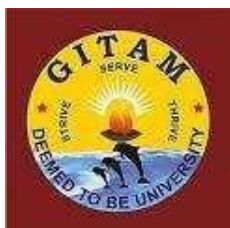


GANDHI INSTITUTE OF TECHNOLOGY AND MANAGEMENT (GITAM)
(Deemed to be University, Estd. u/s 3 of UGC Act 1956)
VISAKHAPATNAM *HYDERABAD *BENGALURU
Accredited by NAAC with 'A⁺' Grade



REGULATIONS AND SYLLABUS

of

B.Sc., Physical Sciences

(W.e.f 2020-21 Admitted batch)

Website: www.gitam.edu

Bachelor of Science
(B.Sc., Physical Sciences)
REGULATIONS
(W.e.f. 2020-21 admitted batch)

ADMISSION

1.1 Admission into **B.Sc. Physical Sciences** program of GITAM University is governed by GITAM University admission regulations.

ELIGIBILITY CRITERIA

2.1. A pass in Intermediate with a minimum aggregate of 50% marks / a pass in any with minimum aggregate of 50% marks along with Mathematics, Physics and Chemistry or equivalent thereof.

2.2. Admission into **B.Sc., Physical Sciences (Bachelor of Science -Physical Sciences)** will be based on an All India GITAM Science Admission Test (GSAT) conducted by GITAM University and the rule of reservation, wherever applicable.

CHOICE BASED CREDIT SYSTEM

Choice Based Credit System (CBCS) is introduced with effect from the admitted Batch of 2015-16 based on UGC guidelines in order to promote:

Student Centered Learning
Cafeteria approach
Inter-disciplinary learning

Learning goals/ objectives and outcomes are specified leading to what a student should be able to do at the end of the program.

STRUCTURE OF THE PROGRAM

4.1 The Program Consists of

Foundation Courses (compulsory) which give general exposure to a Student in communication and subject related area.

Core Courses (compulsory).

Discipline centric electives which
are supportive to the discipline
give expanded scope of the subject
give their disciplinary exposure
nurture the student skills

Open electives are of general nature either related or unrelated to the discipline.

Practical Proficiency Courses, Laboratory and Project work.

4.2 Each course is assigned a certain number of credits depending upon the number of
contact hours (lectures/tutorials/practical) per week.

4.3 In general, credits are assigned to the courses based on the following contact hours per week per semester.

One credit for each Lecture / Tutorial hour per week.

One credit for two hours of Practical per week.

Eight credits for project.

4.4 The curriculum of the six semesters **B.Sc., Physical Sciences** program is designed to have a total of 123 credits for the award of **B.Sc., Physical Sciences** degree.

MEDIUM OF INSTRUCTION

The medium of instruction (including examinations and project reports) shall be in English.

REGISTRATION

Every student has to register himself / herself for each semester individually at the time specified by the Institute / University.

7. ATTENDANCE REQUIREMENTS

7.1. A student whose attendance is less than 75% in all the courses put together in any semester will not be permitted to attend that end - semester examination and he/she will not be allowed to register for subsequent semester of study. He/she has to repeat the semester along with his / her juniors.

7.2. However, the Vice Chancellor on the recommendation of the Principal / Director of the Institute/School may condone the shortage of attendance to the students whose attendance is between 66% and 74% on genuine grounds and on payment of prescribed fee.

8. EVALUATION

8.1 The assessment of the student's performance in a Theory course shall be based on two components: Continuous Evaluation (40 marks) and Semester-end examination (60 marks).

8.2 A student has to secure an aggregate of 40% in the course in continuous and semester end examinations the two components put together to be declared to have passed the course, subject to the condition that the candidate must have secured a minimum of 24 marks (i.e. 40%) in the theory component at the semester-end examination.

8.3 Practical/ Viva voce etc. course are completely assessed under Continuous Evaluation for a maximum of 100 marks and a student has to obtain a minimum of 40% to secure Pass Grade. Details of Assessment Procedure are furnished below in Table 1.

Table 1: Assessment Procedure

S. No.	Component of assessment	Marks allotted	Type of Assessment	Scheme of Examination
1	Theory	40	Continuous evaluation	(i) Three mid semester examinations shall be conducted for 15 marks each. The performance in best two shall be taken into consideration. (ii) 5 marks are allocated for quiz. (iii) 5 marks are allocated for assignments.
		60	Semester-end examination	The semester-end examination shall be for a maximum of 60 marks.
	Total	100		
2	Practicals	100	Continuous evaluation	60 marks for performance, regularity, record/ and case study. Weightage for each component shall be announced at the beginning of the semester. 40 marks (30 marks for experiment(s) and 10 marks for practical Viva-voce.) for the test conducted at the end of the Semester conducted by the concerned lab Teacher.
	Total	100		

RETOTALING & REVALUATION

9.1 Retotaling of the theory answer script of the semester-end examination is permitted on request by the student by paying the prescribed fee within one week after the announcement of the results.

9.2 Revaluation of the theory answer scripts of the semester-end examination is permitted on request by the student by paying the prescribed fee within one week after the announcement of the result.

PROVISION FOR ANSWER BOOK VERIFICATION & CHALLENGE EVALUATION:

10.1 If a student is not satisfied with his/her grade after revaluation, the student can apply for, answer book verification on payment of prescribed fee for each course within one week after announcement of revaluation results.

10.2 After verification, if a student is not satisfied with revaluation marks/grade awarded, he/she can apply for challenge valuation within one week after announcement of answer book verification result/ two weeks after the announcement of revaluation results, which will be valued by the two examiners i.e., one Internal and one External examiner in the presence of the student on payment of prescribed fee. The challenge valuation fee will be returned, if the student is succeeded in the appeal with a change for a better grade.

11. SUPPLEMENTARY EXAMINATIONS & SPECIAL EXAMINATIONS:

- 11.1 The odd semester supplementary examinations will be conducted on daily basis after conducting regular even semester examinations in April/May.
- 11.2 The even semester supplementary examinations will be conducted on daily basis after conducting regular odd semester examinations during November/December
- 11.3 A student who has completed his/her period of study and still has “F” grade in final semester courses is eligible to appear for Special Examination normally held during summer vacation.

12. PROMOTION TO THE NEXT YEAR OF STUDY

- 12.1 A student shall be promoted to the next academic year only if he/she completes the academic requirements of 60% of the credits till the previous academic year.
- 12.2 Whenever there is a change in syllabus or curriculum he/she has to continue the course with new regulations after detention as per the equivalency established by the BoS to continue his/her further studies.

13. BETTERMENT OF GRADES

- 13.1 A student who has secured only a pass or second class and desires to improve his/her class can appear for betterment examinations only in ‘n’ (where ‘n’ is no.of semesters of the program) theory courses of any semester of his/her choice, conducted in summer vacation along with the Special Examinations.
- 13.2 Betterment of Grades is permitted ‘only once’, immediately after completion of the program of study.

REPEAT CONTINUOUS EVALUATION:

- 14.1A student who has secured ‘F’ grade in a theory course shall have to reappear at the subsequent examination held in that course. A student who has secured ‘F’ grade can improve continuous evaluation marks upto a maximum of 50% by attending special instruction classes held during summer.
- 14.2A student who has secured ‘F’ grade in a practical course shall have to attend Special Instruction classes held during summer.
- 14.3 A student who has secured ‘F’ grade in a combined (theory and practical) course shall have to reappear for theory component at the subsequent examination held in that course. A student who has secured ‘F’ grade can improve continuous evaluation marks upto a maximum of 50% by attending special instruction classes held during summer.
- 14.4 The RCE will be conducted during summer vacation for both odd and even semester students. Student can register a maximum of 4 courses. Biometric attendance of these RCE classes has to be maintained. The maximum marks in RCE be limited to 50% of Continuous Evaluation marks. The RCE marks are considered for the examination held after RCE except for final semester students.
- 14.5 RCE for the students who completed course work can be conducted during the academic semester. The student can register a maximum of 4 courses at a time in slot of 4 weeks. Additional 4 courses can be registered in the next slot.
- 14.6 A student is allowed to Special Instruction Classes (RCE) ‘only once’ per course.

15. GRADING SYSTEM

- 15.1 Based on the student performance during a given semester, a final letter grade will be awarded at the end of the semester in each course. The letter grades and the corresponding grade points are as given in Table 2.

Table 2: Grades & Grade Points

Sl.No.	Grade	Grade Points	Absolute Marks
1	O (outstanding)	10	90 and above
2	A+ (Excellent)	9	80 to 89
3	A (Very Good)	8	70 to 79
4	B+ (Good)	7	60 to 69
5	B (Above Average)	6	50 to 59
6	C (Average)	5	45 to 49
7	P (Pass)	4	40 to 44
8	F (Fail)	0	Less than 40
9	Ab. (Absent)	0	-

- 15.2 A student who earns a minimum of 4 grade points (P grade) in a course is declared to have successfully completed the course, subject to securing an average GPA (average of all GPAs in all the semesters) of 5 at the end of the Program to declare pass in the program.

Candidates who could not secure an average GPA of 5 at the end of the program shall be permitted to reappear for a course(s) of their choice to secure the same.

