292-3414-6 / ISBN:10-14641-0962- 1.
5. Principles of Genetics (2010) 5th ed., Snustad, D.P. and Simmons, M.J., John Wiley &Sons Asia, ISBN:978-0-470-39842-5.
E-learning Resources https://www.genome.gov/genetics-glossary/DNA-Replication https://www.nature.com/scitable/topicpage/gene-expression-14121669/ https://www.genome.gov/genetics-glossary/Mutation https://www.frontiersin.org/articles/10.3389/fmicb.2020.624830/full

Part D- Assessment and Evaluation (As per University and Autonomous Guideline)

Suggested Continuous Evaluation Methods: Internal (CCE) + External Assessment (ESE)				
Assessment	**Mode**	**Max. Marks**		**Pattern**
CCE	Class Test/ Assignment/Presentation	10		
ESE	University Exam	40		
	Total Marks	**50**		

Part A- Introduction

Program: B.Sc. Course	Semester: V		Year: (Jul-Dec) 2024	Session: 2024-25
1.	**Course Code**	S5BCH 5P		
2.	**Course Title**	LAB5: Gene Replication, Expression and Regulation		
3.	**Course Type**	DSE 2A Practical		
4.	**Pre-requisite (if any)**	To study this course, a student must have completed I to IV Semester in biochemistry		
5.	**Course learning Outcome (CLO)**	**Course Outcomes (COs)** On successful completion of the course, the student shall be able to: CO1- Demonstrate assay for nucleic acid by various methods. CO2- Demonstrate isolation process of DNA from different samples. CO3- Apply electrophoresis technique for different isolated compounds. CO4- Illustrate PCR techniques. CO5- Illustrate SDS-PAGE techniques by biomolecules. CO6- Demonstrate effect of various mutagens in various samples.		
6.	**Credit Value**	2		
7.	**Marks**	Max. Marks-10+40		

Part B- Content of the Course

Total numbers of Lectures (in hours):30	
Tentative Practical List	1. Estimation of DNA by diphenylamine method. 2. Effect of temperature on the viscosity of DNA using Oswald's viscometer. 3. Extraction of RNA and its estimation by Orcinol method. 4. Estimation of hemoglobin by measuring total iron in blood. 5. Estimation of calcium and phosphorus in serum & urine. 6. Estimation of creatine and creatinine in urine. 7. Estimation of immunoglobulin by precipitation with saturated ammonium sulphate. 8. Denaturation of enzyme, studies on DNA. 9. A. Separation of proteins by column chromatography. B. Determination of proteins by dye binding assay. 10. Separation of protein by SDS-polyacrylamide gel electrophoresis. 11. Isolation of RNA and cDNA synthesis. 12. Isolation and estimation of RNA from yeast. 13. Agarose Gel Electrophoresis and separation of DNA 14. Isolation of DNA from bacteria/eukaryotic cells and check its purity **Note:** This is tentative list; the teachers concern can add more program as per requirement.

Part C- Learning resources

Text Books, Reference Books, Other resources
Recommended Books
1. Molecular Cell Biology (2013) 7th ed., Lodish, H., Berk, A., Kaiser, C.A., Krieger, M.,Bretscher, A.,Ploegh, H., Amon, A. and Scott, M.P., W.H. Freeman & Company (NewYork), ISBN:13:978-1-4641-0981-2.
2. Principles of Biochemistry (2008) 3rd ed., Voet, D.J., Voet, J.G. and Pratt, C.W., JohnWiley & Sons,Inc. (New York), ISBN:13: 978-0470-23396-2
3. Molecular Biology of the Gene (2008) 6th ed., Watson, J.D., Baker, T.A., Bell, S.P.,Gann, A., Levine, M. and Losick, R., Cold Spring Harbor Laboratory Press, Cold springHarbor (New York), ISBN:0-321-50781 / ISBN:978-0-321-50781-5.
4. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W. H. Freeman & Company (New York), ISBN:13: 978-1-4292-3414-6 / ISBN:10-14641-0962- 1.
5. Principles of Genetics (2010) 5th ed., Snustad, D.P. and Simmons, M.J., John Wiley &Sons Asia, ISBN:978-0-470-39842-5.
6. The World of the Cell, Wayne M. Becker, Lewis J. Kleinsmith, Jeff Hardin, Gregory Paul Bertoni, 7th Edition.

CHAIRPERSON/H.O.D	SUBJECT EXPERT (University Nominee)	SUBJECT EXPERT (Academic Council)	SUBJECT EXPERT (Academic Council)	REPRESENTATIVE (Industry)	REPRESENTATIVE (Alumni)	SENIOR FACULTY 1. 2. 3.

7.Gene Machine, Venki Ramakrishnan

E-learning Resources
https://link.springer.com/article/10.1007/s11368-019-02427-y
https://biocyclopedia.com/index/biotechnology_methods/biochemistry/estimation_of_rna_by_the_orcinol_method.php
https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/dna-binding
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2874567/
https://pubmed.ncbi.nlm.nih.gov/22546956/

Part D- Assessment and Evaluation (As per University and Autonomous Guideline)

Suggested Continuous Evaluation Methods: Internal (CCE) + External Assessment (ESE)				
Assessment	**Mode**	**Max. Marks**		**Pattern**
CCE	Class Test/ Assignment/Presentation	10		
ESE	University Exam	40		
	Total Marks	**50**		

CHAIRPERSON/H.O.D   SUBJECT EXPERT   SUBJECT EXPERT   SUBJECT EXPERT   REPRESENTATIVE   REPRESENTATIVE   SENIOR FACULTY
                     (University Nominee)   (Academic Council)   (Academic Council)   (Industry)   (Alumni)   1.
                                                                                                                  2.
                                                                                                                  3.

Part A- Introduction

Program: B.Sc Course		Semester: V	Year: (Jul-Dec) 2024	Session: 2024-25
1.	Course Code	**S5 BCH 5T**		
2.	Course Title	**Biotechnology**		
3.	Course Type	**DSE 2B Theory**		
4.	Pre-requisite (if any)	To study this course, a student must have completed I to IV Semester in biochemistry		
5.	Course learning Outcome (CLO)	On successful completion of the course, the student shall be able to: 1. The students will acquire basic knowledge of recombinant DNA technology, DNA manipulation in prokaryotes and eukaryotes, engineering of DNA molecules using restriction and modification enzymes. 2. They will get acquainted with the use of cloning and expression vectors, creation of genomic and cDNA libraries and their applications. 3. Students will also understand the methods for production of proteins using recombinant DNA technology and their application in industrial systems.		
6.	Credit Value	04		
7.	**Marks**	Max. Marks-10+40		

Part B- Content of the Course

Total numbers of Lectures (in hours):60		
Unit	**Topics**	**Numbers of Lectures**
I	Principles of gene cloning: Restriction and modification systems, restriction endonucleases and other enzymes used in manipulating DNA molecules. Ligation of DNA molecules, DNA ligase, sticky ends, blunt ends, linkers and adapters, homopolymer tailing, Synthetic oligonucleotides.	12
II	Plasmids and bacteriophages as vectors for gene cloning. Cloning vectors based on E. coli plasmids, pBR322, pUC8, pGEM3Z. Viruses as vectors, cloning vectors based on M13 and λ bacteriophage.	12
III	**Uptake of DNA by cells**, Selection and identification for transformed cells, Transfection. Chemical and physical methods of DNA introduction into cells. Direct selection, marker rescue. cDNA and Genomic libraries, Southern and Northern hybridization.	12
IV	**Plant genetic engineering**: gene isolation, gene transfer systems, Ti plasmid, plant virus vectors, electroporation, microinjection, microprojectile technology, Transgenic plants and animals. **Production of recombinant proteins** by eukaryotic cells. Fusion tags such as, polyhistidine, glutathione, maltose binding proteins and their role in purification of recombinant proteins.	12
V	**Fermentation technology** – Fermentors, general design of fermentor, fermentation processes, production of alcohols, antibiotics, steroids and enzymes. **Enzyme Technology** - Large scale production of enzymes, enzyme reactors. Enzyme electrodes, biosensors.	12

Key Words: Recombinant DNA, Transfection, Recombinant Protein, Transgenics

CHAIRPERSON/H.O.D	SUBJECT EXPERT (University Nominee)	SUBJECT EXPERT (Academic Council)	SUBJECT EXPERT (Academic Council)	REPRESENTATIVE (Industry)	REPRESENTATIVE (Alumni)	SENIOR FACULTY 1. 2. 3.

Part C- Learning resources

Text Books, Reference Books, Other resources
Suggested readings : 1. Principles of Gene Manipulation and Genomics (2006) 7th ed., Primrose, S.B., and Twyman, R. M., Blackwell publishing (Oxford, UK) 2. Gene Cloning and DNA Analysis (2010) 6th ed., Brown, T.A., Wiley-Blackwell publishing (Oxford, UK) 3. Molecular Biotechnology: Principles and Applications of Recombinant DNA (2010) 4th ed., Glick B.R., Pasternak, J.J. and Patten, C.L., ASM Press (Washington DC) 4. Molecular Cloning: A laboratory manual (2014), 4nded., Michael R Green and J. Sambrook Cold spring Harbor laboratory press (3vol.) https://www.klimud.org/public/atlas/idrar/web/www.irvingcrowley.com/cls/fund.htm https://www.mayoclinic.org/tests-procedures/prothrombin-time/about/pac-20384661 https://www.ncbi.nlm.nih.gov/books/NBK482339/ https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6709845/

Part D- Assessment and Evaluation(As per University and Autonomous Guideline)

Suggested Continuous Evaluation Methods: Internal (CCE) + External Assessment (ESE)				
Assessment	**Mode**	**Max. Marks**		**Pattern**
CCE	Class Test/ Assignment/Presentation	10		
ESE	University Exam	40		
	Total Marks	**50**		

Part A- Introduction

Program: B.Sc		Semester: V	Year: (Jul – Dec) 2024	Session: 2024-25
1.	Course Code	**S5 BCH 5P**		
2.	Course Title	**Lab - Biotecnology**		
3.	Course Type	**DSE-2B Practical**		
4.	Pre-requisite (if any)	To study this course, a student must have completed I to IV Semester in biochemistry		
5.	Course learning Outcome (CLO)	On successful completion of the course, the student shall be able to: Students will learn the experimental techniques of recombinant DNA technology and their biotechnological applications, such as separation of DNA fragments by Agarose gel electrophoresis, isolation of plasmid DNA from *E. coli,* transformation of *E. coli* cells, digestion of plasmid DNA, amplification of a DNA fragment by PCR, etc.		
6.	Credit Value	02		
7.	Marks	Max. Marks-10+40		

Part B- Content of the Course

Total numbers of Lectures (in hours): 30
Topics
Practical content 1. Agarose gel electrophoresis for separation of DNA fragments. 2. Isolation of plasmid DNA from *E. coli.* 3. Transformation of *E. coli* cells with plasmid DNA. 4. Digestion of plasmid DNA with restriction enzymes. 5. Amplification of a DNA fragment by PCR. 6. Complementation of $\beta-$galactosidase for Blue and White selection.

Key Words: SDS, DNA isolation, Restriction digestion, PCR

Part C- Learning resources

Text Books, Reference Books, Other resources
Suggested readings : 1. Principles of Gene Manipulation and Genomics (2006) 7th ed., Primrose, S.B., and Twyman, R. M., Blackwell publishing (Oxford, UK) 2. Gene Cloning and DNA Analysis (2010) 6th ed., Brown, T.A., Wiley-Blackwell publishing (Oxford, UK) 3. Molecular Biotechnology: Principles and Applications of Recombinant DNA (2010) 4th ed., Glick B.R., Pasternak, J.J. and Patten, C.L., ASM Press (Washington DC) 4. Molecular Cloning: A laboratory manual (2014), 4nded., Michael R Green and J. Sambrook Cold spring Harbor laboratory press (3vol.) https://www.klimud.org/public/atlas/idrar/web/www.irvingcrowley.com/cls/fund.htm https://www.mayoclinic.org/tests-procedures/prothrombin-time/about/pac-20384661 https://www.ncbi.nlm.nih.gov/books/NBK482339/ https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6709845/

Part D- Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE) + External Assessment (ESE)				
Assessment	Mode	Max. Marks		Pattern
CCE	Class Test/ Assignment/Presentation	10		
ESE	University Exam	40		
	Total Marks	**50**		

CHAIRPERSON/H.O.D   SUBJECT EXPERT   SUBJECT EXPERT   SUBJECT EXPERT   REPRESENTATIVE   REPRESENTATIVE   SENIOR FACULTY
                      (University Nominee)   (Academic Council)   (Academic Council)   (Industry)   (Alumni)   1.
                                                                                                                               2.
                                                                                                                               3.

Part A- Introduction

Program: B.Sc Course	Semester: VI	Year: (Jan- Jun) 2025	Session: 2024-25

1.	Course Code	S6 BCH-6T	
2.	Course Title	**Biochemistry and Function of Hormones**	
3.	Course Type	**DSE-2C Theory**	
4.	Pre-requisite (if any)	To study this course, a student must have completed I to V semester study in Biochemistry	
5.	**Course learning Outcome (CLO)**	**Course Outcomes (COs)** The students will understand the different modes of communication between cells including signal reception, transduction, amplification and response. They will understand the role of endocrine system in maintaining ionic and glucose homeostasis and the communications that regulate growth appetite, metabolism and reproduction in humans. The students will be able to decipher molecular and biochemical mechanisms of all hormones and will be in a position to interpret hormonal levels in individuals with health and disease conditions. Besides, students will also understand the role of various plant hormones in growth and development of plants.	
6.	**Credit Value**	4	
7.	**Marks**	Max. Marks-10+40	

Part B- Content of the Course

	Total numbers of Lectures (in hours):60	
Unit	**Topics**	**Numbers of Lectures**
I	Hormones: Chemical classification of hormones, Functions of hormones and their regulation. Chemical signaling - endocrine, paracrine, autocrine, intracrine and neuroendocrine mechanisms. General introduction to Endocrinology. Hormone receptors - extracellular and intracellular. Receptor - hormone binding, G protein coupled receptors, second messengers - cAMP, cGMP, IP3, DAG, Ca2+, Effector systems - adenylcyclase, guanylcyclase, PDE, PLC. Protein kinases (PKA, PKB, PKC, PKG). Receptor tyrosine kinases - EGF, insulin and Ras - MAP kinase cascade. Non receptor tyrosine kinase-erythropoietin receptor JAK - STAT pathway. Steroid hormone Receptor. Receptor regulation and crosstalk.	12
II	Hypothalamic-Hypophysialsystem, Pituitary: anatomy, histology, vasculature and secretions. Physiological and biochemical actions of hypothalamic hormones and anterior pituitary hormones; Feed- back regulation. Posterior pituitary hormones – structure, physiology and biochemical actions of AVP and Oxytocin.	12
III	Thyroid gland - Histology; Biosynthesis of thyroid hormone and its regulation: Role of TRH and TSH in T4 synthesis and response. Physiological and biochemical action of Thyroxine. Pathophysiology of thyroxine secretion: Hyper and hypothyroidism, Goiter, Graves' disease, Cretinism, Myxoedema. **Regulation of calcium homeostasis:** PTH, Vitamin D and calcitonin. Mechanism of Ca2+ regulation.Regulation of Growth: growth hormone and somatomedin, Endocrine disorders - gigantism, acromegaly, dwarfism, pygmies. Physiology and biochemical actions of Growth factors- EGF, PDGF andErythropoietin.	12
IV	**Hormones of adrenal gland:** Physiology and action of Aldosterone; the Renin Angiotensin System. Physiology and Biochemical actions of Cortisol. Adrenal medullary Hormones: Epinephrine and Norepinephrine. General adaptation syndrome: acute and chronic stress response. Pathophysiology – Addison's disease, Conn's syndrome.	12
V	**Cells involved in the release of gastrointestinal hormones**; the gastrin family of hormones and CCK: the secretin family of hormones; Incretins; Ghrelin; Summary of hormone metabolite control of GI function. Hormones of the Pancreas: Structure, synthesis, physiology and biochemical actions of insulin and glucagon. Adipocyte hormones: Adiponectin and leptin; Appetite and satiety control. **Male and female sex hormones.** Hormones during ovarian and uterine phases of menstrual cycle; Placental hormones; role of hormones during parturition and lactation.	12

CHAIRPERSON/H.O.D   SUBJECT EXPERT   SUBJECT EXPERT   SUBJECT EXPERT   REPRESENTATIVE   REPRESENTATIVE   SENIOR FACULTY
     (University Nominee)   (Academic Council)   (Academic Council)   (Industry)   (Alumni)   1.
     2.
     3.

Key Words: Cell Organelles, Cell Biology, Circulatory System, Respiratory System, Digestive System, Endocrine system, Excretory System

Part C- Learning resources

Text Books, Reference Books, Other resources
Recommended Books: 1. Lehninger:PrinciplesofBiochemistry(2017)7thed.,Nelson,D.L.andCox,M.M. W.H. Freeman & Company (New York 2. Vander'sHumanPhysiology(2019)15thed.,Widmaier,E.P.,Raff,H.andStrang, K.T. McGraw Hill International Publications (USA) 3. Endocrinology (2007) 6thed., Hadley, M.C. and Levine, J.E. Pearson Education (New Delhi), Inc. 4. The Cell: A Molecular Approach (2009) 5th Ed. Cooper, G.M. and Hausman, R.E. ASM Press & Sunderland, (Washington DC), Sinauer Associates. (MA).
E-learning Resources https://www.nature.com/scitable/topic/cell-biology-13906536/ https://www.sciencedirect.com/topics/medicine-and-dentistry/endocrinology https://www.webmd.com/lung/how-we-breathe https://www.britannica.com/science/circulatory-system https://www.niddk.nih.gov/health-information/digestive-diseases/digestive-system-how-it-works

Part D- Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE) + External Assessment (ESE)				
Assessment	**Mode**	**Max. Marks**		**Pattern**
CCE	Class Test/ Assignment/Presentation	10		
ESE	University Exam	40		
	Total Marks	**50**		

Part A- Introduction

Program: B.Sc. Course		Semester: VI	Year: (Jan-Jun) 2025	Session: 2024-25
1.	Course Code	S6 BCH -6P		
2.	Course Title	LAB6: Biochemistry and Function of Hormones		
3.	Course Type	DSE-2C Practical		
4.	Pre-requisite (if any)	To study this course, a student must have completed I to V semester study in Biochemistry		
5.	Course learning Outcome (CLO)	On successful completion of the course, the student shall be able to: Students will acquire practical training to undertake clinical tests like Glucose Tolerance test, estimation of serum Ca2+, serumT4, serumelectrolytes and HCG based pregnancy test. They will be in a position to interpret hormonal level with clinical conditions of the individuals.		
6.	Credit Value	2		
7.	Marks	Max. Marks-10+40		

Part B- Content of the Course

Total numbers of Lectures (in hours):30	
Tentative Practical List	1. Estimation of serum Ca2+. 2. Estimation of serum T4 3. HCG based pregnancy test. 4. Estimation of serum electrolytes. **5.** Case studies

Part C- Learning resources

Text Books, Reference Books, Other resources
Recommended Books: 1. Vander's Human Physiology (2008) 11th ed., Widmaier, E.P., Raff, H. and Strang, K.T.,McGraw HillInternational Publications (New York), ISBN: 978-0-07-128366-3.   2. Textbook of Medical Physiology (2011) 10th ed., Guyton, A.C. and Hall, J.E., ReedElsevier's India Pvt. Ltd. (New Delhi). ISBN: 978-1-4160-4574-8.   3. Endocrinology (2007) 6th ed., Hadley, M.C. and Levine, J.E. Pearson Education (NewDelhi), Inc. ISBN: 978-81-317-2610-5.   4. Fundamental of Anatomy and Physiology (2009), 8th ed., Martini, F.H. and Nath, J.L.,Pearson Publications (San Francisco), ISBN: 10:0-321-53910-9 / ISBN: 13: 978-0321-53910-6.   **E-learning Resources**   https://www.klimud.org/public/atlas/idrar/web/www.irvingcrowley.com/cls/fund.htm   https://www.mayoclinic.org/tests-procedures/prothrombin-time/about/pac-20384661   https://www.ncbi.nlm.nih.gov/books/NBK482339/   https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6709845/

Part D- Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE) + External Assessment (ESE)				
Assessment	Mode	Max. Marks		Pattern
CCE	Class Test/ Assignment/Presentation	10		
ESE	University Exam	40		
	Total Marks	**50**		

Part A- Introduction

Program: B.Sc (Hons) Course		Semester: VI	Year: 2025		Session: 2024-25	
1.	Course Code	S6 BCH 6T				
2.	Course Title	Plant Biochemistry				
3.	Course Type	DSE-2D Theory				
4.	Pre-requisite (if any)	To study this course, a student must have completed I to V semester study in Biochemistry				
5.	Course learning Outcome (CLO)	Learning outcomes for this course include detailed understanding of metabolic processes specific for plants such as nitrate assimilation, photosynthesis, respiration, nitrogen fixation and the role of different metabolic pathways in plant growth and development. Students will also gain insight to various stressful conditions of the environment that affect plant growth and productivity as well as the defense mechanisms in plants due to which plants survive under stresses.				
6.	Credit Value	04				
7.	Marks	Max. Marks-10+40				

Part B- Content of the Course

Total numbers of Lectures (in hours):60		
Unit	Topics	Numbers of Lectures
I	**Electron transport system in plants:** oxidative phosphorylation, mitochondrial respiratory complexes, order and organization of electron carriers, electrochemical gradient, chemiosmotic theory, ATP synthase and mechanism of ATP synthesis.	12
II	**Nitrogen metabolism:** assimilation of nitrate, structural features of nitrate reductase and nitrite reductase, incorporation of ammonia into organic compounds, regulation of nitrate assimilation. Biological nitrogen fixation by free living and in symbiotic association; structure and function of the enzyme nitrogenase.	10
III	**Photosynthesis** – Photosynthetic apparatus, pigments of photosynthesis, role of carotenoids, photosystems I and II, their location; Hill reaction, photosynthetic electron transport and generation of NADPH & ATP, cyclic and non-cyclic photophosphorylations, complexes associated with thylakoid membranes; light harvesting complexes, path of carbon in photosynthesis – C3 and C4 pathway of carbon reduction and its regulation, Photorespiration.	12
IV	**Special features of secondary plant metabolism,** terpenes (classification, biosynthesis), lignin, tannins, pigments, phytochrome, waxes, alkaloids, biosynthesis of nicotine, functions of alkaloids, cell wall components. **Toxins of plant origin** – mycotoxins, phytohemagglutinins, lathyrogens, nitriles, protease inhibitors, protein toxins. **Stress metabolism in plants** – Environmental stresses, salinity, water stress, heat, chilling, anaerobiosis, pathogenesis, heavy metals, radiations and their impact on plant growth and metabolism, criteria of stress tolerance.	16
V	**Antioxidative defense system in plants** – reactive oxygen species and their generation, enzymic and non-enzymic components of antioxidativedefense mechanism.	10

Key Words: Electron transport, Nitrogen assimilation, secondary metabolites, Reactive oxygen species.

CHAIRPERSON/H.O.D	SUBJECT EXPERT (University Nominee)	SUBJECT EXPERT (Academic Council)	SUBJECT EXPERT (Academic Council)	REPRESENTATIVE (Industry)	REPRESENTATIVE (Alumni)	SENIOR FACULTY
						1.
						2.
						3.

Part C- Learning resources

Text Books, Reference Books, Other resources
Suggested readings:
1. Buchann (2015), Biochemistry and Molecular Biology of Plants, 2nded. Publisher: I KInternational. ISBN-10: 8188237116, ISBN- 978047 0714218
2. Taiz and Zeiger, Plant Physiology, 5thedition, Sinauer Associates Inc.ISBN-13:978- 0878938667, ISBN-10:0878938664
3. Caroline Bowsher, Martin steer, Alyson Tobin (2008), Plant Biochemistry, Garland science ISBN978-0-8153-4121-5.
4. P.M Dey and J.B. Harborne (Editors) (1997), Plant Biochemistry, Publisher:Academic Press ISBN-10:0122146743,ISBN-13:978-0122146749

Part D- Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE) + External Assessment (ESE)				
Assessment	**Mode**	**Max. Marks**		**Pattern**
CCE	Class Test/ Assignment/Presentation	10		
ESE	University Exam	40		
	Total Marks	**50**		

Part A- Introduction

Program: B.Sc		Semester: VI	Year: 2025	Session: 2024-25
1.	Course Code	S6 BCH-6P		
2.	Course Title	Lab- Plant Biochemistry		
3.	Course Type	DSE - 2D Practical		
4.	Pre-requisite (if any)			
5.	Course learning Outcome (CLO)	Students will gain expertise to determine the contents of photosynthetic pigments, ascorbic acid, phenols, tannins, hydrogen peroxide in plant samples. They will understand the spectral patterns of photosynthetic pigments and will get training to extract and assay enzymes like urease from Jack bean.		
6.	Credit Value	02		
7.	Marks	Max. Marks-10+40		

Part B- Content of the Course

Total numbers of Lectures (in hours): 30	
	Topics
	Practical content: 1. Estimation of chlorophylls and carotenoids from grass/spinach leaves 2. Estimation of ascorbic acid, phenols, tannins in fruits and vegetables 3. Determination of radical scavenging activity of plant extracts 4. Estimation of hydrogen peroxide in tissue extracts 5. Extraction and assay of urease from Jackbean 6. Separation of photosynthetic pigments by TLC and determination of absorption Spectra.

Key Words:

Part C- Learning resources

Text Books, Reference Books, Other resources
Suggested readings: 1. Buchann (2015), Biochemistry and Molecular Biology of Plants, 2nded. Publisher: I KInternational. ISBN-10: 8188237116, ISBN- 978047 0714218   2. Taiz and Zeiger, Plant Physiology, 5thedition, Sinauer Associates Inc.ISBN-13: 978- 0878938667, ISBN-10:0878938664   3. Caroline Bowsher, Martin steer, Alyson Tobin (2008), Plant Biochemistry, Garland science ISBN978-0-8153-4121-5.   4. P.M Dey and J.B. Harborne (Editors) (1997), Plant Biochemistry, Publisher: Academic Press ISBN-10:0122146743,ISBN-13:978-0122146749

Part D- Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE) + External Assessment (ESE)				
Assessment	Mode	Max. Marks		Pattern
CCE	Class Test/ Assignment/Presentation	10		
ESE	University Exam	40		
	Total Marks	**50**		

Part A- Introduction

Program: B. Sc. Course		Semester: VI	Year: (Jul - Dec) 2025	Session: 2024-25
1.	Course Code	S6 SEC 2P		
2.	Course Title	**Clinical Biochemistry**		
3.	Course Type	SEC-2		
4.	Pre-requisite (if any)	Basic knowledge of biochemistry.		
5.	Course learning Outcome (CLO)	On successful completion of the course, the student shall be able to: 1. To understand normal constituents of urine, blood and their significance in maintaining good health 2. To understand the mechanisms of causation of diseases of liver and kidney. 3. To understand the current concepts related to mechanism of Cancer. 4. To understand the variations in the levels of trigycerides and lipoproteins and their relationship with various diseases. To get acquainted with the role of enzymes in diagnosis of various diseases.		
6.	Credit Value			
7.	Marks	Max. Marks-10+40		

Part B- Content of the Course

Total numbers of Lectures (in hours):60		
Unit	Topics	Numbers of Lectures
I	Introduction Organization of clinical laboratory, Introduction to instrumentation and automation in clinical biochemistry laboratories safety regulations and first aid. General comments on specimen collection, types of specimen for biochemical analysis. Precision, accuracy, quality control, precautions and limitations. **Exercises** a. Collection of blood and storage. b. Separation and storage of serum. c. Analysis of Cell Morphology Evaluation of biochemical changes in diseases.	12
II	Basic hepatic, renal and cardiovascular physiology. Biochemical symptoms associated with disease and their evaluation. Diagnostic biochemical profile. Assessment of glucose metabolism in blood Clinical significance of variations in blood glucose. Diabetes mellitus. **Exercise:** Estimation of blood glucose by glucose oxidase peroxidase method.	12
III	Lipid profile Composition and functions of lipoproteins. Clinical significance of elevated lipoprotein. **Exercise:** Estimation of triglycerides. Liver function tests Exercise: Estimation of bilirubin (direct and indirect).	12
IV	Renal function tests and urine analysis Use of urine strip / dipstick method for urine analysis. **Exercise:** Quantitative determination of serum creatinine and urea.	12
V	Tests for cardiovascular diseases Involvement of enzymes in diagnostics of heart disease including aspartate transaminase, isoenzymes of creatine kinase and lactate dehydrogenase and troponin. **Exercise:** Assessment of hypertension by blood pressure measurement,	12

Key Words:

Part C- Learning resources

Text Books, Reference Books, Other resources
Essentials of clinical pathology by Shirish M. Kawthalkar-JPB. 2. Clinical pathology, Haematology and blood banking by Maheshwari- Jay Kay. 3. Clinical pathology by James Carton and Richard Daly- OUP Oxford.

CHAIRPERSON/H.O.D	SUBJECT EXPERT (University Nominee)	SUBJECT EXPERT (Academic Council)	SUBJECT EXPERT (Academic Council)	REPRESENTATIVE (Industry)	REPRESENTATIVE (Alumni)	SENIOR FACULTY
						1.
						2.
						3.

https://www.klimud.org/public/atlas/idrar/web/www.irvingcrowley.com/cls/fund.htm
https://www.mayoclinic.org/tests-procedures/prothrombin-time/about/pac-20384661
https://www.ncbi.nlm.nih.gov/books/NBK482339/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6709845/

Part D- Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE) + External Assessment (ESE)				
Assessment	**Mode**	**Max. Marks**		**Pattern**
CCE	Class Test/ Assignment/Presentation	10		
ESE	University Exam	40		
	Total Marks	**50**		

CHAIRPERSON/H.O.D   SUBJECT EXPERT   SUBJECT EXPERT   SUBJECT EXPERT   REPRESENTATIVE   REPRESENTATIVE   SENIOR FACULTY
     (University Nominee)   (Academic Council)   (Academic Council)   (Industry)   (Alumni)   1.
   2.
   3.

Part A- Introduction

Program: B. Sc.		Semester: IV	Year: Jan-Jun 2024	Session: 2023-24
1.	Course Code	S4SEC1P		
2.	Course Title	Biostatistics		
3.	Course Type	SEC-1		
4.	Pre-requisite (if any)	Successfully completed I to III Semester of UG Course.		
5.	Course learning Outcome (CLO)	Students will acquire hands-on practical training to plan biological experiments with requisite sample size. After completion of experiments based on different sample sizes students will be able to perform proper statistical analysis of the data using mean, median, mode, variance and standard deviations. Students will be able to apply the principles of biological data management in real life situations. Statistical training will improve computational, mathematical and computer skills of the students by learning the use of ANOVA, AMOVA and student t-test. Students will be able to formulate a hypothesis, relevance to type of sample collected and sample size.		
6.	Credit Value	02		
7.	Marks	Max. Marks-10+40		

Part B- Content of the Course

Unit	Topics (30 Hrs)
	Course content: **Data Collection and Presentation:** 1. Estimation of population means and variance in simple random sampling. 2. Collection of data - Random sampling method; Stratified sampling method; Cluster sampling methods. 3. Cluster Sampling- Equal and unequal cluster sizes. Double sampling using regression and ratio estimates and double sampling for stratification. 4. Data representation - Frequency and relative frequency distribution table, Plotting of biological data in a representative graphical format. **Analysis of variance:** 5. Data analysis - Calculating Mean, median, mode, variance, standard deviation and standard error for a given data set. Standard t-test for grouped samples. Analysis of 2 way variance **Probability and Hypothesis testing :** 6. Chi square goodness of fit test. Regression analysis and calculating regression coefficient 7. Learning to analyze data using SPSS /Prism software

Part C- Learning resources

Text Books, Reference Books, Other resources
1. Principles of Biostatistics, M. Pagano and K. Gauvreau (2000); Duxbury Thomas learnings.   2. Analysis of Biological Data, M. Whitlock and D. Schluter (2009); Roberts and company publishers.

Part D- Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE) + External Assessment (ESE)				
Assessment	Mode	Max. Marks		Pattern
CCE	Class Test/ Assignment/Presentation	10		
ESE	University Exam	40		
	Total Marks	**50**		

CHAIRPERSON/H.O.D   SUBJECT EXPERT   SUBJECT EXPERT   SUBJECT EXPERT   REPRESENTATIVE   REPRESENTATIVE   SENIOR FACULTY

                       (University Nominee) (Academic Council)   (Academic Council)   (Industry)   (Alumni)   1.

                                                                                                                              2.

                                                                                                                              3.

SYLLABUS

SEMESTER-II

BOTANY

ACADEMIC YEAR - 2022-23

DEPARTMENT OF BOTANY

GOVERNMENT NAGARJUNA P.G. COLLEGE OF SCIENCE, RAIPUR (C.G.)

PART A- INTRODUCTION

Program-U.G. Certificate Course in Science	Class- SEMESTER-II	YEAR-2022-23	SESSION-2022-23
	Subject- BOTANY		
1.	Course code	S 2-BOT-2 T	
2.	Course Title	Archegoniate and Morphology of Angiosperm	
3.	Course Type	Core course, Theory	
4.	Prerequisite (if any)	Appeared in I semester Exam.	
5.	Course Learning outcome (CLO)	The students will be able to learn about - Morphology and Life cycle of Bryophytes, Pteridophytes and Gymnosperm. - Geological time scale. - Types and process of Fossilization. - Morphology of Angiosperm.	
6.	Credit Value	04(15 hours/Credit)	
7.	Marks	10+ 40 =50	

PART-B CONTENT OF THE COURSE

TOTAL NUMBER OF LECTURES (in Hours)		
UNIT	TOPICS (60 Hours)	NUMBER OF LECTURES
I	**Bryophytes:** General characteristics of archegoniate, Bryophytes: General characteristics and affinities, adaptations to the land habit, Range of thallus organization. Classification , morphology, anatomy and reproduction *of Riccia, Marchantia , Anthoceros* and *Polytrichum.* Economic importance of bryophytes.	18
II	**Pteridophytes:** General characteristic and affinities, Classification with examples, Heterospory and Seed habit, Evolution of Stele, economic importance of Pteridophytes, Morphology, anatomy, and life cycle of *Psilotum, Lycopodium, Selaginella, Equisetum,* and *Marselia.*	18
III	**Gymnosperms:** General Characteristics Classification and distribution of gymnosperms; Salient features of Cycadales, Ginkgoales, Coniferales and Gnetales with examples, Structure and reproduction; economic importance, Morphology, anatomy, and life cycle of *Cycas, Pinus* and *Ephedra.*	18
IV	**Palaeobotany:** History, Geological time scale; Process of fossilization & types of fossils and study techniques; Radio carbon dating, General account of Fossil plants: *Rhynia, Williamsonia, Cycadeoidea.* Contribution of Prof.	18

	Birbal Sahni.	
V	**Angiosperm Morphology:** Morphology and modifications of root; Stem, leaf, and bud. Types of inflorescences; flowers, fruits, types of placentation; and types of seeds.	18

PART-C-LEARNING RESOURCES

TEXTBOOKS, REFERENCE BOOKS AND OTHER RESOURCES
SUGGESTED READINGS: -

1. Gangulee H. S. and K. Kar 1992. College Botany Vol. I and II. (New Central Book Agency)
2. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
3. Pandey S.K. (2012). Quick Concept of Botany. Publisher LAP LAMBERT Academic Publishing GmbH & Co. KG, Germany (ISBN: 978-3-8484-3104-5).
4. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.
5. Rashid A (1999) An Introduction to Pteridophyta, Vikas Publishing House Pvt. Ltd. New Delhi.
6. Sharma OP (1990) Textbook of Pteridophyta. MacMillan India Ltd. Delhi.
7. Vashishtha BR, Sinha AK and Kumar A (2010) Botany for Degree Students – Pteridophyta, S. Chand and Company,
8. Vashishtha BR, Sinha AK and Kumar A (2010) Botany for Degree Students – Gymnosperms, S. Chand and
9. Parihar NS (1976) Biology and Morphology of Pteridophytes. Central Book Depot.
10. Bhatnagar SP (1996) Gymnosperms, New Age International Publisher.
11. Pandey BP (2010) College Botany Vol II S. Chand and Company, New Delhi.

PART-D- ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods: -Internal (CCE) + EXTERNAL ASSESSMENT (ESE)			
Assessment	Mode	Max. Marks.	Pattern
CCE	Class Test Assignment /Presentation	10	
ESE	Autonomous Exam.	40	
		50	

Signature H.O.D.

External Subject Experts: 1.   Representative from Industry

                                 2.

                                 3.

Departmental Members: Student Member

                                 1.   1.

                                 2.   2.

                                 3.

                                 4.

                                 5.

                                 6.

                                 7.

SYLLABUS

SEMESTER-I

BOTANY

ACADEMIC YEAR - 2022-23

DEPARTMENT OF BOTANY

GOVERNMENT NAGARJUNA P.G. COLLEGE OF
SCIENCE, RAIPUR (C.G.)

Program-U.G. Certificate Course in Science	Class- SEMESTER-I	YEAR-2022-23		SESSION-2022-23
	Subject -BOTANY			
1.	Course code	S1-BOT-1T		
2.	Course Title	Instrumentation, Algae, Fungi & Plant Pathology		
3.	Course Type	Core course ,Theory		
4.	Prerequisite (if any)	12 th pass with Biology stream Botany as a subject		
5.	Course Learning outcome (CLO)	The students will be able to learn about - Important instruments of Botany lab. - Viruses, Bacteria, Mycoplasma, Actinomycetes, Algae, Fungi their structure and Life cycle. - Disease symptoms, disease cycle and control of disease. - The various organism and their role and importance.		
6.	Credit Value	04(15 Hrs. /Credit)		
7.	Marks	10+40=50		

PART-B CONTENT OF THE COURSE

TOTAL NUMBER OF LECTURES (in Hours)		
UNIT	TOPICS (Total Hours 60)	NUMBER OF LECTURES
I	**Instrumentation:** Microscopy – Light, phase contrast, Scanning and Transmission electron microscopy, Staining techniques for light microscopy. Common equipment of lab and principle of their working – Centrifuge, Colorimetry, Spectrophotometry and Electrophoresis.	18
II	**Microbial world:** Structure of bacteria; Bacterial Growth curve, Factors affecting growth of Bacteria; Sporulation, reproduction, recombination in bacteria. Viruses, general characteristics, Structure of viruses, Bacteriophages; Lytic and Lysogenic cycles, viroid, Prions & Mycoplasma, Phytoplasma, Actinomycetes and their economic Importance.	18
III	**Algae:** General characteristic, Classification, and range of thallus organization of Algae. Classification and life cycle of –*Volvox, Oedogonium, Vaucheria, Ectocarpus* and *Polysiphonia*. Economic importance of algae - Role of algae in soil fertility, biofertilizer and algae as a biofuel.	18
IV	**Fungi, Lichens and Mycorhiza:** General characteristic, Economic importance and Classification of Fungi. General characters of Myxomycota; Mastigomycota: Life cycle of *Phytophthora* and *Albugo*, Zygomycota: Life	18

	cycle of *Mucor*, Ascomycota: Life cycle of *Penicillium, Peziza*. Basidiomycota: Life cycle of *Ustilago, Puccinia, Agaricus*; Deuteromycota: *Colletotrichum*, *Fusarium, Alternaria*. Heterothallism, Heterokaryosis & Parasexuality, General account and significance of Lichens; Mycorrhiza.		
V	**Plant Pathology:** Classification of plant diseases, Disease Symptoms, Defence mechanism in plants: physical and biochemical defence, Plant disease control. Plant Quarantine and Integrated plant disease management. **Diseases**: Symptoms, Causal organism, Disease cycle and Control measures of – Early & Late Blight of Potato, Black Stem Rust of Wheat, Early blight of Potato , White rust of Crucifers, Red Rot of Sugarcane, Wilting of Arhar, Mosaic diseases on tobacco , yellow vein mosaic of bhindi; Citrus Canker, Little leaf of brinjal.	18	

PART-C-LEARNING RESOURCES

TEXTBOOKS, REFERENCE BOOKS AND OTHER RESOURCES SUGGESTED READINGS: -
Suggested Readings: 1. Microbiology Fundamental and Applications (Hindi) (pb) 9. ISBN: 9788188826230 Edition: 03Year: 2016 Author: Dr. Purohit SS, Dr. Deo Publisher: Student Edition Language: Hindi   2. Modern Microbiology (Hindi) (hb) ISBN: 9788177543599Edition: 1Year : 2018Author : Dr. Purohit SS , Dr. Singh T Publisher: Agrobios (India)   3. Plant pathology by R.S. Mehrotra, Tata McGraw-Hill Publication.   **Textbooks:**   1. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.   2. Sethi, I.K. and Walia, S.K. (2011). Textbook of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.   3. Aggarwal, S. K. 2009. Foundation Course in Biology, A one books Pvt. Ltd., New Delhi.   4. Aneja, K. R. 1993. Experiments in Microbiology, Pathology and Tissue Culture, Vishwa Prakashan, New Delhi.   5. Annie Ragland, 2012. Algae and Bryophytes, Saras Publication, Kanyakumari, India.   6. Basu, A. N. 1993. Essentials of Plant Viruses, Vectors and Plant diseases, New Age International, New Delhi.   7. Chopra. G. L. 1984. A textbook of Algae, Rastogi publications, Meerut, India.   8. Dubey, R. C. and Maheshwari. D.K. 2012. Practical Microbiology, S. Chand & Company, Pvt. Ltd., New Delhi.   9. Sharma, P.D. (2011). Plant Pathology. Meerut, U.P.: Rastogi Publication.   10. Pandey B.P. 2001. College Botany Volume 1, S Chand & Company Pvt. Ltd, New Delhi.   11. Pandey. B.P. 2014 Modern Practical Botany, (Vol-I) S. Chand and Company Pvt. Ltd., New Delhi.   12. Pelzar, 1963. Microbiology, Tata Mc Graw Hill, New Delhi   13.Rangaswamy, G. 2009, Disease of Crop Plants in India, Prentice Hall of India, New Delhi.

PART-D- ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods :-Internal(CCE) + EXTERNAL ASSESSMENT (ESE)			
Assessment	Mode	Max. Marks.	Pattern
CCE	Class Test Assignment /Presentation	10	
ESE	Autonomous Exam.	40	
		50	

Signature H.O.D.

External Subject Experts: 1.   Representative from Industry

2.

3.

Departmental Members: Student Member

1.   1.

2.   2.

3.

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5.