16. GRADE POINT AVERAGE

- 16.1 A Grade Point Average (GPA) for the semester will be calculated according to the formula:

$$\text{GPA} = \frac{[C*G]}{C}$$

Where

C = number of credits for the course,

G = grade points obtained by the student in the course.

- 16.2 To arrive at Cumulative Grade Point Average (CGPA), a similar formula is used considering the student's performance in all the courses taken, in all the semesters up to the particular point of time.
- 16.3 CGPA required for classification of class after the successful completion of the program is shown in Table 3.

Table 3: CGPA required for award of Class

Class	CGPA Required
First Class with Distinction	$\geq 8.0^*$
First Class	≥ 6.5
Second Class	≥ 5.5
Pass Class	≥ 5.0

* In addition to the required CGPA of 8.0 or more the student must have necessarily passed all the courses of every semester in first attempt.

ELIGIBILITY FOR AWARD OF THE B.Sc Physical Sciences DEGREE

- 17.1 Duration of the program: A student is ordinarily expected to complete **B.Sc Physical Science** program in six semesters of three years. However a student may complete the program in not more than five years including study period. However the above regulation may be relaxed by the Vice Chancellor in individual cases for cogent and sufficient reasons.
- 17.2 A student shall be eligible for award of the **B.Sc Physical Science** Degree if he / she fulfills all the following conditions.
- Registered and successfully completed all the courses and projects if applicable.
 - Successfully acquired the minimum required credits as specified in the curriculum corresponding to the branch of his/her study within the stipulated time.
 - Has no dues to the Institute, hostels, Libraries, NCC / NSS etc, and
 - No disciplinary action is pending against him / her.
- 17.3 The degree shall be awarded after approval by the Academic Council.

18. DISCRETIONARY POWER:

Not with standing anything contained in the above sections, the Vice Chancellor may review all exceptional cases, and give his decision, which will be final and binding.

Program Educational Objectives

1. Understand various theories how they are contributed to field of science
2. Acquire knowledge with understanding, demonstration and solving in the problem
3. Independent thinking towards scientific contribution conducting or participating in expos/seminars/workshops
4. Evidence of various concepts with experiments and analysis
5. Compare studies of theoretical and experimental with evaluation

Program Outcomes

- PO-1 To understand the basic laws and explore the fundamental concepts of physics
- PO-2 To understand the concepts and significance of the various physical phenomena.
- PO-3 To carry out experiments to understand the laws and concepts of Physics.
- PO-4 To apply the theories learnt and the skills acquired to solve real time problems.
- PO-5 To acquire a wide range of problem solving skills, both analytical and technical and to apply them.
- PO-6 To enhance the student's academic abilities, personal qualities and transferable skills this will give them an opportunity to develop as responsible citizens.
- PO-7 To produce graduates who excel in the competencies and values required for leadership to serve a rapidly evolving global community.
- PO-8 To motivate the students to pursue PG courses in reputed institutions.
- PO-9 This course introduces students to the methods of experimental physics.
- PO-10 Emphasis will be given on laboratory techniques specially the importance of accuracy of measurements.
- PO-11 Providing a hands-on learning experience such as in measuring the basic concepts in properties of matter, heat, optics, electricity and electronics.
- PO-12 This programme will also help students to enhance their employability for jobs in different sectors.

Program Specific Outcomes

- PSO1: Students will understand in detail the concepts of physics with underlying Mathematical analogy
- PSO2: Students will gain knowledge on various courses in program and emphasize with verification of concepts studied experimentally in Lab demonstrate knowledge of classical mechanics, electromagnetism and modern physics and be able to apply this knowledge to analyse a variety of physical phenomena.
- PSO3: Students perform experiments independently and individually tabulate reading for their behaviour and perform error analysis drawing valid conclusions
- PSO4: Gain expertise with experiments performed and also verify with online resources available performing experiment with simulation
- PSO5: Students will develop attitude of writing scientific articles on their contributing to academic community

B.Sc., Physical Science – Scheme of Instruction

I Semester

B. Sc., Physical Science (Physics, Mathematics, Electronics)

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P		CE	SE	Total Marks
SFC 101	English for Communication– I	AECC	3	0	2	40	60	100
SPH 103	Mechanics	CC	4	0	4	40	60	100
SPH 123	Mechanics Lab	PPC	0	4	2	100	--	100
SPH 107	Basic Circuit Theory	CC	4	0	4	40	60	100
SPH 127	Basic Circuits Lab	PPC	0	4	2	100	--	100
SPH 101	Differential Calculus	CC	4	0	4	40	60	100
SPH 121	Differential Calculus Tutorial	PPC	2	0	2	100	--	100

B. Sc., Physical Science (Physics, Mathematics, Chemistry)

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P		CE	SE	Total Marks
SFC 101	English for Communication– I	AECC	3	0	2	40	60	100
SPH 101	Differential Calculus	CC	4	0	4	40	60	100
SPH 121	Differential Calculus Tutorial	PPC	2	0	2	100	--	100
SPH 103	Mechanics	CC	4	0	4	40	60	100
SPH 123	Mechanics Lab	PPC	0	4	2	100	--	100
SPH 105	Atomic Structure, Bonding, General Organic Chemistry & Aliphatic Hydrocarbons	CC	4	0	4	40	60	100
SPH 125	Atomic Structure, Bonding, General Organic Chemistry & Aliphatic Hydrocarbons Lab	PPC	0	4	2	100	--	100

B. Sc., Physical Science (Physics, Mathematics, Computer Science)

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P		CE	SE	Total Marks
SFC 101	English for Communication– I	AECC	3	0	2	40	60	100
SPH 101	Differential Calculus	CC	4	0	4	40	60	100
SPH 121	Differential Calculus Tutorial	PPC	2	0	2	100	--	100
SPH 103	Mechanics	CC	4	0	4	40	60	100
SPH 123	Mechanics Lab	PPC	0	4	2	100	--	100
SPH 109	Object Oriented Programming in C++	CC	4	0	4	40	60	100
SPH 129	Object Oriented Programming in C++ Lab	PPC	0	4	2	100	--	100

II Semester

B. Sc. Physical Science (Physics, Mathematics, Electronics)

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P		CE	SE	Total Marks
SFC 102	Environmental Science	AECC	3	0	2	40	60	100
SPH 104	Waves and Optics	CC	4	0	4	40	60	100
SPH 122	Waves and Optics Lab	PPC	0	4	2	10 0	--	100
SPH 108	Electronic Devices & Circuits	CC	4	0	4	40	60	100
SPH 126	Electronic Devices & Circuits Lab	PPC	0	4	2	10 0	--	100
SPH 102	Differential Equations	CC	4	0	4	40	60	100
SPH 120	Differential Equations Tutorial	PPC	2	0	2	10 0	--	100

B. Sc., Physical Science (Physics, Mathematics, Chemistry)

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P		CE	SE	Total Marks
SFC 102	Environmental Science	AECC	3	0	2	100	--	100
SPH 104	Waves and Optics	CC	4	0	4	40	60	100
SPH 122	Waves and Optics Lab	PPC	0	4	2	100	--	100
SPH 106	Chemical Energetics, Equilibria & Functional Organic Chemistry	CC	4	0	4	40	60	100
SPH 124	Chemical Energetics, Equilibria & Functional Organic Chemistry Lab	PPC	0	4	2	100	--	100
SPH 102	Differential Equations	CC	4	0	4	40	60	100
SPH 120	Differential Equations Tutorial	PPC	2	0	2	100	--	100

B. Sc. Physical Science (Physics, Mathematics, Computer Science)

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P		CE	SE	Total Marks
SFC 102	Environmental Science	AECC	3	0	2	40	60	100
SPH 104	Waves and Optics	CC	4	0	4	40	60	100
SPH 122	Waves and Optics Lab	PPC	0	4	2	10 0	--	100
SPH 102	Differential Equations	CC	4	0	4	40	60	100
SPH 120	Differential Equations Tutorial	PPC	2	0	2	10 0	--	100
SPH 110	Data Structures And File Processing	CC	4	0	4	40	60	100
SPH 128	Data Structures And File Processing Lab	PPC	0	4	2	10 0	--	100

III SEMESTER

B. Sc. Physical Science (Physics, Mathematics , Electronics)

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P		CE	SE	Total Marks
SPH 203	Thermal Physics and Statistical Mechanics	CC	4	0	4	40	60	100
SPH 223	Thermal Physics and Statistical Mechanics Lab	PPC	0	4	2	100	--	100
SPH 207	Digital Electronics	CC	4	0	4	40	60	100
SPH 227	Digital Electronics Lab	PPC	0	4	2	100	--	100
SPH 201	Real Analysis	CC	4	0	4	40	60	100
SPH 221	Real Analysis Tutorial	PPC	2	0	2	100	--	100
SFC203	English for Communication– II	AECC	3	0	2	40	60	100
Choose any one								
SSE 271	Physics Workshop Skill	SEC	2	0	2	100	--	100
SSE 273	Basic analytical chemistry	SEC	2	0	2	100	--	100
SSE 275	Logic and sets	SEC	2	0	2	100	--	100
SSE 277	Computer Graphics	SEC	2	0	2	100	--	100

III SEMESTER

B. Sc., Physical Science (Physics, Mathematics ,Chemistry)

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P		CE	SE	Total Marks
SPH 203	Thermal Physics and Statistical Mechanics	CC	4	0	4	40	60	100
SPH 223	Thermal Physics and Statistical Mechanics Lab	PPC	0	4	2	100	--	100
SPH 205	Solutions, phase equilibrium, conductance, electro chemistry & functional group organic chemistry-II	CC	4	0	4	40	60	100
SPH 225	Solutions, phase equilibrium, conductance, electro chemistry & functional group organic chemistry-II Lab	PPC	0	4	2	100	--	100
SPH 201	Real Analysis	CC	4	0	4	40	60	100
SPH 221	Real Analysis Tutorial	PPC	2	0	2	100	--	100
SFC203	English for Communication-- II	AECC	3	0	2	40	60	100
Choose any one								
SSE 271	Physics Workshop Skill	SEC	2	0	2	100	--	100
SSE 273	Basic analytical chemistry	SEC	2	0	2	100	--	100
SSE 275	Logic and sets	SEC	2	0	2	100	--	100
SSE 277	Computer Graphics	SEC	2	0	2	100	--	100

III SEMESTER

B. Sc., Physical Science (Physics, Mathematics, Computer Science)

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P		CE	SE	Total Marks
SPH 203	Thermal Physics and Statistical Mechanics	CC	4	0	4	40	60	100
SPH 223	Thermal Physics and Statistical Mechanics Lab	PPC	0	4	2	100	--	100
SPH 201	Real Analysis	CC	4	0	4	40	60	100
SPH 221	Real Analysis Tutorial	PPC	2	0	2	100	--	100
SPH 209	Design and Analysis of Algorithms	CC	4	0	4	40	60	100
SPH 229	Design and Analysis of Algorithms Lab	PPC	0	4	2	100	--	100
SFC203	English for Communication– II	AECC	3	0	2	40	60	100
Choose any one								
SSE 271	Physics Workshop Skill	SEC	2	0	2	100	--	100
SSE 273	Basic analytical chemistry	SEC	2	0	2	100	--	100
SSE 275	Logic and sets	SEC	2	0	2	100	--	100
SSE 277	Computer Graphics	SEC	2	0	2	100	--	100

IV SEMESTER
B. Sc., Physical Science (Physics, Mathematics , Electronics)

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P		20	CE	SE
SPH 204	Electricity & Magnetism	CC	4	0	4	40	60	100
SPH 222	Electricity & Magnetism Lab	PPC	0	4	2	100	--	100
SPH 208	Analog & Digital IC Applications	CC	4	0	4	40	60	100
SPH 226	Analog & Digital IC Applications Lab	PPC	0	4	2	100	--	100
SPH 202	Algebra	CC	4	0	4	40	60	100
SPH 220	Algebra Tutorial	PPC	2	0	2	100	--	100
Choose any one								
SSE 272	Radiation safety	SEC	2	0	2	100	--	100
SSE 274	Chemical technology & society	SEC	2	0	2	100	--	100
SSE 276	Vector calculus	SEC	2	0	2	100	--	100
SSE 278	Number theory	SEC	2	0	2	100	--	100
SSE 280	E-Commerce	SEC	2	0	2	100	--	100

IV SEMESTER

B. Sc., Physical Science (Physics, Mathematics, Chemistry)

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P		CE	SE	Total Marks
SPH 204	Electricity & Magnetism	CC	4	0	4	40	60	100
SPH 222	Electricity & Magnetism Lab	PPC	0	4	2	100	--	100
SPH 206	Coordination chemistry, states of matter & chemical kinetics	CC	4	0	4	40	60	100
SPH 224	Coordination chemistry, states of matter & chemical kinetics Lab	PPC	0	4	2	100	--	100
SPH 202	Algebra	CC	4	0	4	40	60	100
SPH 220	Algebra Tutorial	PPC	2	0	2	100	--	100
Choose any one								
SSE 272	Radiation safety	SEC	2	0	2	100	--	100
SSE 274	Chemical technology & society	SEC	2	0	2	100	--	100
SSE 276	Vector calculus	SEC	2	0	2	100	--	100
SSE 278	Number theory	SEC	2	0	2	100	--	100
SSE 280	E-Commerce	SEC	2	0	2	100	--	100

IV SEMESTER
B. Sc., Physical Science (Physics, Mathematics, Computer Science)

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P		CE	SE	Total Marks
SPH 204	Electricity & Magnetism	CC	4	0	4	40	60	100
SPH 222	Electricity & Magnetism Lab	PPC	0	4	2	100	--	100
SPH 202	Algebra	CC	4	0	4	40	60	100
SPH 220	Algebra Tutorial	PPC	2	0	2	100	--	100
SPH 210	Operating Systems	CC	4	0	4	40	60	100
SPH 228	Operating Systems Lab	PPC	0	4	2	100	--	100
Choose any one								
SSE 272	Radiation safety	SEC	2	0	2	100	--	100
SSE 274	Chemical technology & society	SEC	2	0	2	100	--	100
SSE 276	Vector calculus	SEC	2	0	2	100	--	100
SSE 278	Number theory	SEC	2	0	2	100	--	100
SSE 280	E-Commerce	SEC	2	0	2	100	--	100

V SEMESTER
B. Sc. Physical Science (Physics, Mathematics, Electronics)

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P		20	CE	SE
Choose any one								
SPH 351*	Elements of Modern Physics	DSE	4	0	4	40	60	100
SPH 355**	Electronic Devices and Circuits	DSE	4	0	4	40	60	100
SPH 357***	Materials Science	DSE	4	0	4	40	60	100
Choose any one (*corresponding to theory course)								
SPH321*	Modern Physics lab	PPC	0	4	2	100	--	100
SPH325**	Electronic Devices & circuits Lab	PPC	0	4	2	100	--	100
SPH347***	Materials Science Lab	PPC	0	4	2	100	--	100
Choose any one								
SPH371	Microprocessors (Intel 8085)	DSE	4	0	4	40	60	100
SPH373	Electronic communications	DSE	4	0	4	40	60	100
SPH375	Consumer electronics	DSE	4	0	4	40	60	100
Choose any one (\$ corresponding to theory course)								
SPH 327\$	Microprocessors lab	PPC	0	4	2	100	--	100
SPH 329\$\$	Electronic communications lab	PPC	0	4	2	100	--	100
SPH 331\$\$\$	Consumer electronics lab	PPC	0	4	2	100	--	100
Choose any one								
SPH361	Matrices	DSE	4	0	4	40	60	100
SPH363	Statics & Dynamics	DSE	4	0	4	40	60	100
SPH365	Linear Algebra	DSE	4	0	4	40	60	100
Choose any one (@ corresponding to theory course)								
SPH333@	Matrices Tutorial	PPC	2	0	2	100	--	100
SPH335@@	Statics & Dynamics Tutorial	PPC	2	0	2	100	--	100
SPH337@@@	Linear Algebra Tutorial	PPC	2	0	2	100	--	100
Choose any one								
SSE 371	Applied Optics	SEC	2	0	2	100	--	100
SSE 373	Pharmaceutical chemistry	SEC	2	0	2	100	--	100
SSE 375	Theory of Equations	SEC	2	0	2	100	--	100
SSE 377	Probability and Statistics	SEC	2	0	2	100	--	100
SSE 379	Combinatorial Optimization	SEC	2	0	2	100	--	100

V SEMESTER
B. Sc., Physical Science (Physics, Mathematics, Chemistry)

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P		CE	SE	Total Marks
Choose any one								
SPH 351*	Elements of Modern Physics	DSE	4	0	4	40	60	100
SPH 355***	Electronic Devices and Circuits	DSE	4	0	4	40	60	100
SPH 357**	Materials Science	DSE	4	0	4	40	60	100
Choose any one (*corresponding to theory course)								
SPH321*	Modern Physics lab	PPC	0	4	2	100	--	100
SPH325**	Electronic Devices & circuits Lab	PPC	0	4	2	100	--	100
SPH347***	Materials Science Lab	PPC	0	4	2	100	--	100
Choose any one								
SPH381	Analytical methods in chemistry	DSE	4	0	4	40	60	100
SPH383	Green chemistry	DSE	4	0	4	40	60	100
Choose any one (# corresponding to theory course)								
SPH 339#	Analytical methods in chemistry lab	PPC	0	4	2	100	--	100
SPH 341###	Green chemistry lab	PPC	0	4	2	100	--	100
Choose any one								
SPH361	Matrices	DSE	4	0	4	40	60	100
SPH363	Statics & Dynamics	DSE	4	0	4	40	60	100
SPH365	Linear Algebra	DSE	4	0	4	40	60	100
Choose any one (@ corresponding to theory course)								
SPH333@	Matrices Tutorial	PPC	2	0	2	100	--	100
SPH335@@	Statics & Dynamics Tutorial	PPC	2	0	2	100	--	100
SPH337@@@	Linear Algebra Tutorial	PPC	2	0	2	100	--	100
Choose any one								
SSE 371	Applied Optics	SEC	2	0	2	100	--	100
SSE 373	Pharmaceutical chemistry	SEC	2	0	2	100	--	100
SSE 375	Theory of Equations	SEC	2	0	2	100	--	100
SSE 377	Probability and Statistics	SEC	2	0	2	100	--	100
SSE 379	Combinatorial Optimization	SEC	2	0	2	100	--	100