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Govt. N. P. G. College of Science, Raipur

Part A: Introduction				
Program: **Certificate Course in Computer Science**		Class: **B.Sc.-CS I Year**	Year: **2022**	Session:**2022-2023**
1	Course Code	**S1-COMP-1T**		
2	Course Title	COMPUTER FUNDAMENTALS		
3	Course Type	**Core Course**		
4	Pre-requisite (if any)	To study this course a student must have had the subject Maths in 12th class		
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be : • Understand basic computer hardware architecture and be able to design fundamental logic circuits. • Convert between different number systems and describe some different codes. • Understand the functions of basic digital combinatorial circuits and sequential circuits. • Understand the fundamental hardware components that make up a computer hardware and the role of each of these components. • Understand the role of CPU and its components		
6	**Credit Value**	**4**		

Part B:Content of the Course		
Total No. of Lectures (in Hours):60		
Unit	**Topics**	**No. of Lectures per week**
I	History of computer, Generation of computer, calculator vs computer. Digital and Analogue computers and its evolution. Major components of digital computers, Memory addressing capability of CPU. Word length and processing speed of computers, Microprocessors, Single chip Microcomputer, Large and small computers, Users interface, hardware, software and firmware, multiprogramming multiuser system, Dumb smart and intelligent terminals, computers Network and multiprocessing LAN parallel processing, Finn's classification of computers control flow and data flow computers.	12
II	Parts of CPU-ALU control unit, Registers; Architecture of Intel 8085 microprocessor, Instruction for Intel 8085 microprocessor, Instruction Word size, Various addressing mode, Interrupts some special control signals, Instruction cycle fetch and execute operation, Timing Diagram, Instruction flow and data flow.	12
III	Memory hierarchy, Primary and Secondary Memory, Cache memory, Virtual Memory, Direct Access storage devices (DASD) Destructive and Non-destructive Readout, Program and data memory, Memory Management Unit (MMU) PCMCIA cards and Slots.	12
IV	I/O devices-Keyboard, Mouse, Monitor, Impact and Non-Impact Printers, Plotters, Scanner, other Input/output devices: Scan method of Display, Raster Scan, Vector Scan, Bit Mapped Scan, CRT Controller, I/O Port, Programmable and Non Programmable I/O port, Inbuilt I/O ports, Parallel and Serial ports, USB,	12

	IEEE 1394, AGP, Serial data transfer scheme, Microcontroller, Signal Processor, I/O processor, Arithmetic Processor.	
V	Application and System Software: Introduction, Example, Difference etc. Introduction to Open Source Software such as Unix/Linux (Ubuntu), Liber office etc. Introduction to Machine Language Assembly Language and High Level Language; Programming Techniques, Stack Subroutine, Debugging of programs, Macro Program Design Software Development, Flow Chart, Multiprogramming, Multiuser, Multitasking Protection, Operating system and Utility programs Application packages	12

Part C -Learning Resources
Text Books, Reference Books, Other Resources

Suggested Readings:
 	
TEXT BOOK:
 	
   1. Computer Fundamentals, P. K. Sinha, BPB Publications, Sixth Edition.
   2. Introduction to Information Technology, V. Rajaraman, PHI, Second Edition.
   3. Fundamental of Information Technology, ChetanShrivastava, Kalyani Publishers.
   4. Computers Today, Suresh K Basandra, Galgotia Publications.
Recommended links
 	
https://swayam.gov.in/explorer?searchText=computer+fundamental
 	
https://nptel.ac.in/courses/106106092

LAB 1: Introduction to Computers
    At least 15 practical's covering topic Introduction to computers

Part A: Introduction				
Program: **Certificate Course in Computer Science**		Class: **B.Sc.-CS I Year**	Year: **2022**	Session:**2022-2023**
1	Course Code	S2-COMP-2T		
2	Course Title	**Programming in C**		
3	Course Type	**Core Course**		
4	Pre-requisite (if any)			
5	Course Learning. Outcomes (CLO)	• At the end of this course, the students: • Learn how to build the algorithms for problem. • Understand how to create pictorial representations of the program. • Develop problem solving skill and understand how to apply logic for problems. • Apply their programming skills. • Understand the basic terminology used in computer programming and will be able to design programs involving decision structures, loops and functions. • Analyze a simple programming problem specification. • Design a high-level (programming language independent) solution to the problem			
6	**Credit Value**	**Theory: 4**		

Part B:Content of the Course		
Total No. of Lectures (in Hours): 60		
Unit	**Topics**	**No. of Lectures per week**
I	Fundamentals of C Programming - Overview of C : History of 'C', Structure of 'C' program. Keywords, Tokens, Data types, Constants, Literals and Variables, Operators and Expressions : Arithmetic operators, Relational operator, Logical operators, Expressions, Operator : operator precedence and associativity ,Type casting, Console I/O formatting, Unformatted I/O functions: getch(), getchar, getche(), getc(), putc(), putchar().	12
II	Control Constructs: If-else, conditional operators, switch and break, nested conditional branching statements, loops: For, do.. while, while, Nested loops, break and continue, goto and label, exit function. UNIT-II Arrays, Strings and Functions : Array:- Array declaration, One and Two dimensional numeric and character arrays. Multidimensional arrays..	12
III	String:- String declaration, initialization, string manipulation with/without using library function. Functions:-definition, function components: Function arguments, return value, function call statement, function prototype. Type of function arrangement: return and argument, no return and no argument, return and no argument, no return and argument. Scope and lifetime of variable. Call by value and call by reference. Function	12

	using arrays, function with command line argument. User defined function: maths and character functions, Recursive function.	
IV	Structure, Union & Enum- Structure: basics, declaring structure and structure variable, typedef statement, array of structure, array within structure, Nested structure; passing structure to function, function returning structure. Union: basics, declaring union and union variable, Enum: declaring enum and enum variable. Dynamic Data Structures in 'C' - Pointers: definition of pointers, pointer declaration, using & and * operators. Void pointer, pointer to pointer, Pointer in math expression, pointer arithmetic, pointer comparison	12
V	File Handling and Miscellaneous Features - File handling: file pointer, file accessing functions,: fopen, fclose, fputc, fgetc, fprintf, fscanf, fread, fwrite,beof, f flush, rewind, fseek, ferror. File handling through command line argument. Introduction to C preprocessor #include, #define, conditional compilation directives: #if, #else, #elif, #endif, #ifndef etc.	12

Part C -Learning Resources
Text Books, Reference Books, Other Resources

Suggested Readings:
 	
TEXT BOOK:
 	
   1. Programming in C - YashwantKanetkar
   2. Programming in C - Venugopal
   3. The C Programming Language - Kemigham and Ritche[Prentice Hall].
   4. Application Programming in C - R. Johnson-baugh& Martin Kalin Macmillan International Editions.
Supplementary Readings:
1. The art of C Programming - Jones, Robin & Stewart, Narosa Publishing House.
2. C Problem solving and Programming - A. Kenneth, Prentice Hall International.
3. C made easy - H. Schildt, McGraw Hill Book Company
Links:
https://swayam.gov.in/explorer?searchText=programming%20in%20c
https://archive.nptel.ac.in/courses/106/104/106104128/

LAB 2: Programming in C
    At least 15 practical's covering topic of C like loops, functions arrays.

<table>
<tr><td colspan="4" align="center">Part A Introduction.</td></tr>
<tr><td>Programme: Certificate Course</td><td>Class: B.Sc. I</td><td>Year: 2022</td><td>Session: 2022-23</td></tr>
<tr><td colspan="4" align="center">Subject-Mathematics</td></tr>
</table>

1	**Course Code**	S1: Maths - 1(T)
2	**Course Title**	Calculus
3	**Course Type**	Core Course
4	**Prerequisite**	To study this course the student must have the knowledge of differential calculus of 12th class.
5	**Course Learning outcomes**	This course will enable the students to 　　　　1. Calculate the limit and examine the continuity and understand the geometric interpretation of differentiability. 　　　　2. Understand the consequences of various mean value theorems. 　　　　3. Understand conceptual variations while advancing from one variable to several variables in calculus.
6	**Credit Value**	05(Theory)+1(Tutorials)=6

<table>
<tr><td colspan="3" align="center">Part B: Content of the Course</td></tr>
<tr><td colspan="3" align="center">Total no. of Lectures (in hours per week): 4 hours per week
Total Lectures: 75 Hours</td></tr>
<tr><td align="center">Unit</td><td align="center">Topics</td><td align="center">No. of Lectures</td></tr>
<tr><td>I</td><td>Sequence Continuity and Differentiability
1.1 Historical Background
1.1.1 Development of Indian Mathematics later classical period (500-1250).
1.1.2 A brief biography of Ramanujan and Arya bhatt
1.2 Notion of convergence of sequence and series of real numbers.
1.2.1 Bounded sequence, Monotonic sequence, Oscillatory sequence, Divergent sequence, some theorem on sequence.
1.2.2 Cauchy sequence, Cauchy general principle of convergence of sequence.
1.2.3 Cauchy's First Theorem on Limit.
1.2.4 Sequence of partial sum of series, sum of a series, sum and difference of series.
1.2.5 Ɛ-δ definition of the limit of a function, continuity of real valued function, Differentiability and its geometrical interpretation.
1.3 Roles theorem, Lagrange's theorem, Cauchy's Mean Value theorem and their geometrical interpretation.</td><td align="center">30</td></tr>
<tr><td>II</td><td>Expansion of functions
2.1 Successive differentiation Leibnitz theorem, Maclaurin's and Taylor's theorems for function of one variable.</td><td align="center">20</td></tr>
</table>

III	**Curvature, Asymptotes and Curve tracing**	20
	3.1 Curvature formula for Radius of curvature, Pedal formula, formula for polar equations.	
	3.2 Centre of Curvature, Chord of curvature.	
	3.3 Asymptotes, Asymptotes of Algebraic curves, Asymptotes Parallel to axes, Asymptotes of polar curves, Concavity and Convexity.	
	3.4 Point of inflection, Tangents at origin, Multiple points, Position and nature of double points	
	3.5 Curve Tracing (Cartesian and Polar form of equations)	
	3.6 Envelope and Evolutes.	
IV	**Functions of several variables**	20
	4.1 Partial derivatives, Partial derivatives of Higher orders.	
	4.2 Composite function and Total differentiable coefficient	
	4.3 Homogeneous function, Euler's theorem for Homogeneous function of two variables.	
	4.4 Change of variable	
	4.5 Jacobian	
V	**Double and Triple integrals, Change of order of integral**	20
	5.1 Double integrals, Evaluation of Double integral, Properties of double integral	
	5.2 Evaluation of Triple integral	
	5.3 Double integral in polar form	
	5.4 Change of order of integration in Double Integrals.	

Total 15 hours Allotted for tutorials.

Part C Learning Resources
Text Books:
1 Howard Anton, I. Bivens & Stephan Davis (2016). Calculus (10th edition). Wiley India.
2. Gabriel Klambauer (1986). Aspects of Calculus. Springer-Verlag.
3. Gorakh Prasad (2016). Differential Calculus (19 edition). Pothishala Pvt. Ltd.
4. Gerard C. Emch, R. Sridharan and M. D. Srinivas: Contributions to the History of Indian Mathematics. Hindustan Book Agency, Vol. 3, 2005.

		Part A Introduction			
Programme: Certificate Course		**Class:** B.Sc. I	**Year:** 2022	**Session:** 2022-23	
Subject-Mathematics					
1	**Course Code**	S2: Maths - 1(T)			
2	**Course Title**	Algebra			
3	**Course Type**	Core Course 2			
4	**Prerequisite**	To study this course the student must have the knowledge of Set theory of Class 12.			
5	**Course Learning outcomes**	This course will enable the students to: i) Employ De Moivre's theorem in a number of applications to solve numerical problems. ii) Learn about the fundamental concepts of groups, subgroups, normal subgroups, isomorphism theorems, cyclic and permutation groups. iii) Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix, using rank. iv) Find eigen values and corresponding eigenvectors for a square matrix. v) Understand real vector spaces, subspaces, basis, dimension and their properties.			
6	**Credit Value**	05(Theory) +01(Tutorials)			

Part B: Content of the Course		
Total no. of Lectures(in hours per week): 4 hours per week		
Total Lectures: 90 Hours		
Unit	Topics	No. of Lectures
I	**Set Theory and Theory of Equations** 1.1 Sets, Relations, Equivalence relations, Equivalence classes; Finite, countable and uncountable sets; 1.2 The division algorithm, Divisibility and the Euclidean algorithm, Modular arithmetic and basic properties of congruences; 1.3 Elementary theorems on the roots of polynomial equations, Imaginary roots, 1.4 The fundamental theorem of algebra (statement only); 1.5 The nth roots of unity, De Moivre's theorem for integer and rational indices and its applications.	20
II	**Groups, Subgroups, Normal Subgroups and Isomorphism Theorems** 2.1 Definition and properties of a group, Abelian groups, Examples of groups including D_n (dihedral groups), Q_8 (quarternian group), $GL(n, \mathbb{R})$ (general linear groups) and $SL(n, \mathbb{R})$ (special linear groups); 2.2 Subgroups and examples, Cosets and their properties, Lagrange's theorem and its applications, 2.3 Normal subgroups and their properties, Simple groups, Factors groups; 2.4 Group homeomorphisms and isomorphism with properties; First, second and third isomorphism theorems for groups.	15
III	**Cyclic and Permutation Groups** 3.1 Cyclic groups and properties, Classifications of subgroup of cyclic groups, 3.2 Cauchy theorem for finite Abelian groups; Centralizer, Normalizer, Center of a group, 3.3 Product of two subgroups, Permutation group and properties, Even and odd permutations, Cayley's theorem.	15
IV	**Row Echelon Form of Matrices and Applications** 4.1 Systems of linear equations, Row reduction and echelon forms, The rank of a matrix and its applications in solving system of linear equations; 4.2 Matrix operations, Symmetric, skew symmetric, self-adjoint, orthogonal, Hermition, skew-Hermition and unitary matrices; 4.3 Determinant of a square matrix, The inverse of a square matrix, Eigenvectors and Eigen values, 4.4 The characteristic equation and the Cayley-Hamilton theorem.	20
V	**Vector Spaces and Linear Transformations** 5.1 Definitions of field and vector space with examples, Subspaces, 5.2 Linear span, Quotient space and direct sum, Linearly independent and dependent sets, 5.3 Bases and dimension, Linear transformation and matrix of a linear transformation, 5.4 Change of coordinates, Rank and nullity of linear transformation, Rank-nullity theorem.	20

Total 15 hours Allotted for tutorials.

Part C Learning Resources

Text Books:

1. Michael Artin (2014). Algebra (2nd edition). Pearson.

2. John B. Fraleigh (2007). A First Course in Abstract Algebra (7th edition). Pearson.

3. Stephen H. Friedberg, Arnold J.Insel& Lawrence E. Spence (2003). Linear Algebra (4thedition). Prentice-Hall of India Pvt. Ltd.

4. Joseph A. Gallian (2017). Contemporary Abstract Algebra (9th edition). Cengage.

5. Kenneth Hoffman & Ray Kunze (2015). Linear Algebra (2nd edition). Prentice-Hall.

6. I. N. Herstein (2006). Topics in Algebra (2nd edition). Wiley India.

7. Nathan Jacobson (2009). Basic Algebra I (2nd edition). Dover Publications.

8. Ramji Lal (2017). Algebra 1: Groups, Rings, Fields and Arithmetic. Springer.

9. I.S. Luthar & I.B.S. Passi (2013). Algebra: Volume 1: Groups. Narosa.

Program- U.G.Certificate Course in Science	Class- SEMESTER-I	YEAR-2022-23	SESSION-2022-23
	Subject- BOTANY		
1.	Course code	S1-BOT-1P	
2.	Course Title	Instrumentation, Lower plants, and Plant pathology	
3.	Course Type	Core course Practical	
4.	Prerequisite (if any)	12 th class pass	
5.	Course Learning outcome (CLO)	The students will be able to learn about ● Instruments and its working principle. ● Culture ,staining and identification of Microbes. ● Identification of lower plants Algae, Fungi, Lichens on the basis of morphology and anatomy. ● Habitat and Habit of Algae, Fungi & Lichens. Collection and identification of diseased specimens. ● Collection and identification of diseased specimens. ● Host parasite relationship..	
6.	Credit Value	02 (15 Hours/Credit)	
7.	Marks	10+40 =50	

PART-B CONTENT OF THE COURSE

TOTAL NUMBER OF LECTURES (in Hours)		
Exercise	TOPICS (30 Hours)	NUMBER OF LECTURES
I	**INSTRUMENTS & TECHNIQUES:** 1. Principle and application of Laboratory instruments-microscope, incubator, autoclave, centrifuge, Laminar air flow, filtration unit, shaker, pH meter, Spectrophotometer, Colony counter. 3. Buffer Solution preparation & titration 4. Cleaning and Sterilization of glassware 5. Preparation of media- PDA and NAM 6. Inoculation and culturing of Fungi and bacteria. **BACTERIAL IDENTIFICATION:** 1. Isolation of bacteria. 2. Staining techniques: Gram's, staining.	15
II	**MYCOLOGY:** 1. Study/ Slide preparation and Staining of fungi. *Mucor, Penicillium, Peziza, Puccinia; Collectotrichum ,Alternaria.* 2. Lichens: crustose, foliose and fruticose specimens.	10

III	**PHYCOLOGY:** 1.Study / Slide preparation and Staining of algae – *Volvox, Oedogonium ; Vaucheria; Ectocarpus* and *Polysiphonia*	10
IV	**EXPERIMENTAL PLANT PATHOLOGY** Isolation of pathogen from diseased leaf. Identification: Pathological specimens of Brown spot of rice, Bacterial blight of rice, Loose smut of wheat, red rot of sugar cane, Tikka disease of ground nut, Slides of uredial, telial, pycnial & aecial stages of *Puccinia*, Leaf curl of Papaya, Citrus canker and Little leaf of Brinjal.	10

PART-C-LEARNING RESOURCES

TEXTBOOKS, REFERENCE BOOKS AND OTHER RESOURCES
SUGGESTED READINGS: -

Suggested Readings:
1. Practical Botany (Part I) ISBN #:81-301-0008-8 Sunil D Purohit, Gotam K Kukda & Anamika Singhvi Edition:2013 Apex Publishing House Durga Nursery Road, Udaipur, Rajasthan (bilingual).
2. Pandey S.K. (2012). Quick Concept of Botany. Publisher LAP LAMBERT Academic Publishing GmbH & Co. KG, Germany (ISBN: 978-3-8484-3104-5).
3. Dubey, R. C. and Maheshwari. D.K. 2012. Practical Microbiology, S. Chand & Company, Pvt. Ltd., New Delhi.
4. Pandey. B.P. 2014 Modern Practical Botany, (Vol-I) S. Chand and Company Pvt. Ltd., New Delhi.

PART-D- ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods: -Internal (CCE) + EXTERNAL ASSESSMENT (ESE)				
Assessment	Mode	Max. Marks.	Practical	Minimum Marks
CCE	Class Test Assignment /Presentation	10	10	
ESE	Autonomous Exam.	40	40	
		50	50	17

Signature H.O.D.

External Subject Experts: 1.   Representative from Industry

        2.

        3.

Departmental Members: Student Member

        1.   1.

        2.   2.

        3.

        4.

        5.

        6.

        7.

Govt. Nagarjuna PG College of Science, Raipur (CG)

COURSE STRUCTURE & SCHEME OF MARKS UNDERGRADUATE (B.Sc.)

SEMESTER SYSTEM

B. Sc. I Semester (Maths Group)

S. No.	Course Type	Course Code	Title of Paper	Max. Marks			Credit
				ESE	INT	Total	
1.	Core-I	S1PHY1T	Physics	40	10	50	4
2	Core-I	S1PHY1P	Physics Lab Course	50	--	50	2
3.	Core-II	S1MAT1T	Mathematics	60	15	75	6
4.	Core-III	S1CHE1T	Chemistry/CS/IT/Def./Geo	40	10	50	4
5.	Core-III	S1CHE1P	Chemistry/CS/IT/Def./Geo Lab	50	--	50	2
6.	AEC-I	S1HIN1T	Hindi Language	40	10	50	2
7.	AEC-II	S1ENG1T	English Language	40	10	50	2
8.	AEC-III	S1EVS1T	EVS	40	10	50	1
9.	EC	S1EXC1P	NSS/Sports/Yoga etc.	--	--	--	1
			Total			**425**	**24**

B.Sc. ISEMESTER PHYSICS THEORY

Program: Certificate		Class: **B.Sc. I Sem**	Year:2022	Session:2022-23
Subject: Physics				
1.	**Course Code**	**S1-PHY-1T**		
2.	**Course Title**	**Mechanics**		
3.	**Course Type**	**Core Course**		
4.	**Pre-requisite**	To study this course, a student must have had the subject Physics in 12th class		
5.	**Course Learning Outcomes (CLO)**	Upon completion of this course, students are expected to understand the following concepts: • Understand the role of vectors and coordinate systems in Physics; solve Ordinary Differential Equations, laws of motion and their application to various dynamical situations. • Learn the concept of inertial reference frames their transformations. Also, the concept of conservation of energy, momentum, angular momentum and apply them to basic problems. • Understand the phenomena of elastic and in-elastic collisions, phenomenon of simple harmonic motion, understand angular momentum of a system of particle, understand concept of geosynchronous orbits. • Application of elasticity and surface tension in various elastic systems/ fluids • Understand special theory of relativity - special relativistic effects and their effects on the mass and energy of a moving object.		
6.	**Credit Value**	4		
7.	**Marks**	Max. Marks- 10 + 40		

Total numbers of Lectures (in hours):60		
Unit	**Topics**	**No. of Lectures**
I	**Vectors:** Vector algebra. Scalar and vector products. Derivatives of a vector with respect to a parameter. **Ordinary Differential Equations:** 1st order homogeneous differential equations. 2nd order homogeneous differential equations with constant coefficients.	12
II	**Laws of Motion:** Frames of reference, Newton's Laws of motion. Dynamics of a system of particles, Centre of Mass. **Momentum and Energy:** Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets.	12
III	**Rotational Motion:** Angular velocity and angular momentum, Torque. Conservation of angular momentum. **(5Lectures)** **Gravitation:** Newton's Law of Gravitation. Motion of aspartic leina central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). Kepler's Laws (statement only). Satellite in circular orbit and applications. Geo synchronous or bits. Weightlessness. Basic idea of global positioning system (GPS).	12
IV	**Elasticity:** Hooke's law - Stress-strain diagram - Elastic moduli-Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants-Work done in stretching and work done in twisting a wire-Twisting couple on a cylinder-	12

	Determination of Rigidity modulus by static torsion-Torsional pendulum- Determination of Rigidity modulus and moment of inertia - q, η and σ by Searle's method. **Fluids:** Surface Tension: Synclastic and anticlastic surface - Excess of pressure –Application to spherical and cylindrical drops and bubbles- variation of surface tension with temperature - Jaegar's method. Viscosity: Viscosity - Rate flow of liquid in a capillary tube - Poiseuille's formula - Determination of coefficient of viscosity of a liquid.	
V	**Oscillations:** Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Dam pedoscillations. **Special Theory of Relativity:** Constancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation. Relativistic addition of velocities.	12

Text Books, Reference Books, Other resources
Suggested Readings: **Reference Books:** • University Physics. FWS ears, MW Zemansky and HD Young13/e,1986. Addison Wesley • Mechanics Berkeley Physics course, v.1: Charles Kittel, et. Al. 2007, Tata McGraw-Hill. • Physics–Resnick, Halliday & Walker 9/e, 2010, Wiley • Engineering Mechanics, Basudeb Bhattacharya, 2nd edn., 2015, Oxford University Press • University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
Suggested equivalent online courses: https://www.edx.org/course/mechanics

Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE)+ External Assessment (ESE)			
Assessment	**Mode**	**Max. Marks**	**Pattern**
CCE	Class Test/ Assignment/Presentation	10	
ESE	University Exam	40	
	Total Marks	50	

B. Sc. I SEMESTER MECHANICS LAB

(60 Lectures Credits: 02)

CO: In the laboratory course, after acquiring knowledge of how to handle measuring instruments (like screw gauge, Vernier calipers, travelling microscope) student shall embark on verifying various principles and associated measurable parameters.

1. Measurements of length (ordia meter) using vernier calliperse, screw gauge and travelling microscope.
2. To determine the Height of a Building using a Sextant.
3. To determine the Moment of Inertia of a Flywheel.
4. To determine the Young's Modulus of a Wire by Optical Lever Method.

5. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
6. To determine the Elastic Constants of a Wire by Searle's method.
7. To determine**g** by Bar Pendulum.
8. To determine**g** by Kater's Pendulum.
9. To determine**g** and velocity for a freely falling body using Digital Timing Technique
10. To study the Motion of a Spring and calculate (a) Spring Constant (b) Value of g.

Reference Books:

- Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
- Advanced level Physics Practicals, Michael Nelson and Jon M.Ogborn, 4th Edition, reprinted1985, Heinemann Educational Publishers.
- Engineering Practical Physics, S. Panigrahi & B.Mallick, 2015, Cengage Learning India Pvt. Ltd.
- A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11thEdition, 2011, Kitab Mahal, NewDelhi.

Suggested equivalent online courses:

Introduction to classical mechanics: https://www.youtube.com/watch?v=rk0rp2Jpidc&list=PLyqSpQzTE6M_d9f-9fKxUQYR1qI5YEnSz&index=1

Newton's law:
https://www.youtube.com/watch?v=2cE5842kT4w&list=PLvyl1YgaAepLZpteZ7rs0SQ87_MBIIJ6x&index=1

Conservation forces and potential:
https://www.youtube.com/watch?v=EVmdST8ubXo&list=PLWweJWdB_GuLYUIxyXQswOt6JEPhphrrR&index=2

Signatures :

HOD:………………………..

External Subject Experts:1. ………………………2. …………………….3. ………………

Departmental Members :1. ……….2. ……….3. ………4. ……….5. …………

6. ……….7. ………. 8. ……..9. ………….

Student Members : 1. …………………2. …………………3 …………………..

Govt. Nagarjuna PG College of Science, Raipur (CG)

COURSE STRUCTURE & SCHEME OF MARKS UNDERGRADUATE (B.Sc.)

SEMESTER SYSTEM

B. Sc. II Semester (Maths Group)

S.N.	Course Type	Course Code	Title of Paper	Max. Marks			Credit
				ESE	INT	Total	
1.	Core-I	S2PHY2T	Physics	40	10	50	4
2	Core-I	S2PHY2P	Physics Lab Course	50	--	50	2
3.	Core-II	S2MAT2T	Mathematics	60	15	75	6
4.	Core-III	S2CHE2T	Chemistry/CS/IT/Def./Geo	40	10	50	4
5.	Core-III	S2CHE2P	Chemistry/CS/IT/Def./Geo Lab	50	--	50	2
6.	AEC-I	S2HIN2T	Hindi Language	40	10	50	2
7.	AEC-II	S2ENG2T	English Language	40	10	50	2
8.	AEC-III	S2EVS1P	EVS (Project)	25	--	25	1
9..	EC	S2EXC2P	NSS/Sports/Yoga etc.	--	--	--	1
			Total			**400**	**24**

B.Sc. II SEMESTER PHYSICS THEORY

Program: Certificate	Class: **B.Sc. II Sem**	Year: 2023	Session: 2022-23

Subject: Physics		
1.	**Course Code**	**S2-PHY-2T**
2.	**Course Title**	**Electricity and Magnetism**
3.	**Course Type**	**Core Course**
4.	**Pre-requisite**	To study this course, a student must have had the subject Physics in 1st semester class.
5.	**Course Learning Outcomes (CLO)**	At the end of this course, students will be able to - Have basic knowledge of Vector Calculus. - Demonstrate Gauss law, Coulomb's law for the electric field, and apply it to systems of point charges as well as line, surface, and volume distributions of charges. - Apply Gauss's law of electrostatics to solve a variety of problems. Articulate knowledge of electric current, resistance and capacitance in terms of electric field and electric potential. - Calculate the magnetic forces that act on moving charges and the magnetic fields due to currents (Biot- Savart and Ampere laws). - Have brief idea of magnetic materials, understand the concepts of induction, solve problems using Faraday's and Lenz's laws - To understand propogation of electro magnetic waves through Maxwell's equations
6.	**Credit Value**	4
7.	**Marks**	Max. Marks- 10 + 40

Content of the Course

Total numbers of Lectures (in hours): 60		
Unit	**Topics**	**Number of Lectures**
I	**Vector Analysis**: 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).	12
II	**Electrostatics:** Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gauss theorem-Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor. 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	12

		theorem in dielectrics. Parallel plate capacitor completely filled with dielectric.	
III		**Magnetism:** 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. Brief introduction of dia-, para-and ferro- magnetic materials.	12
IV		**Electromagnetic Induction:** 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.	12
V		**Max well's equation sand Electromagnetic wave propagation:** Equation of continuity of current, Displacement current, Max well's equations, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, polarization.	12

Text Books, Reference Books, Other resources

Reference Books:
- Electricity and Magnetism, Edward M.Purcell, 1986, McGraw-Hill Education.
- Electricity and Magnetism, J.H. Fewkes & J. Yarwood. Vol.I, 1991, Oxford Univ. Press.
- Electricity and Magnetism, DC Tayal, 1988, Himalaya Publishing House.
- University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
- D.J. Griffiths, Introduction to Electrodynamics, 3rd Edn, 1998, Benjamin Cummings.

Suggested equivalent online courses:
Introduction to vector:
https://www.youtube.com/watch?v=pGdr9WLto4A&list=PL1CE5B4FFFA997E5D&index=1
Coulombs Laws:
https://www.youtube.com/watch?v=0A45kt2U3U8&list=PL1CE5B4FFFA997E5D&index=3
Suggested equivalent online courses:
Concepts in Magnetism and Superconductivity:
https://www.google.com/url?q=https://onlinecourses.nptel.ac.in/noc22_ph31/preview&sa=D&source=edit ors&ust=1657615492489630&usg=AOvVaw1zHFzIRvbcofduU5Bi-p0C

Suggested equivalent online courses: Waves and Oscillations:

https://www.google.com/url?q=https://onlinecourses.nptel.ac.in/noc22_ph27/preview&sa=D&source=edit ors&ust=1657615492486627&usg=AOvVaw36I9IxXBLsX9s4Mguj-o4Q

Suggested Continuous Evaluation Methods: Internal (CCE)+ External Assessment (ESE)			
Assessment	**Mode**	**Max. Marks**	**Pattern**
CCE	Class Test/ Assignment/Presentation	10	
ESE	University Exam	40	
	Total Marks	50	

B. Sc. II SEMESTER LAB: ELECTRICITYANDMAGNETISM

(60 Lectures Credits: 02)

Cos : In the Lab course, students will be able to measure resistance (high and low), Voltage, Current, self and mutual inductance, capacitor, strength of magnetic field and its variation, study different circuits RC, LCR etc.

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: (i) Measurement of charge and current sensitivity Measurement of CDR, (ii) Determine a high resistance by Leakage Method (iii) To determine Self Inductance of a Coil by Rayleigh's Method.
3. To compare capacitances using De'Sauty's bridge.
4. Measurement of field strength Band its variation in a Solenoid (Determined B/dx).
5. To study the Characteristics of a Series RC Circuit.
6. To study the 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 venin and Norton theorem
10. To verify the Super position, and Maximum Power Transfer Theorem

Reference Books

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

Signatures :

HOD:………………………..
External Subject Experts:1. ………………………2. ……………………3. ………………
Departmental Members :1. ……….2. ……….3. ………4. ………5. …………
Student Members : 1. ………………….2. …………………3 ………………….

Govt. Nagarjuna PG College of Science, Raipur (CG)

COURSE STRUCTURE & SCHEME OF MARKS UNDERGRADUATE (B.Sc.) SEMESTER SYSTEM

B. Sc. III Semester (Maths Group)

S. No.	Course Type	CourseCode	Title of Paper	Max. Marks			Credit
				ESE	INT	Total	
1.	Core-I	S3PHY3T	Physics	40	10	50	4
2	Core-I	S3PHY3P	Physics Lab Course	50	--	50	2
3.	Core-II	S3MAT3T	Mathematics	60	15	75	6
4.	Core-III	S3CHE3T	Chemistry/CS/IT/Def./Geo	40	10	50	4
5.	Core-III	S3CHE3P	Chemistry/CS/IT/Def./Geo Lab	50	--	50	2
6.	AEC-I	S3HIN3T	Hindi Language	40	10	50	2
7.	AEC-II	S3ENG3T	English Language	40	10	50	2
8.	SEC-I	S3SEC1P	Skill Enhancement Course	50	--	50	2
9.	EC	S2EXC3P	NSS/Sports/Yoga etc.	--	--	--	1
			Total			425	25

B.Sc. III Semester Physics

Part A

Program: Diploma	**Class:** B.Sc. III Sem	**Year:**2023	**Session:**2023-24	
Subject: Physics				
1.	**Course Code**	S2-PHY-3T		
2.	**Course Title**	**THERMAL PHYSICS AND STATISTICAL MECHANICS**		
3.	**Course Type**	**Core Course**		
4.	**Pre-requisite (if any)**	To study this course, a student must have had the subject Physics in II sem class		
5.	**Course Learning Outcomes (CLO)**	1 **After completion of the course students will be able to –** Outcomes (CLO) • To apply laws of thermodynamics and entropy in daily life. • To solve practical problems based on thermodynamic functions and their inter relation • To understand kinetic theory of gases and transport phenomena.		

		• To analyse back body radiation and its consequences
		• To get the introductory knowledge of statistical mechanics
6.	**Credit Value**	4	
7.	**Marks**	Max. Marks- 10 + 40	

Part B

Total numbers of Lectures (in hours): 60

Unit	Topics	Number of Lectures
I	**Laws of Thermodynamics:** **Thermodynamic Description of system**: Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, various Thermodynamical Processes, Work Done during Isothermal and Adiabatic Processes, Reversible & irreversible processes. Second law of thermodynamics & Entropy, Carnot's cycle, Carnot's theorem, Entropy changes in reversible & irreversible processes, Entropy-temperature diagrams, Third law of thermodynamics.	12
III	**Kinetic Theory of Gases:** Maxwellian distribution of speeds in an ideal gas: distribution of speeds and velocities, experimental verification, distinction between mean, rms and most probable speed values, Transport Phenomena in gases: Viscosity, Conduction and Diffusion, Molecular collisions, mean free path and collision cross section.	12
IV	**Theory of Radiation:** Blackbody radiation, Spectral distribution, Concept of Energy Density, Stefan Boltzmann Law, Newton's law of cooling from Stefan Boltzmann's law. Pressure of radiation, Wien's displacement law and Rayleigh-Jeans Law. Planck's radiation Law. Experimental verification of Planck's radiation law.	12
V	**Statistical Mechanics:** Introductory Idea, Phase space, Macro state and Microstate, Entropy and Thermodynamic probability, equilibrium between two systems in thermal contact, Boltzmann canonical distribution law. Maxwell-Boltzmann distribution law, Quantum statistics - Fermi-Dirac distribution law and its application for Fermi Levels and Fermi Energy, Bose-Einstein distribution law and its use for black body radiation, comparison of three statistics.	12

Part C – Learning Resources

Reference Books:
- Heat and Thermodynamics, M.W. Zemasky and R. Dittman, 1981, McGraw Hill
- Heat and Thermodynamics, Enrico Fermi, 1956, Courier Dover Publications.
- Heat and Thermodynamics: Brij Lal and N. Subramanyam
- Heat and Thermodynamics: Dayal, Verma and Pandey
- Heat and Thermodynamics: Singhal, Agrawal and Satya Prakash
- Thermal Physics: B.K. Agrawal
- A Treatise on Heat, Meghnad Saha, and B.N. Srivastava, 1969, Indian Press.

• Physics (Part-2): Editor, Prof. B.P. Chandra, M.P. Hindi Granth Academy		
• Thermal and Statistical Physics: R.K. Singh, Y.M. Gupta and S. Sivraman. Statistical Mechanics : R.K. Pathria		
• **Suggested Readings:**		
• Statistical Physics: F.Reif Statistical Physics: K.Haung Thermodynamics, Kinetic theory & Statistical thermodynamics, F.W.Sears & G.L.Salinger. 1988, Narosa		
Suggested equivalent online courses: **First law of Thermodynamics** https://youtu.be **/OjXeNaSM5Xc** **Thermodynamics** https://youtu.be **/Fi9Z5DxVsuO** **Thermodynamics Potentilas:** https://youtu.be **/YkKYL5PRE54** **Introduction to Statistical Mechanics:** https://youtu.be **/iud7fzXPJUs**		

Part D – Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE)+ External Assessment (ESE)			
Assessment	Mode	Max. Marks	Pattern
CCE	Class Test/ Assignment/Presentation	10	
ESE	University Exam	40	
	Total Marks	50	

Part A – Introduction

Program: Diploma	Class: B.Sc. III Sem	Year:2023	Session:2023-24
Subject: Physics			
1.	**Course Code**	**S3-PHY-3P**	
2.	**Course Title**	**THERMAL PHYSICS AND STATISTICAL MECHANICS Pratical**	
3.	**Course Type**	**Core Course**	
4.	**Pre-requisite (if any)**	To study this course, a student must have had the subject Physics in II sem	
5.	**Course Learning Outcomes (CLO)**	Students able to get working knowledge of laws and methods of thermodynamics and elementary statistical mechanics	
6.	**Credit Value**	2	
7.	**Marks**	Max. Marks- 25	

Part B – Content of the Course

Total numbers of Lectures (in hours): 60		
		Number of Lectures
	Tentative Practical *At least 6 experiment from each group* **List***Group-A(Thermal Physics and Statistical mechanics)* 01- To determine the thermal conductivity of a non-conducting material by Lee's disc method. 02- To verify Newton's law of cooling. 03- To study binomial distribution law of probability using 4 coins. 04- To determine the frequency of electric generator by Melde's experiment. 05- To study the heat efficiency of an electric kettle with varying voltage. 06- To determine the frequency of A.C. mains using sonometer. 07- To determine the ratio of specific heat at constant pressure and constant volume ($\gamma=C_p/C_v$) of air Clement and Desorme's method. 08- To determine the coefficient of thermal conductivity (k) by rubber tubing method.	

Part C – Learning Resources

Text Books, Reference Books, Other resources   Reference Books:
• Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, 1971, Asia Publishing House. • Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers • A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi. A Laboratory Manual of Physics for Undergraduate Classes, D.P. Khandelwal, 1985, Vani Publication
Suggested Readings:
Suggested equivalent online courses:

Part D – Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE)+ External Assessment (ESE)				
Assessment	**Mode**	**Max. Marks**	**Min. Marks**	**Pattern**
CCE	Class Test/ Assignment/Presentation			
ESE	University Exam			
	Total Marks	25		

Signatures :
HOD:………………………..

External Subject Experts:1. …………………………2. …………………..3. …………..……

Departmental Members :1. ……….2. ……….3. ………4. ………5. ………… 6. ……….7. ….......... 8. ……..9. ………….

Student Members : 1. ………………….2. …………………..3 …………………..

Govt. Nagarjuna PG College of Science, Raipur (CG)

COURSE STRUCTURE & SCHEME OF MARKS UNDERGRADUATE (B.Sc.)
SEMESTER SYSTEM

B. Sc. IV Semester (Maths Group)

S. No.	Course Type	Course Code	Title of Paper	Max. Marks			Credit
				ESE	INT	Total	
1.	Core-I	S4PHY4T	Physics	40	10	50	4
2	Core-I	S4PHY4P	Physics Lab Course	50	--	50	2
3.	Core-II	S4MAT4T	Mathematics	60	15	75	6
4.	Core-III	S4CHE4T	Chemistry/CS/IT/ Def./Geo	40	10	50	4
5.	Core-III	S4CHE4P	Chemistry/CS/IT/ Def./Geo Lab	50	--	50	2
6.	AEC-I	S4HIN4T	Hindi Language	40	10	50	2
7.	AEC-II	S4ENG4T	English Language	40	10	50	2
8.	SEC-2	S4SEC2P	Skill Enhancement Course	50	--	50	2
9.	EC	S4EXC4P	NSS/Sports/Yoga etc.	--	--	--	1
			Total			**425**	**25**

B.Sc. IV Semester (Physics)

Part A – Introduction

Program: Diploma	**Class:** B.Sc. IV Sem	**Year:**2023		**Session:**2023-24

Subject: Physics		
1.	**Course Code**	**S4-PHY-4T**
2.	**Course Title**	**WAVE, ACOUSTIC AND OPTICS**
3.	**Course Type**	**Core Course**
4.	**Pre-requisite (if any)**	To study this course, a student must have had the subject Physics in III sem
5.	**Course Learning Outcomes (CLO)**	On successful completion of this course students will: 01. Get the knowledge about waves in medium and different properties of sound wave. 02. Understand the interference of light and its application as interferometer. 03. To comprehend the different type of diffractions of light. 04. To know about the polarization of light and its application. 05. To get introductory idea about laser, types of laser and its application.
	Credit Value	4
7.	**Marks**	Max. Marks- 10 + 40

Part B – Content of the Course

Unit	Topics	Number of Lectures
Total numbers of Lectures (in hours):60	
I	**Waves in Medium:** Speed of transverse waves on uniform string, speed of longitudinal waves in a fluid, energy density and energy transmission in waves. Group velocity and phase velocity and relationship between them. Reflection, refraction and diffraction of sound: Acoustic impedance of a medium, percentage reflection & refraction at a boundary, principle of a sonar system	**12**
II	**Interference:** Interference: Division of amplitude and division of wave front. Young's Double Slit experiment. Fresnel's Biprism. Phase change on reflection: Stokes' treatment. Interference in Thin Films: parallel and wedge-shaped films. Newton's Rings: measurement of wavelength and refractive index. Michelson's Interferometer: Formation of fringes, Determination of wavelength, Wavelength difference.	**12**
III	**Diffraction:** Fresnel Diffraction: Half-period zones. Zone plate. Fresnel Diffraction pattern of a straight edge, a slit and a wire using half-period zone analysis. Fraunhofer diffraction: Single slit, Double slit. Multiple slits &Plane Diffraction Grating, Resolving Power of Grating	**12**
IV	**Polarization:** Polarized light and its mathematical representation, Production of polarized light by reflection, refraction and scattering. Circular and elliptical polarization. Polarization by double refraction and Huygens's theory, Nicol Prism, Optical activity and Fresnel's theory, Biquartz polarimeter	**12**

V	Basic properties of LASERs, coherence length and coherence time, spatial coherence of a source, Einstein's A and B coefficients, Spontaneous and induced emissions, conditions for laser action, population inversion. Types of Laser: Ruby, He-Ne Laser and Semiconductor Laser, Application of Laser in communication and Holography	**12**

Part C – Learning Resources

Text Books, Reference Books, Other resources Reference Books:

• Fundamentals of Optics, F A Jenkins and H E White, 1976, McGraw-Hill
     • Principles of Optics, B.K. Mathur, 1995, Gopal Printing
     • Lasers fundamentals and applications, Thyagarajan K.,Ajoy.
 	
     • A text book of Oscillations, Waves and Acoustics, Ghosh M., Bhattacharya D., S. Chand.

Suggested Readings: Lasers and non-linear optics, Laud B.B, New age international publishers   • Fundamentals of Optics, H.R. Gulati and D.R. Khanna, 1991, R. Chand Publication
Suggested equivalent online courses: **Interference of light :** https://youtu.be **/jtsqsdkjr7g**   **Polarization of light :** https://youtu.be **/vQncNWPD114**   **Laser:** https://youtu.be **/Ab1nxxkgjH8**   **Diffraction of light :** https://youtu.be **/BfnYT3ee-nU**

Part D – Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE)+ External Assessment (ESE)			
Assessment	**Mode**	**Max. Marks**	**Pattern**
CCE	Class Test/ Assignment/Presentation	10	
ESE	University Exam	40	
	Total Marks	50	

Part A – Introduction

Program: Diploma	**Class:** B.Sc. IV Sem	**Year:**2023	**Session:**2023-24

Subject: Physics		
1.	**Course Code**	S4-PHY-4P
2.	**Course Title**	**WAVE, ACOUSTIC AND OPTICS Pratical**
3.	**Course Type**	**Core Course**
4.	**Pre-requisite (if any)**	To study this course, a student must have had the subject Physics in III sem
5.	**Course Learning Outcomes (CLO)**	Students get experimental knowledge about the wave nature of light, and understand interference, diffraction and polarization
6.	**Credit Value**	2
7.	**Marks**	Max. Marks- 25

Part B – Content of the Course

Total numbers of Lectures (in hours): 60	Number of Lectures
01- To determine the refractive index of the material of the prism with the help of spectrometer. 02- To find out wavelength of monochromatic light source with the help of Newton's Ring. 03- To determine the specific rotation of sugar solution with the help of polarimeter 04- To determine the wavelength of laser light by diffraction grating. 05- To determine the resolving power of a telescope. 06- To determine the resolving power of a plane diffraction grating. 07- To determine the wavelength of monochromatic light source by single slit diffraction. 08- To determine the dispersive power of the prism with the help of spectrometer. 09- To determine the refractive index of ordinary and extraordinary rays for the calcite prism using spectrometer. 10- To determine the refractive index of water using laser light and photocell	

Part C – Learning Resources

Text Books, Reference Books, Other resources   Reference Books:
• Advanced Practical Physics for students, B.L.Flint & H.T.Worsnop, 1971, Asia Publishing House. • Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers • A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi. • A Laboratory Manual of Physics for Undergraduate Classes, D.P. Khandelwal, 1985, Vani Publication
Suggested Readings:
Suggested equivalent online courses:

Part D – Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE)+ External Assessment (ESE)			
Assessment	Mode	Max. Marks	Pattern
CCE	Class Test/ Assignment/Presentation		
ESE	University Exam		
	Total Marks	25	

Signatures :

HOD:…………………………..

External Subject Experts:1. ………………………2. …………………..3. …………..……

Departmental Members :1. ………..2. ………..3. ………4. ………5. …………

6……….7. …........ 8. ……..9

Student Members: 1. ………………….2. ………………….3 …………………..

Govt. Nagarjuna PG College of Science, Raipur (CG)

COURSE STRUCTURE & SCHEME OF MARKS UNDERGRADUATE (B.Sc.)

SEMESTER SYSTEM

B. Sc. V Semester (Maths Group)

S. No.	Course Type	Course Code	Title of Paper	Max. Marks			Credit
				ESE	INT	Total	
1.	DSE-IA **OR** DSE-IB	S5PHY5T	Elective Phy-1 **OR** Elective Phy-2	40	10	50	4
2	DSE-IA **OR** DSE-IB	S5PHY5P	Elective Phy Lab-1**OR** Elective Phy Lab-2	50	--	50	2
3	DSE-IIA **OR** DSE-IIB	S5MAT5T	Elective Maths-1 **OR** Maths-2	60	15	75	6
4.	DSE-IIIA **OR** DSE-IIIB	S5CHE5T	Elective Chem./CS/IT/Def./Geo-1 **OR** Chem./CS/IT/Def./Geo-2	40	10	50	4
5.	DSE-IIIA **OR** DSE-IIIB	S5PHY5P	Elective Chem./CS/IT/Def./Geo Lab-1 **OR** Chem./CS/IT/Def./Geo Lab-2	50	--	50	2
6.	AEC-I	S5HIN5T	Hindi Language	40	10	50	2
7.	AEC-II	S5ENG5T	English Language	40	10	50	2
8.	SEC-3	S5SEC3P	Skill Enhancement Course	50	--	50	2
9.	EC	S5EXC5P	NSS/Sports/Yoga etc.	--	--	--	1
			Total			**425**	**25**

Part A – Introduction

Program: Certificate	**Class:** B.Sc. V Sem		**Year:**2024	**Session:**2024-25
Subject: Physics				
1.	**Course Code**	S3-PHY-5T		
2.	**Course Title**	: DIGITAL AND ANALOG CIRCUITS AND INSTRUMENTATION		
3.	**Course Type**	Core Course		
4.	**Pre-requisite (if any)**	To study this course, a student must have had the subject Physics in IV sem		
5.	**Course Learning Outcomes (CLO)**	• Get an idea about Semiconductor Devices. • Understand the use of transistors. • Get knowledge about CRO & POWER Supply. • Get the introductory understanding about **Operational Amplifiers** • Get the introductory knowledge of Digital Circuits		
6.	**Credit Value**	4		
7.	**Marks**	Max. Marks- 10 + 40		

Part B – Content of the Course

Total numbers of Lectures (in hours):60		
Unit	**Topics**	**Number of Lectures**
I	**Semiconductor Devices and Amplifiers:** Semiconductor Diodes: p and n type semiconductors. Barrier Formation in PN Junction Diode. Qualitative Idea of Current Flow Mechanism in Forward and Reverse Biased Diode. PN junction and its characteristics. Static and Dynamic Resistance. Principle andstructure of (1) LEDs (2) Photodiode (3) Solar Cell.	**12**
II	: Bipolar Junction transistors: n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC Configurations. Active, Cut off, and Saturation Regions. Current gains α and β. Relations between α and β. Load Line analysis of Transistors. DC Load line and Q- point. Voltage Divider Bias Circuit for CE Amplifier. h-parameter Equivalent Circuit. Analysis of a single-stage CE amplifier using Hybrid Model. Input and Output impedance current, voltage and power gains. Class A,B,AND C Amplifiers	**12**
III	**Instrumentations:** Introduction to CRO: Block Diagram of CRO. Applications of CRO: (1) Study of Waveform, (2) Measurement of Voltage, Current, Frequency, and Phase Difference. Power Supply: Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers Calculation of Ripple Factor and Rectification Efficiency, Basic idea about capacitor filter, Zener Diode and Voltage Regulation	**12**

IV	**Operational Amplifiers (Black Box approach):**	12
	Characteristics of an Ideal and Practical Op-Amp (IC 741), Open-loop& Closed-loop Gain. CMRR, concept of Virtual ground. Applications of Op-Amps: (1) Inverting and Non-inverting Amplifiers, (2) Adder, (3) Subtractor, (4) Differentiator, (5) Integrator, (6) Zero Crossing Detector.	
V	Digital Circuits	12
	Difference between Analog and Digital Circuits. Binary Numbers. Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates (Realization using Diodes and Transistor). NAND and NOR Gates as Universal Gates. XOR and XNOR Gates.	

Part C – Learning Resources

- **Text Books, Reference Books, Other resources** Integrated Electronics, J. Millman and C.C. Halkias, 1991, Tata Mc-Graw Hill.
- Electronic devices and circuits, S. Salivahanan and N. Suresh Kumar, 2012, TataMc-Graw Hill.
- Microelectronic Circuits, M.H. Rashid, 2ndEdn.,2011, Cengage Learning.
- Modern Electronic Instrumentation & Measurement Tech., Helfrick&Cooper,1990,PHI Learning
- Digital Principles & Applications, A.P. Malvino, D.P. Leach & Saha, 7th Ed.,2011,Tata McGraw Hill
- Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6th Edn., Oxford University Press.
- Fundamentals of Digital Circuits, A. Anand Kumar, 2nd Edition, 2009, PHI LearningPvt. Ltd.
- OP-AMP and Linear Digital Circuits, R.A. Gayakwad, 2000, PHI Learning Pvt. Ltd.

Suggested Readings:

Suggested equivalent online courses:

Part D – Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE)+ External Assessment (ESE)			
Assessment	**Mode**	**Max. Marks**	**Pattern**
CCE	Class Test/ Assignment/Presentation	10	
ESE	University Exam	40	
	Total Marks	50	

Part A – Introduction

Program: Diploma		**Class:** B.Sc.V Sem	**Year:**2024	**Session:**2024-25
Subject: Physics				
1.	**Course Code**	S5-PHY-5P		
2.	**Course Title**	: DIGITAL AND ANALOG CIRCUITS AND INSTRUMENTATION Pratical		
3.	**Course Type**	**Core Course**		
4.	**Pre-requisite (if any)**	To study this course, a student must have had the subject Physics in IV sem		
5.	**Course Learning Outcomes (CLO)**	Students able to get working knowledge of **DIGITAL AND ANALOG CIRCUITS AND INSTRUMENTATION**		
6.	**Credit Value**	2		
7.	**Marks**	Max. Marks- 25		

Part B – Content of the Course

Total numbers of Lectures (in hours):60	Number of Lectures
Tentative Practical ***At least 6 experiment from each group* List** ***Group-A (*DIGITAL AND ANALOG CIRCUITS AND INSTRUMENTATION *)*** 1. To measure (a) Voltage, and (b) Frequency of a periodic waveform using a CRO 2. To verify and design AND, OR, NOT and XOR gates using NAND gates. 3. To minimize a given logic circuit. 4. Half adder, Full adder and 4-bit Binary Adder. 5. Adder-Subtractor using Full Adder I.C. 6. To design an astable multivibrator of given specifications using 555 Timer. 7. To design a monostable multivibrator of given specifications using 555 Timer. 8. To study IV characteristics of PN diode, Zener and Light emitting diode 9. To study the characteristics of a Transistor in CE configuration. 10. To design a CE amplifier of a given gain (mid-gain) using voltage divider bias. 11. To design an inverting amplifier of given gain using Op-amp 741 and study its frequency response. 12. To design a non-inverting amplifier of given gain using Op-amp 741 and study its Frequency Response. 13. To study a precision Differential Amplifier of given I/O specification using Op-amp. **14.** To investigate the use of an op-amp as a Differentiator.	

Part C – Learning Resources

- **Text Books, Reference Books, Other resources   Reference Books:** Basic Electronics: A text lab manual, P.B. Zbar, A.P. Malvino, M.A. Miller, 1994,Mc-Graw Hill.
- Electronics: Fundamentals and Applications, J.D. Ryder, 2004, Prentice Hall.
- OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, PrenticeHall.
- Electronic Principle, Albert Malvino, 2008, Tata Mc-Graw Hill.

Suggested Readings:
Suggested equivalent online courses:

Part D – Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE)+ External Assessment (ESE)			
Assessment	**Mode**	**Max. Marks**	**Pattern**
CCE	Class Test/ Assignment/Presentation		
ESE	University Exam		
	Total Marks	25	

Part A – Introduction

Program: Certificate		**Class:** B.Sc. V Sem	**Year:**2024	**Session:**2024-25
Subject: Physics				
1.	**Course Code**	S3-PHY-5T		
2.	**Course Title**	: SOLID STATE PHYSICS		
3.	**Course Type**	Core Course		
4.	**Pre-requisite (if any)**	To study this course, a student must have had the subject Physics in IV sem		
5.	**Course Learning Outcomes (CLO)**			
6.	**Credit Value**	4		
7.	**Marks**	Max. Marks- 10 + 40		

Part B – Content of the Course

Total numbers of Lectures (in hours):60		
Unit	**Topics**	**Number of Lectures**
I	**Crystal Structure:** Solids: Amorphous and Crystalline Materials. Lattice Translation Vectors. Lattice with a Basis – Central and Non-Central Elements.	**12**

	Unit Cell. Miller Indices. Reciprocal Lattice. Types of Lattices. Brillouin Zones. Diffraction of X-rays byCrystals. Bragg's Law. Atomic and Geometrical Factor.	
II	**Elementary Lattice Dynamics:** Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains. Acoustical and Optical Phonons. Qualitative Description of the Phonon Spectrum in Solids. Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids. T^3 law	12
III	**Magnetic Properties of Matter:** Dia-, Para-, Ferri- and Ferromagnetic Materials. Classical Langevin Theory of dia – and Paramagnetic Domains. Quantum Mechanical Treatment of Paramagnetism. Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains. Discussion of B-H Curve. Hysteresis and Energy Loss.	12
IV	**Dielectric Properties of Materials:** Polarization. Local Electric Field at an Atom. Depolarization Field. Electric Susceptibility. Polarizability. Clausius Mosotti Equation. Classical Theory of Electric Polarizability. Normal and Anomalous Dispersion. Cauchy and Sellmeir relations. Langevin-Debye equation. Complex Dielectric Constant. Optical Phenomena. Application: Plasma Oscillations, Plasma Frequency, Plasmons.	12
V	**Elementary band theory:** Kronig Penny model. Band Gaps. Conductors, Semiconductors and insulators. P and N type Semiconductors. Conductivity of Semiconductors, mobility, Hall Effect, Hall coefficient.**(10 Lectures)** **Superconductivity:** Experimental Results. Critical Temperature. Critical magnetic field. Meissner effect. Type I and type II Superconductors, London's Equation and PenetrationDepth. Isotope effect.	12

Part C – Learning Resources

Reference Books:

- Introduction to Solid State Physics, Charles Kittel, 8th Ed., 2004, Wiley India Pvt.Ltd.
- Elements of Solid State Physics, J.P. Srivastava, 2nd Ed., 2006, Prentice-Hall ofIndia
- Introduction to Solids, Leonid V. Azaroff, 2004, Tata Mc-Graw Hill
- Solid State Physics, Neil W. Ashcroft and N. David Mermin, 1976, CengageLearning
- Solid State Physics, Rita John, 2014, McGraw Hill
- Solid-state Physics, H. Ibach and H Luth, 2009, Springer
- Elementary Solid State Physics, 1/e M. Ali Omar, 1999, Pearson India
- Solid State Physics, M.A. Wahab, 2011, Narosa Publications

Suggested Readings:

Suggested equivalent online courses:

Part D – Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE)+ External Assessment (ESE)			
Assessment	**Mode**	**Max. Marks**	**Pattern**
CCE	Class Test/ Assignment/Presentation	10	
ESE	University Exam	40	
	Total Marks	50	

Part A – Introduction

Program: Degree	**Class:** B.Sc.V Sem		**Year:**2024	**Session:**2024-25
Subject: Physics				
1.	**Course Code**	S5-PHY-5P		
2.	**Course Title**	: SOLID STATE PHYSICS PRACTICAL		
3.	**Course Type**	Core Course		
4.	**Pre-requisite (if any)**	To study this course, a student must have had the subject Physics in IV sem		
5.	**Course Learning Outcomes (CLO)**			
6.	**Credit Value**	2		
7.	**Marks**	Max. Marks- 25		

Part B – Content of the Course

Total numbers of Lectures (in hours): 60	Number of Lectures
Tentative Practical ***At least 6 experiment from each group* List** ***Group-A (SOLID STATE PHYSICS)*** 1. Measurement of susceptibility of paramagnetic solution (Quinck`s Tube Method) 2. To measure the Magnetic susceptibility of Solids. 3. To determine the Coupling Coefficient of a Piezoelectric crystal. 4. To measure the Dielectric Constant of a dielectric Materials with frequency 5. To determine the complex dielectric constant and plasma frequency of metal usingSurface Plasmon resonance (SPR) 6. To determine the refractive index of a dielectric layer using SPR 7. To study the PE Hysteresis loop of a Ferroelectric Crystal. 8. To draw the BH curve of iron using a Solenoid and determine the energy loss fromHysteresis. 9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by four- probe method (from room temperature to 150 °C) and to determine its band gap. 10. To determine the Hall coefficient of a semiconductor sample.	

Part C – Learning Resources

Reference Books
Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, AsiaPublishing House.
Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Ed., 2011,Kitab Mahal, New Delhi
Elements of Solid State Physics, J.P. Srivastava, 2nd Ed., 2006, Prentice-Hall ofIndia
Suggested Readings:
Suggested equivalent online courses:

Part D – Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE)+ External Assessment (ESE)			
Assessment	**Mode**	**Max. Marks**	**Pattern**
CCE	Class Test/ Assignment/Presentation		
ESE	University Exam		
	Total Marks	25	

Signatures :

HOD:………………………..

External Subject Experts:1. …………………………2. …………………..3. ………..……

Departmental Members :1. ……….2. ……….3. ………4. ………5. …………

Student Members : 1. …………………..2. …………………..3 …………………..

Govt. Nagarjuna PG College of Science, Raipur (CG)

COURSE STRUCTURE & SCHEME OF MARKS UNDERGRADUATE (B.Sc.) SEMESTER SYSTEM

B. Sc. VI Semester (Maths Group)

S. No.	Course Type	Course Code	Title of Paper	Max. Marks			Credit
				ESE	INT	Total	
1.	DSE-IA **OR** DSE-IB	S6PHY6T	Elective Phy-1 **OR** Elective Phy-2	40	10	50	4
2	DSE-IA **OR** DSE-IB	S6PHY6P	Elective Phy Lab-1 **OR** Elective Phy Lab-2	50	--	50	2
3	DSE-IIA **OR** DSE-IIB	S6MAT6T	Elective Maths-1 **OR** Maths-2	60	15	75	6
4.	DSE-IIIA **OR** DSE-IIIB	S6CHE6T	Elective Chem./CS/IT/Def./Geo-1 **OR** Chem./CS/IT/Def./Geo-2	40	10	50	4
5.	DSE-IIIA **OR** DSE-IIIB	S6PHY6P	Elective Chem./CS/IT/Def./Geo Lab-1 **OR** Chem./CS/IT/Def./Geo Lab-2	50	--	50	2
6.	AEC-I	S6HIN6T	Hindi Language	40	10	50	2
7.	AEC-II	S6ENG6T	English Language	40	10	50	2
8.	SEC-4	S6SEC4P	Skill Enhancement Course	50	--	50	2
9.	EC	S6EXC6P	NSS/Sports/Yoga etc.	--	--	--	1
			Total			**425**	**25**

Part A – Introduction

Program: Certificate	Class: B.Sc. VI Sem	Year:2025	Session:2024-25

Subject: Physics		
1.	Course Code	S3-PHY-6T
2.	Course Title	**ELEMENTS OF MODERN PHYSICS**
3.	Course Type	Core Course
4.	Pre-requisite (if any)	To study this course, a student must have had the subject Physics in V sem
5.	Course Learning Outcomes (CLO)	• Get an idea about De Broglie matter waves. • Understand the uncertainty principle. . • Get knowledge about Application of Schrodinger equation . • Get the introductory understanding about **nuclear physics** • Get the introductory knowledge of radioactivity.
6.	Credit Value	4
7.	**Marks**	Max. Marks- 10 + 40	

Part B – Content of the Course

Total numbers of Lectures (in hours):60		
Unit	Topics	Number of Lectures
I	**:** Planck's quantum, Planck's constant and light as a collection of photons; Photo-electric effect and Compton scattering. De Broglie wavelength and matter waves; Davisson- Germer experiment. Problems with Rutherford model- instability of atoms and observation of discrete atomic spectra; Bohr's quantization rule and atomic stability; calculation of energy levels for hydrogen like atoms and their spectra	12
II	**:** Position measurement- gamma ray microscope thought experiment; Wave-particle duality, Heisenberg uncertainty principle- impossibility of a particle following a trajectory; Estimating minimum energy of a confined particle using uncertainty principle; Energy-time uncertainty principle. Schrodinger equation for non-relativistic particles; Momentum and Energy operators; stationary states; physical interpretation of wave function, probabilities and normalization; Probability and probability current densities in one dimension	12
III	One dimensional and three dimensional box- energy eigenvalues and eigen functions, normalization; Quantum mechanical scattering and tunnelling in one dimension - across a step potential and across a rectangular potential barrier.	12
IV	**:** Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force, NZ graph, semi-empirical mass formula and binding energy. .	12
V	Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force, NZ graph, semi-empirical mass formula and binding energy.	12

Part C – Learning Resources

- **Text Books, Reference Books, Other resources** Concepts of Modern Physics, Arthur Beiser, 2009, McGraw-Hill
- Modern Physics, John R. Taylor, Chris D. Zafiratos, Michael A.Dubson,2009, PHILearning
- Six Ideas that Shaped Physics: Particle Behave like Waves, Thomas A. Moore,2003, McGraw Hill
- Quantum Physics, Berkeley Physics Course Vol.4. E.H. Wichman, 2008, TataMcGraw-Hill Co.
- Modern Physics, R.A. Serway, C.J. Moses, and C.A.Moyer, 2005, CengageLearning
- Modern Physics, G. Kaur and G.R. Pickrell, 2014, McGraw Hill

| Suggested Readings: |
| Suggested equivalent online courses: |

Part D – Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE)+ External Assessment (ESE)

Assessment	Mode	Max. Marks	Pattern
CCE	Class Test/ Assignment/Presentation	10	
ESE	University Exam	40	
	Total Marks	50	

Part A – Introduction

Program: Diploma	Class: B.Sc. VI Sem	Year:2025	Session:2024-25

Subject: Physics

1.	**Course Code**	S6-PHY-6P	
2.	**Course Title**	**ELEMENTS OF MODERN PHYSICS** Pratical	
3.	**Course Type**	**Core Course**	
4.	**Pre-requisite (if any)**	To study this course, a student must have had the subject Physics in V sem	
5.	**Course Learning Outcomes (CLO)**	Students get experimental knowledge about the **ELEMENTS OF MODERN PHYSICS**	
6.	**Credit Value**	2	
7.	**Marks**	Max. Marks- 25	

Part B – Content of the Course

Total numbers of Lectures (in hours):60	
Tentative Practical ***At least 6 experiment from each group* List** ***Group-A(*DIGITAL AND ANALOG CIRCUITS AND INSTRUMENTATION** 1. To determine value of Boltzmann constant using V-I characteristic of PN diode. 2. To determine work function of material of filament of directly heated vacuum diode. 3. To determine value of Planck's constant using LEDs of at least 4 different	**Lectures**

colours.

4. To determine the ionization potential of mercury.
5. To determine the wavelength of H-alpha emission line of Hydrogen atom.
6. To determine the absorption lines in the rotational spectrum of Iodine vapour.
7. To study the diffraction patterns of single and double slits using laser source and measure its intensity variation using Photosensor and compare with incoherent source – Na light.
8. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light
9. To determine the value of e/m by magnetic focusing.
10. To setup the Millikan oil drop apparatus and   determine the charge of an electro.

Part C – Learning Resources

- Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, 1971, AsiaPublishing House.
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
- A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

Suggested Readings:

Suggested equivalent online courses:

Part D – Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE)+ External Assessment (ESE)			
Assessment	**Mode**	**Max. Marks**	**Pattern**
CCE	Class Test/ Assignment/Presentation		
ESE	University Exam		
	Total Marks	25	

Part A – Introduction

Program: Certificate	Class: B.Sc. VI Sem	Year:2025	Session:2024-25
Subject: Physics			

1.	Course Code	S3-PHY-6T	
2.	Course Title	**MATHEMATICAL PHYSICS**	
3.	Course Type	**Core Course**	
4.	Pre-requisite (if any)	To study this course, a student must have had the subject Physics in V sem	
5.	Course Learning Outcomes (CLO)		
6.	Credit Value	4	
7.	Marks	Max. Marks- 10 + 40	

Part B – Content of the Course

Total numbers of Lectures (in hours):60		
Unit	Topics	Number of Lectures
I	**Calculus of functions of more than one variable**: Partial derivatives, exact and inexact differentials. Integrating factor, with simple illustration. Constrained Maximization using Lagrange Multipliers.	**12**
II	**Fourier Series**: Periodic functions. Orthogonality of sine and cosine functions, Dirichlet Conditions (Statement only). Expansion of periodic functions in a series of sine and cosine functions and determination of Fourier coefficients. Complex representation of Fourier series. Expansion of functions with arbitrary period. Expansion of non-periodic functions over an interval. Even and odd functions and their Fourier expansions.Application. Summing of Infinite Series.	**12**
III	**Frobenius Method and Special Functions**: Singular Points of Second Order Linear Differential Equations and their importance. Frobenius method and its applications to differential equations. Legendre, Bessel, Hermite and Laguerre Differential Equations. Properties of Legendre Polynomials: Rodrigues Formula, Orthogonality. Simple recurrence relations.	**12**
IV	**Some Special Integrals:** Beta and Gamma Functions and Relation between them. Expression of Integrals in terms of Gamma Functions. Error Function (Probability Integral). **Partial Differential Equations**: Solutions to partial differential equations, using separation of variables: Laplace's Equation in problems of rectangular, cylindrical and spherical symmetry.	**12**
V	**Complex Analysis**: Brief Revision of Complex Numbers and their Graphical Representation. Euler's formula, De Moivre's theorem, Roots of Complex Numbers. Functions of Complex Variables. Analyticity and Cauchy-Riemann Conditions. Examples of analytic functions. Singular functions: poles and branch points, order of singularity, branch cuts. Integration of a function of a complex variable. Cauchy's Inequality. Cauchy's Integral formula.	**12**

Part C – Learning Resources

Reference Books:
• Mathematical Methods for Physicists: Arfken, Weber, 2005, Harris, Elsevier.
• Fourier Analysis by M.R. Spiegel, 2004, Tata McGraw-Hill.
• Mathematics for Physicists, Susan M. Lea, 2004, Thomson Brooks/Cole.
• An Introduction to Ordinary Differential Equations, Earl A Coddington, 1961, PHILearning.
• Differential Equations, George F. Simmons, 2006, Tata McGraw-Hill.
• Essential Mathematical Methods, K.F. Riley and M.P. Hobson, 2011, CambridgeUniversity Press
• Partial Differential Equations for Scientists and Engineers, S.J. Farlow, 1993, DoverPublications.
• Mathematical methods for Scientists and Engineers, D.A. McQuarrie, 2003, VivaBooks.
Suggested Readings:
Suggested equivalent online courses:

Part D – Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE)+ External Assessment (ESE)			
Assessment	Mode	Max. Marks	Pattern
CCE	Class Test/ Assignment/Presentation	10	
ESE	University Exam	40	
	Total Marks	50	

(6 Lectures)

Part A – Introduction

Program: Diploma	Class: B.Sc. VI Sem	Year:2025	Session:2024-25
Subject: Physics			

1.	**Course Code**	**S6-PHY-6P**	
2.	**Course Title**	**MATHEMATICAL PHYSICS PRACTICAL**	
3.	**Course Type**	**Core Course**	
4.	**Pre-requisite (if any)**	To study this course, a student must have had the subject Physics in V sem	
5.	**Course Learning Outcomes (CLO)**	- Highlights the use of computational methods to solve physical problems - Use of computer language as a tool in solving physics problems (applications) - The course will consist of lectures (both theory and practical) in the ComputerLab - Evaluation done not on the programming but on the basis of formulating theproblem - Aim at teaching students to construct the computational problem to be solved - Students can use anyone operating system Linux or Microsoft Windows	
6.	**Credit Value**	2	
7.	**Marks**	Max. Marks- 25	

Part B – Content of the Course

Topics	Description with Applications
Introduction and Overview	Computer architecture and organization, memory and Input/output devices
Basics of scientific computing	Binary and decimal arithmetic, Floating point numbers, algorithms, Sequence, Selection and Repetition, single and double precision arithmetic, underflow & overflow- emphasize the importance of making equations in terms of dimensionless variables, Iterative methods
Errors and error Analysis	Truncation and round off errors, Absolute and relativeerrors, Floating point computations.

Review of C & C++ Programming fundamentals	Introduction to Programming, constants, variables and data types, operators and Expressions, I/O statements, scanf and printf, c in and c out, Manipulators for data formatting, Control statements (decision making and looping statements) (*If-statement. If-else Statement. Nested if Structure. Else-if Statement. Ternary Operator. Goto Statement. Switch Statement. Unconditional and Conditional Looping. While-Loop. Do-While Loop. FOR Loop. Break and Continue Statements. Nested Loops*), Arrays (*1D&2D*) and strings, user defined functions, Structures and Unions, Idea of classes and objects
Programs: using C/C++ language	Sum & average of a list of numbers, largest of a given list of numbers and its location in the list, sorting of numbers in ascending-descending order, Binary search
Random number generation	Area of circle, area of square, volume of sphere, value ofpi (π)
Solution of Algebraic and Transcendental equations by Bisection, Newton Raphson and Secant methods	Solution of linear and quadric equation, solving $\alpha = \tan\alpha$; $I = I_0 \left(\dfrac{\sin\alpha}{\alpha} \right)^2$ in optics
Interpolation by Newton Gregory Forward and Backward difference formula, Error estimation of linear interpolation	Evaluation of trigonometric functions e.g. *sin θ, cos θ, tan θ, etc.*
Numerical differentiation (Forward and Backward difference formula) and Integration (Trapezoidal a n d Simpson rules), Monte Carlo method	Given Position with equidistant time data to calculate velocity and acceleration and vice-versa. Find the area ofB-H Hysteresis loop
Solution of Ordinary Differential Equations (ODE) First order Differential equation Euler, modified Euler and Runge-Kutta (RK) second and fourth order methods	First order differential equation • Radioactive decay • Current in RC, LC circuits with DC source • Newton's law of cooling • Classical equations of motion Attempt following problems using RK 4 order method: • Solve the coupled differential equations $$\frac{dx}{dt} = y + x - \frac{x^3}{3} ; \frac{dy}{dx} = -x$$ for four initial conditions x(0) = 0, y(0) = -1, -2, -3, -4. Plot x vs y for each of the four initial conditions onthe same screen for $0 \leq t \leq 15$ The differential equation describing the motion of a pendulum is $\dfrac{d^2P}{dt^2} = -\sin(P)$. The pendulum is released from rest at an angular displacement α, i. e. P(0) = α and P$'$(0) = 0. Solve the equation for α = 0.1, 0.5 and 1.0 and plot P as a function of time in the range $0 \leq t \leq 8\pi$. Also plot the analytic solution valid for small P $(\sin(P) = P$

Part C – Learning Resources

Reference Books:

- Introduction to Numerical Analysis, S.S. Sastry, 5[th]Edn., 2012, PHI Learning Pvt.Ltd.
- Schaum's Outline of Programming with C[++]. J.Hubbard, 2000, McGraw-HillPublications.
- Numerical Recipes in C[++]: The Art of Scientific Computing, W.H. Pressetal.,3[rd]Edn., 2007, Cambridge University Press.
- A first course in Numerical Methods, Uri M. Ascher and Chen Greif, 2012, PHILearning
- Elementary Numerical Analysis, K.E. Atkinson, 3rd Edn., 2007, Wiley IndiaEdition.
- Numerical Methods for Scientists and Engineers, R.W. Hamming, 1973, CourierDover Pub.
- An Introduction to Computational Physics, T. Pang, 2[nd]Edn., 2006, CambridgeUniv. Press

Suggested Readings:

Suggested equivalent online courses:

Part D – Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE)+ External Assessment (ESE)			
Assessment	**Mode**	**Max. Marks**	**Pattern**
CCE	Class Test/ Assignment/Presentation		
ESE	University Exam		
	Total Marks	25	

Signatures :

HOD:………………………..

External Subject Experts:1. ………………………2. …………………..3. ………………

Departmental Members :1. ……….2. ……….3. ………4. ………5. …………

Student Members : 1. …………………2. …………………3 …………………..

Skill Enhancement Course (any four) (Credit: 02 each)- SEC1 to SEC4

BASIC INSTRUMENTATION SKILLS

(Credits: 02)

Theory: 30 Lectures

This course is to get exposure with various aspects of instruments and their usage through hands-on mode. Experiments listed below are to be done in continuation of the topics.

Unit - I

Basic of Measurement: Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects. **Multimeter:** Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance.

(4 Lectures)

Electronic Voltmeter: Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage, measurement (block diagram only). Specifications of an electronic Voltmeter/Multimeter and their significance.   **(2 Lectures)**

Unit - II

Cathode Ray **Oscilloscope:** Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only– no mathematical treatment), brief discussion on screen phosphor, visual persistence & chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance. **(6 Lectures)**

Unit - III

Use of CRO for the measurement of voltage (dc and ac frequency, time period. Special features of dual trace, introduction to digital oscilloscope, probes. Digital storage Oscilloscope: Block diagram and principle of working. **(3 Lectures)**

AC millivoltmeter: Type of AC millivoltmeters: Amplifier- rectifier, and rectifier- amplifier. Block diagram ac millivoltmeter**,** specifications and their significance. **(3 Lectures)**

Unit - IV

Signal Generators and Analysis Instruments: Block diagram, explanation and specifications of low frequency signal generators. Pulse generator, and function generator. Brief idea for testing, specifications. Distortion factor meter, wave analysis. **(4 Lectures)**

Impedance Bridges & Q-Meters: Block diagram of bridge. Working principles of basic (balancing type) RLC bridge. Specifications of RLC bridge. Block diagram & working principles of a Q- Meter. Digital LCR bridges. **(2 Lectures)**

Unit - V

Digital Instruments: Principle and working of digital meters. Comparison of analog & digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter.

(3 Lectures)

Digital Multimeter: Block diagram and working of a digital multimeter. Working principle of time interval, frequency and period measurement using universal counter/frequency counter, time-base stability, accuracy and resolution. **(3 Lectures)**

The test of lab skills will be of the following test items:

1. Use of an oscilloscope.

2. CRO as a versatile measuring device.

3. Circuit tracing of Laboratory electronic equipment,

4. Use of Digital multimeter/VTVM for measuring voltages

5. Circuit tracing of Laboratory electronic equipment,

6. Winding a coil / transformer.

7. Study the layout of receiver circuit.

8. Trouble shooting a circuit

9. Balancing of bridges

Laboratory Exercises:

1. To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.

2. To observe the limitations of a multimeter for measuring high frequency voltage and currents.

3. To measure Q of a coil and its dependence on frequency, using a Q- meter.

4. Measurement of voltage, frequency, time period and phase angle using CRO.

5. Measurement of time period, frequency, average period using universal counter/frequency counter.

6. Measurement of rise, fall and delay times using a CRO.

7. Measurement of distortion of a RF signal generator using distortion factor meter.

8. Measurement of R, L and C using a LCR bridge/ universal bridge.

Open Ended Experiments:

1. Using a Dual Trace Oscilloscope

2. Converting the range of a given measuring instrument (voltmeter, ammeter)

Reference Books:

A text book in Electrical Technology - B L Theraja - S Chand and Co.

Performance and design of AC machines - M G Say ELBS Edn.

Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.

Logic circuit design, Shimon P. Vingron, 2012, Springer.

Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.

Electronic Devices and circuits, S. Salivahanan & N. S.Kumar, 3rd Ed., 2012, Tata Mc-Graw Hill

Electronic circuits: Handbook of design and applications, U.Tietze, Ch.Schenk, 2008, Springer

Electronic Devices, 7/e Thomas L. Floyd, 2008, Pearson India

Signatures :
HOD:………………………….

External Subject Experts:1. …………………….2. …………………….3. …………………………

Departmental Members :1. ……….2. ……….3. ………4. ………5. …………6……………… 7……………………8……………………

Student Members : 1. …………………….2. …………………….3 …………………….

B.Sc. I / II sem. 2022-23

First Semester / Second II sem.

English Language & Communication Skills

Unit	Title	Content	Period & Credit
Unit –1	Introduction	**a.** Landmarks in the history of English language. **b.** Characteristics of English Language.	
Unit-2	Grammar	**1.** Sentences - **a.** Assertive **b.** Imperative **c.** Interrogative **d.** Exclamatory **2.** Articles- a, an, the **3.** Pronouns **4.** Modals	02 Credit
Unit – 3	Short Story	The Devoted Friend- By Oscar wilde A Bottle of Dew- By Sudha Murthy	
Unit- 4	Communication Skills	Verbal and non-Verbal Communication	
Unit-5	Comprehension	Notice Writing Diary Writing Story Writing	

B.Sc.III

(संशोधित पाठ्यक्रम)

बी.ए. / बी.एस.–सी. / बी.कॉम. / बी.एच.एस.–सी.

भाग – तीन, आधार पाठ्यक्रम

प्रश्न पत्र – प्रथम (हिन्दी भाषा)

(पेपर कोड – 0231)

पूर्णांक– 75

इकाई–एक   (क)   भारत माता : सुमित्रानंदन पंत

               (ख)   कथन की शैलियां

1. विवरणात्मक शैली

2. मूल्यांकन शैली

3. व्याख्यात्मक शैली

4. विचारात्मक शैली

इकाई–दो   (क)   सूखी डाली : उपेन्द्रनाथ अश्क

              (ख)   विभिन्न संरचनाएँ

1. विनम्रता सूचक संरचना

2. विधि सूचक संरचना

3. निषेध परक संरचना

4. काल–बोधक संरचना

5. स्थान–बोधक संरचना

6. दिशा बोधक संरचना

7. कार्य–कारण सम्बन्ध संरचना!

8. अनुक्रम संरचना

इकाई–तीन   (क)   वसीयत : मालती जोशी

            (ख)   कार्यालयीन पत्र और आलेख

1. परिपत्र

2. आदेश

3. अधिसूचना

4. ज्ञापन

5. अनुस्मारक

6. पृष्ठाकंन

इकाई–चार   (क)   योग की शक्ति : हरिवंश राय बच्चन

           (ख)   अनुवाद : स्वरूप एवं परिभाषा, उद्देश्य

स्त्रोत भाषा और लक्ष्य भाषा,

अच्छे अनुवाद की विशेषताएं,

अनुवाद प्रक्रिया, अनुवादक

इकाई-पांच (क) संस्कृति और राष्ट्रीय एकीकरण : योगेश अटल

(ख) घटनाओं, समारोहों आदि का प्रतिवेदन, विभिन्न प्रकार के निमंत्रण पत्र

मूल्यांकन योजना : प्रत्येक इकाई से एक-एक प्रश्न पूछा जाएगा। प्रत्येक प्रश्न में आंतरिक विकल्प होगा। प्रत्येक प्रश्न के 15 अंक होंगे। इसलिए प्रत्येक प्रश्न के दो भाग 'क' और 'ख' होंगे एवं अंक कमशः 8 एवं 7 अंक होंगे। प्रश्नपत्र का पूर्णांक 75 निर्धारित है।

पाठ्यक्रम संशोधन का औचित्य –

निर्धारित पाठ का अध्ययन एवं हिन्दी भाषा प्रयोग की व्यवहारिक प्रणालियों से विधार्थियों को परिचित कराना तथा भाषा प्रयोग की सामान्य अशुद्धियों को दूर करने की दृष्टि से पाठ्यक्रम तैयार किया गया है। विधार्थियों के लिए पाठ्यक्रम का विस्तार बहुत ज्यादा न हो इसका ध्यान रखा गया है।

(डा. रूद्र कुम्भकार)
विभागाध्यक्ष अध्यक्ष- हिंदी अध्ययन मंडल

1. प्रो० (डॉ०) अनुसूया अग्रवाल डी० लिट्०   AA96
   (विश्वविद्यालय विषय विशेषज्ञ प्राध्यापक)   27/09/2021

2. डॉ. अंजलि शर्मा
   प्राध्यापक (हिन्दी)   27/9/21

3. डॉ. कविता मिश्रा
   प्राध्यापक दिन्दी   27/09/21

4. शिव कुमार शर्मा
   स. प्रा.   27-9-21

बी.ए./बी.एस-सी./बी.कॉम./बी.एच.एस.-सी.
भाग – दो, आधार पाठ्यक्रम
प्रश्न पत्र – प्रथम (हिन्दी भाषा) (पेपर कोड – 0171)   पूर्णांक– 75

खण्ड – क   निम्नलिखित 5 लेखकों के पाठ शामिल होंगे –   अंक–35

1. महात्मा गांधी   – चोरी और प्रायश्चित
2. आचार्य नरेंद्र देव   – युवकों का समाज में स्थान
3. वासुदेव शरण अग्रवाल   – मातृभूमि
4. हरि ठाकुर   – डॉ. खूबचंद बघेल
5. पं. माधवराव सप्रे   – सम्भाषण–कुशलता

खण्ड–ख   हिन्दी भाषा और उसके विविध रूप   अंक–16

1. कार्यालयीन भाषा
2. मीडिया की भाषा
3. वित्त एवं वाणिज्य की भाषा
4. मशीनी भाषा

खण्ड–ग   हिन्दी की व्याकरणिक कोटियाँ   अंक–24
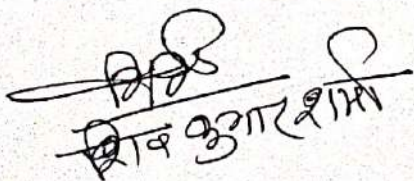
संज्ञा, सर्वनाम, विशेषण, किया विशेषण,

समास, संधि एवं संक्षिप्तियां

अनुवाद व्यवहार : अंग्रेजी से हिन्दी में अनुवाद

इकाई विभाजन–

इकाई– 1   चोरी और प्रायश्चित : महात्मा गांधी / कार्यालयीन भाषा, मीडिया की भाषा

इकाई– 2   युवकों का समाज में स्थान : आचार्य नरेन्द्र देव / वित एवं वाणिज्य की भाषा, मशीनी भाषा

इकाई– 3   मातृभूमि: वासुदेवशरण अग्रवाल / संज्ञा सर्वनाम, विशेषण, किया विशेषण

इकाई– 4   डॉ. खूबचंद बघेल : हरि ठाकुर / समास, संधि,

इकाई– 5   सम्भाषण–कुशलता : पं. माधवराव सप्रे, / अनुवाद – अंग्रेजी से हिन्दी में अनुवाद, संक्षिप्तियाँ

मूल्यांकन योजना –

प्रत्येक इकाई से एक–एक प्रश्न पूछे जाएंगे। प्रत्येक प्रश्न में आंतरिक विकल्प होगा। प्रत्येक प्रश्न के 15 अंक होंगे । प्रत्येक इकाई को दो–दो खण्डों (कमश' 'क' और 'ख' में) विभक्त करते हुए निर्धारित पाठ से 8 एवं शेष पाठ्य सामग्री से 7 अंक के प्रश्न होंगे। इस प्रकार पूरे प्रश्न-पत्र के पूर्णांक 75 होंगे।

B.Sc. Part – III
INFORMATION TECHNOLOGY
PAPER – I (AMPLIFIERS AND OSCILLATORS)
(Paper Code-3025)

M.M.-50

UNIT-I

POWER AMPLIFIER :- Classification of power amplifiers, requirement of power amplifiers, single ended class A power amplifier, and its efficiency, transformer coupled power amplifier, power dissipation curve, harmonic dissipation curve, harmonic distortion in pushpull power amplifier, power and efficiency calculation for pushpull for pushpull power amplifier, Distortion in pushpull power amplifier, Advantages of pushpull power amplifier.

UNIT-II

FEEDBACK AMPLIFIERS AND OSCILLATORS :- Feedback in amplifiers, types of feedback positive, and negative feedback. Derivation of input and output impedance in voltage and current series feedback. Advantages of negative feedback. Positive feedback. Berkhauson criteria for sustained oscillator. RF oscillators-Hartley oscillator, Colpetts oscillators (Qualitative study) relaxation osillators, Multivibrators- Astable, Monostable.

UNIT-III

OPERATIONAL AMPLIFIER AND POWER CONTROL DEVICES :- Differential amplifier, operational amplifier, Characteristics of an ideal OPAMP, definition of input bias current input offset current, current driff, impout offset, common mode rejection ratio, slew rate, universal biasing technique, Application of OP-Amp, as inverting, non inverting amplifiers, differentiation, Integration, scal charger and voltage follower, Silicon controlled rectifier (SCR), Diac, Traic and UJT (Only qualitative study).

UNIT-IV

THE INTEL 8080/8085 MICROPROCESSOR :- Introduction, the 8085 pin diagram and functions, The 8085 architecture, addressing modes, the 8080/8085 instruction set, the 8080/8085 data transfer instructions, the 8080/8085 arithmetic instructions, the 8080/8085 logical instructions the 8080/8085 stack, I/O and machine controlled instructions.
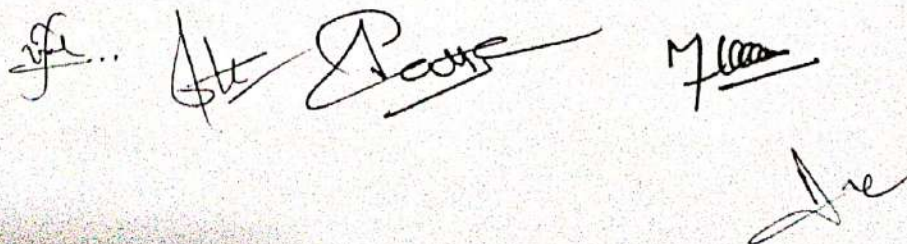
UNIT-V

PROGRAMMING THE MICROPROCESSOR :
Machine and assembling languages simplified instruction set, Instruction set, arithmetic operation, Instructions set logical operations, instruction set data transfer operations, instruction set branch operations, instruction set-subroutine all and return operations, instruction set miscellaneous operations, writing a program, addressing modes, program branching, program looping using subroutines. Programming the 8080/8085 microprocessor: Introduction straight-line programs looping programs, mathematical programs.

Format for paper setter -

Section	Type of Questions	Word Limit	No. of Questions	Mark in each Questions	Marks in each Section
Section A	Objective type/ MCQ	-	10 (Two questions from each unit)	01	10
Section B	Short Answer type	75-100 Words	5 (Two questions from each unit with internal choice)	03	15
Section C	Long Answer type	250-300 Words	5 (Two questions from each unit with internal choice)	05	25
				Total Marks	50

B.Sc. Part – III
INFORMATION TECHNOLOGY
PAPER – II (Fundamental Data Structure)
(Paper Code-3026)

M.M.-50

UNIT-I

Introduction to Data Structure : The concept of data structure, Abstract data structure, Analysis of Algorithm, The concept of list. Stacks and Queues : Introduction to stack & primitive operation on stack, Stack as an abstract data type, Multiple Stack, Stacks application : infix, post fix, and Recursion, Introduction to queues, Primitive Operations on the Queues, Queue as an abstract data type, Circular Queue, Dequeue, Priority Queue.

UNIT-II

Linked List :- Introduction to the linked list of stacks, The linked list of queues, Header nodes, Doubly linked list, Circular linked list, Stacks & Queues as a Circular linked list, Application of linked list.

UNIT-III

Trees :- Basic Terminology, Binary Trees, Tree Representations as Array & Linked list, Binary tree representation, Traversal of binary trees : In order, Preorder & post order. Application of Binary tree, Threaded binary tree, B-Tree & Height balanced tree, representation of B+ & B* trees, Binary tree representation of trees, Counting binary trees, 2-3 Trees algorithm or manipulating 2-3 Trees.

UNIT-IV

Searching & Sorting :- Sequential Searching, Binary search, Insertion sort, Selection sort, Quick sort, Bubble sort, Heap sort, Comparison of sorting methods.

UNIT-V

Tables & Graphs :- Hash Table, Collision resolution Techniques, Introduction to graphs, Definition, Terminology, Directed, Undirected & Weighted graph, Representation of graphs. Graph Traversal Depth first & Breadth first search, Spanning Trees, minimum spanning Tree, The basic, Greedy Strategy for computing Algorithm of Kruskal and prims.

TEXT & REFERENCE BOOK :

Fundamentals of Data structure : By S. Sawhney & Horowith

Data Structure : By Trembley & Sorrenson.