V SEMESTER

B. Sc., Physical Science (Physics, Mathematics, Computer Science)

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P		CE	SE	Total Marks
Choose any one								
SPH 351*	Elements of Modern Physics	DSE	4	0	4	40	60	100
SPH 355**	Electronic Devices and Circuits	DSE	4	0	4	40	60	100
SPH 357***	Materials Science	DSE	4	0	4	40	60	100
Choose any one (*corresponding to theory course)								
SPH321*	Modern Physics lab	PPC	0	4	2	100	--	100
SPH325**	Electronic Devices & circuits Lab	PPC	0	4	2	100	--	100
SPH347***	Materials Science Lab	PPC	0	4	2	100	--	100
Choose any one								
SPH361	Matrices	DSE	4	0	4	40	60	100
SPH363	Statics & Dynamics	DSE	4	0	4	40	60	100
SPH365	Linear Algebra	DSE	4	0	4	40	60	100
Choose any one (@ corresponding to theory course)								
SPH333@	Matrices Tutorial	PPC	2	0	2	100	--	100
SPH335@@	Statics & Dynamics Tutorial	PPC	2	0	2	100	--	100
SPH337@@@	Linear Algebra Tutorial	PPC	2	0	2	100	--	100
Choose any one								
SPH391	Data Mining	DSE	4	0	4	40	60	100
SPH393	Cryptography	DSE	4	0	4	40	60	100
Choose any one (& corresponding to theory course)								
SPH343&	Data Mining Lab	PPC	0	4	2	100	--	100
SPH345&&	Cryptography Lab	PPC	0	4	2	100	--	100
Choose any one								
SSE 371	Applied Optics	SEC	2	0	2	100	--	100
SSE 373	Pharmaceutical chemistry	SEC	2	0	2	100	--	100
SSE 375	Theory of Equations	SEC	2	0	2	100	--	100
SSE 377	Probability and Statistics	SEC	2	0	2	100	--	100
SSE 379	Combinatorial Optimization	SEC	2	0	2	100	--	100

VI SEMESTER

B. Sc. Physical Science (Physics, Mathematics, Electronics)

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P		CE	SE	Total Marks
Choose any one								
SPH 352*	Digital and Analog Electronics	DSE	4	0	4	40	60	100
SPH 356**	Electronic Communications	DSE	4	0	4	40	60	100
SPH 358***	Solid State and Nuclear Physics	DSE	4	0	4	40	60	100
Choose any one (*corresponding to theory course)								
SPH320***	Solid State and Nuclear Physics lab	PPC	0	4	2	100	--	100
SPH322*	Digital and Analog Electronics Lab	PPC	0	4	2	100	--	100
SPH326**	Electronic Communications Lab	PPC	0	4	2	100	--	100
Choose any one								
SPH372	Microcontrollers& Applications	DSE	4	0	4	40	60	100
SPH374	VLSI Design	DSE	4	0	4	40	60	100
SPH376	Mathematical methods and analysis Using MATLAB	DSE	4	0	4	40	60	100
Choose any one (\$ corresponding to theory course)								
SPH 328\$	Microcontrollers & Applications Lab	PPC	0	4	2	100	--	100
SPH 330\$\$	VLSI design Lab	PPC	0	4	2	100	--	100
SPH 332\$\$\$	MATLAB	PPC	0	4	2	100	--	100
Choose any one								
SPH362	Numerical methods	DSE	4	0	4	40	60	100
SPH364	Complex analysis	DSE	4	0	4	40	60	100
SPH366	Linear programming	DSE	4	0	4	40	60	100
Choose any one (@ corresponding to theory course)								
SPH334@	Numerical methodsTutorial	PPC	2	0	2	100	--	100
SPH336@@	Complex analysisTutorial	PPC	2	0	2	100	--	100
SPH338@@@	Linear programmingTutorial	PPC	2	0	2	100	--	100
SPH392	Minor Project: (From Mathematics /Physics/Electronics)	PPC	0	6	3	100	-	100

VI SEMESTER
B. Sc. Physical Science (Physics, Mathematics, Chemistry)

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P		CE	SE	Total Marks
Choose any one								
SPH 352*	Digital and Analog Electronics	DSE	4	0	4	40	60	100
SPH 356**	Electronic Communications	DSE	4	0	4	40	60	100
SPH 358***	Solid State and Nuclear Physics	DSE	4	0	4	40	60	100
Choose any one (*corresponding to theory course)								
SPH320***	Solid State and Nuclear Physics Lab	PPC	0	4	2	100	--	100
SPH322*	Digital and Analog Electronics Lab	PPC	0	4	2	100	--	100
SPH326**	Electronic Communications Lab	PPC	0	4	2	100	--	100
Choose any one								
SPH 352*	Digital and Analog Electronics	DSE	4	0	4	40	60	100
SPH 354**	Nuclear and Solid State Physics	DSE	4	0	4	40	60	100
SPH 356***	Electronic Communications	DSE	4	0	4	40	60	100
Choose any one (*corresponding to theory course)								
SPH322*	Digital and Analog Electronics Lab	PPC	0	4	2	100	--	100
SPH324**	Nuclear and solid state physics lab	PPC	0	4	2	100	--	100
SPH326***	Electronic Communications Lab	PPC	0	4	2	100	--	100
Choose any one								
SPH382	Industrial chemicals and environment	DSE	4	0	4	40	60	100
SPH384	Instrumental methods of analysis	DSE	4	0	4	40	60	100
Choose any one (# corresponding to theory course)								
SPH 340#	Industrial chemicals and environment Lab	PPC	0	4	2	100	--	100
SPH 342##	Instrumental methods of analysis Lab	PPC	0	4	2	100	--	100
Choose any one								
SPH362	Numerical methods	DSE	4	0	4	40	60	100
SPH364	Complex analysis	DSE	4	0	4	40	60	100
SPH366	Linear programming	DSE	4	0	4	40	60	100
Choose any one (@ corresponding to theory course)								
SPH334@	Numerical methodsTutorial	PPC	2	0	2	100	--	100
SPH336@@	Complex analysisTutorial	PPC	2	0	2	100	--	100
SPH338@@@	Linear programmingTutorial	PPC	2	0	2	100	--	100
SPH392	Minor Project: (From Mathematics /Physics/ Chemistry)	PPC	0	6	3	100	-	100

VI SEMESTER
B. Sc. Physical Science (Physics, Mathematics, Computer Science)

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P		CE	SE	Total Marks
Choose any one								
SPH 352*	Digital and Analog Electronics	DSE	4	0	4	40	60	100
SPH 356**	Electronic Communications	DSE	4	0	4	40	60	100
SPH 358***	Solid State and Nuclear Physics	DSE	4	0	4	40	60	100
Choose any one (*corresponding to theory course)								
SPH320***	Solid State and Nuclear Physics Lab	PPC	0	4	2	100	--	100
SPH322*	Digital and Analog Electronics Lab	PPC	0	4	2	100	--	100
SPH326**	Electronic Communications Lab	PPC	0	4	2	100	--	100
Choose any one								
SPH362	Numerical methods	DSE	4	0	4	40	60	100
SPH364	Complex analysis	DSE	4	0	4	40	60	100
SPH366	Linear programming	DSE	4	0	4	40	60	100
Choose any one (@ corresponding to theory course)								
SPH334@	Numerical methodsTutorial	PPC	2	0	2	100	--	100
SPH336@@	Complex analysisTutorial	PPC	2	0	2	100	--	100
SPH338@@@	Linear programmingTutorial	PPC	2	0	2	100	--	100
Choose any one								
SPH392	Information security	DSE	4	0	4	40	60	100
SPH394	Database applications	DSE	4	0	4	40	60	100
SPH396	Computer networks							
Choose any one (& corresponding to theory course)								
SPH344&	Information security Lab	PPC	0	4	2	100	--	100
SPH346&&	Database applications Lab	PPC	0	4	2	100	--	100
SPH348&&	Computer networks Lab	PPC	0	4	2	100	--	100
SPH392	Minor Project: (From Mathematics /Physics/Computers)	PPC	0	6	3	100	-	100

B.Sc., Physical Science
SEMESTER-I
SFC: 101 English for Communication– I

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 M

Preamble: This course has been designed to enrich students' listening, speaking, reading and writing, abilities so they can pursue their personal, academic and career goals through the acquisition and improvement of English language skills. Students engage with the text while reinforcing what is learnt.

Objective:

- To develop right pronunciation
- To enable students to use English in day-to-day communication
- To facilitate the use of language without grammatical errors
- To expose them to prose and poetry and enable them to learn language through simple literature.
- To build advanced vocabulary
- To improve reading skills

UNIT- I The eyes are not here – Ruskin Bond

Pronunciation: Consonants, **Grammar:** Nouns, **Vocabulary:** Roots forms of words, **Spelling:** Correcting wrong spelling, **Punctuation:** Capitalisation,
Conversation and Role Play: Introducing oneself in formal or social contexts,

Learning outcomes:

By the end of the course, the student will be able to:

- Develop creative communication skills
- Understand and use consonant sounds in phonemic language
- Use correct spelling and capitalization.
- Introduce oneself in the appropriate diction, style and tone.

UNIT- II Work Brings Solace – APJ Abdul Kalam

Pronunciation: Monophthongs **Grammar:** Pronouns,
Vocabulary: Prefixes & Suffixes, **Spelling:** using 'un' and 'dis' to complete antonyms,
Punctuation: Capitalisation,
Conversation and Role Play: starting a conversation/controlling a conversation,

Learning outcomes:

By the end of the course, the student will be able to:

- perceive the content in the academic text and recognize the organization and purpose of reading a text.
- determine the meaning of words using roots, *prefixes, and suffixes*.
- engage in discussion on everyday topics
- . *open* and keep *conversations* going.
- interrupt and end *conversations* appropriately

UNIT –III Bangle Sellers – Sarojini Naidu

Pronunciation: Diphthongs **Grammar:** Helping verbs & auxiliary verbs, **Vocabulary:** Homophones, Homographs, Homonyms **Punctuation:** comma & full stop,
Conversation: Describing one's college and course of study, **Writing:** Paragraph writing/
Descriptive Writing,

Learning outcomes:

By the end of the course, the student will be able to:

Comprehend and interpret poetic diction
define '*diphthong*'; recognize and identify *diphthongs* in speech and text
Demonstrate the use of homophones, homographs, and homonyms in writing.
Recognize and use comma and *full stop* in appropriate places in the text.
Speak about his/her course of study and describe the college he/she is studying in with the right diction and tone.
Construct a paragraph on familiar and academic topics using a topic sentence

UNIT -IV The Merchant of Venice (Extract) – William Shakespear

Pronunciation: varied pronunciation of some letters of the alphabet **Grammar:** Main verbs

Tenses, **Vocabulary:** Collocations, **Punctuation:** Question mark and Exclamation mark, **Conversation:** Leaving a message and taking an appointment

Learning outcomes:

By the end of the course, the student will be able to:

appreciate the varied uses of language in Shakespearean Play
Use present, past and future tenses with appropriate time markers.
Be aware of the different types of collocations and use them appropriately
Recognize and use question mark and *exclamation mark* in appropriate places in the text.
Leave a message and take an appointment in a professional manner

UNIT- V Vocabulary building: Synonyms, Antonyms, One Word Substitutes, Phrasal Verbs, Idiomatic Expressions, Foreign Phrases**Learning outcomes:**

By the end of the course, the student will be able to:

Demonstrate understanding of synonyms and antonyms in active learning
Strengthen their vocabulary base in one-word substitution
Use phrasal verbs in their day to day communication
Familiarize with commonly used idiomatic expressions and use them correctly
Recognize frequently used foreign words and phrases related to areas of immediate relevance.

Text Books:

Part – 1 (English for Enhanced Competence (by Sumit Roy, A.Karunakar, A.Aruna Priya)

Supplementary Reading:

Communicative skills for Technical Students, M. Faratullah. Orient Longman.

Rizvi,MAshraf. **Effective Technical Communication.** McGraw - Hill.

B.Sc., Physical Science
SEMESTER –I SPH
103: Mechanics

Hours per week: 4

End Examination: 60 Marks

Credits: 4

Sessionals: 40 Marks

Preamble: To introduce operators, simple coordinate systems and its relevance to particles, rigid bodies and extending to strings and bars. Introductory aspects of relativity were realized for energy and mass relation

Objective: The student will determine equation of motion for systems and rigid bodies with concepts of scalar and vector fields. Understand new concepts like Fourier coefficients and special theory of relativity.

UNIT -I
Vector Analysis

Scalar and vector fields, gradient of a scalar field and its physical significance. Divergence and curl of a vector field with derivations and physical interpretation. Vector integration (line, surface and volume), Statement and proof of Gauss and Stokes theorems., Cartesian, Curvilinear and Spherical coordinate systems.

Learning Outcomes:

To understand the significance of scalar and vector fields with its application to line, surface and volume elements (L2)

Make use of different coordinate systems.(L3)

UNIT – II

Mechanics of particles

Laws of motion, motion of variable mass system, motion of a rocket. Conservation of energy and momentum, Collisions in two and three dimensions, Concept of impact parameter, scattering cross-section, Rutherford scattering-derivation.

Learning Outcomes:

To outline the equation of system of particles corresponding to variable mass as consequence of conservation of energy and momentum(L2).

To interpret types of collision in two and three dimensions with its implications to atomic system in determination of respective parameters(L5)

UNIT - III

Mechanics of Rigid bodies:

Definition of rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum, Euler equation, precession of a top. Gyroscope, precession of the equinoxes.

Complex vibrations

Fourier theorem and evaluation of the Fourier coefficients, Fourier analysis of - square wave, triangular wave, saw tooth wave.

Learning Outcomes:

To develop equation of motion for rotational system and determination of energy for rigid body rotating about an axis. (L3)

Construct Euler equation of motion and its application to top and gyroscope. (L3)

Solve Fourier coefficient and its determination to complex vibrations. (L3)

UNIT IV

Vibrating strings and Bars

Transverse wave propagation and velocity along a stretched string, Energy transport and transverse impedance. Longitudinal vibrations in bars-wave equation and its general solution. Special cases i) bar fixed at both ends ii) bar fixed at the midpoint iii) bar free at both ends iv) bar fixed at one end.

Learning Outcomes:

To analyze of energy and impedance for stretching string in transverse mode of propagation(L4).

To classify longitudinal vibration in bars with its general solution(L2)

Unit V

Introduction to Relativity

Frame of reference, Galilian transformations, Galilian invariance, Postulates of Special Theory of Relativity, Lorentz transformations of space and time(Qualitative), Length contraction. Time dilation. Relativistic addition of velocities. Variation of mass with velocity, Einstein's Mass energy relation.

Learning Outcomes:

1. Introduce the concept of relative terms like rest and motion. (L2)

2. Understanding the postulates of special theory of relativity with emphasis of length contraction and time dilation(L2)

Course Outcomes:

On completion of the course, the student is able to

1. On completion of the course, the student is able to Applying different type of operators and understanding coordinate systems

2. Understand motion of particles and interpret its conservation laws

3. Realize rigid bodies for its equation of motion

4. Analyze equation of motion of strings and bars

5. Understand the concept of relativity

Text Books:

B.Sc Physics Vol.1, Telugu Academy, Hyderabad

Mechanics & Properties of Matter, J.C. Upadhyaya, Himalaya Publishing House, Mumbai, 2015.

Unified Physics Vol.1, Mechanics, Waves & Oscillations, S.L.Gupta and Sanjeev Gupta, Jai Prakash Nath & Co., Meerut

Reference Books:

Fundamentals of Physics Vol. I - Resnick-Halliday-Krane, Wiley India 2007

College Physics-I. T. Bhimasankaram and G. Prasad. Himalaya Publishing House.

University Physics-FW Sears, MW Zemansky & HD Young, Narosa Publications, Delhi

Mechanics, S.G.Venkatachalapathy, Margham Publication, 2003

**B.Sc. Physical Science
SEMESTER –I**

SPH 123: Mechanics Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

Preamble: Determination and analyzing physical constants

Objective: To find Physical constants and analyze for its accuracy

List of Experiments

Determination of 'g' by compound/bar pendulum
Determination of the force constant of spring.
Time period of simple pendulum(L-T and L-T² graph)
Verification of laws of vibrations of stretched string –sonometer
Determination of velocity of transverse wave along a stretched string-sonometer
Determination of frequency of a electrically driven tuning fork –Melde's experiment.
Rigidity modulus of material of a wire-dynamic method (torsional pendulum)
Fly-wheel
Determination of Y of bar(metal Scale) –cantilever.
Simple pendulum normal distribution of errors-estimation of time period and the error of the mean by statistical analysis

Course Outcomes:

- 1 Understand the use of vernier caliper, screw gauge and travelling microscope.
- 2: Learn the concept of Moment of Inertia.
3. Understand use of Pendulums.
- 4: Understand the physical meaning of 'g'.
- 5: After acquiring knowledge of how to handle measuring instruments student shall embark on verifying various principles learnt in theory.

B.Sc. Physical Science
SEMESTER –I

SPH 101: Differential Calculus

Hours per week: 4

Credits: 4

End Examination: 60 Marks

Sessionals: 40 Marks

Preamble: Differential Calculus provides information about limits, continuity, differentiation and partial differentiation. The focus of the course is to study the limits and continuity, applications of partial differentiation, tracing of curves in Cartesian coordinates and Polar coordinates and mean value theorem on differentiation.

Objective: To introduce

- Basic properties of continuity and differentiation
- Partial differentiation and application of Euler's theorem
- Tracing of curves and to find tangents and normals
- Rolle's theorem and mean value theorem
- Expansion of the function using Taylor's series and Maclaurin's series

UNIT-I

Limit and Continuity (ϵ and δ definition), Types of discontinuities, Differentiability of functions, Successive differentiation, Leibnitz's theorem.

Learning Outcomes:

The student will be able to:

- Define the basic properties of limits and continuity
- Explain different types of discontinuities
- Define differentiability of functions and successive differentiation

UNIT-II

Partial differentiation, Euler's theorem on homogeneous functions.

Learning Outcomes:

The student will be able to:

- Define partial differentiation
- Evaluate problems on partial differentiation
- Apply Euler's theorem on homogeneous functions with the help of partial differentiation

UNIT-III

Tangents and normals, Curvature, Asymptotes, Singular points, Tracing of curves, Parametric representation of curves and tracing of parametric curves, Polar coordinates and tracing of curves in polar coordinates.