Data Structure Using Pascal : By Tannenbaum & Alugenstein

Data Structure : By lipschuists (Schaume's Outline Series Mcgraw Hill Publication)

Fundamentals of Computer Algorithm : By Ellis Horowitz and Sartaj Sawhney.

PRACTICAL WORK

1. The sufficient practical work should be done for understanding the date structure with C++.
2. The sufficient practical work must be performed on stack, queue, linked list, tree etc.
3. All practical works should prepared in form of print outs and valuated while practical examination.

Format for paper setter -

Section	Type of Questions	Word Limit	No. of Questions	Mark in each Questions	Marks in each Section
Section A	Objective type/ MCQ	-	10 (Two questions from each unit)	01	10
Section B	Short Answer type	75-100 Words	5 (Two questions from each unit with internal choice)	03	15
Section C	Long Answer type	250-300 Words	5 (Two questions from each unit with internal choice)	05	25
			Total Marks		50

B.Sc. Part - II
INFORMATION TECHNOLOGY
PAPER – I (Digital Circuits & Computer H/W)
(Paper Code - 2025)

M.M.-50

UNIT-I

(A) Number Systems: Octal and Hexadecimal number, decimal rep., complements, addition, subtraction, multiplication, division, fixed point rep, floating point rep., other binary code, gray code, excess 3 gray, excess-3, 2421, etc. error detection code.

(B) Boolean Algebra: Laws, DeMorgan's Theorem, Simplification Boolean expression & logic diagram, positive & negative logic, K-map and simplification of K-map.

UNIT-II

Combinational circuits : Half adder, full adder, flip-flop : SR, JK, D,T, sequential circuits : encoder, decoder, multiplexer, shift resister, binary counters, BCD adder.

UNIT-III

Multivibrator circuits : Monostable, astable, bistable, smitt trigger, clocked RS, master-slave flip-flop, edge triggered flip-flop, latch. Intergrated circuits : RTL, DITL, TTL, CMOS, MOS.

UNIT-IV

(A) Central Processing Unit: Introduction, register organization, stack organization, Instruction formats, Addressing modes.
(B) I/O Organization: I/O interfaces, Data transfer, types and modes, interrupts, DMA, IOP.

UNIT-V

Memory Organization : Memory hierarchy, main memory, Auxiliary memory, Associative memory, cache memory, virtual memory, memory management techniques.

REFERENCE TAXT BOOK:
1. Integrated Electronics - Millman & Halkias
2. Principle of Electronics - V.K. Mehta
3. Digital Electronics - R.P. Jain
4. Computer System Architecture - Morris Mano
5. Digital Electronics & Computer Hardware - Morris Mano

Format for paper setter -

Section	Type of Questions	Word Limit	No. of Questions	Mark in each Questions	Marks in each Section
Section A	Objective type/ MCQ	-	10 (Two questions from each unit)	01	10
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Section C	Long Answer type	250-300 Words	5 (Two questions from each unit with internal choice)	05	25
				Total Marks	50

M.M.-50

UNIT-I

Introduction to OOP: Advantages of OOP, the Object oriented approach, characteristics of object oriented languages : object, classes, inheritance, reusability, polymorphism and C++.

UNIT-II

Function : function declaration, calling function, function definition, passing arguments to function, passing constant, passing value, fegerence argument, returning by reference, inline function, function overloading, default arguments in function.

UNIT-III

Object and classes, using the classes, class constructor, class destructor, object as function argument, copy constructor, struct and classes, array as class member, static class data, static member functions, friend function, friend class, operator overloading, type of inheritance, bass class derive class, access specifier, protected, member function.

UNIT-IV

Pointers : & and * operator pointer variables, pointer to pointer, void pointer, pointer and array, pointer and functions, pointer and string, memory management, new and delete, pointer to object, this pointer, virtual function : virtual function, virtual member function, accesses with pointer, pure virtual function.

UNIT-V

File and stream:- C++ steams, C++ manipulators, Stream class, string I/O, char I/O; object I/O, I/O with multiple objects, disk I/O.

REFERENCE TEXT BOOKS:

1. Programming in C++ - E. Balaguruswami
2. Mastering in C++ - Venu Gopal
3. Object Oriented Programming in C++ - Robert Lafore
4. Let us C++ - Y. Kanetkar

PRACTICAL WORK

1. The sufficient Practical work should be done for understanding the paper 2.

2. At least five programs on each unit from unit 2 to unit 5 be prepared.

3. All practical works should be prepared in form of print outs and be evaluated while practical examination.

Format for paper setter -

Section	Type of Questions	Word Limit	No. of Questions	Mark in each Questions	Marks in each Section
Section A	Objective type/ MCQ	-	10 (Two questions from each unit)	01	10
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Section C	Long Answer type	250-300 Words	5 (Two questions from each unit with internal choice)	05	25
				Total Marks	50

There shall be three theory papers. Two compulsory and one optional Each paper carrying 50 marks is divided into five units and each unit carry equal marks.

PAPER - I (Paper Code-   )
ANALYSIS
REAL ANALYSIS

UNIT-I Series of arbitrary terms. Convergence, divergence and Oscillation. Abel's and Dirichlet's test. Multiplication of series. Double series. Partial derivation and differentiability of real-valued functions of two variables. Schwarz and Young's theorem. Implicit function theorem. Fourier series. Fourier expansion of piecewise monotonic functions.

UNIT-II Riemann integral. Intergrability of continuous and monotonic functions. The fundamental theorem of integral calculus. Mean value theorems of integral calculus. Improper integrals and their convergence. Comparison tests. Abel's and Dirichlet's tests. Frullani's integral. Integral as a function of a parameter. Continuity, derivability and integrability of an integral of a function of a parameter.

COMPLEX ANALYSIS

UNIT-III Complex numbers as ordered pairs. Geometric representation of Complex numbers. Stereographic projection. Continuity and differentiability of Complex functions. Analytic functions. Cauchy- Riemann equations. Harmonic functions. Elementary functions. Mapping by elementary functions. Mobius transformations. Fixedpoints, Cross ratio. Inverse points and critical mappings. Conformal mappings.

METRIC SPACES

UNIT-IV Definition and examples of metric spaces. Neighbourhoods. Limit points, Interior points, Open and closed sets. Closure and interior. Boundary points, Sub-space of a metric space. Cauchy sequences, Completeness, Cantor's intersection theorem. Contraction principle, Construction of real numbers as the completion of the incomplete metric space of rationals. Real numbers as a complete ordered field.

UNIT-V Dense subsets. Baire Category theorem. Separable, second countable and first countable spaces. Continuous functions. Extension theorem. Uniform continuity, Isometry and homeomorphism. Equivalent metrics. Compactness, Sequential compactness. Totally bounded spaces. Finite intersection property. Continuous functions and compact sets. Connectedness, Components, Continuous functions and connected sets.

REFERENCES :
1. T.M. Apostol, Mathematical Analysis, Narosa Publishing House, New Delhi, 1985.
2. R.R. Goldberg, Real Analysis, Oxford & IBH publishing Co., New Delhi, 1970.
3. S. Lang, Undergraduate Analysis, Springer-Verlag, New York, 1983.
4. D. Somasundaram and B. Choudhary, A First Coarse in Mathematical Analysis, Narosa Publishing House, New Delhi, 1997.
5. Shanti Narayan, A Course of Mathematical Analysis, S. Chand & Co. New Delhi.
6. P.K. Jain and S.K. Kaushik, An introduction to Real Analysis, S. Chand & Co., New Delhi, 2000.
7. R.v. Churchill & J.W. Brown, Complex Variables and Applications, 5*ⁿ Edition, McGraw- Hill, NewYork, 1990.
8. MarkJ. Ablowitz & A.S.Fokas, Complex Variables : Introduction and Applications, Cambridge University Press, South Asian Edition, 1998.
9. Shanti Narayan, Theory of Functions of a Complex Variable, S. Chand & Co., New Delhi.
10. E.t. Copson, Metric Spaces, Cambridge University Press, 1968.
11. P.K. Jain and K. Ahmad, Metric Spaces, Narosa Publishing House, New Delhi, 1996.
12. G.F. Simmons, Inroductin to Topology and Modern Analysis, McGraw-Hill, 1963.

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			Total	50

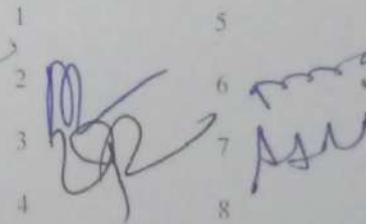Signature

External Subject Expert

Departmental Members   1   5

HOD

Student Members

UNIT-I Group-Automorphisms, inner automorphism. Automorphism groups and their computations, Conjugacy relation, Normaliser, Counting principle and the class equation of a finite group. Center for Group of prime-order, Abelianizing of a group and its universal property. Sylow's theorems, Sylow subgroup, Structure theorem for finite Abelian groups.

UNIT-II Ring theory-Ring homomorphism, Ideals and Quotient Rings. Field of Quotients of an Integral Domain, Euclidean Rings, Polynomial Rings. Polynomials over the Rational Field. The Eisenstien Criterion, Polynomial Rings over Commutative Rings, Unique factorization domain. R unique factorisation domain implies so is $R[x_1, x_2 \ldots x_n]$ Modules, Submodules, Quotient modules, Homomorphism and Isomorphism theorems.

UNIT-III Definition and examples of vector spaces, Subspaces. Sum and direct sum of subspaces, Linear span. Linear dependence, independence and their basic properties. Basis, Finite dimensional vector spaces, Existence theoremfor bases. Invariance of the number of elements of a basis set, Dimension. Existence of complementary subspace of a subspace of a finite dimensional vector space. Dimension of sums of subspaces. Quotient space and its dimension.

UNIT-IV Linear transformations and their representation as matrices, The Algebra of linear transformations. The rank nullity theorem. Change of basis. Dual space. Bidual space and natural isomorphism. Adjoint of a linear transformation. Eigenvalues and eigenvectors of a linear transformation. Diagonalisation. Annihilator of a subspace. Bilinear, Quadratic and Hermitian forms.

UNIT-V Inner Product Spaces-Cauchy-Schwarz inequality. Orthogonal vectors. Orthogonal Complements. Orthonormal sets and bases. Bessel's inequality for finite dimensional spaces. Gram-Schmidt Orthogonalization process.

REFERENCES :

1. I.N. Herstein, Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975.

2. N. Jacobson, Basic Algebra, Vols. I & II. W.H. Freeman, 1980 (also published by Hindustan Publishing Company).

3. Shanti Narayan, A Text Book of Modern Abstract Algebra, S.Chand & Co. New Delhi.

4. K.B. Datta, Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd., New Delhi, 2000.

5. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal, Basic Abstract Algebra (2"" Edition)
Cambridge University Press, Indian Edition, 1997.

6. K. Hoffman and R. Kunze, Linear Algebra, 2"" Editon, Prentice Hall, Englewood Cliffs, New Jersey, 1971.

7. S.K. Jain, A. Gunawardena & P.B. Bhattacharya, Basic Linear Algebra with MATLAB. Key College Publishing (Springer-Verlag) 2001.

8. S. Kumaresan, Linear Algebra, A.Geometric Approach, Prentice-Hall of India, 2000.

9. Vivek Sahai and Vikas Bist, Algebra, Norosa Publishing House, 1997.

10. I.S. Luther and I.B.S.Passi, Algebra, Vol. I-Groups, Vol. II-Rings, Narosa Publishing House (Vol. I-1996, Vol. II-1999)

11. D.S. Malik, J.N. Mordeson, and M.K. Sen, Fundamentals of Abstract Algebra, McGraw-Hill International Edition, 1997.

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Section C	Long Answer type	5 (One question form each unit with internal choice)	05	25
			Total	50

Signature

External Subject Expert

HOD

Departmental Members   1   5
                        2   6
                        3   7
                        4   8

Student Members

Session 2022-23
PAPER - III - (OPTIONAL)
(II) DISCRETE MATHEMATICS (Paper Code-　　　　)

UNIT-I Sets and Propositions - Cardinality, Mathematical Induction, Principle of Inclusion and exclusion, Computability and Formal Languages - Ordered Sets, Languages, Phrase Structure Grammars, Types of Grammars and Languages, Permutations, Combinations and Discrete Probability.

UNIT-II Relations and Functions - Binary Relations, Equivalence Relations and Partitions, Partial Order Relations and Lattices, Chains and Antichains, Pigeon Hole Principle, Graphs and Planar Graphs - Basic Terminology, Multigraphs, Weighted Graphs, Paths and Circuits, Shortest Paths, Eulerian Paths and Circuits, Travelling Salesman Problem, Planner Graphs, TREES.

UNIT-III Finite State Machines - Equivalent Machines, Finite State Machines as Language Recognizers, Analysis of Algorithms - Time Complexity, Complexity of Problems, Discrete Numeric Functions and Generating Functions.

UNIT-IV Recurrence Relations and Recursive Algorithms - Linear Recurrence Relations with Constant Coefficients, Homogeneous Solutions, Particular Solution, Total Solution, Solution by the Method of Generating Functions, Brief review of Groups and Rings.

UNIT-V Boolean Algebras - Lattices and Algebraic Structures, Duality, Distributive and Complemented Lattices, Boolean Lattices and Boolean Algebras, Boolean Functions and Expressions, Prepositional Calculus, Design and Implementation of Digital Networks, Switching Circuits.

REFERENCES :
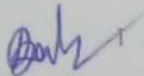
C.L. Liu, Elements of Discrete Mathematics, (Second Edition), McGraw Hill, International Edition, Computer Science Series, 1986.

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			Total	50

Signature　　　　External Subject Expert　　　　Departmental Members　　1　　　　　5

HOD　　　　　　　　　　　　　　　　　　　2　　　　　　　　　　　　　2　　　　　6

Student Members　　　　　　　　　　　　　3　　　　　　　　　　　　　3　　　　　7

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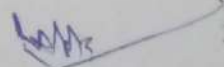
MATHEMATICS

There shall be three compulsory papers. Each paper of 50 marks is divided into five units and each unit carry equal marks.

PAPER - I
ADVANCED CALCULUS
(Paper Code -   )

UNIT-I Definition of a sequence. Theorems on limits of sequences. Bounded and monotonic sequences. Cauchy's convergence criterion. Series of non-negative terms. Comparison tests. Cauchy's integral test. Ratio tests. Raabe's, logarithmic, De Morgan and Bertrand's tests. Alternating series. Leibnitz's theorem. Absolute and conditional covergence.

UNIT-II Continuity. Sequential continuity. Properties of continuous functions. Uniform continuity. Chain rule of differentiability. Mean value theroems and their geometrical interpretations. Darboux's intermediate value theorem for derivatives Taylor's theorem with various forms of remainders.

UNIT-III Limit and continuity of functions of two variables, Partial differentiation Change of variables. Euler's theorem on homogeneous functions, Taylor's theorem for functions of two variables. Jacobians.

UNIT-IV Envelopes, Evolutes, Maxima, minima and saddle points of functions, two variables, Lagrange's multiplier method.

UNIT-V Beta and Gamma functions, Double and triple integrals, Dirichet's integrals, Change of order of intergration in double integrals.

REFERENCES :

1. Gabriel Klaumber, Mathematical Analysis, Marcel Dekkar, Inc. New York, 1975.
2. T.M. Apostol, Mathematical Analysis, Narosa Publishing House, New Delhi. 1985.
3. R.R. Goldberg, Real Analysis, Oxford & I.B.H. Publishing Co., New Delhi, 1970.
4. D. Soma Sundaram and B. Choudhary, A First Course in Mathematical Analysis, Narosa Publishing House, New Delhi, 1997.
5. P.K. Jain and S.K. Kaushik, An introduction to Real Analysis, S. Chand & Co., New Delhi, 2000.
6. Gorakh Prasad, Differential Calculus, Pothishala Pvt. Ltd., Allahabad.
7. Murray R. Spiegel, Theory and Problems of Advanced Calculus, Schaum Publishing Co., New York.
8. Gorakh Prasad, Integral Calculus, Pothishala Pvt. Ltd., Allahabad.
9. S.C. Malik, Mathematical Analysis, Wiley Eastern Ltd., New Delhi.
10. O.E. Stanaitis, An Introduction to Sequences, Series and Improper Integrals, Holden-Dey, Inc., San Francisco, California.
11. Earl D. Rainville, Infinite Series, The Macmillan Company, New York.
12. Chandrika Prasad, Text Book on Algebra and Theory of Equations, Pothishala Pvt. Ltd., Allahabad.
13. N. Piskunov, Differential and Integral Calculus, Peace Publishers, Moscow.
14. Shanti Narayan, A Course of Mathematical Analysis, S.Chand and Company, New Delhi.

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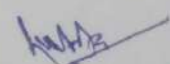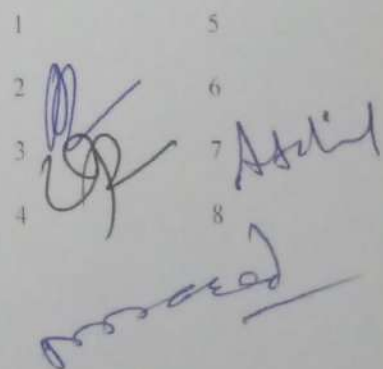Signature   External Subject Expert   Departmental Members   1   5

HOD   2

Student Members   3

UNIT-I Series solutions of differential equations- Power series method, Bessel and Legendre Functions and their properties- convergence, recurrence and generating relations, Orthogonality of functions, Sturm-Liouville problem, Orthogonality of eigen-functions, Reality of eigen values, Orthogonality of Bessel functions and Legendre polynomials.

UNIT-II Laplace Transformation - Linearity of the Laplace transformation, Existence theorem for Laplace transforms, Laplace transforms of derivatives and integrals, Shifting theorems, Differentiation and integration of transforms, Convolution theorem, Solution of integral equations and systems of differential equations using the Laplace transformation.

UNIT-III Partial differential equations of the first order, Lagrange's solution, Some special types of equations which can be solved easily by methods other than the general method, Charpit's general method of solution.

UNIT-IV Partial differential equations of second and higher orders, Classification of linear partial differential equations of second order, Homogeneous and non-homogeneous equations with constant coefficients, Partial differential equations reducible to equations with constant coefficients, Monge's methods.

UNIT-V Calculus of Variations - Variational problems with fixed boundaries- Euler's equation for functionals containing first order derivative and one independent variable, Externals, Functionals dependent on higher order derivatives, Functionals dependent on more than one indepedent variable, Variational problems in parametric form, invariance of Euler's equation undercoordinates transformation. Variational Problems with Moving Boundaries - Functionals dependent on one and two functions, One sided variations. Sufficient conditions for an Extremum - Jacobi and Legendre conditions, Second Variation, Variational principle of least action.

REFERENCES :

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, Inc., New York, 1999.
2. D.A. Murray, Introductory Course on Differential Equations, Orient Longman, (India), 1967.
3. A.R. Forsyth, A Treatise on Differential Equations, Macmillan and Co. Ltd., London.
4. Lan N. Sneddon, Elements of Partial Differential Equations, McGraw-Hill Book Company, 1988.
5. Francis B. Hilderbrand, Advanced Calculus for Applications, Prentice Hall of India Pvt. Ltd., New Delhi, 1977.
6. Jane Cronin, Differential equations, Marcel Dekkar, 1994.
7. Frank Ayres, Theory and Problems of Differential Equations, McGraw-Hill Book Company,1972.
8. Richard Bronson, Theory and Problems of Differential Equations, McGraw-Hill, Inc., 1973.
9. A.S. Gupta, Calculus of variations with-Applications, Prentice-Hall of India, 1997.
10. R. Courant and D. Hilbert, Methods of Mathematical Physics, Vols. I & II, Wiley- Interscience, 1953.
11. I.M. Gelfand and S.V. Fomin, Calculus of Variations, Prentice-Hill, Englewood Cliffs (New Jersey), 1963.
12. A.M. Arthurs, Complementary Variational Principles, Clarendon Press, Oxford, 1970.
13. V. Kornkov, Variational Principles of Continuum Mechanics with Engineering Applications, Vol. 1, Reidel Publ. ; Dordrecht, Holland, 1985.
14. T. Oden and J.N. Reddy, Variational Methods in Theoretical Mechanics, Springer-Verlag, 1976.

Pattern of Question Paper

Section	Type of Question	No. Of Questions	Mark in each Question	Marks in Section
Section A	Objective Type/MCQ	10 (Two question from each unit)	01	10
Section B	Short Answer type	5 (One question form each unit with internal choice)	03	15
Section C	Long Answer type	5 (One question form each unit with internal choice)	05	25
			Total	50

Signature
HOD
Student Members

External Subject Expert 1
2
3

Departmental Members 1
2
3
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5
6
7
8

PAPER – III
Session 2022-23
MECHANICS
(Paper Code -   )
STATICS

UNIT-I Analytical conditions of Equilibrium, Stable and unstable equilibrium, virtual work, Catenary.

UNIT-II Forces in three dimensions, Poinsot's central axis, Null lines and planes, Dynamics.

UNIT-III Simple harmonic motion, Elastic strings, velocities and accelerations along radial and transverse directions, Projectile, Central orbits.

UNIT-IV Kepler's laws of motion, velocities and acceleration in tangential and normal directions, motion on smooth and rough plane curves.

UNIT-V Motion in a resisting medium, motion of particles of varying mass, motion of a particle in three dimensions, acceleration in terms of different co-ordinate systems.
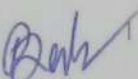
REFERENCES :
1. S.L. Loney, Statics, Macmillan and Company, London.
2. R.S. Verma, A Text Book on Statics, Pothishala Pvt. Ltd., Allahabad.
3. S.L. Loney, An Elementary Treatise on the Dynamics of a particle and of rigid bodies, Cambridge University Press, 1956.

Pattern of Question Paper

Section	Type of Question	No. Of Questions	Mark in each Question	Marks in Section
Section A	Objective Type/MCQ	10 (Two question from each unit)	01	10
Section B	Short Answer type	5 (One question form each unit with internal choice)	03	15
Section C	Long Answer type	5 (One question form each unit with internal choice)	05	25
			Total	50

Signature

External Subject Expert   Departmental Members   1   5

HOD   2   6

Student Members   3   7

                                                            4   8

Bsc. III

Microbiology

Paper-1: Medical Microbiology And Immunology

Unit-1: Air borne diseases

Air borne diseases: types- Tuberculosis, Pertussis, Diphtheria, Influenza, Small and Chicken pox, Mumps, Measles, symptoms, treatment, and prevention.

Unit-2: Water borne diseases

Concept and causes of water borne diseases: Types, hepatitis, dysentery, diarrhea, cholera, typhoid. Symptoms, treatment, and prevention

Unit-3: Clinical diseases and diagnosis

Clinical diseases: diabetes, asthma, multiple sclerosis, rheumatoid arthritis, cancer. symptoms, treatment, and prevention.

Unit-4: Basic concepts of immunity

Immune system: Structure and Function of the cell, tissues and organs of immune system. Types of immunity: humoral and cell mediated, innate acquired immunity. Antigen – Antibody: Types, properties. Haptens, adjuvents, Immunoglobulins: Structure, types, properties and their function- theory of antibody production.

Unit-5: Immune disease diagnosis

Methods based on Ag-Ab interaction- Precipitation, Agglutination, ELISA, RIA, Immuno-electrophoreses, PCR, based diagnosis method for infectious diseases.

Textbooks recommended:

1. Immunology: Kuby
2. General microbiology: Pawar and Daginawala
3. Zinssers microbiology by K.J.. Wolpgang, McGraw Hill company.
4. Medical microbiology: N.C. Dey, allied agency, Calcutta.
5. Bacteriological technique by F.J. Baker.
6. A textbook of microbiology: Dubey and Maheshwari; S. Chand and sons.
7. Scott's diagnostic microbiology by E.J. Baron.

Bsc. III
Microbiology
Paper- 2 Environmental, industrial and Agricultural Microbiology

UNIT-1 : AIR MICROBIOLOGY

Basics of Aerobiology , Microbes in atmosphere , source of micro organism in air, droplet nuclei, infectious dust and bio- aerosol, Factors affecting microbial survival in the air , Sampling , Collection and isolation of microbes from air.

UNIT-2 : WATER MICROBIOLOGY

Basics concept , water zonation , eutrophication , microbial community in natural water. Determining the quality of water bacteriological evidence for fecal pollution .Water purification methods . Disinfection of potable water supply.

UNIT-3 : SOIL MICROBIOLGY

Soil as an environmental culture medium , microbes of soil. Brief account of microbial interactions – symbiosis , mutualism , commensalism , competition , predation , parasitism . Microbiological examination of soil . Rhizosphere concept and role of microbes , rhizosphere and non rhizosphere micro – flora Mycorrhiza .

UNIT -4 : INDUSTRIAL MICROBIOLOGY

Introduction and brief history and scope , important microbes in various industries . Fermentation – definition , types – Aerobic and anaerobic , Batch and SSF. Important products bread , cheese , vinegar , fermented dairy products and oriented fermented food involving microbes . Microbial cells as food . SCP – mushroom cultivation , production of alcohol and fermented beverages , beer and wine .

UNIT -5 : AGRICULTURAL MICROBIOLOGY

History of Agricultural Microbiology , Microbes and their importance in maintenance of soil , Biogeochemical cycles , role of microbes in maintaining the fertility of soil . Bio fertilizers - Bacterial , azotobacter and vermiform compost . Soil micro organism - association with vascular plants – phyllosphere , Rhizobium , Rhizoplane associative nitrogen fixation . Bio – fertilizers – Cyanobacterial and Azolla .

TEXT BOOKS RECOMMENDED :

1. Hugo , W. B . Russell , A. D . pharmaceutical Microbiology 4th edition . Blackwell scientific publications / Oxford .
2. Russell and Ayliffe , G. A .J (1982) Principles and practice of Disinfection , preservation and sterilization Oxford :
3. Gregory P. H. Microbiology of the atmosphere 2nd edition . Leonadr Hill.
4. Food Microbiology by WC Frazier and D Westhoff .
5. Agricultural Microbiology by Bhagyaraj and Rangaswamy .
6. Bioremediation by K H Baker and DS Herson

MICROBIOLOGY
BSc-2nd Paper-I

paper- I: Molecular Biology and Genetic Engineering

UNIT-1: FUNDAMENTALS OF MOLECULAR BIOLOGY
History and scope of molecular biology, concept and mechanism of heredity. DNA as genetic material- experimental evidences. DNA replication- mechanism, process and enzymes/proteins involved in replication.

UNIT-2: CENTRAL DOGMA OF PROTEIN SYNTHESIS
Transcription- initiation, elongation, termination, RNA polymerases and sigma factor. Transcription inhibitors (antibiotics, drugs). Translation- initiation, elongation and termination. Factors involved in translation. Genetic code.

UNIT-3: MUTATION AND DNA REPAIR MECHANISM
Introduction and Types of Gene mutations- Base substitution, frame shift mutation (insertion, deletion, miss-sense, nonsense mutation.) mutagens – physical and chemical. Reverse mutation in bacteria. DNA repair mechanism (mismatch repair, photo-reactivation, excision and SOS repair). Beneficial and harmful effect of mutation.

UNIT-4: GENE REGULATION
Concept of gene- Cistron, Recon, Muton. Operon Concept- lac Operon, tryptophan Operon, His Operon. Activator, Co-activator and Repressor. Introduction to Bioinformatics- Elementary genome Database.

UNIT-5: GENETIC ENGINEERING
Basic concept of Genetic Engineering, DNA modifying enzymes Restriction endonuclease, DNA ligase, terminal transferase. Vectors- pBR322, pUC19, BAC and YAC. Phage based vectors, expression of vector. Transformation – physical and chemical method. Bacterial Host. Screening of recombinant vector Blue white Screening, Colony Hybridization.

Text Books Recommended:

1. Gene Cloning by T.A. Brown.
2. General Microbiology by Power and Daganiwala.
3. Zinssers Microbiology by KJ Wolfgang. McGraw- HJill Company.
4. Microbial Genetics by RM Stanley, F David and EC John.
5. Bacteriological Techniques by FJ Baker.
6. Molecular Biology of the Cell; *3rd Edition;* Bruce Alberts ,et.al; Garland Publishing.
7. Cell biology; C.B. Powar; Himalaya Publishing House; Fifth edition
8. Cell & Molecular Biology; Gerald Karp; Fourth edition
9. A Textbook of Microbiology; Dubey&Maheshwari; S.chand& Sons.
10. Cell biology & Genetics; P. K. Gupta
11. Introduction to Bioinformatics; T K Atwood and D J Parry-Smith; Pearson Education Ltd

Paper- II: Bioinstrumentation and Biostatistics

1: MICROSCOPY AND CENTRIFUGATION

Simple and compound light microscope, Bright field, Dark field, Phase contrast and Electron microscope. Centrifugation- principle and types of centrifuges (analytical and preparatory), types of centrifugation- differential and rate zonal centrifugation.

UNIT-2: pH metry and chromatography

Principle of pH meter, types of electrodes, factors affecting pH measurements, and application of pH meter. Chromatography-principle, types- paper, TLC and column chromatography, HPLC.

UNIT-3: SPECTROPHOTOMETRY

Electromagnetic spectrum, Beers-Lamberts law, Types (Principles, working and application)- colorimeter, UV - Vis Spectrophotometry and IR- Spectrophotometry. Turbidometry.

UNIT-4: Electrophoresis and X-Ray Diffraction

Principle of electrophoresis, instrumentation and Application, types of Paper, Gel electrophoresis and Immunoelectrophoresis. X-ray diffraction- principle and application.

UNIT-5: Biostatistics

Data- Types, characteristics, presentation and distribution. Data analysis- central tendency (Mean, Median and Mode), Deviation (variance SD and SE). Concept of probability.

Text Books Recommended:

1. Introduction to Istrumental analysis by Robert Braun.
2. Instrumental Techniques by Upadhyay and Upadhyay.
3. Instrumental Methods of Chemical Analysis by BK Sharma.
4. Bio statistics; Sunder Rao
5. Statistical Methods; S. P. Gupta; Sultan Chand & Sons

PAPER – I (Code- 3034)
RELATIVITY, QUANTUM MECHANICS, ATOMIC MOLECULAR AND NUCLEAR PHYSICS.

Unit-1 Reference systems, inertial frames, Galilean invariance propagation of light, Michelson-Morley experiment, search for ether. Postulates for the special theory of relativity, Lorentz transformations, length contraction, time dilation, velocity addition, variation of mass with velocity, mass-energy equivalence, particle with zero rest mass.

Unit-2 Origin of the quantum theory : Failure of classical physics to explain the phenomena such as black-body spectrum, photoelectric effect, Compton effect, Wave-particle duality, uncertainty principle, de Broglie's hypothesis for matter waves, the concept of Phase and group velocities, experimental demonstration of mater waves. Davisson and Germer's experiment. Consequence of de Broglie's concepts, Bohr's complementary Principle, Bohr's correspondence principle, Bohr's atomic model, energies of a particle in a box, wave packets. Consequence of the uncertainty relation, gamma ray microscope, diffraction at a slit.

Unit-3 Quantum Mechanics: Schrodinger's equation, Statistical interpretation of wave function, Orthogonality and normalization of wave function, Probability current density, Postulatory basis of quantum mechanics, operators, expectation values, Ehrenfest's theorem, transition probabilities, applications to particle in a one and three dimensional boxes, harmonic oscillator in one dimension, reflection at a step potential, transmission across a potential barrier.

Unit-4 Spectra of hydrogen, deuteron and alkali atoms spectral terms, doublet fine structure, screening constants for alkali spectra for s, p, d and f states, selection rules. Discrete set of electronic energies of moleculers, quantisation of vibrational and rotational energies, determination of inter-nuclear distance, pure rotational and rotation vibration spectra. Dissociation limit for the ground and other electronic states, transition rules for pure vibration and electronic vibration spectra. Raman effect, Stokes and anti-Stokes lines, complimentary character of Raman and infrared spectra, experimental arrangements for Raman spectroscopy.

Department of Physics
College of Science, RAIPUR

Signatures :

HOD : ----------

External subject Experts: 1- ---------- 2---------- 3----------

Departmental Members : 1---------- 2---------- 3---------- 4---------- 5----------
6---------- 7---------- 8---------- 9----------

Student Members: 1---Ch.Alekhiya---- 2---------- 3----------

Unit-5 Structure of nuclei:- Basic Properties of Nuclei: (1) Mass, (2) Radii, (3) Charge, (4) Angular Momentum, (5) Spin, (6) Magnetic Moment (μ), (7) Stability and (8) Binding Energy, Nuclear Models:- Liquid Drop Model, Mass formula, Shell Model, Types of Nuclear reactions, laws of conservation, Q-value of reactions, Interaction of Energetic particles with matter, Ionization chamber, GM Counter, Cloud Chambers, Fundamental Interactions, Classification of Elementary Particles, Particles and Antiparticles, Baryons, Hyperons, Leptons, and Mesons, Elementary Particle Quantum Numbers: Baryon Number, Lepton Number, Strangeness, Electric Charge, Hypercharge and Isospin, introductory idea of discovery of Higg's Boson.

TEXT AND REFERENCE BOOKS:

1. H.S. Mani and G.K. Metha: "Introduction to Modern Physics"" (Affiliated East-West Press, 1989).
2. A Beiser, "Prospective of Modern Physics".
3. H.E. White, Introduction to Atomic Physics".
4. Barrow, "Introduction to Molecular Physics".
5. R.P. Feynman, R.B. Leighton and M Sands, "The Feynman Lectures on Physics", Vol.III (B.I. Publications, Bombay, Delhi, Calcutta, Madras).
6. T.A. Littlefield and N Thorley, "Atomic and Nuclear Physics" (Engineering Language Book Society)
7. H.A. Enge, "Introduction to Nuclear Physics", (Addision-Wesly)
8. Eisenberg and Resnick, "Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles" (John Wiley)
9. D.P. Khandelwal, "Optics and Atomic Physics", (Himalaya Publishing House, Bombay, 1988).
10. Quarks and Leptons, F. Halzen and A.D. Martin, Wiley India, New Delhi, 1984.
11. Radiation detection and measurement, G.F. Knoll (John Wiley & Sons, 2000).
12. Theoretical Nuclear Physics, J.M. Blatt & V.F.Weisskopf (Dover Pub.Inc., 1991).
13. Electronic Devices & Circuits By Milliman Helkiyan.

Department of Physics
College of Science, RAIPUR

Signatures :

HOD : ----------

External subject Experts: 1- ---------- 2---------- 3----------

Departmental Members : 1---------- 2---------- 3---------- 4---------- 5----------
6---------- 7---------- 8---------- 9----------

Student Members: 1- Ch. Alekhya 2---------- 3----------

PAPER-II (Code-3035)
SOLID STATE PHYSICS, SOLID STATE DEVICES AND ELECTRONICS

Unit-1 Amorphous and crystalline solids, Elements of symmetry, seven crystal system, Cubic lattices, Crystal planes, Miller indices, Laue's equation for X-ray diffraction, Bragg's Law, Bonding in solids, classification. Cohesive energy of solid, Madelung constant, evaluation of Parameters, Specific heat of solids, classical theory (Dulong-Petit's law), Einstein and Debye theories, Vibrational modes of one dimensional monoatomic lattice, Dispersion relation, Brillouin Zone.

Unit-2 Free electron model of a metal, Solution of one dimensional Schrödinger equation in a constant potential, Density of states, Fermi Energy, Energy bands in a solid (Kronig-Penny model without mathematical details), Difference between Metals, Insulator and Semiconductors, Hall effect, Dia, Para and Ferromagnetism, Langevin's theory of dia and para-magnetism, Curie-Weiss's Law, Qualitative description of Ferromagnetism (Magnetic domains), B-H curve and Hysteresis loss.

Unit-3 Intrinsic and extrinsic semiconductors, Concept of Fermi level, Generation and recombination of electron hole pairs in semiconductors, Mobility of electrons and holes, drift and diffusion currents, p-n junction diode, depletion width and potential barrier, junction capacitance, I-V characteristics, Tunnel diode, Zener diode, Light emitting diode, solar cell, Bipolar transistors, pnp and npn transistors, characteristics of transistors, different configurations, current amplification factor, FET and MOSFET Characteristics.

Unit-4 Half and full wave rectifier, rectifier efficiency ripple factor, Bridge rectifier, Filters, Inductor filter, L and π section filters, Zener diode, regulated power supply using zener diode, Applications of transistors, Bipolar Transistor as amplifier, h-parameter, h-parameter equivalent circuit, Transistor as power amplifier, Transistor as oscillator, principle of an oscillator and Bark Hausen's condition, requirements of an oscillator, Wein-Bridge oscillator and Hartley oscillator.

Unit-5 Digital Circuits: Difference between Analog and Digital Circuits, Binary Numbers, Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates (Realization using Diodes and Transistor), NAND and NOR Gates as Universal Gates, XOR and XNOR Gate, De Morgan's Theorems, Boolean Laws, Simplification of Logic Circuit using Boolean Algebra, Digital to Analog Converter, Analog to Digital Converter.

Department of Physics
College of Science, RAIPUR

Signatures :

HOD : 14.7.22

External subject Experts: 1- 2- 3-

Departmental Members : 1- 2- 3- 4- 5-
6- 7- 8- 9-

Student Members: 1- Ch. Alekhya 2- 3-

PAPER – I (Code- 2034)
THERMODYNAMICS, KINETIC THEORY AND STATISTICAL PHYSICS

Unit-1 The laws of thermodynamics : The Zeroth law, first law of thermodynamics, internal energy as a state function, reversible and irreversible change, Carnot's cycle, carnot theorem, second law of thermodynamics. Claussius theorem inequality. Entropy, Change of entropy in simple cases (i) Isothermal expansion of an ideal gas (ii) Reversible isochoric process (iii) Free adiabatic expansion of an ideal gas. Concept of entropy, Entropy of the universe. Entropy change in reversible and irreversible processes, Entropy of Ideal gas, Entropy as a thermodynamic variable, S-T diagram, Principle of increase of entropy. The thermodynamic scale of temperature, Third law of thermodynamics, Concept of negative temperature.

Unit-2 Thermodynamic functions, Internal energy, Enthalpy, Helmholtz function and Gibb's free energy, Maxwell's thermodynamical equations and their applications, TdS equations, Energy and heat capacity equations Application of Maxwell's equation in Joule-Thomson cooling, adiabatic cooling of a system, Van der Waals gas, Clausius-Clapeyron heat equation. Blackbody spectrum, Stefan-Boltzmann law, Wien's displacement law, Rayleigh-Jean's law, Planck's quantum theory of radiation.

Unit-3 Maxwellian distribution of speeds in an ideal gas: Distribution of speeds and velocities, experimental verification, distinction between mean, rms and most probable speed values. Doppler broadening of spectral lines. Transport phenomena in gases: Molecular collisions mean free path and collision cross sections. Estimates of molecular diameter and mean free path. Transport of mass, momentum and energy and interrelationship, dependence on temperature and pressure.
Behaviour of Real Gases: Deviations from the Ideal Gas Equation. The Virial Equation. Andrew's Experiments on CO_2 Gas. Critical Constants.

Unit-4 The statistical basis of thermodynamics: Probability and thermodynamic probability, principle of equal a priori probabilities, statistical postulates. Concept of Gibb's ensemble, accessible and inaccessible states. Concept of phase space, γ phase space and μ phase space. Equilibrium before two systems in thermal contact, probability and entropy, Boltzmann entropy relation. Boltzmann canonical distribution law and its applications, law of equipartition of energy.

Signatures :

HOD : ----------- 14-7-22

External subject Experts: 1- -------------------2-----------------------3---------------------

Departmental Members : 1---------------2---------3-----------------4----------------5------------
6----------------7-----------8-------------9------

Student Members: 1-- Ch. Alekhya ----------2--------------------------3---------------------

Transition to quantum statistics: 'h' as a natural constant and its implications, cases of particle in a one-dimensional box and one-dimensional harmonic oscillator.

Unit-5 Indistinguishability of particles and its consequences, Bose-Einstein & Fermi-Dirac conditions, Concept of partition function, Derivation of Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac Statistics, Limits of B-E and F-D statistics to M-B statistics. Application of B-E statistics to black body radiation, Application of F-D statistics to free electrons in a metal.

TEXT AND REFERENCE BOOKS:
1. B.B. Laud, "Introduction to Statistical Mechanics" (Mcmillan 1981)
2. F. Reif : "Statistical Physics" (Mcgraw-Hill, 1998).
3. K, Haung : "Statatistical Physics" (Wiley Eastern, 1988).
4. Thermal and statistical Physics: R.K. Singh, Y.M. Gupta and S. Sivraman.
5. Statistical Physics: Berkeley Physics Course, Vol. 5
6. Physics (Part-2): Editor, Prof. B.P. Chandra, M.P. Hindi Granth Academy.
7. Heat and Thermodynamics: K.W. Zeemansky.
8. Thermal Physics: B.K. Agarwal.
9. Heat and Thermodynamics: Brij Lal and N. Subramanyam.
10. Heat and Thermodynamics: Dayal, Verma and Pandey.
11. A Treatise on Heat: M.N. Saha and B.N. Srivastava.

<u>Note:-</u> **Pattern of Questions paper setting**

Section A - Objective type – 1x10=10 marks, 10 questions – select 2 questions form each unit each carry 1 marks.
Section B - Short Answer type – 3x5 =15 marks, 02 questions from each unit (total 10 question) each carrying 3 marks. Word Limit (75-100 Words)
Section C – Long Answer type – 5x5 =25 marks, 02 long questions from each unit (total 10 question) each carrying 5 marks. Word Limit (250-300 Words)

Signatures :

HOD : --------

External subject Experts: 1- ---------- 2---------- 3--------------

Departmental Members : 1---------- 2---------- 3---------- 4---------- 5----------
6---------- 7---------- 8---------- 9----------

Student Members: 1--Ch.Alekhya 2---------- 3--------------

Department of Physics
College of Science, RAIPUR

PAPER – II (Code- 2035)
(WAVES, ACOUSTICS AND OPTICS)

Unit-1 Waves in media: Speed of transverse waves on uniform string, speed of longitudinal waves in a fluid, energy density and energy transmission in waves. Waves over liquid surface: gravity waves and ripples. Group velocity and phase velocity and relationship between them. Production and detection of ultrasonic and infrasonic waves and applications.

Reflection, refraction and diffraction of sound : Acoustic impedance of a medium, percentage reflection & refraction at a boundary, impedance matching for transducers, diffraction of sound, principle of a sonar system, sound ranging.

Unit-2 Fermat's Principle of extremum path, the aplanatic points of a sphere and other applications. Cardinal points of an optical system, thick lens and lens combinations. Lagrange equation of magnification, telescopic combinations, telephoto lenses. Monochromatic aberrations and their reductions; aspherical mirrors and Schmidt corrector plates, aplanatic points, oil immersion objectives, meniscus lens.
Optical instruments: Entrance and exit pupils, need for a multiple lens eyepiece, common types of eyepieces. (Ramsdon and Hygen's eyepieces).

Unit-3 Interference of light: The principle of superpositions, two slit interference, coherence requirement for the sources, optical path retardations, Conditions for sustained interference, Theory of interference, Thin films. Newton's rings and Michelson interferometer and their applications its application for precision determinations of wavelength, wavelength difference and the width of spectral lines. Multiple beam interference in parallel film and Fabry-Perot interferometer. Rayleigh refractometer, Twyman-Green interferometer and its uses.

Unit-4 Diffraction, Types of Diffraction, Fresnel's diffraction, half-period zones, phasor diagram and integral calculus methods, the intensity distribution, Zone plates, diffraction due to straight edge, Fraunhofer diffraction due to a single slit and double slit, Diffraction at N-Parallel slit, Plane Diffraction grating, Rayleigh criterion, resolving power of grating, Prism, telescope.

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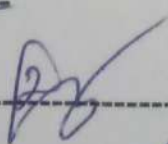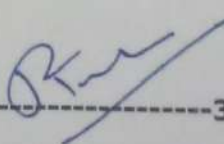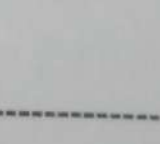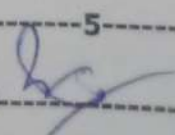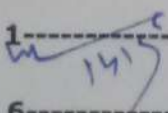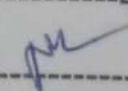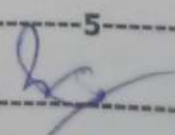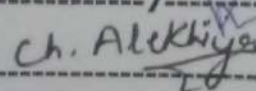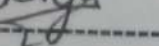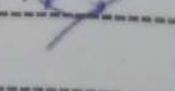
HOD : ----------------------------22----

External subject Experts: 1- ----------------------2----------------------------3----------------------

Departmental Members : 1----------------2----------3----------------4----------------5------------

6----------------7----------------8----------------9----------------

ch. Alekhya

Student Members: 1----------------------2----------------------------3----------------------

Polarized light and its mathematical representation, Production of polarized light by reflection, refraction and scattering. Polarization by double refraction and Huygen's theory, Nicol prism, Retardation plates, Production and analysis of circularly and elliptically polarized light. Optical activity and Fresnel's theory, Biquartz polarimeter.

Unit-5 Laser system: Basic properties of Lasers, coherence length and coherence time, spatial coherence of a source, Einstein's A and B coefficients, Spontaneous and induced emissions, conditions for laser action, population inversion, Types of Laser : Ruby and, He-Ne laser and. Applications of laser : Application in communication, Holography and Basics of non linear optics and Generation of Harmonic.

TEXT AND REFERENCE BOOKS:

1. A.K. Ghatak, 'Physical Optics'
2. D.P. Khandelwal, Optical and Atomic Physics' (Himalaya Publishing House, Bombay, 1988)
3. K.D. Moltev; 'Optics' (Oxford University Press)
4. Sears: 'Optics'
5. Jenkins and White: 'Fundamental of Optics' (McGraw-Hill)
6. B.B. Laud: Lasers and Non-linear Optics (Wiley Eastern 1985)
7. Smith and Thomson: 'Optics' (John Wiley and Sons)
8. Berkely Physics Courses: Vol.-III, 'Waves and Oscillations'
9. I.G. Main, 'Vibrations and Waves' (Cambridge University Press)
10. H.J. Pain: 'The Physics of Vibrations and Waves' (MacMillan 1975)
11. Text Book of Optics: B.K. Mathur
12. B.Sc. (Part III) Physics: Editor: B.P. Chandra, M.P. Hindi Granth Academy.
13. F. Smith and J.H. Thomson, Manchester Physics series: optics (John wiley, 1971)
14. Born and Wolf : 'Optics'.
15. Physical Optics: B. K. Mathur and T. P. Pandya.
16. A textbook of Optics: N. Subrahmanyam, Brijlal and M. N. Avadhanulu.
17. Geometrical and Physical Optics: Longhurst.
18. Introduction to Modern Optics: G. R. Fowels.
19. Optics: P. K. Srivastav.

Note:- Pattern of Questions paper setting

Section A - Objective type – 1x10=10 marks, 10 questions – select 2 questions form each unit each carry 1 marks.

Section B - Short Answer type – 3x5 =15 marks, 02 questions from each unit (total 10 question) each carrying 3 marks. Word Limit (75-100 Words)

Section C – Long Answer type – 5x5 =25 marks, 02 long questions from each unit (total 10 question) each carrying 5 marks. Word Limit (250-300 Words)

Department of Physics
College of Science, RAIPUR

Signatures :

HOD : ----

External subject Experts: 1- ---------------- 2---------------- 3----------------

Departmental Members : 1----------------2----------------3----------------4----------------5----------------

6----------------7----------------8----------------9----------------

Student Members: 1---- Ch. Alekhiya ----2----

B.Sc. III, ZOOLOGY (2021-2022)

Paper-I: ECOLOGY, ENVIRONMENTAL BIOLOGY; TOXICOLOGY; MICROBIOLOGY AND MEDICAL ZOOLOGY

Unit: I (Ecology)

1. Aims and scopes of ecology
2. Major ecosystems of the world-Brief introduction
3. Population- Characteristics and regulation of densities
4. Communities and ecosystem
5. Bio-geo chemical cycles
6. Air & water pollution
7. Ecological succession

Unit: II (Environmental Biology)

1. Laws of limiting factor
2. Food chain in fresh water ecosystem
3. Energy flow in ecosystem- Trophic levels
4. Conservation of natural resources
5. Environmental impact assessment

Unit: III (Toxicology)

1. Definition and Classification of toxicants
2. Basic concepts of toxicology
3. Heavy metal toxicity (Arsenic, mercury, lead, cadmium)
4. Animal poisons- snake venom, scorpion & bee poisoning
5. Food poisoning

Unit: IV (Microbiology)

1. General and applied microbiology
2. Microbiology of domestic water and sewage
3. Microbiology of milk & milk products
4. Industrial microbiology: fermentation process, production of Penicillin, alcoholic beverages, bioleaching

Unit:V (Medical Microbiology)

1. Brief introduction to pathogenic microorganisms, Rickettsia, Spirochaetes, AIDS and typhoid
2. Brief account of life history & pathogenicity of the following pathogens with reference to man: prophylaxis & treatment: (a) Pathogenic protozoans- Entamoeba, Trypanosome & Plasmodium (b)Pathogenic helminths- Schistosoma (c) Nematode pathogenic parasites of man
3. Vector insects

Note: There will be 3 sections in each paper and each paper will cover all the units. Section A with 10 multiple choice/ objective questions of 1 mark each without internal choice. Section B with 5 short answer type question of 3 marks each with internal choice and section C with 5 long answer type question no f 5 marks each with internal choice.

B.Sc. III, ZOOLOGY (2021-22)

Paper- II: GENETICS, CELL PHYSIOLOGY, BIOCHEMISTRY, BIOTECHNOLOGY AND BIOTECHNIQUES

Unit: I (Genetics)

- Linkage & linkage maps, Sex determination and sex linkage
- Gene interaction – incomplete dominance & codominance, supplementary gene, complimentary gene, epistasis lethal gene, Pleiotropic Gene and multiple alleles
- Mutation: Gene & chromosomal mutation
- Human genetics: chromosomal alteration: Down, Edward, Patau, Turner and Klinefelter syndrome, single gene disorders: Alkaptonuria, Phenylketonuria, Sickle cell anemia, albinism and colour blindness.

Unit: II (Cell Physiology)

- General idea about pH & buffer
- Transport across membrane: Diffusion and osmosis
- Active transport in mitochondria & endoplasmic reticulum
- Enzymes- Classification and action

Unit: III (Biochemistry)

- Amino acids & peptides- Basic structure & biological function
- Carbohydrates & its metabolism- Glycogenesis; Gluconeogenesis; Glycolysis; Glycogenolysis; Cosi-cycle
- Lipid metabolism- Oxidation of glycerol; Oxidation of fatty acids
- Protein metabolism- Deamination, transamination, transmethylation;

Unit: IV (Biotechnology)

- Application of Biotechnology
- Recombinant DNA & Gene cloning
- Cloned genes & other tools of biotechnology (Tissue culture, Hybridoma, Transgenic animals and gene library)

Unit: V (Biotechniques)

- Principles & techniques about the following:
  (i) pH meter
  (ii) Colorimeter
  (iii) Microscopy- Light microscopes: compound, Phase contrast & Electron microscopes
  (iv) Centrifuge
  (v) Separation of biomolecules by chromatography & electrophoresis

Note: There will be 3 section in each paper and each paper will cover all the units. Section A with 10 multiple choice/ objective questions of 1 mark each without internal choice. Section B with 5 short answer type question of 3 marks each with internal choice and section C with 5 long answer type question no f 5 marks each with internal choice.

12

B. Sc. II: ZOOLOGY (2021-2022)
PAPER-I
ANATOMY AND PHYSIOLOGY

Unit: I Comparative Anatomy of various organ systems of vertebrates
1. Integument and its derivatives: structure of scales, hair and feathers
2. Alimentary canal and digestive glands in vertebrates
3. Respiratory organs : Gills and lung , air-sac in birds

Unit: II
1. Endoskeleton: (a) Axial skeleton -skull & vertebrae (b) appendicular skeleton- Limbs, girdles
2. Circulatory System: Evolution of heart and aortic arches
3. Urinogenital System: Kidney and excretory ducts

Unit: III
1. Nervous System: General plan of brain and spinal cord
2. Ear and eye: Structure and function
3. Gonads and genital ducts
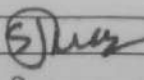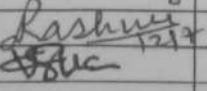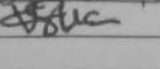
Unit: IV
1. Digestion and absorption of dietary components
2. Physiology of heart, cardiac cycle and ECG
3. Blood Coagulation
4. Respiration: mechanism and control of breathing
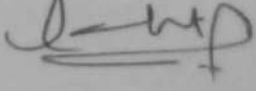
Unit: V
1. Excretion: Physiology of excretion, osmoregulation
2. Physiology of muscle contraction
3. Physiology of nerve impulse, Synaptic transmission

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Signature of B.o.S. members:

Chairman		Dr. Seema Gupta		Dept.Members-1	Dr. R. Maheshwari	
Subject expert	1	Dr. S.K. Prasad		2.	Dr. P. Mishra	
	2.	Dr. Kanti Chaubey		3.	Mrs. I. Mandrik	
	3.	Dr. Rashmi Sao		4.	Dr. K. Das	
Corporate sector		Shri Vinay Shukla		5.	Dr. Shashi Gupta	
Ex. Student member		Ku. Priyanka Sahu		6.	Dr. P. Sinha	
				7.	S. Raulett	

B. Sc. II: ZOOLOGY (2021-2022)
PAPER-II
VERTEBRATE ENDOCRINOLOGY, REPRODUCTIVE BIOLOGY BEHAVIOUR, EVOLUTION AND APPLIED ZOOLOGY

Unit: I
1. Structure and function of endocrine gland
2. Hormone receptor
3. Biosynthesis and secretion of thyroid, adrenal, ovarian and testicular hormones
4. Endocrine disorder Pituitary, thyroid, adrenal and Pancreas

Unit:II
1. Reproductive cycle in vertebrates
2. Menstruation, lactation and pregnancy
3. Mechanism of parturition
4. Hormonal regulation of gametogenesis

Unit: III
1. Evidences of organic evolution.
2. Theories of organic evolution.
3. Variation, Mutation, Isolation and Natural selection.
4. Evolution of Horse
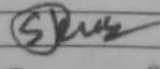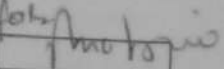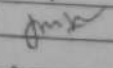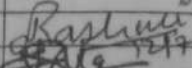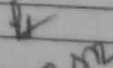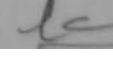
Unit:IV
1. Introduction to Etholog: Branches and concepts of ethology
2. Patterns of Behaviour: Taxes, Reflexes, Drives and Stereotyped behaviours.
3. Reproductive behavioural patterns.
4. Drugs and behaviour, Hormones and behaviour

Unit:V
1. Prawn culture
2. Sericulture
3. Apiculture
4. Pisciculture
5. Poultry keeping
6. Elements of pest control-
   1. Chemical control
   2. Biological control

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Subject expert		Dr. Seema Gupta				
	1	Dr. S.K. Prasad		2.	Dr. P. Mishra	
	2.	Dr. Kanti Chaubey		3.	Mrs. I. Mandrik	
	3.	Dr. Rashmi Sao		4.	Dr. K. Das	
Corporate sector		Shri Vinay Shukla		5.	Dr. Shashi Gupta	
Ex. Student member		Ku. Priyanka Sahu		6.	Dr. P. Sinha	
				7.	S. Ramlli	

B.Sc. Part III
Paper I
MOLECULAR BIOLOGY

Unit – I   Basic Concepts of Genetic Information   **M.M. 50 Marks**

Nucleic acids as genetic information carriers, experimental, TMV reconstitution experiment. Central dogma of molecular genetics-current version, reverse transcription and retroviruses. Primary structure of nucleic acids and their properties, salient features of Eukaryotic, prokaryotic and viral genomes; highly repetitive, moderately repetitive and unique DNA sequences. Basic concepts about the secondary structure of nucleic acids, 5' ---> 3' direction antiparallel strands, base composition, base equivalence, base pairing and base-stacking in DNA molecule. Tm and buoyant density and their relationship with G-C content in DNA.

Unit – II   Structure Levels of Nucleic Acids and Sequencing

Secondary and Tertiary structure of DNA; Watson and Crick model, A, B and Z types of DNA, major and minor grooves, chirality's of DNA, tertiary Structure of DNA. Structure and properties of RNA: secondary and tertiary structures. Nucleic acid hybridization: Cot value and satellite DNA. Sequencing: Restriction and modification system, sequencing of DNA and RNA.

Unit – III DNA Replication

DNA replication in prokaryotes-conservative, semiconservative and Dispersive types, experimental evidence for semiconservative replication. DNA polymerases, other enzymes and protein factors involved in replication.

Transcription: Transcription in prokaryotes. RNA polymerase, promoters, initiation, Elongation and termination of RNA synthesis, inhibitors of transcription. Reverse transcriptase, post-transcriptional processing of RNA in eukaryotes.

Unit – IV Translation and Regulation of Gene Expression

Genetic code: Basic features of genetic code, biological significance of degeneracy. Wobble hypothesis, gene within genes and overlapping genes. Mechanisms of translation: Ribosome structure, A and P sites, charged tRNA f-met-tRNA, inititor codon, Shine-Dalgarno consensus sequence (AGGA), formation of 70S initiation complex, role of EF-Ts, EF-G and GTP, non – sense codons and release factors, RF1 and RF2. Regulation of Gene Expression in prokaryotes: Enzyme induction and repression, operon concept, Lac operon, Try operon.

Unit – V Mutation and Repair

Mutation: Molecular basis of mutation, types of mutation, e.g. transition, frame shift, insertion, deletion, suppresser sensitive, germinal and somatic, backward and forward mutations, true reversion and suppression, dominant and recessive mutations, spontaneous and induced mutations – Lederberg's replica plating experiment. Mutagenecity testing: Correlation of mutagenecity and carcinogenicity : Ames testing, Random and site- directed mutagenesis . DNA Repair : UV repair system in E. coli, significance of thymine in DNA.

Recombinant DNA Technology

Restriction endonuleases, brief discussion of steps in DNA cloning .

Applications of recombinant DNA technology.

Pattern of Question Paper

Section	Type of Question	Word Limit	No. of Questions	Marks in each question	Marks in Section
Section A	Objective Type/MCQ	-	10 (Two From Each Unit)	1	10
Section B	Short Answer Type	75-100 words	5 (From Each Unit with internal Choice)	3	15
Section C	Long Answer Type	150- 250 Words	4 (From Each Unit with internal Choice)	05	25
			Total Marks		50

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B.Sc. Part – III
Paper - II
NUTRITIONAL, CLINICAL & ENVIRONMENTAL BIOCHEMISTRY

M.M. 50 Marks

Unit -1   **Nutritional Biochemistry**

Introduction and definition of foods and nutrition. Factors determining food acceptance, physiological, energy, body building (growth and development). Regulation of body temperature. Physiology and nutrition of carbohydrates, fats, proteins and water. Vitamins A, D, E, K, Vit. B-complex and Vit. C and minerals like Ca, Fe and Iodine and their biological functions. Basic food groups: energy giving foods, body building foods and protective Foods. Composition of balance diet, recommended dietary allowances (RDA) for average Indian, Locally available foods, inexpensive quality foods stuffs rich in more than one nutrients. Balanced vegetarian and non-vegetarian diets, emphasis on nutritional adequacy.

Unit – II   **Nutritive and calorific value of foods**

Basic concepts of energy expenditure, units of energy, measurement of energy expenditure by direct or indirect calorimetry, calculation of non-protein RQ with respect to carbohydrate and lipids. Determination of heat production of the diet. The basal metabolic rate (BMR) ; energy requirements during growth pregnancy, lactation and various physical activities. Calculation of energy expenditure of average man and woman .Specific dynamic action (SDA) of foods, nutritive value of various kinds of foods generally used by Indian population. Planning of dietary regimes for infants, during pregnancy and old age. Malnutrition, its implications and relationship with dietary habits and prevention of malnutrition specially protein-calorie malnutrition (Kwashiorkor and Marasmus) by improvement of diets. Human milk and its virtues, breast vs formulated milk feeding. Food preservation standards, food adulterations and precautions, government regulations on preservation and quality of food .

Unit – III Clinical Biochemistry

Basic concept of clinical biochemistry

a. Definition and scope of clinical biochemistry in diagnosis, a brief review of units and abbreviations used in expressing concentrations and standard solutions. Quality control. Manual vs automation in clinical laboratory.

b. Collection and preservation of biological fluids (blood, serum, plasma, urine and CSF). Chemical analysis of blood, urine and CSF. Normal values for important constituents (in SI units) in food (plasma / serum), CSF and urine, clearance test for urea.

Unit –IV

Clinical enzymology

a. Definition of functional and non-functional plasma enzymes and diagnostic tests. Enzyme pattern in health and diseases with special mention of plasma lipase, amylase, cholinesterase, alkaline and acid phosphatase, SGOT , SGPT,LDH and CPK .

b. Functional tests of kidney, liver, and gastric fluids.

Disease related to metabolism

Hypo and Hyper-glycemia, glycogen storage diseases; lipid mal-absorption And steatorrhea, sphingolipidosis; role of lipoproteins. Inborn errors of amino Acid metabolism-alkaptonuria, phenyl-ketonuria , albinism , gout and hyper-uricemia.

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Unit – V   **Environmental Biochemistry**

Air pollution: Particulate matter, compounds of carbon, sulphur, Nitrogen and their inter-reactions, methods of their estimation, their effect on atmosphere.

Water pollution: Types of water bodies and their general characteristics, major pollutants in Domestic, agricultural and industrial wastes, methods of their estimation, Effects of pollutants on plants and animals, treatment of domestic and Industrial wastes, solid-wastes, and their treatment.

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Pattern of Question Paper

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			Total Marks		50

	Name and Signature	(Professor Science Faculty Other Dept.)
Chairperson /H.O.D		
Subject Expert (University Nominee) .... 5 Kumar 27/10/21		
Subject Expert (Academic Council) 1. .... 27.1.21 2.		
Representative (Industry).........................		
Representative (Alumni).........................		

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B. Sc. Part II
Paper I
ENZYMOLOGY

M.M. 50 Marks

Unit – I   Introduction

History,   general characteristics,   nomenclature,   IUB enzyme classification (Rationale, overview and specific examples), significance of numbering system. Definitions with examples of holoenzyme, apoenzmyem coenzymes, cofactors, Activators, inhibitors, active site (identification of groups excluded), metallo-Enzymes, units of enzyme activity, specific enzymes, isoenzymes, monomeric Enzymes, algometric enzymes and multi-enzyme complexes. Enzyme specificity. Historical perspective, nature of non-enzyme activity-enzyme assays. Definition of IU, Katal, enzyme turn over number and specific activity.

Unit – II   Enzyme catalysis

Role of cofactors in enzyme catalysis: NAD/NADP, FMN/FAD, coenzyme A, Biocytin, cobamide, lipoamide, TPP pyridoxal phosphate, tetrahydrofolate and Metal ions with special emphasis on coenzyme functions. Acid-base catalysis, Proximity and orientation effects, strain and distortion theory.

Unit – III   Enzyme Purification

Methods for isolation, purification and characterization of enzymes. Role of non-Protein organic molecules and inorganic ions-coenzyme, prosthetic groups. Role of Vitamins as coenzymes precursors (general treatment) Mechanism of action of   chymotrypsin carboxypeptidase, ribonuclease and lysozyme.

Unit-VI   Enzyme Kinetics

Factors affecting enzyme activity: enzyme concentration, substrata concentration, pH and temperature. Derivation of Michaoils-Mentenequation for uni-substrate reactions. Km and its significance. Line Weaver-Burk plot and its limitations.

Importance of Kcm/Km Bi-substrate reactions-brief introduction to sequential and Ping-pong mechanism with examples. Kinetics of zero and first order reactions. Significance and evaluation of energy of Activation and free energy. Reversible and irreversible inhibition, competitive, non-competitive and Uncompetitive inhibitions, determination of Km & V max in presence and Absence of inhibitor: Allosteric enzymes.

Unit – V   Industrial and Clinical Application of Enzymes

Immobolization of enzymes and their industrial applications. Production Of glucose, starch, cellulose and dextran; use of lactase in dairy industry Production of glucose syrup

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from sucrose; Use of Proteases in food, detergent And leather industry application of enzymes; Use of glucose oxidase in Electrodes.

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Pattern of Question Paper

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B.Sc. Part II

Paper II
INTERMEDIARY METABOLISM

Course objective:

1. To provide the students an understanding about the major metabolic pathways of different types of metabolism such as carbohydrates, lipids, amino acids and nucleic acid with their regulation.

2. To provide the student's knowledge about the possible correlation between all metabolic pathway.

Course Outcomes (COs)

On successful completion of the course, the student shall be able to:

CO.1 – Describe the fundamentals of thermodynamics in biochemical processes.

CO.2 – Acquire the knowledge of energy production in living systems by the degradation of fatty acids.

CO.3 – Explain the various pathways of fatty acid synthesis in living systems.

CO.4 – Describe the energy generated from the carbohydrate metabolism.

CO.5 – Explain the mechanism of the machinery system involved in carbohydrate metabolism.

CO.6 – Discuss breakdown and synthesis of amino acids in humans and recognize its relevance with respect to nutrition and human diseases.

CO.7 – Describe how amino acids are converted into a variety of precursors.

CO.8 – Describe breakdown and synthesis of nucleotides in humans and recognize its relevance with respect to nutrition and human diseases.

CO.9 – Explain inhibitors of nucleotide metabolism, which are potentially being used as chemotherapeutic drugs.

CO.10 – Define citric acid cycle and oxidative phosphorylation in the cell.

B.Sc. Part II
Paper II
INTERMEDIARY METABOLISM

M.M. 50 Marks

Unit – I **Introduction to Metabolism**

General features of metabolism, experimental approaches to study metabolism: Use of intact organism, bacterial mutants, tissue slices, stable and radioactive Isotopes.

Carbohydrate Metabolism

Reactions and energetics of glycolysis. Alcoholic and lactic acid fermentations. Entry of fructose, galactose, mannose etc. Reactions and energetic of TCA Cycle. Gluconeogenesis, glycogenesis and glycogenolysis. Reaction and Physiological significance of pentose phosphate pathway. Regulation of Glycolysis and TCA cycle Photosynthesis a brief review.

Unit – II **Electron Transport Chain and Oxidative Phosphorylation**

Structure of mitochondria, sequence of electron carriers, sites of ATP production, inhibitors of electron transport chain. Hypothesis of mitochondrial Oxidative phosphorylation . Transport of reducing potentials into mitochondria.

Unit – III **Lipid Metabolism**

Introduction, hydrolysis of triacylglycerols, transport of fatty acids into Mitochondria, B oxidation saturated fatty acids, ATP yield from fatty acid Oxidation. Biosynthesis of saturated and unsaturated fatty acids. Metabolim of Ketone bodies, oxidation of unsaturated and odd chain fatty acids. Biosynthesis of triglycerides and important phospholipids, glycolipids, sphingolipids and cholesterol. Regulation of cholestoral metabolism.

Unit – IV **Amino acid Metabolism**

General reactions of amino acid metabolism : transamination, oxidative Deamination and decarboxylation. Urea cycle. Degradation and biosynthesis of Amino acids. Glycogenic and ketogenic amino acids.

Unit – V **Nucleotide Metabolism**

Sources of the atoms in the purine and pyrimidine molecules. Biosynthesis and Degradation of purines and pyrimidines biosynthesis.

Porphyrin Metabolism

Biosynthesis and degradation of porphyrins. Production of bile pigments

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Pattern of Question Paper

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Section C	Long Answer Type	150-250 Words	4 (From Each Unit with internal Choice)	05	25
			Total Marks		50

18

MM-50

UNIT-I

1. Introduction to Plant cell and Tissue culture: History, Scope and Application.
2. Tissue culture Media and Cellular Differentiation.
3. Protoplast Isolation and Fusion, Organogenesis , Embryogenesis, Anther and Ovary culture.

UNIT-II

1. Agrobacterium Mediated Transformation, Ti and Ri Plasmid.
2. Bt Gene and Bt Cotton, Edible vaccines and Genetically modified plants- Golden rice, Herbicide Resistance, Drought Resistance.
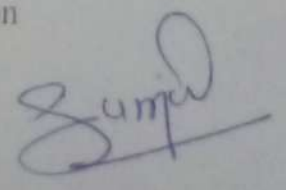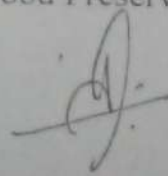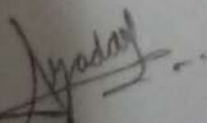3. Germplasm storage and Cryopreservation.

UNIT-III

1. General Introduction and Scope of Environmental Biotechnology.
2. Environmental Pollution and its type.
3. Solid Waste Management: Principle of management. Types of Sources, Effect of Solid waste. Concept of composting and Vermi composting.
4. Wastewater Treatment: Physical. Chemical, and Biological.

UNIT-IV

1. Biofertilizer and Biopesticides-Cyanobacteria, Bacteria, Fungi; Significance and Practices
2. Bioremediation of Xenobiotic compounds.
3. Types of IPR-Patents, Copyright, Trademark, G.I., Patenting Genes and Life form.

UNIT-V

1. Types of Bioreactor; Design of Stirred tank, Fliidized bed.
2. Fermentation: Lactic acid and Alcohol.
3. Industrially important Microorganisms: Isolation, Preservation (Slant, Mineral Oil and Lyophilize) and its application.
4. Food Technology: Food spoilage Canning. Packing and Food Preservation

UNIT-I

MM-50

1. Concept of Immunity: Innate and Acquired, Humoral and Cell mediated Response.
2. Cells and Organs involved in Immune system-Structure and Function.
3. Antigen, Antibody: Types, Structure and Functions.

UNIT-II

1. Cytokines
2. Autoimmune diseases- Hemolytic Anemia. Rheumatoid arthritis. Insulin dependent diabetes.
3. Immuno deficiencies. Diseases- SCID, AIDS

UNIT-III

1. Antigen-Antibody Interaction: Agglutination, Precipitation, RIA, ELISA, Immuno Electrophoresis and Immunofluorescence.
2. Immunity of Infectious Diseases: Protozoa (Malaria, Kalaazar), Bacteria (TB, Typhoid) and Virus (Influenza, Pox).
3. Fundamental of Epidemic Diseases: Swine flu and Dengue.

UNIT-IV

1. Animal Cell Culture and Growth Media.
2. Primary, Secondary culture and Established Cell line Culture.
3. Tissue engineering: Basic Concept, Transgenic animal: Mice and Sheep.

UNIT V

1. Hypersensitivity, Interferon and Monoclonal Antibody.
2. Organ Transplantation, Biology of Cancer.
3. *In vitro* fertilization and Embryo Transfer.

MM 50

Unit I

1. Nucleic acids: Bases , Nucleosides and nucleotides, DNA & RNA structure
2. Plasmids
3. Transposons: Repetitive elements, LINEs & SINEs, Structure of Gene

Unit II
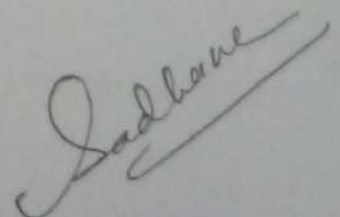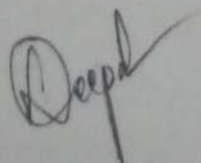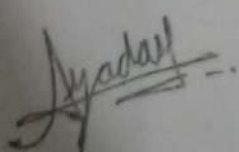
1. DNA replication: Enzymes involved and mechanism of DNA replication in prokaryotes.
2. Mutation: Molecular level of mutation, Types of mutagens, Spontaneous and induced mutations.
3. DNA Repair: NER, BER and Mismatch repair

Unit III

1. Genetic code: Features, Codon assignment and Wobble hypothesis.
2. Transcription: Initiation, Elongation & Termination in Prokaryotes
3. Translation : Initiation, Elongation & Termination Translation machinery in Prokaryotes
   Operon: Concept of Operator, Regulator, Promoter gene, Inducer and Co-Repressor

Unit IV

1. Biophysics- Introduction, scope & application
2. Principle, structure & functions of following-

   a. Microscopy b. Colorimeter and Spectroscopy c. Electrophoresis

   d. Centrifugation e. Chromatography

MM 50

Unit I

1. Recombinant DNA Technology : General Concept, Steps in gene cloning & Application
2. Host controlled Restriction Modification system, Ligases and polymerases, Klenow fragment, Taq, Pfu polymerase and nuclease (Endo, Exo and Restriction endonuclease).
3. Modification enzyme (Kinase, Phosphatase and terminal deoxynucleotidyl transferase). Reverse transcriptase.

Unit II

1. Vectors: Plasmid, Bacteriophages, Cosmid, SV 40 and expression vectors'
2. Gene library: Genomic and cDNA library
3. Selection and screening of recombinants: Genetic and hybridization methods.

Unit III
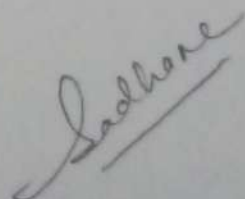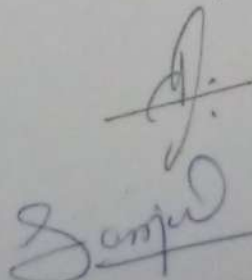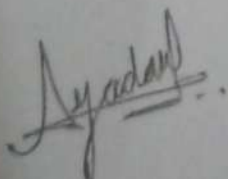
1. PCR: Types of PCR , Steps (Denaturation, Annealing and extension) ; Applications, Advantages & limitations of PCR
2. Molecular marker- RFLP, RAPD and microarray.
3. Human genome project

Unit IV

1. Basic concept of gene transfer methods: Microinjection, electroporation, lipofection and microprojectile.
2. Gene therapy- in vivo and ex vivo, Germ line and somatic gene therapy.
3. Basic idea of Stem cell technology: Types of stem cell cultures and their significance.

Unit V

1. Introduction to Bioinformatics: History, objective and application.
2. Major Bioinformatics resources: NCBI, Types of databases (Primary and secondary databases) , BLAST and FASTA
3. Basic concept of Genomics and proteomics.

Unit V

1. Radioisotopes techniques: Measurement of radioactivity, Ionization chambers, Geiger Muller and Scintillation counter.
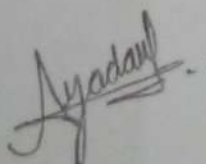2. Autoradiography & DNA fingerprinting
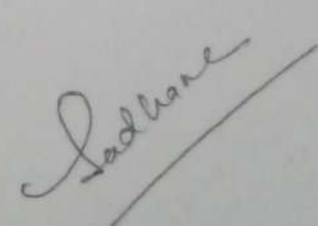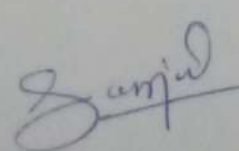3. Biosensor

List of Books:

1. C.B. Pawar: Cell Biology, Himalay Publishing House
2. Gerald Karp: Cell & Molecular Biology(2005)
3. Lewis, Smith& Valerie: Principles of Cell & Molecular Biology(2002)
4. P.K. Gupta: Cell & Molecular Biology (2003), Rastogi Publications.
5. R. Twyaman: Advanced Molecular Biology (1998)
6. Wilson & Walker: Principle & Techniques of Biotechnology & molecular biotechnology.
7. Upadhya & Upadhya, Biophysical Chemistry.

Pattern of Questions paper

n	Type of Questions	Word Limit	No. of Questions	Mark in each Questions	Marks in each Section
n A	Objective type/ MCQ	-	10 (Two questions from each unit)	01	10
n B	Short Answer type	75-100 Words	5 (Two questions from each unit with internal choice)	03	15
n C	Long Answer type	250-300 Words	5 (Two questions from each unit with internal choice)	05	25
			Total Marks		50

Members of Board of Studies in B.Sc. Biotechnology

B.SC.-III (BOTANY) PAPER –I

(ANALYTICAL TECHNOLOGY, PLANT PATHOLOGY, EXPERIMENTAL EMBRYOLOGY, ELEMENTARY BIOSTATISTICS, ENVIRONMENTAL POLLUTION AND CONSERVATION)

UNIT-I

Structure, Principle, and applications of analytical instrumentation.
Chromatography technique, Oven, Incubator, Autoclave, Centrifuge, Spectrophotometer

UNIT-II

Plant Tissue culture techniques, growth media, totipotency, protoplast culture, somatic hybrids and cybrids, micropropagation, soma clonal variations, haploid culture.

Analytical techniques: Microscopy-Light microscope, Electron microscope

UNIT-III

General principles of plant pathology, general symptoms of fungal, bacterial, and viral diseases, mode of infection, diseases resistance and control measures, plant quarantine. A study of epidemiology and etiology of following plant diseases.

Rust diseases of wheat, Tikka diseases of ground nut, Red rot of sugar can, Bacterial blight of rice, Yellow vein mosaic of bhindi, Little leaf of brinjal.

UNIT-IV

Introduction to pollution, greenhouse gases, Ozone depletion, Dissolve oxygen, B.O.D., C.O.D.

Bio magnification, Eutrophication, Acid precipitation, Phytoremediation, Plant indicators, Biogeographical Zones of India, Concept of biodiversity, CBD, MAB, National parks and

biodiversity Hot spots, Conservation strategies, Red Data Book, IUCN threat categories, invasive species, endemic species, concept of sustainable development.

UNIT-V

ELEMENTARY BIOSTATISTICS:

Introduction and application of Biostatics, measure of central tendency-Mean, Median, Mode, measures of dispersal-Standard deviation, standard error.

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Pattern of Questions paper

Section	Type of Questions	Word Limit	No. of Questions	Marks in each Question	Marks in Section
Section A	Objective type/ MCQ	-	10 (Two questions from each unit)	01	10
Section B	Short Answer type	75-100 Words	5 (Two questions from each unit with internal choice)	03	15
Section C	Long Answer type	250-300 Words	5 (Two questions from each unit with internal choice)	05	25
Total Marks					50

Books Recommended:

Singh, RS, *Plant Diseases*, Oxford & IBH, New Delhi.

Pandey, BP, *Plant Pathology*, S.Chand Publishing, New Delhi

Sharma, PD, *Microbiology and Plant pathology*, Rastogi Publications, Meerut

Sharma PD, *Mycology and Phytopathology*, Rastogi Publications, Meerut

Singh JS, Singh SP and Gupta, SR, *Ecology Environmental Science and Conservation*, S. Chand Publishing, New Delhi

Sharma, PD, *Ecology and Environment*, Rastogi Publiications, Meerut

Bhojwani, SS and Razdan, MK, *Plant Tissue Culture:Theory and Practices*, Elsevier

Sharma AK, *Text book of Biostatistics*, Discovery Publishing House Pvt. Ltd.

B.Sc.-III (BOTANY) PAPER –II

(GENETICS, MOLECULAR BIOLOGY, BIOTECHNOLOGY AND BIOCHEMISTRY)

UNIT-I

Cell and cell organelles, organization and morphology of chromosomes, giant chromosomes, cell division, Mendel's laws, gene interactions, linkage and crossing over, chromosomal aberration, polyploidy, sex linked inheritance, sex determination, cytoplasmic inheritance, gene concept: cistron, muton, recon.

UNIT-II

Nucleic acids, structure and forms of DNA and RNA, DNA/RNA as genetic material, replication of DNA, biochemical and molecular basis of mutation, genetic code and its properties, mechanism of transcription and translation in prokaryotes, regulation of gene expression, Operon model.

UNIT-III

Recombinant DNA, Enzymes in recombinant DNA technology, cloning vectors (Plasmid, Bacteriophages, Cosmids, Phagemids), gene cloning, PCR, Application of Biotechnology; G.M.Plants, Monoclonal antibodies, DNA finger printing

UNIT-IV

Protein: Chemical composition, primary, secondary and tertiary structure of Proteins. Carbohydrate general account of monosaccharides, disaccharids and Polysaccharides Fat: Structure and properties of fats and fatty acids, synthesis and breakdown.

UNIT-V

ENZYMES: Nomenclature and classifaction, components of enzyme, theories of enzyme action, enzyme kinetics (Michaelis-Menten constant), allosteric enzymes, isozymes, Abzymes. Ribozymes, factors affecting enzyme activity.

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B.Sc.–II (BOTANY) PAPER-I

(PLANT TAXONOMY, ECONOMIC BOTANY, PLANT ANATOMY AND EMBRYOLOGY)

UNIT-I

Bentham and Hooker system of classification. Binomial Nomenclature, International Code of Nomenclature for Algae, Fungi, and plants (IUCN), Typification, numerical Taxonomy and chemotaxonomy. Preservation of Plant material and Herbarium techniques. Important botanical gardens and herbaria of India, Kew Botanical garden, England.

UNIT-II

Systematic position, distinguishing characters and economic importance of the following families, Ranunculaceae, Magnoliaceae, Brassicaeae, Rosaceae, Papaveraceae, Caryophyllaceae, Rutaceae, Cucurbitaceae, Apiaceae, Rubiaceae, Apocynaceae, Asclepiadaceae, Solanaceae, Malvaceae, Convolvulaceae, Orchidaceae, Acanthaceae, verbenaceae, Lamiaceae, Asteraceae, Fabaceae, Euphorbiaceae, Poaceae and Liliaceae.

UNIT-III

Economic Botany: Botanical name, family, part used and uses of the following economically important plants, fiber yielding plants; Cotton, jute, sun, hemp, coir. Timber yielding plants: Sal, Teak, Shisham and Pine. Medicinal plants: Kalmegh, Ashwangandha, Ghritkumari, Giloy, Brahmi, sarpgandha, of medicinal plants of C.G. Food plants: Pearl millet, Buck of wheat, Sorghum, Soyabean, gram, Ground nut, Sugarcane and Potato. Fruit plants: Pear, Peach, Litchi. Spices: Cinnamon, Turmeric, Ginger, Asafoetida and Cumin. Beverages: Tea, Coffee Rubber Cultivation of important flowers: Chrysanthemum, Dahelia, Biodiesel plants Jatropha, Pongamia Ethnobotany in context of Chhattisgarh.

UNIT-IV

Plant Anatomy: Root and shoot apical meristems theories of root and shoot apex organization, permanent tissues, anatomy of root, stem and leaf of dicot and monocot, secondary growth in root and stem, Anatomical anomalies in the primary structure of stems (Nyctanthes, Boerhaavia, Casuarina), Anomalous secondary growth in Dracaena, Bignonia, Laptadenia.

UNIT-V

Embryology: Flower as a reproductive organ, anther, microsporogenesis, types of ovules, megasporogenesis, development of male and female gametophyte, pollination, mechanisms, self-incompatibility, fertilization, endosperm, embryo, polyembryony, apomixes and parthenocarpy.

B.Sc.-II (BOTANY) PAPER-II
(ECOLOGY AND PLANT PHYSIOLOGY)

UNIT-I

Introduction and scope of ecology, environmental and ecological factors, Soil formation and soil profile, Liebig's law of minimum, Shelford's law of tolerance, morphological and anatomical adaptations in hydrophytes, xerophytes and epiphytes.

UNIT-II

Population and community characteristics, Raunkiaer's life forms, population interactions (e.g. Symbiosis, Amensalism etc.), succession, ecotone and edge effect, ecological niches, ecotypes, ecads, keystone species

Concept of ecosystem, trophic levels, flow of energy in ecosystem, food chain and food web, concept of ecological pyramids

Biogeochemical cycles: carbon cycle, nitrogen cycle and phosphorus cycle

UNIT-III

Plant water relations: Diffusion, permeability, osmosis, imbibition, plasmolysis, osmotic potential and water potential, Types of soil water, water holding capacity, wilting, Absorption of water, theories of Ascent of sap, Mineral nutrition and absorption, Deficiency symptoms, Transpiration, stomatal movement, significance of transpiration, Factors affecting transpiration, guttation.

UNIT-IV

Photosynthesis: Photosynthetic apparatus and pigments, light reaction mechanism of ATP synthesis. C3, C4 CAM pathway of carbon reduction, photorespiration, factors affecting photosynthesis.

Respiration: Aerobic and anaerobic respiration, Glycolysis, Kreb's cycle, factors affecting respiration, R.Q.

UNIT-V

Plant growth hormones: Auxin, Gibberellin, Cytokinin, Ethylene and Abscisic acid. Physiology of flowering, Florigen concept, Photoperiodism and Vernalization. Seed dormancy and germination, plant movement.

BSC PART – III CHEMISTRY

The new curriculum will comprise of Three papers of 33, 33, & 34 marks each and Practical work of 50 marks. The curriculum is to be completed in 180 working days as per the UGC norms & conforming to the directives of the Govt. of Chhattisgarh. The theory papers are of 60 hrs. each duration & the practical work of 180 hrs. duration.

PAPER - I

INORGANIC CHEMISTRY   M.M. 33

(Paper Code-0895)

Section –A [Multiple choice/Objective Type] This section contains 8 questions from all five unit at least ONE question is compulsory from each unit (1 marks each)
Section –B [Short answer type] This section contains 5 questions from each unit of 2 marks each with internal choice.
Section –C [Long answer type] contains 5 questions from each unit of 3 marks each with internal choice.

UNIT-I

METAL-LIGAND BONDING IN TRANSITION METAL COMPLEXES

(A) Limitations of valence bond theory, Limitation of Crystal Field Theory, Application of CFSE, tetragonal distortions from octahedral geometry, Jahn–Teller distortion, square planar geometry. Qualitative aspect of Ligand field and MO Theory.

(B) Thermodynamic and kinetic aspects of metal complexes. A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes, Trans- effect, theories of trans effect. Mechanism of substitution reactions of square planar complexes.

UNIT-II

MAGNETIC PROPERTIES OF TRANSITION METAL COMPLEXES

Types of magnetic behavior, methods of determining magnetic susceptibility, spin only formula, LS coupling, correlation of μ_{so} (spin only) and μ_{eff}. values, orbital contribution to magnetic moments, application of magnetic moment data for 3d metal complexes. Electronic spectra of Transition Metal Complexes. Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectro-chemical series. Orgel-energy level diagram for d^1 and d^2 states, discussion of the electronic spectrum of $[Ti(H_2O)_6]^{3+}$ complex ion.

UNIT-III

ORGANOMETALLIC CHEMISTRY

Definition and classification of organometallic compounds on the basis of bond type. Concept of hapticity of organic ligands. Metal carbonyls: 18-electron rule, electron count of mononuclear, polynuclear and substituted metal carbonyls of 3d series. General methods of preparation (direct combination, reductive carbonylation, thermal and photochemical decomposition) of mono and binuclear carbonyls of 3d series. Structures of mononuclear and binuclear carbonyls of Cr, Mn, Fe, Co and Ni using VBT. πacceptor behavior of CO (MO diagram of CO to be discussed), Zeise's salt: Preparation and structure.

Catalysis by Organometallic Compounds – Study of the following industrial processes and their mechanism :

1. Alkene hydrogenation (Wilkinsons Catalyst)

2. Polymeration of ethane using Ziegler – Natta Catalyst

UNIT-IV

BIOINORGANIC CHEMISTRY

Essential and trace elements in biological processes, Excess and deficiency of some trace metals, Toxicity of some metal ions (Hg, Pb, Cd and As), metalloporphyrins with special reference to hemoglobin and myoglobin. Biological role of alkali and alkaline earth metals with special reference to Ca^{2+} and Mg^{2+}, nitrogen fixation.

UNIT-V

HARD AND SOFT ACIDS AND BASES (HSAB)

Classification of acids and bases as hard and soft. Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, Applications of HSAB principle

INORGANIC POLYMERS

Types of inorganic polymers, comparison with organic polymers, synthesis, structural aspects and applications of silicones. Silicates, phosphazenes and polyphosphate

REFERENCE BOOKS:

1. Basic Inorganic Chemistry, F. A. Cotton, G. Wilkinson and P. L. Gaus, Wiley.

2. Concise Inorganic Chemistry, J. D. Lee, ELBS.

3. Concepts of Models of Inorganic Chemistry, B. Douglas, D. Mc Daniel and J. Alexander, John Wiley.

4. Inorganic Chemistry, D. E. Shriver, P. W. Atkins and C. H. Langford, Oxford.

5. Inorganic Chemistry, W. W. Porterfield, Addison – Wiley.

6. Inorganic Chemistry, A. G. Sharp, ELBS.

7. Inorganic Chemistry, G. L. Miessler and D. A. Tarr, Prentice Hall.

8. Advanced Inorganic Chemistry, Satya Prakash.

9. Advanced Inorganic Chemistry, Agarwal and Agarwal.

10. Advanced Inorganic Chemistry, Puri, Sharma, S. Naginchand.

11. Inorganic Chemistry, Madan, S. Chand. & Co.

12. Aadhunik Akarbanic Rasayan, A. K. Shrivastav & P. C. Jain, Goel Pub.

13. Uchchattar Akarbanic Rasayan, satya Prakash & G. D. Tuli, Shyamal Prakashan.

14. Uchchattar Akarbanic Rasayan, Puri & Sharma.

15. Selected topic in Inorganic Chemistry by Madan Malik & Tuli, S. Chand

ORGANIC CHEMISTRY

(Paper Code-0896)

M.M. 33

Section –A [Multiple choice/Objective Type] This section contains 8 questions from all five unit at least ONE question is compulsory from each unit (1 marks each)

Section –B [Short answer type] This section contains 5 questions from each unit of 2 marks each with internal choice.