Learning Outcomes:

The student will be able to:

- Define tangents and normals
- Explain curvature and asymptotes
- Trace the parametric curves
- Define polar coordinates

UNIT-IV

Rolle's theorem, Mean Value theorems, Taylor's theorem with Lagrange's and Cauchy's forms of remainder

Learning Outcomes:

The student will be able to:

- Explain Rolle's theorem with an application
- Explain mean value theorems with some examples
- Evaluate Taylor's theorem with Lagrange's and Cauch's forms of remainder

UNIT-V

Taylor's series, Maclaurin's series of $\sin x$, $\cos x$, e^x , $\log(1+x)$, $(1+x)^m$, Maxima and Minima, Indeterminate forms.

Learning Outcomes:

The student will be able to:

- Explain Taylor's series
- Explain Maclaurin's series
- Evaluate Maxima and minima of a function

Text Books :

Elements of Real Analysis , Shanthi Narayan and Dr. M.D. Raisinghania, S.Chand & Co.

A Text Book of B.Sc. Mathematics Volume-II , V.Venkateswara Rao , N Krishna Murthy,

B.V.S.S. Sarma and S. Anjaneya Sastry, S.Chand & Co.

Calculus Single Variable, Howard Anton, Irl Bivens and Stephen Davis,

Calculus and Analytic Geometry, George B. Thomas, Jr. and Ross L. Finney,

Pearson Education, 2007, 9th edition.

**B.Sc. Physical Science
SEMESTER –I**

SPH 121 Differential Calculus Tutorials

Hours per week: 2
Credits: 2

Continuous Evaluation: 100 Marks

Problems on Limits and Continuity

Problems on Partial differentiation

Problems on Euler's theorem

Problems on Tangents and normals

Tracing of curves

Problems on Rolle's theorem

Problems on Mean value theorems

Problems on Taylor's theorem

Problems on Taylor's and Maclaurin's series

Problems on Maxima and Minima

Course Learning Outcomes:

On successful completion of this course, students will be able to:

Evaluate limits and continuity of a function

Solve problems on partial differentiation

Explain applications of Rolle's theorem, Mean value theorems, Taylor's and Maclaurin's series

Define maxima and minima of functions

B.Sc. Physical Science
SEMESTER –I

SPH 107: Basic Circuit Theory

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Preamble: Understanding of Basics of Electronic Circuits and mathematical and graphical solutions to Electrical Circuits.

Objective: To explain the basics of Circuit theory and circuit analysis

UNIT -I

A.C Circuit Fundamentals

The sinusoidal voltage and current-Average and R.M.S values- phasor representation- T operator, polar and rectangular forms of complex numbers, AC applied to RC, RL and RLC circuits, concept of impedance-power factor in a.c circuits, numerical problems.

Passive Networks

Concept of ideal as well as practical voltage and current sources, Regulation

Kirchhoff's current

law – Kirchhoff's voltage law - Method of solving A.C and D.C circuits by Kirchhoff's laws - Loop analysis - Nodal analysis - numerical problems.

Learning Outcomes:

Understanding of the fundamentals of AC, generation of AC and impedance of a circuit
Able to solve the currents and voltages in resistive circuit using nodal and mesh analysis methods

UNIT - II

Network Theorems

Maximum power transfer theorem -Super position theorem - Thevenin's theorem - Norton's theorem -Milliman theorem-Reciprocity theorem- problem solving applications for all the theorems.

Learning Outcomes:

Understand the distribution of currents and voltages in electrical circuits
Able to apply network theorems to solve the resultant currents and voltages in circuit

UNIT - III

RC And RL Circuits

Transient response of RL and RC circuits with step input, Time constants. Frequency response of RC and RL circuits, their action as low pass and high pass filters. Passive differentiating and integrating circuits .numerical problems.

Learning Outcomes:

Understand the Switching characteristics of reactive components like Capacitors and Inductors

Understanding the Frequency response of RL and RC networks and their functioning as Filters and wave shaping networks and also able to solve the numerical problems

UNIT - IV

Resonance in Electric Circuits

Resonance in series and parallel R- L- C circuits .Resonant frequency, Q-factor,Bandwidth, selectivity, Comparison of series and parallel resonance, Tank circuit- LCoscillations. Numerical problems.

Learning Outcomes:

Understand the concept of electrical Resonance and their applications
Able to analyze the RLC circuit and obtain graphical solutions for the Resonance of a circuit

UNIT - V

Cathode Ray Oscilloscope

CRT and its working, Electron gun, electrostatic andmagnetostatic deflections. Deflection sensitivity, Fluorescent screen, CRO block diagram, Measurement of voltage, frequency and phase, Function generator-Block diagram and its description.

Learning Outcomes:

Understand the basic working principle and internal blocks of CRO Instrument
Basic understanding of measurement of voltage, current, frequency and phase of waveforms

Course Outcomes:

Understanding of **How** to generate AC and List the parameters and **recall** the concept of impedance

Apply the concept of Kirchhoff laws to solve the circuit currents and **make use of** network theorems

Understand **what** is the time response of RC networks and **apply** to solve the transient analysis problems

Analysis of RLC series and parallel circuit, understand the frequency selection circuit and **Compare** series and parallel resonance

Understanding of **How** the CRO works and **make use of** CRO for measuring the frequency voltage and phase of AC

Text Books:

Electric circuits by David A. Bell 7th edition Oxford higher education
Robert L Boylestad, "Introductory circuit analysis", Universal Book Stall Fifth edition,2003.
Circuit analysis byP.Gnanasivam-Pearson education.

References:

Networks, lines&fields by Ryder-PHI
Circuits and Networks-A.Sudhakar and Shyammohan-TMH
Unified electronics (Circuit analysis and electronic devices) by Agarwal-Arora.

B.Sc. Physical Science
SEMESTER –I
SPH 127: Basic Circuits Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

Preamble: Understand and realize the working of Instruments and Measurement of Voltages and currents in the electrical Circuits and results analysis. To
Objective: Design and analyze the electrical circuits.

List of Experiments

Measurement of D.C & A.C voltage, frequency using CRO.

Thevenin's theorem - Verification.

Norton's theorem - Verification.

Maximum power transfer theorem - Verification.

CR Circuit - Frequency response (Low pass and High pass)

LR Circuit- Frequency response (Low pass and High pass)

LCR Series resonance circuit - frequency response, Determination of Q and Band width

LCR parallel resonance circuit - frequency response, Determination of Q and Band width.

Verification of Kirchhoff's laws.

Course Outcomes:

Understand **How** Filters work, **classify** the filters **Distinguish** the high pass, low pass filters and Series and parallel resonance

Make use of CRO for the AC measurements and **apply** the Kirchhoff's laws and Network theorems to solve the currents and voltages

Analyze the electrical circuits using network theorems

B.Sc. Physical Science
SEMESTER –I
SPH 105: Atomic Structure, Bonding, General Organic Chemistry & Aliphatic Hydrocarbons

Hours per week: 4

End Examination: 60 Marks

Credits: 4

Sessionals: 40 Marks

Preamble: The students of undergraduate program in science in Chemistry need to be conversant with the various fields of chemistry. Therefore, one module each on in general, physical and organic chemistry is introduced which helps the student familiarize with the concepts of chemistry essential for allied and interdisciplinary fields of science.

Objective: To introduce the concepts of general chemistry. The students will be conversant with the chemistry of all the elements that is closely knitted with analytical chemistry, physical chemistry and organic chemistry.

Section A: Inorganic Chemistry-1

UNIT-I

Atomic Structure: Review of: Bohr's theory and its limitations, dual behaviour of matter and radiation, de Broglie's relation, Heisenberg Uncertainty principle..

What is Quantum mechanics? Time independent Schrodinger equation and meaning of various terms in it. Significance of ψ and ψ^2 , Schrödinger equation for hydrogen atom. Graphical representation of 1s, 2s, 2p, 3s, 3p and 3d orbitals. Significance of quantum numbers, orbital angular momentum and quantum numbers m_l and m_s . Shapes of s, p and d atomic orbitals, nodal planes.

Rules for filling electrons in various orbitals, Electronic configurations of the atoms. Stability of half-filled and completely filled orbitals, concept of exchange energy. Relative energies of atomic orbitals, Anomalous electronic configurations.

Learning Outcomes

The student will learn about the fundamental assumptions of atomic theory and explain the composition of atoms including electronic configuration.

UNIT-II

Chemical Bonding and Molecular Structure

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

Covalent bonding: VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements.

MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their characteristics for s-s, s-p and p-p combinations of atomic orbitals, nonbonding combination of orbitals, MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including idea of s- p mixing) and heteronuclear diatomic molecules such as CO, NO and NO^+ .

Learning Outcomes

The students will learn about ionic, covalent bonding in molecules. Compare/contrast the properties of molecular and ionic compounds.

UNIT-III

Section B: Organic Chemistry-1

Fundamentals of Organic Chemistry

Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis.

Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles.

Reactive Intermediates: Carbocations, Carbanions and free radicals.

Strength of organic acids and bases: Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Hückel's rule.

Learning Outcomes

The students learn about the fundamental concepts of reaction mechanism, reactive species in organic chemistry and concept of aromaticity.

UNIT-IV

Stereochemistry

Conformations with respect to ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds). Threo and erythro; D and L; cis - trans nomenclature; CIP Rules: R/ S (for upto 2 chiral carbon atoms) and E / Z Nomenclature (for upto two C=C systems).

Aliphatic Hydrocarbons

Functional group approach for the following reactions (preparations & reactions) to be studied.

Alkanes: (Upto 5 Carbons). Preparation: Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. Reactions: Free radical Substitution: Halogenation.

Learning Outcomes

The student shall learn the essential concepts of chirality, configuration, isomerism in organic chemistry and nomenclature of isomers.

Students will familiarize with the elementary concept of saturated aliphatic hydrocarbons and reactions

UNIT- V

Alkenes: (Upto 5 Carbons) Preparation: Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (Partial catalytic hydrogenation) and trans alkenes (Birch reduction). Reactions: cis-addition (alk. KMnO_4) and trans-addition (bromine), Addition of HX (Markownikoff's and anti-Markownikoff's addition), Hydration, Ozonolysis.

Alkynes: (Upto 5 Carbons) Preparation: Acetylene from CaC_2 and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides.

Reactions: formation of metal acetylides, addition of bromine and alkaline KMnO_4 , ozonolysis and oxidation with hot alk. KMnO_4 .

Learning Outcomes

The students will learn synthetic reactions, mechanism and properties of aromatic alcohol, aromatic and aliphatic ether, aldehydes and ketones.

Reference Books:

- Lee, J.D. Concise Inorganic Chemistry ELBS, 1991.
- Cotton, F.A., Wilkinson, G. & Gaus, P.L. Basic Inorganic Chemistry, 3rd ed., Wiley.
- Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. Inorganic Chemistry: Principles of Structure and Reactivity, Pearson Education India, 2006.
- McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition, 2013.
- Sykes, P. A Guidebook to Mechanism in Organic Chemistry, Orient Longman, New Delhi (1988).
- Eliel, E.L. Stereochemistry of Carbon Compounds, Tata McGraw Hill education, 2000.
- Finar, I.L. Organic Chemistry (Vol. I & II), E.L.B.S.
- Morrison, R.T. & Boyd, R.N. Organic Chemistry, Pearson, 2010.
- Bahl, A. & Bahl, B.S. Advanced Organic Chemistry, S. Chand, 2010.

B.Sc. Physical Science
SEMESTER –I
SPH 125: Atomic Structure, Bonding, General Organic Chemistry & Aliphatic
Hydrocarbons Lab

Hours per week: 4

Continuous Evaluation: 100 Marks

Credits: 2

Preamble: The students of undergraduate program in science in Chemistry need to be conversant with the various basic methodologies of chemistry. Therefore, one module each on in inorganic, physical and organic chemistry is introduced which helps the student familiarize with the techniques essential for developing the foundation of practical chemistry

Objective: To make student develop the fundamental skill required for quantitative and qualitative analysis in inorganic and organic chemistry.

Section A: Inorganic Chemistry - Volumetric Analysis

Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.

Estimation of oxalic acid by titrating it with KMnO_4 .

Estimation of water of crystallization in Mohr's salt by titrating with KMnO_4 .

Estimation of Fe (II) ions by titrating it with $\text{K}_2\text{Cr}_2\text{O}_7$ using internal indicator.

Estimation of Cu (II) ions iodometrically using $\text{Na}_2\text{S}_2\text{O}_3$.

Learning Outcomes

The student will learn about the quantitative analysis concepts of redox chemistry

Section B: Organic Chemistry

1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)

Separation of mixtures by Chromatography: Measure the R_f value in each case (combination of two compounds to be given)

Identify and separate the components of a given mixture of 2 amino acids (glycine, aspartic

acid, glutamic acid, tyrosine or any other amino acid) by paper chromatography Identify and separate the sugars present in the given mixture by paper chromatography.

Learning Outcomes

The students will familiarize the concept of qualitative element detection in organic chemistry essential for functional group analysis. The students will also the elementary idea of the techniques of planar chromatography

Reference Books:

Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012.

Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.

Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., Textbook of Practical Organic Chemistry, Prentice-Hall, 5th edition, 1996.

Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960.

B.Sc. Physical Science
SEMESTER –I
SPH 109: Object Oriented Programming in C++

Hours per week: 4

End Examination: 60 Marks

Credits: 4

Sessionals: 40 Marks

Preamble: C++ is a general purpose programming language and widely used now a days for competitive programming. It has imperative, object-oriented and generic programming features. C++ runs on lots of platform like Windows, Linux, Unix, Mac etc.

Objective:

To develop logic through algorithms and flowcharts.

To understand the difference between procedure oriented programming and object oriented programming.

To learn the basic concepts , applications of OOPS and practice of object oriented analysis and design in the construction of robust, maintainable programs which satisfy their requirements;

To develop the ability to implement features of object oriented programming to solve real world problems using Inheritance, data abstraction, encapsulation and Polymorphism.

UNIT- I

Programming Concepts: Algorithm and its characteristics, pseudo code / flow chart

Assignment statement, input/output statements, if, if then else statements.

Introduction to structured programming: Data types- simple data types, floating data types, character data types, string data types, arithmetic operators and operator precedence, variables and constant declarations, expressions, operators, preprocessor directives, creating a C++ program.

Learning Outcomes:

By the end of this Unit, the student will be able to

Show the logic involved in solving a problem through algorithms and flowcharts.(L1)

Describe the basic concepts of object oriented programming. (L2)

Develop and run simple C++ programs.(L3)

Choose appropriate data type and operators in programs. (L3)

UNIT- II

Input/output statements, Expressions, Control Structures if and if ... else statement, switch and break statements. For, while and do – while, break and continue statement, nested control statements.

Learning Outcomes

By the end of this Unit, the student will be able to

Select the right control structure (L1)

Develop applications by using appropriate concepts. (L3)

UNIT -III

Local and global variables, static and automatic variables, enumeration type, Function Prototyping, Function Overloading, one dimensional array, two dimensional array, character array.

Learning Outcomes

By the end of this Unit, the student will be able to

What is a local variable and what is a Global variable (L1)

Explain the need of static and Automatic variables.(L2)

Develop the concept of overloading functions.(L2)

Utilize the one dimensional and two dimensional arrays in programming.(L3)

UNIT- IV

Object Oriented Concepts: objects, classes, methods, constructors, Destructor, Abstraction, encapsulation, Overloading Unary Operators, Rules for Operator Overloading.

Learning Outcomes

By the end of this Unit, the student will be able to

Illustrate the concept of classes and objects (L3)

Develop real world applications by using appropriate concepts. (L3)

Use unary operators for overloading.(L3)

UNIT- V

Inheritance – Single, Multiple, Multi Level, Hierarchical, Hybrid Inheritance,static and dynamic binding, Pointers, Virtual Functions and Polymorphism.

Learning Outcomes

By the end of this Unit, the student will be able to

Explain the need of reusability concept with inheritance.(L2)

Summarize different types of inheritance.(L2)

Identify the need of pointer.(L1)

Course Outcomes:

Upon completion of the course, the student is able to

Able to emphasize the special features of C++ language.(L4)

Examine the working of Control structures in C++ programs.(L4)

Able to develop and implement classes and objects. (L3)

Understand various Inheritance mechanisms, operator overloading ,polymorphism and apply in applications.(L2)

Text Book:

Object Oriented Programming with C++ by E.Balagurusamy, Tata MC Graw Hill, 6th edition, 2013.

Reference Books:

Mastering C++ by Venugopal K R, Rajkumar Buyya , Tata Mc Graw Hill, 2nd edition, 2013.

Object Oriented Programming using C++ by B.Chandra, Narosa Publications, 2005.

**B.Sc. Physical Science
SEMESTERSS—II**

SPH 129 : Object Oriented Programming in C++ Lab

Hours per week: 4
Credits :2

Continous Evaluation :100 Marks

Write a C++ program to demonstrate the usage of data types & operators.

Write a C++ program to demonstrate Class and Object.

Write a C++ program to demonstrate Control structures.

Write a C++ program to demonstrate operator overloading.

Write a C++ program to demonstrate function overloading using Arrays.

Write a C++ program to demonstrate different types of Arrays.

Write a C++ program to demonstrate Constructors and Constructor overloading.

Write a C++ program to demonstrate Copy constructor and Destructor.

Write a C++ program to demonstrate Single Inheritance, Multiple Inheritance.

Write a C++ program to demonstrate Multi level Inheritance, Hierarchal Inheritance.

Write a C++ program to demonstrate Pointers.

Write a C++ program to demonstrate Run time polymorphism and Compile time Polymorphism.

Text Book:

Object Oriented Programming with C++ by E.Balagurusamy,
Tata MC GrawHill, 6th edition, 2013.