Section –C [Long answer type] contains 5 questions from each unit of 3 marks each with internal choice.

UNIT-I

HETEROCYCLIC COMPOUNDS

Classification and nomenclature, Structure, aromaticity in 5-membered and 6-membered rings containing one heteroatom; Synthesis, reactions and mechanism of substitution reactions of: Furan, Pyrrole (Paal-Knorr synthesis, Knorr pyrrole synthesis, Hantzsch synthesis), Thiophene, Pyridine (Hantzsch synthesis), Indole (Fischer indole synthesis and Madelung synthesis), Quinoline and isoquinoline, (Skraup synthesis, Friedlander's synthesis, Knorr quinoline synthesis, Doebner- Miller synthesis, Bischler-Napieralski reaction, Pictet- Spengler reaction, Pomeranz-Fritsch reaction)

UNIT-II

A. ORGANOMETALLIC REAGENT

Organomagnesium compounds: Grignard reagents formation, structure and chemical reactions. Organozinc compounds: formation and chemical reactions. Organolithium compounds: formation and chemical reactions

B. ORGANOSYNTHESIS VIA INOLATES

Active methylene group, alkylation of diethylmalonate and ethyl acetoacetate, Synthesis of ethyl acetoacetate: The Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate. Robbinson annulations reaction

UNIT-III

BIOMOLECULES

A.CARBOHYDRATES

Occurrence, classification and their biological importance. Monosaccharides: relative and absolute configuration of glucose and fructose, epimers and anomers, mutarotation, determination of ring size of glucose and fructose, Haworth projections and conformational structures; Interconversions of

aldoses and ketoses; Killiani Fischer synthesis and Ruff degradation; Disaccharides – Structural comparison of maltose, lactose and sucrose. Polysaccharides – Elementary treatment of starch and cellulose.

B. AMINO ACIDS, PROTIENS AND NUCLEIC ACIDS

Classification and Nomenclature of amino acids, Configuration and acid base properties of amino acids, Isoelectric Point, Peptide bonds, Protein structure, denaturation/ renaturation, Constituents of nucleic acid, DNA, RNA nucleoside, nucleotides, double helical structure of DNA

UNIT-IV

A. SYNTHETIC POLYMER

Addition or chain growth polymerization, Free radical vinyl polymerization, Ziegler-Natta polymerization, Condensation or Step growth polymerization, polyesters, polyamides, phenols-formaldehyde resins, urea-formaldehyde resins, epoxy resins and polyurethanes, natural and synthetic rubbers

B. SYNTHETIC DYES

Colour and constitution (Electronic Concept). Classification of Dyes. Chemistry of dyes. Chemistry and synthesis of Methyl Orange, Congo Red, Malachite Green, Crystal Violet, phenolphthalein, fluorescein, Alizarine and Indigo.

UNIT-V

A. INFRARED SPECTROSCOPY

Basic principle, IR absorption Band their position and intensity, IR spectra of organic compounds.

B. UV-VISIBLE SPECTROSCOPY

Beer Lambert's law, effect of Conjugation, Types of electronic transitions λ_{max}, Chromophores and Auxochromes, Bathochromic and Hypsochromic shifts, Intensity of absorption Visible spectrum and colour.

C. NMR SPECTROSCOPY

Basic principles of Proton Magnetic Resonance, Tetramethyl silane (TMS) as internal standard, chemical shift and factors influencing it; Spin – Spin coupling and coupling constant (J); Anisotropic

32

effects in alkene, alkyne, aldehydes and aromatics, Interpretation of NMR spectra of simple organic compounds. ^{13}CMR spectroscopy: Principle and applications

REFERENCE BOOKS :

1. Organic Chemistry, Morrison and Boyd, Prentice-Hall.

2. Organic Chemistry, L. G. Wade Jr. Prentice Hall.

3. Fundamentals of Organic Chemistry, Solomons, John Wiley.

4. Organic Chemistry, Vol I, II, III S. M. Mukherjee, S. P. Singh and R. P. Kapoor, Wiley Easters (New Age).

5. Organic Chemistry, F. A. Carey, McGraw Hill.

6. Introduction to Organic Chemistry, Struiweisser, Heathcock and Kosover, Macmillan.

7. Acheson, R.M. Introduction to the Chemistry of Heterocyclic compounds, John Wiley & Sons (1976).

8. Graham Solomons, T.W. Organic Chemistry, John Wiley & Sons, Inc.

9. McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning IndiaEdition, 2013.

10. Kalsi, P. S. Textbook of Organic Chemistry 1st Ed., New Age International (P) Ltd. Pub.

11. Clayden, J.; Greeves, N.; Warren, S.; Wothers, P.; Organic Chemistry, Oxford University Press.

PHYSICAL CHEMISTRY

M.M. 34

(Paper Code-0897)

Section –A [Multiple choice/Objective Type] This section contains 98 questions from all five unit at least ONE question is compulsory from each unit (1 marks each).

Section –B [Short answer type] This section contains 5 questions from each unit of 2 marks each with internal choice.

Section –C [Long answer type] contains 5 questions from each unit of 3 marks each with internal choice.

UNIT-I

QUANTUM MECHANICS-I

Black-body radiation, Planck's radiation law, photoelectric effect, Compton effect. Operator: Hamiltonian operator, angular momentum operator, Laplacian operator, postulate of quantum mechanics, eigen values, eigen function, Schrodinger time independent wave equation, physical significance of ψ & $\psi2$, application of Schrodinger wave equation to particle in a one dimensional box, hydrogen atom (separation into three equations) radial and angular wave functions.

UNIT-II

QUANTUM MECHANICS-II

Quantum Mechanical approach of Molecular orbital theory, basic ideas-criteria for forming M.O. and A.O., LCAO approximation, formation of H_2^+ ion, calculation of energy levels from wave functions, bonding and antibonding wave functions, Concept of σ, σ^*, π, π^* orbitals and their characteristics, Hybrid orbitals-sp, sp^2 , sp^3 . Calculation of coefficients of A.O.'s used in these hybrid orbitals. Introduction to valence bond model of H_2, comparison of M.O. and V.B. models. Huckel theory, Application of Huckel theory to ethene, propene, etc.

UNIT-III

SPECTROSCOPY

Introduction: Characterization of Electromagnetic radiation, regions of the spectrum, representation of spectra, width and intensity of spectral transition, Rotational Spectrum of Diatomic molecules. Energy levels of a rigid rotor, selection rules, determination of bond length, qualitative description of non-rigid rotator, isotopic effect.

Vibrational Spectroscopy: Fundamental vibration and their symmetry, vibrating diatomic molecules, Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, determination of force constant, anharmonic oscillator.

Raman spectrum: Concept of polarizability, quantum theory of Raman spectra, stokes and antistokes lines, pure rotational and pure vibrational Raman spectra. Applications of Raman Spectra.

Electronic Spectroscopy: Basic principles, Electronic Spectra of diatomic molecule, FranckCondon principle, types of electronic transition, application of electronic spectra.

UNIT-IV

ELECTROCHEMISTRY-I

A. Electrolytic conductance: Specific and equivalent conductance, measurement of equivalent conductance, effect of dilution on conductance, Kohlrausch law, application of Kohlrausch law in determination of dissociation constant of weak electrolyte, solubility of sparingly soluble electrolyte, absolute velocity of ions, ionic product of water, conductometric titrations.

B. Theories of strong electrolyte: Limitations of Ostwald's dilution law, weak and strong electrolytes, Elementary ideas of Debye – Huckel - Onsager's equation for strong electrolytes, relaxation and electrophoretic effects.

C. Migration of ions: Transport number, Determination by Hittorf method and moving boundary method, ionic strength.

UNIT-V

ELECTROCHEMISTRY-II

A. Electrochemical cell and Galvanic cells – reversible and irreversible cells, conventional representation of electrochemical cells, EMF of the cell and effect of temperature on EMF of the cell, Nernst equation, Calculation of ΔG, ΔH and ΔS for cell reactions.

B. Single electrode potential : standard hydrogen electrode, calomel electrode, quinhydrone electrode, redox electrodes, electrochemical series.

C. Concentration cell with and without transport, liquid - junction potential, application of concentration cells in determining of valency of ions, solubility product and activity coefficient.

D. Corrosion-types, theories and prevention

35

REFERENCE BOOKS :

1. Physical chemistry, G.M.Barrow. International Student Edition McGraw Hill.

2. University General Chemistry, CNR Rao, Macmillan.

3. Physical Chemistry R.A.Alberty, Wiley Eastrn.

4. The elements of Physical Chemistry P.W.Alkin, Oxford.

5. Physical Chemistry through problems, S.K.Dogra, Wiley Eastern.

6. Physical Chemistry B.D.Khosla.

7. Physical Chemistry, Puri & Sharma.

8. Bhoutic Rasayan, Puri & Sharma.

9. Bhoutic Rasayan, P.L.Soni.

10. Bhoutic Rasayan, Bahl & Tuli.

11. Physical Chemistry, R.L.Kapoor, Vol- I-IV.

12. Introduction to Quantum Chemistry, A.K.Chandra, Tata McGraw Hill.

13. Quantum Chemistry, Ira N.Levine, Prentice Hall

SC. PART II CHEMISTRY

The new curriculum ▉▉▉▉▉ three papers of 33, 33 & 34 marks each and practical work of 50 marks. The curriculum is to be completed in 180 working days as per the UGC norms & conforming to the directives of the Govt. of Chhattisgarh. The Theory papers are of 60 hrs. each duration & the practical work of 180 hrs. duration.

PAPER - I

INORGANIC CHEMISTRY

M.M. 33

(Paper Code - 0845)

Section –A [Multiple choice/Objective Type] This section contains 8 questions from all five unit at least ONE question is compulsory from each unit (1 marks each)

Section –B [Short answer type] This section contains 5 questions from each unit of 2 marks each with internal choice.

Section –C [Long answer type] contains 5 questions from each unit of 3 marks each with internal choice.

UNIT-I

CHEMISTRY OF TRANSITION SERIES ELEMENTS

Transition Elements: Position in periodic table, electronic configuration, General Characteristics, viz., atomic and ionic radii, variable oxidation states, ability to form complexes, formation of coloured ions, magnetic moment μso (spin only) and μeff and catalytic behaviour. General comparative treatment of 4d and 5d elements with their 3d analogues with respect to ionic radii, oxidation states and magnetic properties..

UNIT-II

A. OXIDATION AND REDUCTION

Redox potential, electrochemical series and its applications, Principles involved in extraction of the elements

B. COORDINATION COMPOUNDS

Werner's theory and its experimental verification, IUPAC nomenclature of coordination compounds, isomerism in coordination compounds. Stereochemistry of complexes with 4 and 6coordination numbers. Chelates, polynuclear complexes

UNIT-III

COORDINATION CHEMISTRY

Valence bond theory (inner and outer orbital complexes), electroneutrality rinciple and back bonding. Crystal field theory, Crystal field splitting and tabilization energy, measurement of 10 Dq (Δo), CFSE

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in weak and strong fields, pairing energies, factors affecting the magnitude of 10 Dq (Δ_o, Δ_t). Octahedral vs. tetrahedral coordination.

UNIT-IV

A. CHEMISTRY OF LANTHANIDE ELEMENTS

Electronic structure, oxidation states and ionic radii, and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds.

B. CHEMISTRY OF ACTINIDES

General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from uranium, similarities between the latter actinides and the latter lanthanides

UNIT-V

A. ACIDS-BASES

Arrhenius, Bronsted-Lowry, conjugate acids and bases, relative strengths of acids and bases, the Lux-flood, Solvent system and Lewis concepts of acids and bases.

B. NON-AQUEOUS SOLVENTS

Physical properties of a solvent, types of solvents and their general characteristics, reaction in non-aqueous solvents with reference to liquid ammonia and liquid sulphur dioxide, HF, H_2SO_4, Ionic liquids.

REFERENCE BOOKS:

1. Basic Inorganic Chemistry, F.A. Cotton, G. Wilkinson and P.L. Gaus, Wiley

2. Concise Inorganic Chemistry, J.D. Lee, ELBS.

3. Concepts of models of Inorganic Chemistry, B. Douglas, D. Mc Daniel and J. Alexander, John Wiley.

4. Inorganic Chamistry, D.E. Shriver, P.W. Atkins and C.H. Langford, Oxford.

5. Inorganic Chamistry, W.W. Porterfield. Addison - Wesley.

6. Inorganic Chamistry. A.G. Sharp, ELBS.

7. Inorganic Chamistry, G.L. Miessler and D.A. Tarr, Prentice Hall.

8. Advanced Inorganic Chemistry, StayasPrakash.

9. Advanced Inorganic Chemistry, Agarwal & Agarwal.

10. Advanced Inorganic Chemistry, Purl & Sharma, S. Naginchand

11. Inorganic Chemistry, Madan, S, Chand

12. AadhunikAkarbanicRasayan, A.K. Shrivastav& P.C. Jain, Goel Pub.

13. UcchattarAkarbanicRasayan, SatyaPrakash& G.D. Tuli, ShyamlalPrakashan

14. UcchattarAkarbanicRasayan, Puri& Sharma.

15. Selected topic in Inorgaic Chemistry by Madan Malik, &Tuli, S. Chand.

2022-23

रसायन शास्त्र विभाग
अध्ययन मंडल - नामांकित सदस्य

1 .... 2 ....
3 .... 4 ....
5 .... 6 ....
7 .... 8 ....

रसायन शास्त्र विभाग
अध्ययन मंडल - विभागीय सदस्य

1 .... 2 .... 3 ....
4 .... 5 .... 6 ....
7 .... 8 .... 9 ....
10 .... 11 .... 12 ....
13 .... 14 .... 15 ....

PAPER - II

ORGANIC CHEMISTRY

MM. 33

(Paper Code - 0846)

Question paper will be divided into three section.
Section –A [Multiple choice/Objective Type] This section contains 8 questions from all five unit at least ONE question is compulsory from each unit (1 marks each)
Section –B [Short answer type] This section contains 5 questions from each unit of 2 marks each with internal choice.
Section –C [Long answer type] contains 5 questions from each unit of 3 marks each with internal choice.

UNIT-I

CHEMISTRY OF ORGANIC HALIDES

Alkyl halides: Methods of preparation, nucleophilic substitution reactions – SN1, SN2 and SNi mechanisms with stereochemical aspects and effect of solvent etc.; nucleophilic substitution, elimination reactions.

Aryl halides: Preparation, including preparation from diazonium salts, Nucleophilic Aromatic Substitution; SNAr, Benzyne mechanism. Relative reactivity of alkyl, allyl/benzyl, vinyl and aryl halides towards nucleophilic substitution reactions

UNIT-II

ALCOHOLS

A. Alcohols: Nomenclature, preparation, properties and relative reactivity of 1°, 2°, 3° alcohols, Bouvaelt-Blanc Reduction for the preparation of alcohols, Dihydric alcohols – methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [$Pb(OAc)_4$ and HIO_4] and pinacol-pinacolone rearrangement.

B. Trihydric alcohols - Nomenclature, methods of formation, chemical reactions of glycerol

PHENOLS

A. Structure and bonding, in phenols, physical properties and acidic character, Comparative acidic strength of alcohols and phenols, acylation and carboxylation.

B. Mechanisms of Fries rearrangement, Claisen rearrangement, Gatterman synthesis, Hauben - Hoesch reaction, Lederer - Manasse reaction and ReimerTiemann reaction.

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UNIT-III

ALDEHYDES AND KETONES

A. Nomenclature, structure and reactivity of carbonyl group. General methods of preparation of aldehydes and ketones. Mechanism of nucleophilic addition to carbonyl groups: Benzoin, Aldol, Perkin and Knoevenagel condensation. Condensation with ammonia and its derivatives, Wittig reaction, Mannich reaction, Beckmann and Benzil- Benzilic rearrangement.

B. Use of acetate as protecting group, Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones, Cannizzaro reaction, MPV, Clemmensen reduction, Wolf-Kishner reaction, LiAlH4 and NaBH4 reduction. Halogenation of enolizable ketones, An introduction to α,β-unsaturated aldehydes and ketones

UNIT-IV

A. CARBOXYLIC ACIDS

Preparation, Structure and bonding, Physical and chemical properties including, acidity of carboxylic acids, effects of substituents on acid strength, Hell-Volhard Zeilinsky reaction. Reduction of carboxylic groups, Mechanism of decarboxylation. Di carboxylic acids: Methods of formation and effect of heat and dehydrating agents, Hydroxyacids.

B. CARBOXYLIC ACID DERIVATIVES

Structure of acid chlorides, esters, amides and acid anhydrides, Relative stability of acyl derivatives. Physical properties, inter-conversion of acid derivatives by nucleophilic acyl substitution. Mechanism of acid and base catalyzed esterification and hydrolysis.

UNIT-V

ORGANIC COMPOUNDS OF NITROGEN

A. Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes. Mechanism of nucleophilic substitution in nitroarenes and their reduction in acidic, neutral and alkaline medium.

B. Reactivity, structure and nomenclature of amines, physical properties. Stereochemistry of amines. Separation of mixture of primary, secondary and tertiary amines. Structural features affecting basicity of amines. Preparation of alkyl and aryl amines (reduction of nitro compounds and nitriles), reductive amination of aldehydic and ketonic compounds. Gabriel-Phthalimide reaction, Hofmann- Bromamide

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reaction, Reactions of amines, electrophilic aromatic substitution of aryl amines, Reaction of amines with nitrous acid. Synthetic transformations of aryl diazonium salts, Azo coupling

REFERENCE BOOKS:

1. Organic Chemistry, Morrison and Boyd, Prentice-Hall.

2. Organic Chemistry, L.G. Wade Jr. Prentice-Hall.

3. Fundamentals of Organic Chamistry, Solomons, John Wiley

4. Organic Chemistry, Vol. I, II, III, S.M. Mukherjee, S.P. Singh and R.P. Kapoor, WileyEastern (New-Age)

5. Organic Chemistry, F.A. Carey, McGraw Hill

6. Introduction to Organic Chemistry, Struiweisser, Heathcock and Kosover, Macmillan.

7. Organic Chemistry, P.L. Soni

8. Organic Chemistry, Bahi&Bahl

9. Organic Chemistry, Joginder Singh

10. CarbanicRasayan, Bashi&Bahi

11. CarbanicRasayan, R.N. Singh, S.M.I. Gupta, M.M. Bakodia& S.K. Wadhwa

12. CarbanicRasayan, Joginder Singh

PAPER – III

PHYSICAL CHEMISTRY   M.M. 34

(Paper Code - 0847)

Section –A [Multiple choice/Objective Type] This section contains 9 questions from all five unit at least ONE question is compulsory from each unit (1 marks each)

Section –B [Short answer type] This section contains 5 questions from each unit of 2 marks each with internal choice.

Section –C [Long answer type] contains 5 questions from each unit of 3 marks each with internal choice.

UNIT-I

A. THERMODYNAMICS-I

Intensive and extensive variables, state and path functions; isolated, closed and open systems; Zeroth law of thermodynamics. First law: Concept of heat, work, internal energy and statement of first law; enthalpy, Relation between heat capacities, calculations of q, w, U and H for reversible, irreversible and free expansion of gases under isothermal and adiabatic conditions. Joule-Thomson expansion, inversion temperature of gases, expansion of ideal gases under isothermal and adiabatic condition

B. THERMO CHEMISTRY

Thermochemistry, Laws of Thermochemistry, Heats of reactions, standard states; enthalpy of formation of molecules and ions and enthalpy of combustion and its applications; calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data, effect of temperature (Kirchhoff's equations) and pressure on enthalpy of reactions, Adiabatic flame temperature, explosion temperature.

UNIT-II

A. THERMODYNAMICS-II

Second Law of Thermodynamics: Spontaneous process, Second law, Statement of Carnot cycle and efficiency of heat engine, Carnot's theorem, thermodynamic state of temperature. Concept of entropy: Entropy change in a reversible and irreversible process, entropy change in isothermal reversible expansion of an ideal gas, entropy change in isothermal mixing of ideal gases, physical signification of entropy, Molecular and statistical interpretation of entropy.

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B. Gibbs and Helmholtz free energy, variation of G and A with pressure, volume, temperature, Gibbs-Helmholtz equation, Maxwell relations, Elementary idea of Third law of Thermodynamics, concept of residual entropy, calculation of absolute entropy of molecule.

UNIT-III

A CHEMICAL EQUILIBRIUM

Criteria of thermodynamic equilibrium, degree of advancement of reaction, chemical equilibria in ideal gases. Concept of Fugacity, Thermodynamic derivation of relation between Gibbs free energy of reaction and reaction quotient. Coupling of exergonic and endergonic reactions. Equilibrium constants and their quantitative dependence on temperature, pressure and concentration. Thermodynamic derivation of relations between the various equilibrium constants Kp, Kc and Kx. Le Chatelier principle (quantitative treatment). Equilibrium between ideal gas and a pure condensed phase.

B IONIC EQUILIBRIA

Ionization of weak acids and bases, pH scale, common ion effect; dissociation constants of mono protic acids (exact treatment). Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions; derivation of Henderson equation and its applications. Solubility and solubility product of sparingly soluble salts.– applications of solubility product principle

UNIT-IV

PHASE EQUILIBRIUM

A. Phase rule, Phase, component and degree of freedom, derivation of Gibbs phase rule, Clausius-Claperon equation and its applications to Solid-Liquid, Liquid-Vapor and SolidVapor, limitation of phase rule, applications of phase rule to one component system: Water system and sulphur system. Application of phase rule to two component system: Pb-Ag system, desilverization of lead, Zn-Mg system, Ferric chloride-water system, congruent and incongruent melting point and eutectic point. Three component system: Solid solution liquid pairs.

B. Nernst distribution law, Henry's law, application, solvent extraction

22

UNIT-V

PHOTOCHEMISTRY

Characteristics of electromagnetic radiation, Interaction of radiation with matter, difference between thermal and photochemical processes, Lambert-Beer's law and its limitations, physical significance of absorption coefficients. Laws of photochemistry: Grothus-Drapper law, Stark- Einstein law, quantum yield, actinometry, examples of low and high quantum yields, Photochemical equilibrium and the differential rate of photochemical reactions, Quenching, Role of photochemical reaction in biochemical process. Jablonski diagram depicting various process occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), photosensitized reactions, energy transfer processes {simple examples), photostationary states, Chemiluminescence

REFERENCE BOOKS:

1. Physical Chemistry, G.M. Barrow, International student edition-McGraw Hill
2. University general chemistry, C.N.R. Rao, Macmillan.

3. Physical Chemistry, R.A. Alberty, Wiley Eastern.

4. The elements of Physical Chemistry, Eastern.

5. Physical Chemistry through problems, S.K. Dogra & S. Dogra, Wiley Eastern.

6. Physical Chemistry, B.D. Khosla.

7. Physical Chemistry, Puri& Sharma

8. BhouticRasayan, Puri, Sharma &Pathania; Vishal Publishing Company.

9. BhouticRasayan, P.L. Soni

10. BhouticRasayan, Bahl&Tuli

11. Physical Chemistry, R.L. Kapoor, Vol. I-IV

COMPUTER HARDWARE PART-C

AIM : The emphasis is on the design concepts & organizational details of the common PC, leaving the complicated Electronics of the system to the computer engineers.

Objective of the Course :

1. To introduce the overall organisation of the microcomputers and operating systems.

2. To introduce the interaction of common devices used with computers with operating softwares, excluding the Assembly languages, with special reference to DOS/WINDOWS.

3. To introduce the working of hardware components, Micro-Processor and various chips used in micro-computers by operating system, without the use of electronic circuitry.

4. To introduce the use of operating systems architecture with IBM-PC & clones, excluding Assembly language, with forms an important part of hardwares.

N.B. : Since the computer organisation study is very vast & complicated, so the study is restricted only to the description and understanding part, hence the paper-setter is requested to keep this important factor in mind.

UNIT-1 : ORGANISATION OF Micro-Processor & MIRCO-COMPUTER :-

1. Introduction & organisation of M icro-Computer :

(a) Basic Components of Micro-computer : Basic Block; Prom ram memory; Data memory; I/O Ports; Clock generator; Integration of functional blocks.

(b) Interconnecting Components in a Micro-computer : Necessary functional block; Bussed architecture for microcomputer; memory addressing; Addressing I/O ports; comparision of I/O mapped and memory mapped I/O.

(c) Input Output Techniques : Non-CPU devices, Program & interrupt controlled I/O; Hardware controlled I/O or DMA.
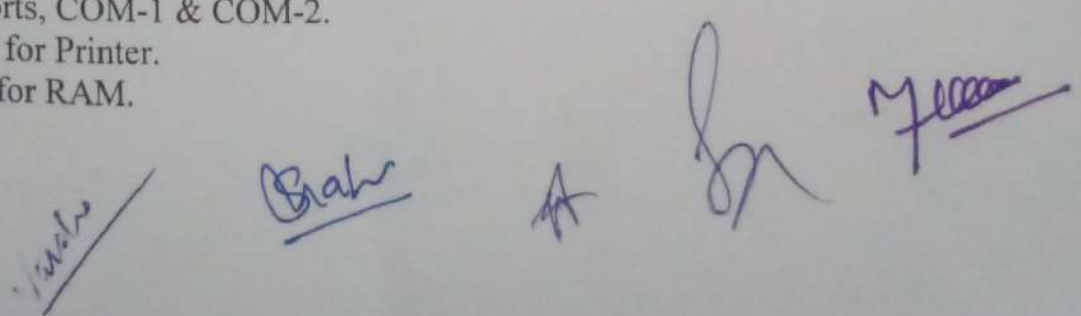
2. An Introduction to the various as :

(a) General understanding of different µ P or CPU : Intel 8088, 286, 386, 486, 586 Pentium, P54C, MMX P55C; Motorola 6800 & 88100 series; CYRIX & AMD CPUs.

(b) The Registers of CPU : (Give Example of P-8088) Register organisation of 8088, Scrach pad segment, pointer, Index and Flag, Registers.

(c) Memory addressing modes of P-8088 : Segment offset; Data addressing modes; Addressing for branch instructions.

(d) I/O Addressing with P-8088 : Memory mapped I/O & I/O mapped I/O.

UNIT-2 : SYSTEM HARDWARE ORGANISATION OF COMPUTERS :

1. Hardware Organization of the Personal Computer :

(a) Block diagram with various parts of PC.

(b) The Mother Board of General P.C. : 8088 CPU; ROM & RAM; Keyboard & its interface; System timer/counters; Hardware interrupt vectoring; DMA controller & channels; Interfacing to audio speaker; Bus slots & facture cards.

(c) The Serial I/O ports, COM-1 & COM-2.

(d) The parallel Port for Printer.

(e) Expansion Slots for RAM.

(f) Disk Controllers : For floppy, Hard disk, CD-ROM & Cassets drives.

2. The Video Display of PCs :
   (a) Video Monitors; Monochrome and colour.
   (b) Video Display Adapters & Their Video Modes; Monochrome & colour graphics adapters.
   (c) Video Control Through ANSI-SYS.
   (d) Video Control Through ROM-BOIS : INT 10H.
   (e) Direct Video Control; Monochrom & colour graphics adapters.
   (f) Installing Customized Character Sets.

UNIT-3 : ORGANISATION OF OPERTING SYSTEM WITH SYSTEM HARDWARE :

1. The ROM-BIOS Services :
   (a) Introduction to UNIX, ENIX, SUN, solaris, DOS & MAC with special reference to DOS & Windows, its ver., as DOS becomes more popular than others in PCs.
   (b) The ROM-BIOS Diskette Services, INT 13H.
   (c) The ROM-BIOS Serial Port Services, INT 14H.
   (d) The ROM-BIOS Keyboard Services, INT 16H.
   (e) The ROM-BIOS Printer Services, INT 17H.
   (f) Miscellaneous Service Provided by the ROM-BIOS : INT 05H, INT 11H, INT 12H, INT 18H, INT 19H, INT 1AH.

2. The fundamental of Operating System viz. DOS/WINDOWS :
   (a) The loading of DOS & Its Basic Structure ; ROM bootstrap, IO.SYS, DOS.SYS & Command..COM.
   (b) The Execution of the programs under DOS ; EXEC functions, program segment prefix; Features of COM & EXE program files.
   (c) Device Handling by Dos ; FDD, HDD, CON, Keyboard, PRN, AUX, CLOCK and NUL devices; Block devices; Character devices; Driver installation sequence.
   (d) File Structures of DOS ;
   (e) The DOS Interrupts : INT 20H-2FH
   (f) The DOS functions through INT 21H; Discuss only the understanding part of various other DOS function to handle hard & softwares.
   (g) Installation of windows : Important system files in windows.

UNIT-4 : ORGANIZATION & HANDLING BY OPERATING SYSTEMS :

1. Disk and Files under DOS :
   (a) Logical Structure of a Disk : Organisation of disk for use; Boot record ; FAT files; disk or root directory.
   (b) File Organisation on a DOS disk : Logical volumes ; Sub directories; Volume lables.
   (c) Manipulating Files under DOS : File attributes ; date and time, file Access; FCB functions.

2. Memory Allocation, Program Loading and Execution :
   (a) Memory Management under DOS : EXEC loader; Memory Management & its functions; Modifying a Program's memory allocation.
   (b) Loading and Executing Programs under DOS : The EXEC function ; Memory considerations; parameter blocks; calling & returning from EXEC.
   (c) Loading the program overlays through EXEC.

UNIT-5 : ORGANISATION OF HARDWARE BY OPERATING SYSTEM :

1. Interrupt Handling through DOS :
   - (a) Types of interrupts.
   - (b) Interrupt Vector Table in PC.
   - (c) Interrupt Service Routines.
   - (d) Special Interrupts in PC : Clock Interrupt; The -C or Break Interrupt ; DOS reserved interrupt INT 28H ; Patching memory resident routines.
2. Filters for DOS :
   - (a) Filters in operating systems.
   - (b) Redirection of I/O under DOS.
   - (c) The Filters Supplied with DOS.
   - (d) Writing Filters to run under DOS.
3. Handling of Various Versions of Windows O.S. :
   - (a) Setup Installation
   - (b) Trouble shooting
   - (c) Networking features

Text Book :

1. Hardware and Software of Personal Computers.By Sanjay K. Bose. (Wiley Eastern Ltd. New Delhi).

Supporting Text Books :

1. Digital System from Gates to Mircoprocessor. By Sanjay K. Bose. (Wiley Eastern Ltd. New Delhi).
2. Computer Fundamentals : Architecture & Organisation. By B. Ram.. (Wiley Eastern Ltd. New Delhi).

Reference Books :

1. IBM PC-XT and Clones : By Govinda Rajalu.
2. Microprocessor and interfacing : By D ouglas Hall.
3. Insight the IBM-PC : Peter Norton.
4. Micriprocessor System : 8086/8088 family architecture, programming & design: By Liu and Gibson.

PAPER - II
(Paper Code-0910)

Aim : To introduce DBMS and RDBMS using Back-end tool and Front-end tool.

Object of the Course :

1. To introduce Data BAse Management System concepts.
2. To introduce the Relational Database Management System and Relational Database Design.
3. To introduce the RDBMS software and utility of query language.
4. To introduce basic concept of GUI Programming and database connectivity using Visual Basic.

UNIT-1 : CONCEPT OF D.B.M.S. AND DATA MODELS

(a) Introduction to DBMS :- Purpose of Data base systems, views of data, Data Modeling Database Languages, Transaction management, Storage Management, Database Administrator and User, Database System Structure.

(b) E-R Model : Basic concepts, Constraints, Keys, Mapping Constraint, E-R Diagram, Weak and Strong Entity sets, E-R Database Schema, Reduction of an E-R Schema to Table.

UNIT-2. : RELATIONAL DATABASE MANAGEMENT SYSTEM

(a) Relational Model : Structure of Relational Database, Relational Algebra, Domain Relational Calculus, Extended Relational- Algebra Operation, Modification of database, Views.

(b) Relational Database Design : Pitfalls in Relational Database Design, Decomposition Functional Dependencies, Normalization : 1NF, 2NF, BCNF, 3NF, 4NF, 5NF.

UNIT-3 : INTRODUCTION TO RDBMS SOFTWARE - ORACLE

(a) Introduction : Introduction to personal and Enterprises Oracle, Data Types, Commercial Query Language, SQL, SQL*PLUS.

(b) DDL and DML : Creating Table, Specifying Integrity Constraint, Modifying Existing Table, Dropping Table, Inserting Deleting and Updating Rows in as Table, Where Clause, Operators, ORDER BY, GROUP Function, SQL Function, JOIN, Set Operation, SQL Sub Queries. Views : What is Views, Create, Drop and Retrieving data from views.

(c) Security : Management of Roles, Changing Password, Granting Roles & Privilege, with drawing privileges.
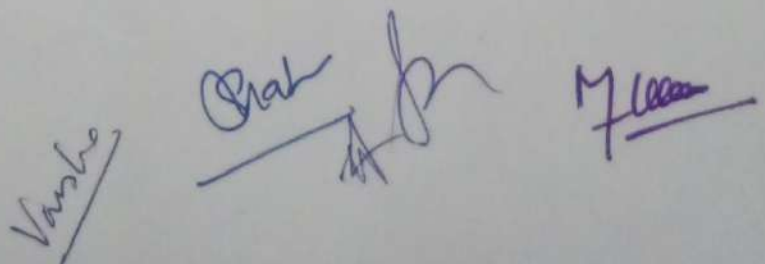
(d) PL/SQL : Block Structure in PL/SQL, Variable and constants, Running PL/SQL in the SQL*PLUS, Data base Access with PL/SQL, Exception Handling, Record Data type in PL/SQL, Triggers in PL/SQL.

UNIT-4 : G.U.I. PROGRAMMING

(a) Introduction to Visual Basic : Event Driven Programming, IDE, Introduction to Object, Controlling Objects, Models and Events, Working with Forms, MDI Form Working with standard Controls.

(b) Overview of Variables, Declaring, Scope, Arrays, User defined data types, Constants, Working with procedures : Function, Subroutine, and Property. Working with Data, Time, Format, String, and Math's Function. Controlling Program Execution: Comparison and Logical Operators, If...Then statements, Select Case Statement, Looping Structures, Exiting a loop. Error Trapping and Debugging.

(c) File Organization : Saving data to file, Sequential and Random access file, the desing and coding.

UNIT-5 : DATA BASE PROGRAMMING IN VB

(a) Introduction :- Concept of DAO, RDO, ADO, input validation : field & form level validation, ADO object model : the ADO object Hierarchy, the connection object, the command object, record set object, parameter object, field object, record object, stream object, Error object, parameter object.

(b) Using Bound control to Present ADO data : Using the ADO data control, ADO data control properties, binding simple controls : Data list, data combo, Data Grid, Data Form Wizard : single form wizard, Grid form, master/Detail form. Programming the ADO data control : Refresh method, Event, Hierarchical flex Grid control.

(c) Data Environment & Data Report : Creating connection, Using command object in the data Environment, Data Environment option and operation, Binding Form to the data Environment, ADO Events in the Data report, Print Preview, Print, Export, Data report in code : Data reports Events, Binding data reports Directly.

REFERENCE BOOKS :

1. Data Base System Concept : By Hery F. Korth, Tata McGraw Hill
2. Fundamental of Data Base : Nawathe & Elmasri (Pearson educations) System Concept
3. Oracle Complete Reference : By Oracle Press
4. Introduction to OOPS & VB : By V.K. Jain, Vikas Publishing House
5. Database Programming VB 6 : By B.P.B. Publication

COMPUTER SCIENCE
PAPER - I
COMPUTER HARDWARE
(Paper Code - 0855)
Duration 3 hours Max. Marks 50

AIM - The emphasis in on the design concepts & organizational details of the common PC, leauing the complicated electronics of the system of the computer Engineers.

OBJECT OF THE COURSE -
1. To introduce the overall organization of the microcomputers.
2. To introduce the common peripheral devices used in computers.
3. To introduce the hardware components, use of micro processor and function of various chips used in microcomputer.

N.B. : Since the computer organisation study is very vast & complicated, so the study is restricted to only the description and understanding part, fence the paper setter is requested to keep this important factor in mind.

UNIT-I CLASSIFICATION AND ORGANIZATION OF COMPUTERS

Digital and analog computers and its evolution. Major components of digital computers; Memory addressing capability of CPU; word length and processing speed of computes. Microprocessors single chip microcomputers; large and small computers. Users interface Hardware software and firmware. multi programming multi user system. Dumb smart and intelligent terminals computer network and multi processing, LAN parallel processing. Flinn's classification of computers. Computer flow and data flow computers.

UNIT-II CENTRAL PROCESSING UNIT.

CPU organization, ALU control unit registers. Instructions for INTEL 8085, Instruction word size, Various addressing mode interrupts and exceptions, some special Control signals and I/O devices. Instruction cycle fetch and execute operation, time Diagram, data flow.

UNIT-III MEMORY OF COMPUTERS.

Main memory secondary memory, backup memory, cache memory; real and virtual Memory Semiconductor memory. Memory controller and magnetic memory; RAM; disks, optical disks Magnetic bubble memory; DASD, destructive and non destructive. readout. Program of data Memory and MMU.

UNIT-IV I/O DEVICES.

I/O devices of micro controller; processors. I/O devices, printer, plotter, other out put devices, I/O port serial data transfer scheme, Micro controller, signal processor, I/O processor I/O processor arithmetic processor.

UNIT-V SYSTEM SOFTWARE AND PROGRAMMING TECHNIQUE.

ML, AL, HLL, stac subroutine debugging of programs macro, micro programming, Program Design, software development, flow & chart multi programming, multiuser, multi tasking Protection, operating system and utility program, application package.

RECOMMENDED BOOKS :
1. Computer Fundamentals:Architecture and Organization-By B.Ram (Wilwy Eastern Ltd.)
2. Computers Today - By Donal H. Sanders
3. Computers Fundamental - By Rajaraman.
4. IBM PC - XT Clones - By Govinda Rajalu

AIM - Introduction to the web-language-HTML & problem solving throgh the concept of object oriented programming.

OBJECT OF THE COURSE -

1. To introduce the internet & web related technology & learn the intricacies of web-page designing using HTML.
2. To introduce the object oriented programming concept using C++ language.
3. To introduce the problem solving methodology using the C++ programming features.
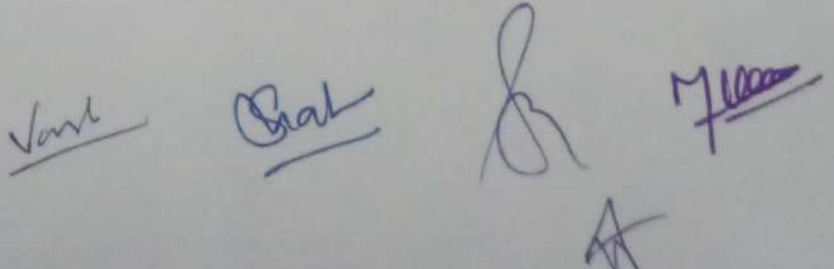
N.B. : Examiners are requested to prepare unit-wise Questions papers.

UNIT-I HTML BASICS & WEB SITE DESIGN PRINCIPLES

Concept of a Web Site, Web Standards, What is HTML? HTML Versions, Naming Scheme for HTML Documents , HTML document/file, HTML Editor , Explanation of the Structure of the homepage , Elements in HTML Documents ,HTML Tags, Basic HTML Tags, Comment tag in HTML, Viewing the Source of a web page, How to download the web page source? XHTML, CSS, Extensible Markup Language (XML), Extensible Style sheet language (XSL), Some tips for designing web pages, HTML Document Structure. HTML Document Structure-Head Section, Illustration of Document Structure,<BASE> Element,<ISINDEX> Element,<LINK> Element ,META, <TITLE> Element,<SCRIPT> Element ,Practical Applications, HTML Document Structure-Body Section:-Body elements and its attributes: Background; Background Color; Text; Link; Active Link (ALINK); Visited Link (VLINK); Left margin; Top margin, Organization of Elements in the BODY of the document: Text Block Elements; Text Emphasis Elements; Special Elements — Hypertext Anchors; Character-Level Elements; Character References ,Text Block Elements: HR (Horizontal Line); Hn (Headings) ; P (Paragraph); Lists; ADDRESS ; BLOCKQUOTE; TABLE; DIV (HTML 3.2 and up) ; PRE (Preformatted); FORM ,Text Emphasis Elements, Special Elements — Hypertext Anchors ,Character-Level Elements: line breaks (BR) and Images (IMG), Lists , ADDRESS Element, BLOCKQUOTE Element, TABLE Element, COMMENTS in HTML ,CHARACTER Emphasis Modes, Logical & Physical Styles, Netscape, Microsoft and Advanced Standard Elements List, FONT, BASEFONT and CENTER.

UNIT-II IMAGE, INTERNAL AND EXTERNAL LINKING BETWEEN WEBPAGES

Netscape, Microsoft and Advanced Standard Elements List, FONT, BASEFONT and CENTER Insertion of images using the element IMG (Attributes: SRC (Source), WIDTH, HEIGHT, ALT (Alternative), ALIGN),IMG (In-line Images) Element and Attributes; Illustrations of IMG Alignment, Image as Hypertext Anchor, Internal and External Linking between Web Pages Hypertext Anchors ,HREF in Anchors ,Links to a Particular Place in a Document ,NAME attribute in an Anchor ,Targeting NAME Anchors ,TITLE attribute, Practical IT Application Designing web pages links with each other, Designing Frames in HTML. Practical examples.

UNIT-III INTRODUCTION TO OOP

Advantages of OOP, The Object Oriented Approach, Characteristics of object oriented languages- Object, Classes, Inheritance, Reusability, Polymorphism and C++. Function: Function Declaration, Calling Function, Function Defines, Passing Argument to function, Passing Constant, Passing Value, Reference Argument, returning by reference, Inline Function, Function Overloading, Default Arguments in function.

UNIT-IV OBJECT CLASSES AND INHERITANCE

Object and Class, Using the class, class constructor, class destructors, object as function argument ,copy constructor ,struct and classes , array as class member, Static Class Data, Static Member Functions, , Friend function, Friend class, operator overloading. Type of inheritance, Base class, Derive class. Access Specifier: protected. Function Overriding, member function, String, Template Function.

UNIT-V POINTERS AND VIRTUAL FUNCTION

pointers: & and * operator pointer variables, .pointer to pointer, void pointer, pointer and array, pointer and function, pointer and string, memory management, new and delete, pointer to object, this pointer Virtual Function: Virtual Function, Virtual member function, accesses with pointer,pure virtual function File and Stream: C++ streams, C++ Manipulators, Stream class, string I/O, char I/O, Object I/O, I/O with multiple object, Disk I/O,

RECOMMENDED BOOKS :

1. Introduction to HTML : Kamlesh Agarwala, O.P.Vyas, Prateek A. Agrawala (Kitab Mahal Publication)
2. Let us C++ : Y. Kanetkar B.P.B Publication
3. Programming in C++ : E. Balaguruswami
4. Mastering in C++ : Venu Gopal
5. Object Oriented Programming in C++ : Lafore R, Galgotia Publications.

DEFENCE- STUDIES B.Sc. - III
PAPER- I
PROBLEMS OF WAR AND PEACE

MM - 50

प्रत्येक प्रश्न पत्र तीन खंडो A B C में विभाजित होगा। खंड A बहु विकल्पीय /वस्तुनिष्ठ प्रश्नों का (Multiple Choice /Objective Question) खंड B लघुउत्तरीय प्रश्नों का (Short Answer Question) खंड C दीर्घउत्तरीय (Long Answer Question) होगा।

सभी खंडो में प्रत्येक ईकाई से प्रश्न होगे। खंड A में कोई भी Internal Choice नही होगी खंड B और C के प्रत्येक प्रश्न में Internal Choice दी जावेगी।

प्रश्न पत्र में कुल अंको एवं पाठ्यक्रम में उल्लेखित ईकाई के आधार पर प्रत्येक खंड में अंकों का वितरण निम्नानुसार होगा।

कुल अंक	कुल युनिट	बहु विकल्पीय/ वस्तुनिष्ठ प्रश्नों पर	लघु उत्तरीय प्रश्नों पर अंक	दीर्घ उत्तरीय प्रश्नों पर अंक
50	5	10 x 1= 10	5 x3 = 15	5 x5= 25

सभी खंडो A B C में प्रत्येक युनिट से प्रश्न पूछा जावेगा ।

- 1   U.N.O.AND WORLD PEACE
1. Organs and its role
2. Main specialized agencies of U.N.O.
3. Role of U.N.O. in world peace.
4. Peace keeping force of the U.N.O.
5. Veto power and Security Council.

- 2   WAR AND PEACE
1. Settlement of International Disputes.
2. Diplomatic agents and Consuls.
3. War Crimes.
4. Neutrality.
5. Intervention.

- 3   HUMANITARIAN AND REFUGEE LAW
1. Basic concepts and development of Humanitarian law.
2. UN General Assembly declaration of human right on Dec. 10, 1948.
3. Protection of Victims and defenceless in armed conflict. POWs, wounded and civilians in Armed Forces.
4. Central Human Right Commission : Organization and Function.
5. State Human Right Commission : Organization and Function.

'- 4   REFUGEE LAW
1. Meaning, concept and causes of Refugee.
2. Refugee and IDPs.
3. Refugee law in India.
4. Refugee Problem in South Asia.
5. Role of International Committee of Cross and UNO in Refugee Problems.

'- 5   LAWS OF WAR
1. Law of Land War.
2. Law of Sea War.
3. Law of Air War.
4. Space Law.
5. The International Court of Justice.

ECTED READINGS :

Maunceclark, J	:	Reading in the Economics of War.
International Security	:	Modern political Science series.
Rajani Kothari	:	World order.
Openhem, I	:	Use of Force by state and International law.

प्रत्येक प्रश्न पत्र तीन खंडो A B C में विभाजित होगा। खंड A बहु विकल्पीय /वस्तुनिष्ठ प्रश्नों का (Multiple Choice /Objective Question) खंड B लघुउत्तरीय प्रश्नों का (Short Answer Question) खंड C दीर्घउत्तरीय (Long Answer Question) होगा। सभी खंडो में प्रत्येक ईकाई से प्रश्न होगे। खंड A में कोई भी Internal Choice नहीं होगी खंड B और C के प्रत्येक प्रश्न में Internal Choice दी जावेगी।

प्रश्न पत्र में कुल अंको एवं पाठ्यकम में उल्लेखित ईकाई के आधार पर प्रत्येक खंड में अंकों का वितरण निम्नानुसार होगा।

कुल अंक	कुल युनिट	बहु विकल्पीय / वस्तुनिष्ठ प्रश्नों पर	लघु उत्तरीय प्रश्नों पर अंक	दीर्घ उत्तरीय प्रश्नों पर अंक
50	5	10 x 1= 10	5 x3 = 15	5 x5= 25

सभी खंडो A B C में प्रत्येक युनिट से प्रश्न पुछा जावेगा ।

Γ - 1
1. Development of Nuclear weapons.
2. Effects of Nuclear Explosion.
3. Spread of Nuclear Weapons.
4. Missile and their characteristics.
5. Type of Missiles.

Γ - 2
1. Trends in Science and Technology and their impact on war.
2. Role of Research and Development.
3. Developments of Weapons and their impact on tactics.
4. Command, Control, Communication and Intelligence (C^3I)in Modern Warfare.
5. Elements of National Power.

Γ - 3
1. Military Satellites.
2. Explosive Bombs.
3. War Gases.
4. Micro Organs : as a Weapons.
5. Smart Weapons.

T - 4
1. Rocket Technology and India.
2. Missile Technology and India.
3. Nuclear Technology and India.
4. Atomic Minerals and India.
5. Space Technology and India.

- 5
1. New word order - Political, Social and Economical.
2. Alliance and Regional co-operation.
3. Mobilization of resources for war.
4. War time economics.
5. New trends.

RENCE BOOKS :
Halailan Morton	:	Cotemporary Military strategy
Brodue, Y.	:	Strategy in the missile Age.
Markabi, Y.	:	Nuclear war and Nuclear peace
Osanka, F.M.	:	Modern Guerilla warfare
Gerald, J.	:	Defence Psychology
Know Kalus	:	Science and Defence
Pandey Girishkant	:	Yudhmein Vigyanaven Takaniki

DEFENCE- STUDIES B.Sc. - II
PAPER- I
WESTERN MILITARY HISTORY

MM - 50

1. प्रत्येक प्रश्न पत्र तीन खंडो A B C में विभाजित होगा। खंड A बहु विकल्पीय /वस्तुनिष्ठ प्रश्नों का (Multiple Choice /Objective Question) खंड B लघुउत्तरीय प्रश्नों का (Short Answer Question) खंड C दीर्घउत्तरीय (Long Answer Question) होगा।

2. सभी खंडो में प्रत्येक ईकाई से प्रश्न होंगे। खंड A में कोई भी Internal Choice नहीं होगी खंड B और C के प्रत्येक प्रश्न में Internal Choice दी जावेगी।

3. प्रश्न पत्र में कुल अंको एव पाठयक्रम में उल्लेखित ईकाई के आधार पर प्रत्येक खंड में अंकों का वितरण निम्नानुसार होगा।

कुल अंक	कुल युनिट	बहु विकल्पीय / वस्तुनिष्ठ प्रश्नों पर	लघु उत्तरीय प्रश्नों पर अंक	दीर्घ उत्तरीय प्रश्नों पर अंक
50	5	10 x 1= 10	5 x3 = 15	5 x5= 25

सभी खंडो A B C में प्रत्येक युनिट से प्रश्न पुछा जावेगा ।

UNIT - 1 Age of Velour
1. Military system of Greek; Tactics of Phalanx.
2. Alexander the Great and his reforms.
3. Military system of Roman; Tactics of Legion, Julius Caesar.
4. Battle of Arbela 311 B.C.
5. Battle of Cannae 216 B.C.

UNIT - 2 Age of Chivalry
1. Emergence and decline of cavalry.
2. Battle of Adrianopole 378 A.D.
3. Battle of Hasting 1066 A.D.
4. Cavalry tactics of Zenghiz Khan.
5. Battle of Cracee 1346 A.D.

UNIT - 3 Age of Gun Powder & Steam
1. Impact of Gun Powder in war.
2. Contribution of Gustavas Adolphus & Fredrik the Great.
3. The Revolution in tactics - Causes of war American Independence 1775-83.
4. The Revolution in tactics - Causes of French Revolution.
5. Napoleonic art of warfare and his military reforms.

UNIT - 4 World War - I & II
1. First World War - Causes of W.W., Policies and Strategic plans of the powers.
2. Role of Air Force with reference to theory of Douhet.
3. Role of Navy with reference to theory of Mahan.
4. Second World War - Causes of W.W., Objective and Strategy of Allied and Axis Force.
5. Personalities of Rommel.

Unit - 5 World War - II
1. Armament and Mechanical warfare with reference to the theories of J.F.C. Fuller and Liddell Hart.
2. Role of air power, weapons, doctrines, tactics.
3. Role of naval power, weapons, doctrines, tactics.
4. Tactics of Second World War.
5. Advent of Nuclear weapons and their impact on warfare.

SELECTED READING :
1. Nuclear war and Nuclear peace   :   Y. Harkabi
2. Makers of Modern strategy   :   E.M. Earl

PAPER- II
THEORY AND PRACTICE OF WAR
MM - 50

4   प्रत्येक प्रश्न पत्र तीन खंडो A B C में विभाजित होगा। खंड A बहु विकल्पीय /वस्तुनिष्ठ प्रश्नों का (Multiple Choice /Objective Question) खंड B लघुउत्तरीय प्रश्नो का (Short Answer Question) खंड C दीर्घउत्तरीय (Long Answer Question) होगा।

5   सभी खंडो में प्रत्येक ईकाई से प्रश्न होंगे। खंड A में कोई भी Internal Choice नहीं होगी खंड B और C के प्रत्येक प्रश्न में Internal Choice दी जावेगी।

6   प्रश्न पत्र में कुल अंको एव पाठ्य क्रम में उल्लेखित ईकाई के आधार पर प्रत्येक खंड में अंकों का वितरण निम्नानुसार होगा।

कुल अंक	कुल युनिट	बहु विकल्पीय / वस्तुनिष्ठ प्रश्नों पर	लघु उत्तरीय प्रश्नों पर अंक	दीर्घ उत्तरीय प्रश्नों पर अंक
50	5	10 x 1= 10	5 x3 = 15	5 x5= 25

सभी खंडो A B C में प्रत्येक युनिट से प्रश्न पुछा जावेगा ।

UNIT - 1
1. SuntZu- Founder of Military Theory and philosophy.
2. Clausewitz - War and its relationship with politics.
3. Macheavelli - Renaissance of Art of War.
4. Jomini - Concept of mass armies.

UNIT - 2
1. Churchil.
2. Mahatma Gandhi.
3. Kautilya.
4. A.Hitler.

UNIT - 3
1. Mao Tse Tung.
2. Che Guevara.
3. Economic War.
4. Economic and Psychological war.
5. Collective Security.

UNIT - 4
1. Indo - China War - 1962 Causes of war, political & military lesson.
2. Indo - Pak War - 1965 Causes of war, political & military lesson.
3. Indo - Pak War - 1971 Causes of war, political & military lesson.
4. Kargil Conflict 1999.

Unit - 5
1. Internal & External threats of National Security.
2. Insurgency and Counter-Insurgency.
3. Terrorism- Problem and Solution.
4. Naxalism- Problem and Solution.

REFRENCE BOOKS :
1. Theory and Practice of war   :   M. Howard
2. Clausewitz   :   M. Howard
3. Guerilla warfare   :   Mao Tse Tung
4. The Lightning War TaditYudh   :   D.K. Palit
5. War of 1971   :   Mankekar

2022- 2023

Foundation Course: Paper II – English Language

BSc III Year (MM: 75)

Unit I: Essay type answers in about 200 words. Five questions to be asked. Three to be attempted.

(15 marks)

Unit II: Essay Writing

(10 marks)

Unit III: Precis Writing

(10 marks)

Unit IV:

(a) Reading comprehension of an unseen passage

(05 marks)

(b) Vocabulary based on text

(15 marks)

Unit V: Grammar Advanced Exercises

(25 marks)

Note: Questions of Unit I and IV (b) shall be asked from the prescribed text, which shall comprise of popular creative writing and the following items: Minimum needs housing and transport; geo economic profile of MP (CG); Communication Education and culture; Women and Women Empowerment; Development; Management of Change; Physical quality of life; War and human survival; the question of human social value and its survival; New Economic philosophy; recent liberalisation; democratic decentralization (with reference to the 73rd and 74th Constitutional Amendments.)

Book prescribed:

Aspects of English language and Development – Published by Hindi Granth Academy, Bhopal.

2020 - 2023

Foundation Course: Paper II – English Language

BSc II Year (MM: 75)

Unit I: Short answer questions: To be assessed by five short answer questions of five marks each.

(15 marks)

Unit II: Reading Comprehension of an unseen passage.

(05 marks)

Unit III: Report Writing

(10 marks)

Unit IV: Expansion of an idea

(10 marks)

Unit V: Grammar and Vocabulary based on prescribed text   (20 & 15 marks)

Questions on all the units shall be asked from the prescribed text book which will comprise specimens of popular creative writing and the following:

(a) Matter and technology

(i) State of matter and its structure

(ii) Technology (Electronic Communication, Space Science)

(b) Our Scientists and institutions

(i)   life and work of our eminent scientists: Arya bhatt, Charak, Susruta, Nagarjuna, JC Bose, CV Raman, S Ramanujan, Homi J Bhabha, Birbal Sahani.

(ii)   Indian Scientific Institutions (Ancient and Modern)

Book Prescribed:

Foundation English for UG II Year - Published by Hindi Granth Academy, Bhopal. ___, ___ ___ ___, ___ ___ general points of narrative or argument. Formal principles of literary criticism should not be taken up at this stage.

Book Prescribed:

English Language and Culture – Published by Hindi Granth Academy, Bhopal.

Unit-1

(1) Palaeontology: Fossils- definition, Essentials for fossilization mode of fossilization.

(2) Uses of fossils; Index fossils & their significance.

(3) Application of palaeontology in the study of stratigraphy. Palaeoecology And Palaeo-geography.

(4) Micro palaeontology & their significance.

(5) Study of plant fossils & their significance.

Unit-2

(1) Morphology & Geologic distribution of foraminifera & Anthozoa fossils.

(2) Morphology & Geological distribution of Gastropoda and lamellibranchia fossils.

(3) Morphology & Geological distribution or Cephalopoda.

(4) Morphology & Geological distribution or Echinoidae & Brachiopoda fossils.

(5) Morphology & Geological distribution of Triobite and Graptolite fossils.

Unit-3

(1) Principles of stratigraphy: Geological time scale.

(2) Basic concept of lithostratigraphic, chronostratigraphic & Biostratigraphic Units.

(3) Structural & Physical Subdivision of Indian subcontinents.

(4) Distribution, classification & Economic importance or Archaeozoic rocks of India (Dharwar)

(5) Distribution, Stratigraphy & Economic Importance of Bastar & Raoghat group of rocks (Chhattisgarh)

Unit-4
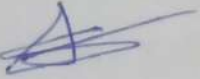
(1) Distribution, stratigraphy & Economic importance of Vindhya & Chhattisgarh group of rocks.

(2) Stratigraphy, Palaeoclimate, Geographical distribution & economic aspects of Gondwana supergroup

(3) Stratigraphy, distribution & age of Deccan trap

(4) Stratigraphy, distribution& fossil contents of Bagh &Lameta bed

(5) Stratigraphy, distribution &palaeontology of salt range group of rocks

Unit- 5 (1) Distribution, stratigraphy,and economic importance of palaeozoic rocks

   Spiti valley

   (2) Stratigraphy, distribution, fossil content of cretaceous rocks of

   Of Tiruchirapalli

   (3) Stratigraphy, distribution, fossil content and economic importance of

   Jurassic rocks of kutch region

   (4) Distribution, structure,economic importance of tertiary rocks of Assam

   Region

   (5) Distribution, stratigraphy and vertebrate palaeontological importance of

   Siwalik groups of rocks

Note: There will be three sections in each paper and each section will cover all the units. Section -A with 10 multiple choice/objective question of 1 mark each without internal choice. Section-B with five short answer type question of 3 marks each with internal choice and Section-C with five long answer type question of 5 marks each with internal choice.
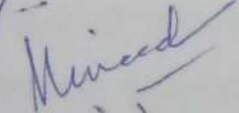
Name & Signature   Representative from Industry
H.O.D.

Dr S. S. Bhadauria   Divyendra Singh
External Subject Experts-

1.Dr KR Hari
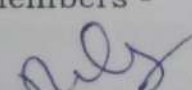
2.Dr N Bodhankar
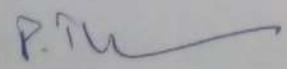
3.Dr P Shrivastav   Student Member
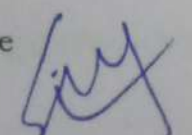
                                                                    Raju Yadav

Departmental members -

1.Dr R Ghuhey

2.Shri P Thakur

3.Dr S Vansutre

Class- B.Sc-III
Paper –II
(Earth Resources & Applied Geology)

Unit-1

(i) Economic Geology & its perspectives; Global mineral deposit & resource. Distribution of mineral deposits in time & space.

(ii) Classification of mineral deposits. Geological thermometers.

(iii) Magmatic & Hydrothermal processes of mineral formation.

(iv) Weathering : product & Residual deposit. Oxidation & sulphide supergene Enrichment processes.

(vi) Sedimentary processes of mineral formation. Placer deposits.

Unit-2

Geological, Geographical distribution, mode of occurrence, mineralogy & economic importance of following metallic & nonmetallic deposits of India.

(i) Iron, Manganes, Chromium

(ii) Copper, Lead, Zinc

(iii) Gold, Aluminium

(iv) Refractory and Fertilizer minerals

(v) Minerals used in cement & chemical industries.

Unit-3

(i) Coal deposit: Origin, Definition & stratigraphy

(ii) Fundamentals of coal petrography. Peat, Lignite, Bituminous & Anthracite Coal deposits of Chhattisgarh.

(iii) Origin of Natural-hydrocarbon, migration & accumulation. Types of oil traps; Structural, stratigraphic and composite. Offshore & onshore oil deposits of India.

(iv) Radioactive mineral : Mineralogy, Geochemistry, Prospecting techniques, Geological & Geographical distribution of atomic-mineral.

(vi) Principles of mineral economics. National mineral policy.

Unit-4

(i) Engineering geology & its importance, Engineering properties of rocks

(ii) Geological conditions for establishing of large Dam and Tunnels.

(iii) Elementary study of Aerial photographs & satellite Imageries. Application of remote sensing in town-planning.

(iv) Hydrologic cycle. Mode of occurrence of ground water, Quality of ground water.

(v) Hydrologic properties of rocks. Classification of Aquifers. Ground water provinces of India.

Unit-5 (i) Introduction to mineral exploration, Surface & subsurface methods of mineral Exploration.

(ii) Prospection methods; Drilling, Sampling & Assaying.

(iii) Geophysical prospecting techniques : Gravity, Electrical & Magnetic methods.

(iv) Aerial and seismic prospecting methods.

(v) Environmental impacts of over exploitation of mineral resources.

Practical-

(1) Study of important metallic/nonmetallic minerals on the basis of physical & optical properties.

(2) Distribution of main metallic/nonmetallic deposits within outline map of India.

(3) Magascopic studies of coal & its varieties.

(4) Exercises related with mineral exploration; Reserve calculation, Tonnage factor calculation, Exercises related with drilling.

(5) Study of Aerial photographs with the help of stereoscopes.

(6) Study of satellite imageries.

(7) Study of hydrologic properties of rocks, Preparation of hydrological maps.

(8) Geological excursion for ten days.

Unit:1
(i) Magma, definition, origin & composition
(ii) Bowen's reaction series, magmatic differentiation & assimilation
(iii) System, phases & component, principles of thermodynamics,
Bi-component magma: Albite-Anorthite and Diposide-Anorthite
Tri-component magma: Diopside-Albite-Anorthite
(iv) Texture, structures & classification of igneous rocks
(v) Forms of igneous rocks

Unit:2
(i) Rock association in Time & Space, concepts of rock kindreds
(ii) Petrographic studies of Acid igneous rocks.
(iii) Petrographic studies of Alkaline igneous rocks
(iv) Petrographic studies of Basic igneous rock
(v) Petrographic studies of Ultrabasic igneous rocks.

Unit:3
(i) Origin, transportation & deposition of sediments
(ii) Dynamics of sedimentary depositional environment ; Aeolian, fluvial, coastal and abyssal environment.
(iii) Concepts of sedimentary facies
(iv) Concepts of diagenesis
(v) Textures & structures of sedimentary rocks.

Unit:4
(i) Classification of sedimentary rocks.
(ii) Petrography of sedimentary rock; rudaceous, aranaceous, calcareous sedimentary rocks
(iii) Metamorphism; definition, agents, facies & grade
(iv) Textures, structures & classification of metamorphic rocks.
(v) Equilibrium & non-equilibrium reactions in metamorphism.

Unit:5   (i)   Paragenetic diagrams; projective analysis A.C.F & A.K.F. diagrams

(ii)   Progressive metamorphism of Argillaceous rocks.

(iii)   Progressive dynamo-thermal metamorphism of impure lime-stone.

(iv)   Progressive dynamo-thermal metamorphism of basic igneous rocks.

(v)   Petrographic provinces of India.

Practical:

(1)   Diagrammatic representation of various form & structures of igneous, sedimentary & Metamorphic rocks

(2)   Megascopic studies of various sedimentary, metamorphic & igneous rocks.

(3)   Microscopic studies of various sedimentary, metamorphic & igneous rocks.

(4)   Norm calculation

(5)   Diagrammatic representation of petrography provinces of India in outline map of India.

Suggested Readings:-

(1)   शैलिकी के सिद्धान्त   – डॉ.अंबिका प्रसाद अग्रवाल

(2)   शैलिकी के सिद्धान्त   – ए.जी. झिंगरन

(3)   Principles of petrology   -   G.W. Tyrell

(4)   Petrology   -   H.William, F.J. Turner & E.M. Gilbert

(5)   Petrology of igneous & metamorphic rocks of India- S.C. Chattarjee

(6)   A text book of sedimentary petrology   -   Verma & Prasad

(7)   Metamorphism & Metamorphic rocks of India- S.Ray

(8)   Sedimentary rocks   -   F.J. Pettijohn

(9)   Introduction of sedimentology   -   S.Sengupta

(10)   Sedimentary environment   -   H.G. Readings

Note: There will be three sections in each paper and each section will cover all the units. Section -A with 10 multiple choice/objective question of 1 mark each without internal choice. Section-B with five short answer type question of 3 marks each with internal choice and Section-C with five long answer type question of 5 marks each with internal choice.

Name & Signature
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2.Dr N Bodhankar
3.Dr P Shrivastav
Departmental members-
1.Dr R Ghuhey
2.Shri P Thakur
3.Dr S Vansutre

Representative from Industry H.O.D.
Divyendra Singh

Student Member
Raju Yadav

Unit:1

(i) Definition and scope of Structural Geology. Study of outcrops. Effects of dip and slope on outcrops.

(ii) Identification of bedding. Dip and strike measurement.

(iii) Clinometer and Brunton compass.

(iv) Recognition of top and bottom of beds.

(v) Concept of rock deformation. Concept of stress and strain ellipsoids.

Unit:2

(i) Fold morphology.

(ii) Geometric and genetic classification of folds.

(iii) Recognition of folds in the field and on geological maps.

(iv) Effect of folds on outcrops.

(v) Elementary idea of mechanics of folding.

Unit:3

(i) Fault morphology. Slip and separation.

(ii) Geometric and genetic classification of faults.

(iii) Recognition of faults in the field and on geological maps.

(iv) Effect of faults on outcrops.

(vi) Elementary idea of mechanics of faulting.

Unit:4

(i) Joint morphology; geometric and genetic classification of joints.

(ii) Foliation; terminology, kinds, origin and relation to major structures.

(iii) Lineation: terminology, Kind, origin and relation to major structures.

(iv) Salt domes.

(vii) Plutons; tectonics & emplacement.

Unit:5

(i) Types and recognition of Unconformity.

(ii) Outlier and inlier. Overlap & offlap.

(iii) Concept of tectonics.

(iv) Tectonic framework of Peninsula, Indo-Gangetic Plains and Extra-Peninsular India.

(v) Stereographic projection & it use in Structural geology.

Practical-

(1) Study of Natural Structures on specimens.

(2) Study of structures with the help of models.

(3) Completion of outcrops.

(4) Preparation of geological section from simple to complex geological maps and its interpretation.

(5) Application of stereographic projection in structural geology.

(6) Geological excursion for seven days.

Books recommended:

(1) संरचनात्क भूविज्ञान — डॉ.डी.के. श्रीवास्तव

(2) भूवैज्ञानिक संरचनाऍ — डॉ. भरत सिंह राठौर

(3) प्रायोगिक भूविज्ञान (भाग—2) — आर.पी. मांजरेकर

(4) Structural Geology. M.P. Billings.

(5) Theory of Structural Geology; Gokhale, N.W. CBS

(6) Exercises on Geological maps and dip-Strike: Gokhale, N.W. CBS.

(7) Outlines of structural Geology. E.S. Hills.

(8) Structural Geology- Hobbs. Means and Williams.

(9) Geological maps- Chiplonkar and Pawar.

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GOVT. NAGARJUNA PG COLLEGE OF SCIENCE, RAIPUR

DEPARTMENT OF PHYSICS

SYLLABUS AND MARKING SCHEME

M. Sc.
(Ist and IInd Semester System)

2022-2023

Course out comes (cos):-

We offer graduation and post graduation level courses in physics. We define. Objectives for graduate student.

Levels of outcomes:-

1) A graduate student after completing his degree should be able to understand scientific facts and figures clearly. He should also have sufficient knowledge about the subject
2) During the course, a student becomes able to develop skill to write scientific theory and concepts in a proper manner. It improves his/her skills regarding science attitude in every span of like.
- A student attains a certain level of experimental as well as the theoretical Knowledge.
- In these years of graduation course, A student understands, apply, analyze, and evaluates scientific facts and figures.
- A student also develops communication skills, which develop their overall personality.
- During the course students interact will the society through N.C.C , N.S.S , and Red cross. During this process they develop a deep understanding about the problems in society.
- A student also learns to express scientific facts and figures objectively as well as descriptively.

Program Outcome (For science Graduation)

- During the graduation degree students develop analytical and critical thinking especially in the field of science.
- It is also desirable that students should understand the basic problems of society and develop their scientific views to overcome the problems specially superstitions, unhygienic living, drugs etc.)
- Student develops effective communication skills to explore and express their scientific thoughts in general.
- During science graduation the students become a responsible citizen of society.
- During the course students develop moral values and professional ethics in all their endeavors.
- This course makes students aware about environmental hazards and sustainable development.
- The process of imparting Knowledge is such that the students possess interest in the subject , even after completion of his graduation.

Program specific out come

Psos of M.Sc. Physics

- Students understand the basic concepts of Quantum Mechanics, mathematical physics , solid state physics, Electronics, classical mechanics as well as the most recent topics of physics such as nanotechnology and Lasers
- Student learns computational methods and programming to solve different problems of physics
- Students study papers on basic electronic devices, Photonic devices & Operational amplifier, Microprocessor and microcomputer and Digital and fiber communication.
- While doing the projects in the surrounding industrial area of city and acquire the experiential Knowledge and be prepared for future job.
- PG students give seminar on various topics that improve their communication as well as teaching skills.

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M. Sc. PHYSICS
Scheme of Semester Examination (2022-2023)

Semester I

Paper Number	Title of the paper	Mark					Credits
		Theory		Internal		Total	
		Max.	Min.	Max.	Min.		
I	Mathematical Physics	80	16	20	04	100	4
II	Classical Mechanics	80	16	20	04	100	4
III	Basic Quantum Mechanics	80	16	20	04	100	4
IV	Electronic Devices	80	16	20	04	100	4
Lab. Course I -General						100	2
Lab. Course II Electronics (Electronic Devices)						100	2
	TOTAL MARKS					600	20

Semester II

Paper Number	Title of the paper	Mark					Credits
		Theory		Internal		Total	
		Max.	Min.	Max.	Min.		
I	Electrodynamics	80	16	20	04	100	4
II	Computational Methods and Programming	80	16	20	04	100	4
III	Advance Quantum Mechanics	80	16	20	04	100	4
IV	Digital Electronics	80	16	20	04	100	4
Lab. Course- I Programming in C						100	2
Lab. Course - II Electronics (Digital Electronics)						100	2
	TOTAL MARKS					600	20

M. Sc. PHYSICS
Scheme of Semester Examination (JULY to DECEMBER- 2022)

Semester I

Paper Number	Title of the paper	Mark					Credits
		Theory		Internal		Total	
		Max.	Min.	Max.	Min.		
I	Mathematical Physics	80	16	20	04	100	4
II	Classical Mechanics	80	16	20	04	100	4
III	Basic Quantum Mechanics	80	16	20	04	100	4
IV	Basic Electronics Devices	80	16	20	04	100	4
Lab. Course I -General						100	2
Lab. Course II Electronics (Electronic Devices)						100	2
	TOTAL MARKS					**600**	**20**

	Total Marks	Total Credits
Theory Papers	320	12.8
Internal Assessment	80	3.2
Lab Course	200	4.0
Grand Total	600	20.0

PAPER – I (Code- PHY-101)
(MATHEMATICAL PHYSICS)

UNIT –I

Vector Spaces and Matrices linear independence Bases; Dimensionality; Inner product; linear transformations; Matrices; Inverse; Orthogonal and unitary matrices; Independent elements of a matrix; Eigen values and eigenvectors; Diagonalization; Complete orthonormal set of functions.

UNIT – II

 Special Functions; Solution by series expansion; Legendre Polynomial Generating function, recursion relations; Rodrique formula, orthogonal properties, Associated Legendre polynomials; Recurrence formulae and orthogonal properties,

Laguerre Polynomial Generating function, recursion relations; Rodrique formula, orthogonal properties, Associated Lagueree differential equation and polynomial. Bessel's Differential equations, First and Second kind, Recurrence formulae and generating function for $J_n(x)$, Jacobi series Bessel's Integrals, orthonormality of Bessel's functions, spherical Bessel's function : Recurrence relation and orthogonality.

Hermite Differential equation and polynomials, generating function, Recurrence relation, Rodrigue formula, orthogonality.

UNIT – III

 Function of complex variables, limit ,continuity and differentiability, Analytic function, the necessary and sufficient condition for a function to be analytic, Cauchy-Riemann condition, Cauchy integral theorem, evaluation of line integral by indefinite integration, Cauchy integral formula, Derivative of an analytic function. Singularities of an analytic function, Residues and their evaluation, Cauchy residue theorem, contour integration.

UNIT-IV

Integral Transforms, Laplace transform; First and second shifting theorems; Inverse LT by partial fractions; LT of derivative and integral of a function.

Fourier series; FS or arbitrary period; Half-wave expansions; Partial sums; Fourier integral and transforms; Dirac delta function, three dimension delta function.

Text and Reference Books:

- Mathematical Methods or Physics, by g Arfken
- Matrices and Tensors for Physicists, by AW Joshi
- Advanced Engineering Mathematics, by E Kreyszig
- Special Functions, by ED Rainville
- Special Functions, by W W Bell
- Mathematical Method for Physicists and Engineers. By KF Reilly, M P Hobson and S J Bence
- Mathematics for Physicists, by Mary L Boas

Signatures :

HOD : ------------------------------

External subject Experts: 1- ---------------------2-------------------------3------------------------

Departmental Members : 1----------------2-------------3-------------4------------5-----------------

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Student Members: 1----------------------------2--------------------3----------------------------

UNIT -I

Conservation Principles, Mechanics of a particle, conservation Principles for system of particles. Constrained motion, constraints and degrees of freedom, principle of virtual work, generalised coordinates, Generalised Notations (i) Generalised Displacement , velocity , Acceleration, momentum, force and potential , limitations of Newton's laws.

D'Alembert's Principle, Lagrange's equation from D'Alembert's principle . Application of Lagrange's equation of motion (i) Linear Harmonic oscillator (ii) Simple pendulum (iii) spherical pendulum (iv) Isotropic oscillator (v) Atwood's Machine, conservation of linear momentum, angular momentum and energy in Lagrangian formulation, Lagrange's equation for nonholonamic system, procedure to eliminate consideration of Ignorable coordinates the Routhian function.

UNIT – II

Variational Principle, calculus of variation, some techniques of calculus of variables , Euler Lagrange differential equation. Hamilton variational principle, Deduction of Hamilton's Principle from D'Alembert's principle, Deduction of Newton's second law of motion from Hamilton's Principle, Deduction of Lagrange's equations of motion from Hamilton's Principle for conservation and for non conservative systems, Non conservative forces, Dissipative system, Rayleigh's Dissipation function , Lagrangian for a charged particle in an electromagnetic field.

UNIT – III

Hamiltonian formulation of mechanics: Phase space and the motion of the system, Hamiltonian function, Hamilton's canonical equation of motion. Physical significance of H, Deduction of Canonical equation from variational principle, Hamilton's canonical equations of motion in different coordinate systems, Application of Hamilton equation of motion (i) Simple pendulum (ii) compound pendulum (iii) Two dimensional Isotropic Harmonic oscillator (iv) Linear Harmonic oscillator (v) Particle in central field of force. Hamiltonian for a charged particle in an electromagnetic field . Principle of least action statement and its proof.

UNIT – IV

Canonical or constant transformation, its advantage example of canonical transformation, necessary and sufficient condition for a transformation to be canonical , Infinitesional contact transformations, Hamilton-Jacobi partial differential equation for Hamilton's Principle function. Solution of Harmonic oscillator problem by Hamilton-Jacobi method. Hamilton- Jacoby theory. Poisson Bracket: Definition and properties. Invariance of Poisson-Brackets with respect to canonical transformation , Equations of motion in Poisson bracket form Jacoby identity. Infinitesimal contact transformations, interpretation in terms of Poisson Brackets. The angular momentum and Poisson Bracket, Lagrange's Brackets: definition & Properties , Relation with Poisson Brackets .

Text and Reference Books:
- Classical mechanics . H. Goldstein
- Principle of mechanics – Synge and Griffith
- Classical mechanics – Gupta Kumar , Sharma
- Classical mechanics of particles and Rigid body- Kiran C. Gupta

Signatures :

HOD : ------------------------------

External subject Experts: 1- ----------------------2-------------------------3------------------------

Departmental Members : 1----------------2-------------3------------4------------5-----------------

6--------------7---------------8-----------------9-------------------------

Student Members: 1--------------------------2--------------------3--------------------------

UNIT – I

Hertz experiment for particle nature of radiation, photoelectric effect and its explanation by plank's theory, Compton effect for particle nature of radiation, Davison - Germer experiment for wave nature of matter, interference experiment and uncertainty principle, probabilistic interpretation of matter waves, exact proof of uncertainty principle, Schrodinger equation physical interpretation of ψ and probability current density, Continuity equation, wave packet, time evolution of 1 D wave packet, group and phase velocities of a wave packet, operators and their commutation relation, Ehrenfest theorem, stationary state solution of schrodinger equation, boundary and continuity condition, degeneracy, orthogonality of eigen function, parity dirac delta function and completeness of eigen function, Gaussion wave packet.

UNIT - II

Some exact solutions for schrodinger equation like: 1D infinite potential well, particle in a 3 D box, density of states and application to free electrons in a metal, rectangular potential barrier, periodic potential wells and barriers, bracket notation properties and some applications, Hilbert space, and representation of states, matrix representation of operators; schrodinger picture, Heisenberg picture, interaction picture, unitary transformation U, V, W, linear harmonic oscillator problem using bracket notation, density operators.

UNIT – III

Angular momentum as infinitesimal rotation operator, Commutation relationship, angular momentum operator and spherical harmonics, Eigen values and eigen functions of Angular Momentum using bracket notation, concept of spin and Stern Gerlach experiment, Pauli's spin Matrices, Pauli's wave function and Pauli equation, angular momentum matrices for J=1, Addition of Angular Momentum and Clebsch-Gordon coefficients, calculation of Clebsch-Gordon coefficients for $J_1=J_2=1/2$

UNIT - IV

Central force problem: Solution of Schrodinger equation for spherically symmetric potentials; Hydrogen atom, center of mass frame, reduced mass,3D square well potential problem and eigen values and eigen function for hydrogen atom, Time-independent perturbation theory; Non-degenerate cases; First order Perturbation with the example of an Oscillator Degenerate cases, Applications of time independent perturbation theory such as Stark effect. Zeeman effect without electron spin , First order Stark Effect in Hydrogen .

Text and Reference Books:

- L I Schiff, Quantum Mechanics (McGraw-Hill)
- S Gasiorowicz, Quantum Physics (Wiley)
- B Craseman and JD Powell, Quantum Mechanics (Addison Wesley)
- A P Messiah, Quantum Mechanics
- J J Sakurai, Modem Quantum Mechanics
- Mathews and Venkatesan Quantum Mechanics

Signatures :

HOD : --------------------------------

External subject Experts: 1- ----------------------2-------------------------3-----------------------

Departmental Members : 1-----------------2-------------3-------------4------------5------------------

6--------------7----------------8------------------9-------------------------

Student Members: 1----------------------------2---------------------3--------------------------

(UNIT – I)

Transistors : Bipolar Junction transistor (BJT) – basics working principle of NPN and PNP transistor, characteristic curve and different modes of transistor, current gain in different modes and relation between them.

Junction Field Effect Transistor (FET) – N channel and P channel FET, Working principle, static and dynamic characteristic curves, pinched off voltage, Coefficient of FET, and relation between different coefficient. Metal Oxide Field Effect Transistor (MOSFET) – DE MOSFET and E-MOSFET- construction and working principle, static and dynamic characteristics.

Uni-junction transistor (UJT) – basics structure, working principle, Voltage – Current characteristics and important parameters .

UNIT – II

MIS Diode : Introduction , Energy band diagram, accumulation, depletion and inversion condition concept of surface space charge, surface potential, surface capacitance, Ideal MIS curves .   Charged Couple Device (CCD) : Basic structure, working principle, charge transfer with clock voltage. IMPATT Diode : Introduction, Structure, Principle of operation, Static and Dynamic Characteristics. Microwave devices: Tunnel DiodeTransfer Electron Devices: Transfer Electron Effect, Gun Diode, Backward Diode

UNIT – III

Other Electronic Devices: Electro-Optic, Magneto-Optic and Acousto-Optic Effects. Materail Properties related to get these effect. Important Ferro electric, Liquid Crystal and Ploymeric materials for these devices, Piezoelectric, Electrostrictive and magneto strictive Effects, Important materials exhibiting these properties, and their applications in sensors and actuator devices. Acoustic Delay lines, piezoelectiric resonators and filters.

UNIT – IV

Modulation : Definition , Types of Modulation, Mathematical expression of modulation, Percentage of modulation, Amplitude modulation, Generation of Amplitude modulation, Demodulation, Demodulation of Amplitude modulated wave, side bands, band width, DSBSC modulation, Generation of DSBSC waves. SSB modulation, Generation and Detection of SSB waves,

Multiplexing: Frequency division multiplexing (FDM)

Text and Reference Books:

1. Principles of Electronics – V.K. Mehta , Rohit Mehta (S.Chand & Company Ltd.)
2. Basic Electronics (Solid state) – B.L. Theraja (S. Chand & Company Ltd.)
3. Electronic Devices and Circuits – Jacob Millman , Christos C. Halkias (Tata McGraw Hill)
4. Optical Electronics by Ajoy Ghatak and K.Thyagarajan. Cambridge Univ. Press
5. Introduction to semiconductor devices, M.S. Tyagi, John Wiley & Sons.
6. Physics of semiconductor Devices – S.M. Sze (Wiley Eastern Ltd.)

Signatures :

HOD : ------------------------------

External subject Experts: 1- ---------------------2------------------------3------------------------

Departmental Members : 1----------------2-------------3------------4------------5-----------------

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Student Members: 1---------------------------2--------------------3--------------------------

M.Sc. (PHYSICS)
SEMESTER - I (JUL. –DEC. 2022)

Lab. Course – I (Code- PHY-105)
GENERAL

Time : 5 Hrs.	**Total Marks – 100**

1.	Experiment	60
2.	Viva Voce	20
3.	Sessional	20

List of Practical

1. Determination of Young's modulus of a metallic rod by using Searle's optical interference Newton's ring method.

2. Determination of wavelength of unknown spectral line of Hg (mercury) light using Hartmann's

3. To study the plank's constant h.

   (a) Determination of material constant.

   (b) Determination of temperature coefficient of current.

4. To study the temperature dependence of total radiation and to verify the Stefan's law.

5. To study the variation of refractive index of the material of the prism with wavelength and to verify Cauchy's dispersion formula.

6. To study the variation of refractive index with concentration of sugar solution by Abbe's refractometer method.

7. To find the ionization potential of mercury using gas filled diode.

8. To study the rise and decay of photo current using a thin film photocell.

9. To find the thickness of a wire using optical bench.

10. To study the characteristic curve of LDR (Light dependent resistor).

11. To study the characteristic curve of Opto-coupler.

Signatures :

HOD : ------------------------------

External subject Experts: 1- ----------------------2-------------------------3------------------------

Departmental Members : 1----------------2-------------3-------------4------------5-----------------

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Student Members: 1---------------------------2--------------------3--------------------------

M.Sc. (PHYSICS)
SEMESTER - I (JUL. –DEC. 2022)

Lab. Course – II (Code- PHY-106)
(Electronic Devices)

Time : 5 Hrs.	**Total Marks – 100**

1.   Experiment   60
2.   Viva Voce   20
3.   Sessional   20

List of Practical

1.   To Study of characteristics of PNP/NPN transistors .
2.   To Study of transistor as amplifier.
3.   To Study of characteristics of JFET.
4.   To Study of characteristics of MOSFET.
5.   To study the characteristic curve of SCR.
6.   To study the characteristic curve of UJT.
7.   To study the process in Amplitude Modulation and Demodulation.
8.   To study the process in Frequency Modulation and Demodulation.
9.   To study the process in Pulse Modulation and Demodulation.
10.   To measure by hybrid parameter i.e. h_{11}, h_{12}, h_{21}, h_{22} of a transistor at a difference current values.

Signatures :

HOD : ------------------------------

External subject Experts: 1- ---------------------2-------------------------3------------------------

Departmental Members : 1----------------2-------------3-------------4------------5-----------------

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Student Members: 1--------------------------2-------------------3--------------------------

Scheme of M. Sc. (PHYSICS)
Semester - II (January to June 2023)

Paper Number	Title of the Paper	Mark Theory Max.	Theory Min.	Internal Max.	Internal Min.	Total	Credits
I	Electrodynamics	80	16	20	04	100	4
II	Computational Methods and Programming	80	16	20	04	100	4
III	Advance Quantum Mechanics	80	16	20	04	100	4
IV	Digital Electronics	80	16	20	04	100	4
Lab. Course- I Programming in C						100	2
Lab. Course - II Electronics (Digital Electronics)						100	2
TOTAL MARKS						**600**	**20**

	Total Marks	Total Credits
Theory Papers	320	12.8
Internal Assessment	80	3.2
Lab Course	200	4.0
Grand Total	600	20.0

M.Sc. (PHYSICS)
SEMESTER - II (January to June 2023)
PAPER – I (Code- PHY-201)
(ELECTRODYNAMICS)
UNIT – I

Equation of continuity, Maxwell's equations (SI unit) and its derivation, Integral form of equation, Maxwell's equations in some particular cases: a) In Free space (b) In linear isotropic medium (c) for harmonically varying fields, Electromagnetic energy: Poynting Theorem, The wave equation. Plane electromagnetic waves in free space. Plane electromagnetic waves in a non-conducting isotropic medium (i.e. Isotropic dielectrics) . Plane electromagnetic waves in Anisotropic Non-conducting medium (Anisotropic dielectric) , Plane electromagnetic waves in conducting medium 1) skin depth 2) Poynting vector. A simple model for dynamic conductivity. Propagation of electromagnetic waves in ionized gases.

UNIT – II

Boundary conditions at the interface of two media, Reflection and Refraction of electromagnetic waves at the interface of Non-conducting media,. Fresnel's equations :case- 1 E-vector is perpendicular to the plane of incidence,case-2 E-vector is parallel to the plane of incidence, experimental verification of Fresnel's equations.

Reflection and transmission coefficients at the interface between two non conducting media, Brewster's law and degree of polarisation , Total internal reflection , Group velocity , Propagation of Electromagnetic waves between parallel conducting planes. Wave guides: TM modes and TE modes, Rectangular wave guides.

UNIT – III

Postulates of Einstein's special theory of relativity, Galliean transformations. Lorentz's transformations and it's consequences: Length Contraction, Time Dilation, Velocity addition, Variation in mass. Transformation of differential operator, Invariance of D'Alembertian operator, Invariance of charge, Transformation of charge density, Electric field measured in different frames of reference, Minkowski space, concept of four vector, Lorentz transformation of space and time in four vector form, Transformation for charge and current density: Equation of continuity in covariant form, special case, Invariance of charge. Transformation of electromagnetic potential A and . Lorentz condition in covariant form, Covariance or invariance of Maxwell field equation in terms of four vectors.

UNIT – IV

Electromagnetic vector and scalar potential , Lorentz Gauge, Lienard Wiechart potentials, the electromagnetic field of a uniformly moving point charge, Radiation from an accelerated charge at low velocity – Larmer's formula , Relativistic generalization of Larmer's formula, Angular distribution of radiation emitted by an accelerated charge, Radiation damping, The Abraham Lorentz formula, Cherenkov radiation, Radiation due to an oscillating electric dipole, electric quadra pole radiation, Radiation due to small current element, Radiation from linear antenna, Half wave antenna, Antenna array: Work, Radiation, Pattern.

Text and Reference Books:

1. Classical electrodynamics by –J.D. Jackson
2. Electromagnetic theory and electrodynamics by Satyaprakash.
3. Classical theory of fields – by Landau L.D. and lifshitz
4. Electrodynamics of continuous media- Landau L.D. and lifshitz
5. Electromagnetic theory – Chopra and Agrawal .

Signatures :

HOD : ------------------------------

External subject Experts: 1- ---------------------2-------------------------3------------------------

Departmental Members : 1----------------2-------------3-------------4------------5-----------------

6-------------7---------------8-----------------9-------------------------

Student Members: 1--------------------------2--------------------3-------------------------

M.Sc. (PHYSICS)
SEMESTER - II (January to June 2023)

PAPER – II (Code- PHY-202)
(COMPUTATIONAL METHODS AND PROGRAMMING)

UNIT - I

Problem analysis and solving scheme. Computational procedure, programming outline, flow chart. Branching and looping writing.

Character set, constants, (numeric string) variables(numeric string) rules for arithmetic expressions and hierarchy of operators, rational expressions, logical expressions, and operators, library functions. Identifiers, qualifiers, define statements, value Initialized variables, operators, and expressions. Operator precedence and associativity.

Scanf with specifier, search set arrangements and suppression Character, format specifier for scanf.

UNIT - II

Control structure, If statement, if else statement, multiway decision, compound statement.
Loops: for loop, while loop, do while loop, break statement , compound statement continue statement , go to statement
Function: function main , function accepting more than one parameter, user defined and library function concept associatively with functions, function parameter, return value, recursion comparison.

Arrays , strings, multidimensional array, array of strings function in string

UNIT - III
(Without Programming)
Solution of algebraic and transcendental equations – Basic properties of equation, transformation of equation and rate of convergence. Methods –Bisection Method, Regula falsi method, Secant method, iteration method, Newton Raphson method, Muller's method.
Solution of simultaneous linear equations Gaussian elimination pivoting, iterative method matrix inversion method, cramer's rule, Gauss-Jordan method.
Eigen values and Eigen vectors of matrices. Power and Jacobi method , curve fitting polynomial least squares

UNIT - IV
(Without Programming)
Finite deference interpolation with equally spaced and unequally spaced points, Numerical differentiation and Integration, Newton cote's quadrature formula–trapezoidal rule, simpson1/3 rule,simspson3/8 rule, Boole's rule, Weddle's rule.

Numerical solution of ordinary differential equation . Euler and Runga Kutta methods. Predictor corrector method

Text and Reference Books:

1. Sastry: Introductory methods of numerical analysis
2. Vetterming, Teukolsky press and Flannery : Numerical Recipes
3. Let Us C : Yashwant Kanitkar
4. Programming in C : E. Balaguruswami.
5. Numerical Methods : P.Kandasamy

Signatures :

HOD : ------------------------------

External subject Experts: 1- ---------------------2-------------------------3------------------------

Departmental Members : 1----------------2-------------3-------------4------------5-----------------

6--------------7----------------8-----------------9-------------------------

Student Members: 1--------------------------2--------------------3--------------------------

UNIT – I

Variational method, Ground state energy of H atom, Ground state energy of He atom, Ground state energy of 1D harmonic oscillator. WKB method, Classically accessible & inaccessible region ,Turning points, condition of validity of semi classical approximation, connection formula to join two WKB solutions at turning points, Sommerfield quantization condition, Energy levels of potential well, quantization rule, Probability of penetration through potential barrier, tunneling through potential barrier, Theory of α decay.

UNIT – II

Time dependent perturbation theory:-Basic Concept, Transition probability, harmonic perturbation, constant perturbation, Fermi's Golden rule, adiabatic approximation ,sudden approximation, Semi classical theory of radiation:-The interaction of radiation with atomic system, Applications of time dependent perturbation theory, Transition probability for absorption and induced emission, Electric dipole transition, transition Probability, Einstein's A & B coefficients, selection rule, forbidden transition

UNIT - III

Scattering, scattering amplitude scattering cross section, Laboratory & centre of mass frame, Techniques for calculating the scattering amplitude, Born approximation, Integral form of Schrodinger equation, First Born approximation, Born approximation for spherically symmetric potential, condition for validity of Born approximation, Applications of Born approximation:- screened coulomb potential, square well potential, Partial wave analysis:-Formalism & strategy, Optical theorem, phase shift, Applications of partial wave analysis, scattering by Perfectly rigid sphere and square well potential.

UNIT – IV

Identical particles : Physical meaning of identity, Symmetric & Anti symmetric wave function, Construction from unsymmetrized function, the Exclusion principle, spin angular momentum.

Relativistic quantum mechanics:- Klein Gorden equation for free particle and for particle in electromagnetic field, continuity equation, Dirac equation for free particle, α and β matrices, charge and current densities, free particle solution, existence of spin and magnetic moment, theory of positron.

Text and Reference Books:

- Davidov: Quantum Mechanics.
- L.I. Schiff : Quantum Mechanics.
- Powell and Craseman : Quantum Mechanics.
- Ghatak and Loknathan : Quantum Mechanics.

Signatures :

HOD : -------------------------------

External subject Experts: 1- ---------------------2-------------------------3------------------------

Departmental Members : 1-----------------2-------------3-------------4-------------5------------------

6--------------7----------------8------------------9--------------------------

Student Members: 1---------------------------2--------------------3--------------------------

M.Sc. (PHYSICS)

UNIT - I

Number system : Decimal, Binary, Octal and Hexadecimal Number System with mutual conversion, BCD addition and subtraction, 1's and 2's compliments, multiplication & division BCD code (8421), Excess –3 code, gray code, binary to gray code and gray code to binary code conversion.

Logic gates: Positive and negative logic , Basic gates, Universal building block. Basic laws of Boolean Algebra, De-Morgan's Theorem, two, three and four variable K-Map, mapping and minimization of SOP and POS expressions, pairs, quads, octet, overlapping, Rolling, concepts of Don't care condition.

UNIT – II

Ex-OR gate, Ex-NOR gate circuitry, Half adder, Full adder, binary parallel adder, Serial adder, Half Subtractor, Full Subtractor, 1's complements Subtractor circuit and 2's complements Subtractor circuit.
Digital logic Families : Introduction, Basic concepts of RTL, DTL, TTL, ECL and CMOS logic.   Decoder : 2 line to 4 line decoder, 1 of 16 decoder, BCD to decimal decoder, BCD to seven segment decoder, Encoder : decimal to BCD encoder.
Multiplexer : 2-input, 4-input, 16 input Multiplexer, DeMultiplexer : 1 line to 2 line , 1 line to 4 line and 1 line to 16 line DeMultiplexer.

UNIT – III

Flip-flop and timing diagram, RS flip-flop using NOR gate, RS flip-flop using NAND gate, Clocked RS flip-flop, D- latch flip-flop, Preset and Clear, JK flip-flop, Positive and negative edge triggered flop-flops., JK Master Slave flip-flop.
Counters : Binary ripple counter , up counter , down counter, decade counter and Ring counter and time diagram
Registers : Parallel and shift Register, Scaling, PIPO, SIPO, PISO, SOSI Bi-directional shift Register, Application of shift register.

UNIT – IV

Digital to analog converter and Analog to Digital converters : D/A converters using binary weighted resistor network and R-2R ladder Network; Counter type A/D converter, Successive approximation A/D converter and dual slope converters , applications of DACs and ADCs.
Intergraded Circuit : Introduction, Technology, Advantages and disadvantages, Basic technology of monolithic IC, Basic processes used in monolithic technology, Fabrication of components on monolithic IC, IC packing, symbol and scale of Integration.

Text and Reference Books :

1. Digital Principles and applications – Malvino and Leach, Tata McGraw Hills, New Delhi, 1991.
2. Digital and Analogue Technique- Navneet Gokhale and Kale, Kitab Mahal
3. Hand Book of Electronics – Gupta and Kumar, Pragati Prakashan, Meerut, 2008
4. Digital integrated Electronics _ Taub and Schilling, McGraw International Edition, 1977
5. Fundamentals of Digital Circuits – A.Anand Kumar, Prentice Hall of India, N.Delhi. 2007.

Signatures :

HOD : -----------------------------

External subject Experts: 1- ---------------------2-------------------------3------------------------

Departmental Members : 1----------------2-------------3-------------4------------5-----------------

                              6--------------7---------------8-----------------9-------------------------

Student Members: 1--------------------------2--------------------3--------------------------

Lab. Course – I (Code- PHY-205)
Programming in C

Time : 5 Hrs.   **Total Marks – 100**

1.	Experiment	60
2.	Viva Voce	20
3.	Sessional	20

List of Practical

1. Write a program for using bisection method.
2. Write a program for using Regula -falsi method.
3. Write a program for using Newton -Raphson method.
4. Write a program for multiplication of two matrices.
5. Write a program for using Gauss- Elimination method.
6. Write a program for using Gauss- Jordon method.
7. Write a program for using Gauss- Seidal iteration method.
8. Write a program for using Newton -forward interpolation formula.
9. Write a program for using Lagrange's - interpolation formula.
10. Write a program for using Trapezoidal rule.
11. Write a program for using Simpson rule.
12. Write a program for using Runge-Kutta method.
13. Write a program for using Muller's method
14. Write a program for using method of Least Squares
15. Write a program for using Euler's method

Signatures :

HOD : ------------------------------

External subject Experts: 1- ---------------------2-------------------------3------------------------

Departmental Members : 1----------------2-------------3-------------4------------5-----------------

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Student Members: 1--------------------------2--------------------3--------------------------

Time : 5 Hrs.   **Total Marks – 100**

1.   Experiment   60
2.   Viva Voce   20
3.   Sessional   20

List of Practical :

1.   Study of RS, D Filp-flop.
2.   Study of JK Flip –flop.
3.   Study of Half Adder and Full Adder.
4.   Study of Half subtractor and Full subtractor.
5.   Study of Decimal to BCD encoder using IC 74147.
6.   Study of BCD to 7 segment decoder using IC 7447.
7.   Study of BCD to Decimal decoder using IC 7442.
8.   Study of Binary to Gray code converter using EX-OR gate.
9.   Study of 16:1 multiplexer using ICs 74150 and 74154 and analyse.
10.   Study of 1:16 demultiplexer using ICs 74150 and 74154 and analyse.

(Photonics & Op Amp)

1.   To study the characteristic of LED.
2.   To study the characteristic of LDR.
3.   To study of operational amplifier as Integrator.
4.   To study of operational amplifier as Differentiator
5.   To study the op-amp. as scalar
6.   To study of operational amplifier as voltage follower
7.   To study op-amp as a differential amplifier.
8.   To study the characteristic of Photo transistor.
9.   To study the characteristic of Opto coupler.

Signatures :

HOD : -------------------------------

External subject Experts: 1- ----------------------2-------------------------3-------------------------

Departmental Members : 1----------------2-------------3-------------4------------5------------------

                                        6--------------7----------------8------------------9--------------------------

Student Members: 1----------------------------2--------------------3--------------------------

GOVT. NAGARJUNA PG COLLEGE OF SCIENCE, RAIPUR

DEPARTMENT OF PHYSICS

SYLLABUS AND MARKING SCHEME

M. Sc.
(IIIrd and IVth Semester System)
2023-2024

M. Sc. PHYSICS
Scheme of Semester Examination (2023-2024)

Semester III

Paper Number	Tital of the Paper	Marks					Credits
		Theory		Internal		Total	
		Max.	Min.	Max.	Min.		
I	Nuclear and Particle Physics	80	16	20	04	100	4
II	Statistical Mechanics	80	16	20	04	100	4
III Special Paper I	Condensed Matter Physics -I	80	16	20	04	100	4
IV Special Paper II	Electronics (Photonics & Op Amp)	80	16	20	04	100	4
	Lab. Course – I Condensed Matter Physics and Materials Modeling					100	2
	TOTAL MARKS					**500**	**18**
	Internal marks i.e. Unit test (Each Paper)					20	

M. Sc. PHYSICS
Scheme of Semester Examination (2023-2024)

Semester IV

Paper Number	Title of the Paper	Marks					Credits
		Theory		Internal		Total	
		Max.	Min.	Max.	Min.		
I	Atomic and Molecular Physics	80	16	20	04	100	4
II Elective Paper	1- Physics of Nanomaterials	80	16	20	04	100	4
	2- Laser Physics and Applications	80	16	20	04	100	4
III Special Paper III	Condensed Matter Physics - II	80	16	20	04	100	4
IV Special Paper –IV	Electronics (Microprocessor and Communication)	80	16	20	04	100	4
	Lab. Course Electronics (Microprocessor and Communication)					100	2
	Project					200	4
	TOTAL MARKS					**700**	**22**
	Internal marks i.e. Seminar (Each Paper)					20	
	GRAND TOTAL [SEMESTER I (600) + SEMESTER II (600) + SEMESTER III (500) + SEMESTER IV (700)]						**2400**

M. Sc. PHYSICS
Scheme of Semester Examination (2023-2024)

Semester III

Paper Number	Title of the Paper	Marks					Credits
		Theory		Internal		Total	
		Max.	Min.	Max.	Min.		
I	Nuclear and Particle Physics	80	16	20	04	100	4
II	Statistical Mechanics	80	16	20	04	100	4
III Special Paper I	Condensed Matter Physics -I	80	16	20	04	100	4
IV Special Paper II	Electronics (Photonic Devices & Op Amp)	80	16	20	04	100	4
	Lab. Course - I Condensed Matter Physics and Materials Modeling					100	2
	TOTAL MARKS					**500**	**18**
	Internal marks i.e. Unit test (Each Paper)					20	

	Total Marks	Total Credits
Theory Papers	320	12.8
Internal Assessment	80	3.2
Lab Course	100	2.0
Grand Total	500	18.0

PAPER – I (Code- PHY-301)
(NUCLEAR & PARTICLE PHYSICS)

UNIT – I

Nuclear Decay :

decay: Introduction, determination of q/M for particles (Rutherford and Royd's experiment), Range of particle, energy of particle, energy velocity-energy-life time relation, alpha particle spectra, some decay schemes, Gamow's theory of particle, its advantanges in theory of alpha decay, Geiger Nuttal law, properties of particle.

decay : Introduction, general theory of decay (Flat type spectrometers, Lanse type spectrometer), The neutrino hypothesis and its indirect method, Fermi theory of decay (Coulomb correction, screening by atomic electron, kurie plot, mass of neutrino, Life time of decay) classification of transitions (selection rules), parity violation of decay, decay schemes of some important nuclides.

UNIT – II

Nuclear Reactions and Energy:

Introduction, types, Conservation laws, kinematics and general solution of the Q equation, binding energy, nuclear transformations (by α particles, protons, neutrons, deuterons, particle of mass three, radiation, heavy ions with examples), nuclear cross section (partial wave analysis of reaction cross section)
Compound Nucleus : Mechanics (formation and breakup), Energy level of nuclei and level width, De-excitation, compound nucleus cross-section (Briet Wigner dispersion formula)
Nuclear fission and fusion : Introduction, Neutrons released in fission process; cross sections, nuclear chain reactions, nuclear reactor, four factor formula, critical size of reactor, , fusion, thermonuclear energy, prospect of controlled fusion energy.

UNIT – III

Counters: Types of counter, Gas filled counter, Solid State counter, scintillation counter with their principle, working method, applications and advantages & disadvantages. Neutron detection :- introduction, different types, principle, experimental detail with applications.
Accelerators : Types of accelerator, Cyclotron, linear accelerators, betatron, electron synchrotron, proton synchrotron with their principle, working method and applications.

UNIT - IV

Elementary Particles :
Classification of elementary particles, basic particle interactions, conservation laws, invariance under parity, CP, time, CPT, Electron and positron, proton and antiproton, neutrino and antineutrino, mesons and hyperons: (their masses, decay modes and reactions) elementary particle symmetry : unitary and eightfold way symmetries. Quark theory : experimental evidence, masses, numbers, mesons and baryons.
Text and Reference Books:

Nuclear Physics ,Ray and Nigam (Wiley Eastern ltd)
Nuclear Physics, I Kaplan (Narosa)
Introduction to nuclear Physics, H.A. Enge (Addison Wesley)
Concepts of Nuclear Physics, B.L.Cohen (TMGH)

Signatures :

HOD : -------------------------------

External subject Experts: 1- ---------------------2-------------------------3------------------------

Departmental Members : 1----------------2-------------3-------------4------------5-----------------

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Student Members: 1---------------------------2-------------------3-------------------------

UNIT - I

Foundation of statistical mechanics – Specification of the state of a system statistical ensemble, contact between statistical and thermo dynamical quantities, Micro canonical ensemble, perfect gas in micro canonical ensemble, partition function and its correlation with thermodynamic quantities nature of probability function partition function for canonical ensemble thermodynamic functions for canonical ensemble. Perfect mono atomic gas in canonical ensemble, Grand canonical ensemble: Partition function and thermo dynamic function for grand canonical ensemble, Perfect gas in grand canonical ensemble.

UNIT - II

Classical ideal gas entropy of mixing, Gibbs's paradox, Phase space Liouvelle's theorem, Maxwellian distribution from canonical distribution, Transition from classical statistical mechanics to quantum statistical mechanics, indistinguishability and quantum statistics .
The density matrix, condition for statistical equilibrium, B.E., F.D. & M.B. statistics evaluation of constant α and β , Result of three statistics, Properties of ideal Bose gas, gas degeneracy, B.E. condensation, ideal fermi dirac gas – energy & pressure of gas & light and strong degeneracy.

UNIT - III

Theory of imperfect gases – Virial equation of state Virial coefficients, cluster expansion for a classical gas. The Ising model in one dimension, exact solution of Ising model in one dimensions Phase transition, Phase transition of first and second kind, Landau's Phenomenological theory of phase transition.

UNIT - IV

Fluctuations – Thermo dynamic fluctuations spatial correlation in a fluid, The Langevin's theory of the Brownian motion, Einstein Relation and Expression for mobility(Nernst relation) Fokker – Planck equation, Fluctuation dissipation theorem.

Text and Reference Books:

1.Statistical & Thermal Physics, by F. Reif
2.Statistical Mechanics, by K. Huang
3.Statistical Mechanics, by R.K. Pathria
4.Statistical Mechanics, by R. Kubo
5. Statistical Physics, Landau and Lifshitz
6. Statistical Physics, R. K. Patharia

Signatures :

HOD : ------------------------------

External subject Experts: 1- ----------------------2-------------------------3------------------------

Departmental Members : 1-----------------2-------------3-------------4------------5-----------------

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Student Members: 1-------------------------2--------------------3--------------------------

PAPER – III (Code- PHY-303)
Special Paper –I
(CONDENSED MATTER PHYSICS – I)

UNIT - I

Crystalline and amorphous solids:-Unit cells and direct lattice. Bravais Lattice Types of lattice:-Two and three dimensional Bravais lattices, Fundamental elements of symmetry(Translation, Rotation, Reflection ,Inversion), Symmetry groups(Point Groups, space Groups) concept of point group and space groups, crystal planes and Miller indices, simple crystal structure : closed packed structures (Hexagonal closed packed Structure, Face centered cubic Structure), Loose packed Structures: (Body Centered Cubic Structure, Simple cubic Structure) , X-Ray Diffraction(Laue's Equation, Bragg's law), Interaction of X rays, electrons and neutrons with matter, Electron Elastic scattering from an perfect lattice, Reciprocal latticeVectors, Reciprocal lattice vectors to SC lattice, Reciprocal lattice to BCC lattice, Reciprocal lattice vectors to FCC Lattice, Properties of Reciprocal lattice Ewald's construction, Brillouin Zones :- Brillouin Zone for Simple cubic lattice, Brillouin Zone for Body centered cubic lattice, Brillouin Zone for Face Centered Cubic Lattice

UNIT - II

Defects or imperfections in crystals and their classification Defects : Introduction, Classification of Defects ,Point defects, Line Defect, Plane Defect, Schottky and Frenkel defects, vacancies, interstitial

Colour center & their production:- Introduction, classification of Colour centre, Formation of F-centre, in ionic crystals, their types and production, Deformation (Plastic Deformation-Slip & Yield, Shear strength of Single Crystal, line defects or Dislocations:-Introduction to Disslocation, Edge and Screw dislocations, Burger Vectors, the role of dislocations in Plastic deformation and crystal growth.

UNIT - III

Electron's in a periodic lattice, The Periodic potential ,Block theorem, First Proof of Bloch theorem The Born Von Karman boundary condition, second Proof of Bloch theorem, General remarks of Bloch theorem, Kroning-Panny model, Band theory, Origin of the energy Gap, magnitude of energy Gap, Band gap, holes , Width of bands, Constant energy curve & surfaces, Classification of solids, Distinction between metal semiconductors & insulators, effective mass, equation of motion, velocity of electron, E-K curve, k-space, negative effective mass & holes, physical interpretation of effective mass , effective mass in semiconductors, Tight bonding:-general formulation remarks on calculating the band Structure, cellular and pseudo potential methods, Fermi surface and its construction, de Haas von Alfen effect, cyclotron resonance, magnetoresistance , quantum Hall Effect, Hall coefficient , hall resistance, Bloch Wave.

UNIT - IV

Magnetism, Ferromagnetism, Weiss theory of ferromagnetism, curie's temperature, Paramagnetic region nature & Origin of weiss molecular field, Exchange interaction, Heisenberg model and molecular field theory, Curie-Weiss law for susceptibility, concept of Domains & hysteresis ,Domains, Bloch wall energy origin of domains single domain particle, magnetic bubble domain, Ferri order, curie temperature & suscesptebility of ferrimagnets from garnets, Antiferromagnetic order, Antiferromagnetic magnons,

Antiferromagnetic resonance, Doman's and Block wall energy. Quantization of Spin waves, Neudron magnetic scattering magnoins , susceptibility below Neel temperature.

Text and Reference Books:

Kittel: solid state physics
Azroff: Introduction to solids
Varma and Shrivastava: Crystallography for solid state Physics
Singhal: solid state physics
Ziman: Principal of theory of solids
Ascrroff and mermin: solid state physics
Madelung : Introduction to solid state theory
Huong: Theoretical solid state physics
Omar: Elementary solid state physics
Kittel : Quantum theory of solids

Signatures :

HOD : ------------------------------

External subject Experts: 1- ---------------------2-------------------------3------------------------

 Departmental Members : 1----------------2-------------3-------------4------------5-----------------

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 Student Members: 1--------------------------2--------------------3--------------------------

Special Paper II
(ELECTRONICS)
(Photonics & Op Amp)

UNIT – I

Radiative and non-radiative transistors , Optical Absorption, bulk and thin film, photoconductive devices (LDR) , Emission spectra , Luminescent efficiency , method of excitation. Light emitting diode (LED) : high frequency limit, effect of surface and indirect combination current , operation of LED, Visible LEDs and Infrared LEDs. Diode Laser (Condition for population inversion in active region, light confinement factor , optical gun and threshold current for lasing, Fabry-Perrot Cavity Length for losing and the separation.

UNIT – II

Photo detectors: Photoconductor, equivalent circuit of photoconductor. Phototransistor. Bipolar phototransistor, photo – Darlington transistor, V-I characteristic of bilateral hetero structure phototransistor, Solar cells, Solar radiation, solar spectrum, ideal conversion efficiency, Energy band diagram of solar cell, IV characteristics of solar cell, PN junction solar cells, Hetero junction, Interface thin film solar cells.

UNIT – III

Basic Op-amp. Differential amplifier – circuit configurations, dual input, balanced output, differential amplifier –DC analysis, Ac analysis, inverting and non-inverting inputs, CMRR, Constant current bias level transistor.

Block diagram of a typical Op-amp. Analysis, open loop configuration, inverting and non-inverting amplifier, Op-amp. With negative feedback, Voltage series feed back, effect of feed back on closed loop gain input persistence output , resistance bandwidth and output offset voltage , voltage follower.

Practical Op-amp. Input offset voltage, Input offset current, total output offset voltage, CMRR frequency response

UNIT – IV

DC and AC amplifier - summing scaling and averaging amplifiers instrumentation amplifier, integrator and differentiator

Oscillators - principles, oscillator types, frequency stability response, The phase shift oscillator. Wein bridge oscillator, LC tunable oscillators –

Multivibrators - Monostable and Astable , Comparators, square wave and triangle wave generators.

Text and Reference Books :
1. Semiconductor Devices – Physics and Technology – S.M. Sze, Wiley, 1985
2. Introduction to Semiconductor Devices – M.S.Tyagi, John Wiley & sons
3. Electronic Devices and circuit theory – Robert Baylested and louis Nashdsky, PHI, New Delhi, 1991
4. Electronic Fundamentals and applications – John D. Ryder PHI, New Delhi, 1987.
5. Operational Amplifier and their applications – Subir Kumar Sarkar, S.Chand & Sons, New Delhi1999.
6. Op-amps & linear integrated circuits- Ramakanth A. Gayakward, PHI, 2 Ed. 1991

Signatures :

HOD : -----------------------------

External subject Experts: 1- ---------------------2-------------------------3-----------------------

Departmental Members : 1----------------2-------------3-------------4-------------5-----------------

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Student Members: 1---------------------------2--------------------3-------------------------

Lab. Course-I (Code- PHY-305)
Condensed Matter Physics and Materials Modeling

Time : 5 Hrs.   **Total Marks – 100**

1.	Experiment	60
2.	Viva Voce	20
3.	Sessional	20

List of Practical : Condensed Matter Physics

- To study the variation of thermo e.m.f. with temperature for the copper iron thermocouple.

- To determine the wavelength of laser with the help of grating.

- To determine the temperature coefficient of resistance of platinum wire with the help of Wheatstone bridge.

- To determine the specific resistance and the energy band gap of a semiconductor.

- Dispersion relation of the monatomic and diatomic (lattice dynamics).

- To determine the braise lattice and point group.

- To study the characteristics of JFET.

- To study the characteristics of MOSFET.

- Characteristics of solar cell :-
  1. to find efficiency of solar cell inverter.
  2. I-V characteristic .
  3. to find intensity in different directions.

- Characteristics of solar mobile charger: -
  1. Efficiency of solar mobile charger.
  2. I-V characteristics

List of Practical : Materials Modeling

1. To creat input file for H2O molecule using Jmol and/or avogadro and run to find optimum energy of the system.[Students can also take pseudopotential files and H2O.fdf from https://departments.icmab.es/leem/siesta/ and test directory of siesta program]

2. To compile eig2dos, gnubands, pdosxml, rho2xsf using fortran compilers and run sample files to verify the compiled utilities.

3. To optimize basis sets and correlations functions using test example of H2O molecule.

4. To optimize the structure of CH4 using mesh-cutoff, kpints and lattice-optimization routes.

5. To study DOS PDOS and energy bands of CH4.

6. To optimize the structure and study the charge density using eig2dos of graphene nanoribons.

7. To analysis the band structure of MgO and calculate direct indirect band gaps at various symmetry points.

8 . To study the magnetic properties of Fe2O3 using spin-polarized technique.

9. To study the optical properties of crystal strutured CdS.

10. To study the different charge populations implemented in siesta and study the bond strength using COOP/COHP tools for Benzen ring.

11. To study the mechanical properties of B2O3.

12. To study the electronic tranport properties of Benzen using graphene electrodes in Transiesta.

    [A separate mannual should be prepared with the help of siesta mannual and test files.]

Signatures :

HOD : ------------------------------

External subject Experts: 1- ---------------------2-------------------------3------------------------

 Departmental Members : 1----------------2-------------3-------------4------------5-----------------

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 Student Members: 1---------------------------2--------------------3--------------------------

Scheme of M. Sc. (PHYSICS)
Semester - IV (JAN. – JUN. 2024)

Paper Number	Name of Paper	Mark				Total	Credits
		Theory		Internal			
		Max.	Min.	Max.	Min.		
I	Atomic and Molecular Physics	80	16	20	04	100	4
II Elective Paper	3- Physics of Nanomaterials	80	16	20	04	100	4
	4- Laser Physics and Applications	80	16	20	04	100	4
III Special Paper III	Condensed Matter Physics - II	80	16	20	04	100	4
IV Special Paper –IV	Electronics (Microprocessor and Communication)	80	16	20	04	100	4
	Lab. Course – Electronics (Microprocessor, Micro Computer, Digital and Fiber Communication)					100	2
	Project					200	4
	TOTAL MARKS					**700**	**22**
	Internal marks i.e. Seminar (Each Paper)					20	
	GRAND TOTAL [SEMESTER I (600) + SEMESTER II (600) + SEMESTER III (500) + SEMESTER IV (700)]						**2400**

	Total Marks	Total Credits
Theory Papers	320	12.8
Internal Assessment	80	3.2
Lab Course	100	2.0
Project	200	4.0
Grand Total	700	22.0

UNIT – I

Bohr theory of spectra of hydrogen and hydrogen like atoms, reduced mass of electron, variation of Rydberg constant. Sommerfeld's elliptical orbit. Space quantization, Larmor's theorem Pauli's vector atom model, four quantum numbers.
Spectra of alkali atoms, The effective quantum number and quantum defect, Fine structure in alkali spectra, selection and intensity rules for doublet, The spinning electron and vector model ,selection and intensity rules
Spectral terms arising from l-s coupling, spin orbit interaction, screening constants for alkali spectra
Atom model for two valence electrons, equivalent and non-equivalent electrons, Spectra of Alkaline earth atoms, singlet-triplet series, LS and JJ coupling, interaction energy, selection and intensity rules.

UNIT – II

The magnetic movement of the atom, Effect of magnetic field on energy levels (mono valent atoms) Gyromagnetic ratio for orbital and spin motion, vector model, Lande's g-factor, normal and anamolous Zeeman effect, Paschen Back effect. Stark effect Hyperfine structure (Qualitative) Line broadening mechanism. Electron spin resonance, Nuclear magnetic resonance.

UNIT – III

Introduction to the theoretical treatment of molecular system Types of molecules-Diatomic linear symmetric top, asymmetric top and spherical top molecules, energy levels and spectra. Rotational energy and spectra of diatomic molecules as rigid rotor and non rigid rotor, inter nuclear distance and isotope effect.
Vibrational energy levels and spectra of diatomic molecules as harmonic oscillator - Anharmonicity of molecular vibrations, energy levels and spectrum, Morse potential energy curve, isotope effects and force constants

UNIT – IV

Molecule as vibrating rotor- rotator vibrational spectrum of diatomic molecules-PQR branches, Rotational spectra, the vibrations of polyatomic molecules, Electronic spectra of diatomic molecules- Born Oppenheimer approximation-vibrational coarse structure of electronic bands-progression and sequences-Intensity of electronic bands-Franck Condon principle-Rotational fine structure of electronic bands.

Text and Reference Books

1. H.E. White   Introduction to atomic physics
2. Barrow   Introduction to molecular physics
3. G.Herz berg   Molecular spectra and molecular structure
4. H.Kuhn   Atomic spectra
5. Walker and straugh   Spectroscopy Vol I,II,III.

Signatures :

HOD : ------------------------------

External subject Experts: 1- ---------------------2-------------------------3-----------------------

Departmental Members : 1----------------2-------------3-------------4-------------5------------------

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Student Members: 1---------------------------2---------------------3-------------------------

UNIT I
(PHYSICAL AND CHEMICAL PROPERTIES)

Introduction: Emergence of Nanotechnology, Challenges in Nanotechnology, Nano Hazards; Societal and Ethical Implications; **Physical Properties of Nanomaterials**: Melting points and lattice constants, Mechanical properties, Optical properties, Surface plasmon resonance, Quantum size effects. Electrical and Magnetic Properties: Surface scattering, Change of electronic structure, Quantum transport, Effect of microstructure. Ferroelectrics and dielectrics, Superparamagnetism**.; Chemical Properties** : Surface Energy, Chemical Potential as a Function of Surface Curvature, Electrostatic Stabilization, Surface charge density, Electric potential at the proximity of solid surface, Van der Waals attraction potential, Interactions between two particles: DLVO theory.

UNIT II
(NANO FABRICATION TECHNIQUES)

Bottom-Up and Top-Down Approaches; **Lithography:** Photolithography, Electron beam lithography, X-ray lithography, Focused ion beam (FIB) lithography ; **Nanomanipulation and Nanolithography**: Scanning tunneling microscopy (STM) , Atomic force microscopy (AFM) , **Soft Lithography**: Microcontact printing, Dip-pen nanolithography; **Self Assembly of NanoMaterials,**
Semiconductor quantum dots synthesis, electronic structure and characterization,
Synthesis of 1-D nanowires VLS (Vapour- Liquid –Solid)growth, and SLS (Solid – Liquid – Solid) growth.; Thin Films (2-D) growth **by** Chemical Vapor Deposition (CVD) **,** Atomic Layer Deposition (ALD), Langmuir-Blodgett Films, Sol-Gel Films.

UNIT III
(MATERIALS AND CHARACTERIZATION)

Structural Characterization: X-ray diffraction (XRD), Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Scanning probe microscopy (SPM),
Chemical Characterization: Optical spectroscopy, Electron spectroscopy, Ionic spectrometry
Special Nanomaterials: Carbon fullerenes, Fullerene-derived crystals, Carbon nanotubes, Ordered and random mesoporous structures, Crystalline Microporous Materials: Zeolites, Intercalation Compounds, Types, Properties and Applications of Core – Shell Nanoparticles.

UNIT IV
(DEVICES AND APPLICATIONS)

Band Gap Engineered Quantum Devices**,** Quantum well devices**,** Quantum dot devices, Photonic Crystals and Plasmon Waveguides**.** Nanobots, Catalysis by Gold Nanoparticles**,**
Active Microfluidic Devices , Smart Passive Microfluidic Devices, Lab-on-a-Chip for Biochemical Analysis, Targeted Drug Delivery mechanism, principle and working of Nano Sensors and nanobio Sensors.
 Molecular Switches and Logic Gates, Pressure Sensor, Inertial Sensor, Optical MEMS , RF MEMS, Current Challenges and Future Trends of NEMs.

Text Book:
1. Nanostructures and Nanomaterials - Synthesis properties and Applications by Guozhong Cao (Empirical College Press World Scientific Pub., 2004).
2. Springer Handbook of Nanotechnology, Bharat Bhushan (Ed.), Spinger-Verlag Berlin Heidelberg New York, ISBN 3-540-01218-4
3. NANO: The essentials, T. Pradeep, Mcgraw Hill Edu Pvt Ltd, Tamilnadu (India), 2007, ISBN 978-0-07-061788-9

Reference Books:
1. Principles of Nanoscience and Nanotechnology by Shah and Ahmad
2. Nanotechnology: Synthesis and Application by N. K. Sharma
3. Encyclopedia of Nanotechnology, H.S. Nalwa.

Signatures :

HOD : ------------------------------

External subject Experts: 1- ---------------------2-------------------------3-----------------------

Departmental Members : 1----------------2-------------3-------------4------------5-----------------

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Student Members: 1---------------------------2--------------------3-------------------------

PAPER – II (Elective) (Code- PHY-402 B)
(Laser Physics and Applications)

Unit- I

Spontaneous and stimulated emission, Einstein's quantum theory of radiation, theory of some optical processes, coherence and monochromacity, kinetics of optical absorption, line broadening mechanism, Basic principle of lasers, population inversion, laser pumping, two & three level laser systems, resonator, Q-factor, losses in cavity, threshold condition, quantum yield.

Unit – II

Solid state lasers- the ruby laser, Nd:YAG laser, ND: Glass laser, semiconductor lasers – features of semiconductor lasers, intrinsic semiconductor lasers, Gas laser -neutral atom gas laser, He-Ne laser, molecular gas lasers, CO2 laser, Liquid lasers, dye lasers and chemical laser.

Unit-III

Production of giant pulse -Q-switching, giant pulse dynamics, laser amplifiers, mode locking and pulling, Non-linear optics, Harmonic generation, second harmonic generation, Phase matching, third harmonic generation, optical mixing, parametric generation and self-focusing of light.

Unit – IV

Multi-photon processes; multi-quantum photoelectric effect, Theory of two-photon process, three-photon process, second harmonic generation, parametric generation of light, Laser spectroscopy : Rayleigh and Raman scattering, Stimulated Raman effect, Hyper-Raman effect, Coherent anti-stokes Raman Scattering, Photo-acoustic Raman spectroscopy.

TEXT AND REFERENCE BOOKS :

Laud, B.B.: Lasers and nonlinear optics, (New Age Int.Pub.1996).
Thyagarajan, K and Ghatak, A.K.: Lasers theory and applications (Plenum press, 1981).
Ghatak, A.K.and Thyagarajan, K : Optical electronics (Cambridge Univ. Press 1999).
Seigman, A.E.: Lasers (Oxford Univ. Press 1986)
Maitland, A. and Dunn, M.H. : Laser Physics (N.H.Amsterdam, 1969).
Hecht, J.The laser Guide book (McGraw Hill, NY, 1986).
Demtroder, W. : Laser Spectroscopy (Springe series in chemical physics vol.5,Springe verlag, Berlin (1981).
Harper, P.G.and Wherrett B.S. (Ed.): Non-linear-optics (Acad.press, 1977).

Signatures :

HOD : ------------------------------

External subject Experts: 1- ---------------------2-------------------------3------------------------

Departmental Members : 1----------------2-------------3-------------4-------------5------------------

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Student Members: 1--------------------------2--------------------3--------------------------

PAPER – III **(Code- PHY-403)**
Special Paper III
(CONDENSED MATTER PHYSICS – II)
UNIT – I

Superconductivity, critical temperature, persistent current, Destruction of Superconductivity by magnetic Field, Meissner effect, heat capacity, Isotopic effect, and flux penetration, type I and type II superconductors, single particle tunneling, thermodynamics of superconducting transitions, London's equations, Coherence length Interaction of electrons with acoustic and optical phonon, Cooper pairing due to phonons, BCS theory of superconductivity (qualitative).Flux quantization in superconducting ring.

Manifestation of energy gap in superconductors, superconducting tunneling, A.C./D.C. Josephson effect, Microscopic quantum interference, high temperature superconductivity (elementary).

UNIT – II

Polarization, depolarization field, local electric field at an atom, Lorenz field, dielectric constant and polarizability, Electronic polarizability, Ionic and orientational polarizability, Debye equation for gases, the complex dielectric constant, dielectric relaxation time, Normal and anomalous dispersion, classical theory of electronic polarizability.

Ferro electric crystal, classification, ferro-electric domains, structural phase transition, Landau theory of phase transition, first and second order phase transition, anti Ferro electricity.

UNIT – III

Energy bands in semiconductor, Intrinsic and Extrinsic semiconductors, Drift velocity, mobility, carrier concentration and Fermi level for intrinsic and extrinsic semiconductors. Electrical conductivity of semiconductors, semimetals.

P-N junction, junction transistors, The tunnel diode, Zener diode, Gunn diode, photovoltaic effect, Quantum wells and super lattices.

UNIT – IV

Interatomic forces and lattice dynamics of simple metals, ionic and covalent crystals, lattice dynamics of linear monoatomic and diatomic lattices, optical and acoustical modes.

Quantization of elastic waves, phonons, momentum of phonons, inelastic neutron scattering by phonons, Anharmonicity, thermal expansion, lattice thermal conductivity.

Text and Reference Books:

Kittel: solid state physics
Azroff: Introduction to solids
Varma and Shrivastava: Crystallography for solid state Physics
Singhal: solid state physics
Ziman: Principal of theory of solids
Ascrroff and mermin: solid state physics
Madelung : Introduction to solid state theory
Huong: Theoretical solid state physics
Omar: Elementary solid state physics
Kittel : Quantum theory of solids

Signatures :

HOD : ------------------------------

External subject Experts: 1- ---------------------2------------------------3------------------------

Departmental Members : 1----------------2-------------3-------------4-------------5-----------------

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Student Members: 1--------------------------2-------------------3--------------------------

UNIT – I

Microprocessor & Micro Computers : Evolution of Microprocessor, Internal Microprocessor, Architecture, Architecture of digital Computer

Memory : - Semiconductor memories (RAM, ROM, PROM, EPROM, Shift register).

Magnetic Memory: - Floppy disks, Hard disks, Optical Disks, Magnetic Bubble Memory.

Networking : Types of network, Design features of a communication network ,Examples, TYMNET, ARPANET, ISDN, LAN , LAN topology (Bus, Star, Ring) .

UNIT – II

Intel 8085 : ALU, Timing and Control Unit, Registers, Data and Address Bus, Pin Configuration.

Instruction Cycle : Op-code and Operands, Fetch Operation, Execute Operation, Machine Cycle, Instruction and Data flow.

Time Diagram : Opcode Fetch Cycle, Memory read, I/O Read, Memory write, I/O Write.

Addressing Modes : Direct Addressing, Register addressing, Register Indirect Addressing, Immediate Addressing, Implicit Addressing.

Instruction set of 8085 : Data transfer group, Arithmetic group, Logical group.

Assembly Language Programs: Addition of Two 8-bit number, Sum 8-bit , Addition of Two 8-bit number, sum 16-bit, 8-bit subtraction, Find the largest number in a data array, To arrange a series of numbers in Descending order, Find the smallest number in a data array, To arrange a data array in ascending order,.

UNIT – III

Digital Communications

Pulse modulation system: Sampling theorem- Low pass and Band pass signals, PAM, Channel BW for a PAM signal, Natural sampling. Flat top smapling. Signal recovery through Holding. Quantization of signals, Quantization, Differential PCM, Delta Modulation, Adaptive Delta Modulation, CVSD

Digital Modulation Techniques: BPSK, DPSK, QPSK, PSK, QASK, BFSK, FSK, MSK.

UNIT – IV

Optical Fibers: Introduction, Structure, Classification, Refraction and Snell's law, Total internal refraction, Light propagation through and optical fiber, Acceptance angle for incident ray, Numerical Aperture, number of modes and cut-off parameter, single mode propagation, comparison of step and graded index fiber. **Types of Optical Fiber** : HPSUU, HPSIR, Halide fiber

Optical fiber cables : Multifibre cable, Splicing and connectors. Advantage and Disadvantage of optical fiber.

Text and Reference Books :

Fundamental of microprocessor and microcomputer – B. Ram, Dhanpat Rai Publication , New Delhi
Microprocessor Architecture, programming and application with 8085/8086- Ramesh S. Gaonkar Wiley
Eastern Ltd. 1987.
Optical Fibres and Fibre Optic Communication Systems – Subir Kumar Sarkar (S.Chand & company Ltd.)
Optical Fiber Communications (Principle and Practice) John M. Senior Prentice Hall of India Pvt. Ltd.
Principle of communication system , Taub and Schilling. TMH

Signatures :

HOD : ------------------------------

External subject Experts: 1- ---------------------2-------------------------3------------------------

Departmental Members : 1----------------2------------3-------------4------------5-----------------

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Student Members: 1--------------------------2--------------------3--------------------------

M. Sc. (PHYSICS)

SEMESTER - IV (JAN. – JUN. 2024)

Lab. Course (Code- PHY-405)
Electronics

Time : 5 Hrs.   **Total Marks – 100**

1.   Experiment   60
2.   Viva Voce   20
3.   Sessional   20

List of Practical

1.   Study of RAM circuit.
2.   Study of ROM circuit.
3.   Study of ALU.
4.   Programming of microprocessor 8085.
5.   Study of shift Register.
6.   Study of fiber optic analog link
7.   Study of fiber optic digital link
8.   Study of Delta Modulation/Demodulation.
9.   Study of Adaptive Modulation/Demodulation.
10.   Intensity Modulation System using analog input system.
11.   Measurement of Numerical Aperture.
12.   To understand synchronization and control signal.
13.   Study of signal sampling and reconstruction Techniques .
14.   Comparison of frequency response of 2nd order and 4th order .
15.   Butterworth Low pass filter.

Signatures :

HOD : ------------------------------

External subject Experts: 1- ---------------------2-------------------------3------------------------

Departmental Members : 1----------------2-------------3-------------4------------5-----------------

                           6--------------7---------------8------------------9--------------------------

Student Members: 1---------------------------2--------------------3--------------------------

M. Sc. (PHYSICS)

SEMESTER - IV (JAN. – JUN. 2024)

Project Work (Code- PHY-406)

Time : III Semester to IV semester   Total Marks – 200

The project work should be related to the field of Physics . The project report should include declaration by the candidate, certificate by the supervisor, acknowledgement, title and introduction along with the following points:

- Introduction
- Review of Literature
- Materials and Methods
- Results & Discussions
- Summary
- Bibliography

Last date of submission of project report: As per M. Sc. Ordinance

Evaluation of Project: Evaluation of the project work of semester system of all the candidates of colleges will be held at GOVT. NAGARJUNA PG COLLEGE OF SCIENCE, RAIPUR (C.G.)

Signatures :

HOD : -------------------------------

External subject Experts: 1- ---------------------2-------------------------3------------------------

Departmental Members : 1----------------2------------3------------4------------5-----------------

                            6--------------7----------------8------------------9-------------------------

Student Members: 1---------------------------2--------------------3--------------------------