Reference Book:

Mastering C++ by Venugopal K R, Rajkumar Buyya ,
Tata Mc Graw Hill, 2nd edition, 2013

B.Sc. Physical Science
SEMESTERSS—II

SFC102. : ENVIRONMENTAL SCIENCE (Common syllabus for all UG science programmes of VSP, HYD and BLR campuses) Effective from admitted batch of 2020-21

No. of hours per week: 03
Credits: 02

Continuous Evaluation :100 Marks

B.Sc. Physical Science SEMESTER –II

Unit -I

The multidisciplinary nature of environmental studies – Definition - Scope and Importance, Need for Public awareness. Natural Resources: Classification – Renewable (Forest, Water and Energy) and Non-Renewable (Mineral, Food and Land) Resources (Uses, reasons for over- utilization and effects).

Activity:

Nature selfie – photographs of the surroundings

Planting tree saplings – Forest resources; Knowing the water sources of your local – visit to water purifying plant – documentation of the rivers of your state

Food resources - Observe your personal diet for a week (Sunday - Saturday). Just record whatever you eat/drink and the amount. Prepare a chart stating its composition, energy levels it can produce to your body (Calorific value) along with the photographic prints.

Unit -II

Eco-system: Structure and function of an Ecosystem – Components and ecological pyramids, - food chains, food web - energy flow in the ecosystem; Types of ecosystems – forest, grassland, aquatic; Biodiversity – Significance, threats and conservation practices.

Activity:

Visit to local national park, sanctuary or zoo – Photographic shooting of wildlife (flora and fauna)

Biodiversity register – Prepare a list of the flora and fauna observed in the campus
Common plants
Common pests – insects, rodents
Common insects – butterflies
Common birds
Common reptiles
Common animals

Cleaning of weeds – Swachh Bharat ~~SEMESTERS~~ Abhiyaan ~~S—II~~ along with NSS units in the nearby villages, schools and semi-urban pockets

Unit -III

Environmental Pollution: Causes, effects and control measures of Air, Water, soil pollution, Thermal

pollution and nuclear hazards and Municipal solid waste management. Ozone layer depletion

Environmental problems: Global Environmental Problems, Greenhouse effect, acid rains and Climate

change.

Activity:

Solid Waste Management activity

Inventory of waste generation and their types

Collection of recyclable wastes – old newspapers and books, records – recycle the paper waste with ITC under WoW scheme – Getting certificate as Corporate Social Responsibility – Getting books and stationery – distribute to the needy.

B.Sc. Physical Science

SEMESTER –II

Establishment of Vermi Compost pit and reaping the compost

Visit to water treatment plants

Eco-friendly models – e.g., Clay moulded idols with seeds in it – Upon dissolution, sprouting of seeds are seen. ‘Ganesh Chaturthi’

Unit -IV

Social Issues and the Environment: Environmental ethics, Issues and possible solutions. Waste land

reclamation. Environmental Legislation: Acts. Disaster definition, Classification, Disaster Management:

Activity:

Visit from local fire fighting personnel to demonstrate the use of fire/flame retardants.

Documentation of the local water resources and relate to drought

Rainwater conservation – Creating rainwater collection/storage pits in the nearby schools/villages.

Unit -V

Human Population and the Environment: Environment and human health. Trends of Population growth in urban areas, reasons for population explosion and its control. Environment and human health - human rights - value education, Role of information technology in environment and human health.

Activity:

Types of contaminants and their identification

Case study on urbanization of our city.

Identifying diseases due to inappropriate environmental conditions

Text Books:

Text Book of Environmental studies for Undergraduate courses by Erach Bharucha
Published by Orient Black Swan. 2nd edition.

Environmental Science: A Global Concern by William P. Cunningham and Baraba
Woodworth Saigo. Published by McGraw-Hill Science/Engineering/Math; 8th edition,.

A text book of Environmental Science by P. C. Joshi and Namita Joshi, Published
by A.P.H. Publishing Corporation.

A text book of Environmental Science by Arvind Kumar, Published by A.P.H.
Publishing Corporation

Environmental Science by S C Santra, Published by New Central Book Agency
(NCBA); (5th Reprint).

Ecology & Environment by P. D. Sharma, Published by Rastogi Publications.

B.Sc. Physical Science
SEMESTER –II
SPH 104: Waves and Optics

Hours per week: 4

Credits: 4

End Examination: 60 Marks

Sessionals: 40 Marks

Preamble:

To introduce the concept of waves and understand the phenomena of light by division of amplitude and division of wave front

B.Sc. Physical Science
SEMESTER –II

Objective: To visualize wave motion and develop intuition about waves for various light phenomena

UNIT- I

Superposition of Two Collinear Harmonic oscillations: Linearity and Superposition Principle. (1) Oscillations having equal frequencies and (2) Oscillations having different frequencies (Beats).

Superposition of Harmonic Oscillations: Graphical and Analytical Methods. Lissajous Figures with equal and unequal frequency and their uses.

Waves Motion- General: Group velocity, Phase velocity. Plane waves. Spherical waves (complex notation), Wave intensity.

Learning outcomes

Understanding superposition principle and realization to harmonic oscillators for determining parameters related to waves (L2)

Analyze the relation between inherent parameters of wave (L4)

UNIT-II

Interference 1 (Division of wavefront)

Principle of superposition, Interference of light, types of interference, Young's experiment, Intensity at a point in a plane, coherence-temporal coherence and spatial coherence-conditions for interference of light, Fresnel's Biprism, determination of wavelength of light, determination of thickness of thin film, Lloyd's single mirror, Verification of change of phase on reflection.

Learning Outcomes

Applying interference of light with concept of wave front with experiments in determination of wavelength, thickness and phase change on reflection. (L3)

Analyze the construction of optical instruments (L4)

UNIT-III

Interference: (Division of Amplitude)

Oblique incidence of a plane wave on a thin film due to reflected and transmitted light (cosine law) –colors of thin films. Interference by a film with two non-parallel reflecting surfaces (Wedge shaped film). Determination of diameter of wire, Newton's rings in reflected light. Determination of wavelength of monochromatic light, Michelson interferometer-types of fringes, Determination of wavelength of monochromatic light.

Learning Outcomes

Applying interference of light with concept of amplitude with experiments relevant to thin films for determination of wavelength, thickness and fringe width. (L3)

Analyze for confirmation for various types of fringes (L4)

Diffraction:

Introduction, distinction between Fresnel and Fraunhofer diffraction, Fraunhofer diffraction –Diffraction due to single slit and circular aperture-Diffraction grating -Limit of resolution-Resolving power of grating.

Fresnel's half period zones-area of the half period zones-zone plate-comparison of zone plate with convex lens-fresnel diffraction at a straight edge-difference between interference and diffraction.

Learning Outcomes

To demonstrate the concept of diffraction its types to different apertures for optical parameters (L2)

Applying to different zones of diffraction (L3)

UNIT -V

Polarisation:

Polarized light: methods of polarization polarization by reflection, refraction, double

B.Sc. Physical Science

SEMESTER –II

refraction, scattering of light-Brewster's law-Mauls law-Nicol prism polarizer and analyzer-Quarter wave plate, Half wave plate-optical activity and Babinet's compensator.

Learning Outcomes

To understand polarization of light with various phenomena and its activity with optical elements (L2).

Applying to different optical instrument (L3).

Course Outcomes:

- 1.Understanding superposition principle
- 2.Analyze the relation between inherent parameters of wave
- 3.Applying interference of light for optical parameters and determine optical instruments
- 4.Analyze interference of light for optical parameters and construct optical instruments
- 5.Applying and analyze interference of light for optical parameters and fringes
- 6.To demonstrate the concept of diffraction to different zones of diffraction
- 7.To apply concept of diffraction to different zones

Text Books:

BSc Physics, Vol.2, Telugu Akademy, Hyderabad
A Text Book of Optics-N Subramanyam, L Brijlal, S.Chand& Co.
Unified Physics Vol.II Optics & Thermodynamics – Jai Prakash Nath&Co.Ltd.,
Meerut

Reference Books:

Optics,F..A. Jenkins and H.G. White, Mc Graw-Hill
Optics, Ajoy Ghatak,Tata Mc Graw-Hill.
Fundamentals of Physics. Halliday/Resnick/Walker.C. Wiley India Edition 2007
Introduction of Lasers – Avadhanulu, S.Chand& Co.
Fundamentals of Optics, H.R. Gulati and D.R. Khanna, 1991, R. Chand Publication
Principles of Optics- BK Mathur, Gopala Printing Press, 1995

B.Sc. Physical Science
SEMESTER –II

SPH 122: Waves and Optics Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

Preamble: Determination and analyzing of optical constants with light

Objective: To find Physical constants and analyze for its accuracy

List of Experiments

Determination of radius of curvature of a given convex lens-Newton's rings.
Resolving power of grating.
Dispersive power of a prism.
Determination of wavelength of light using diffraction grating- minimum deviation method.
Wavelength of light using diffraction grating-normal incidence method.
Determination of thickness of a thin fiber by wedge method
Spectrometer- i-d curve.
Cauchys constants
Hallow prism

Course Outcomes:

- 1.Enable to determine optical constants, estimate and illustrate (L4 and L5)
- 2.Apply basic knowledge of principles and theories about the behavior of light and the physical environment to conduct experiments.
- 3: Explain several phenomena we can observe in everyday life that can be explained as wave phenomena.
- 4: Use the principles of wave motion and superposition to explain the Physics of polarisation, interference and diffraction.
- 5: Understand the working of selected optical instruments like biprism, interferometer, diffraction grating, and holograms.
- 6: In the laboratory course, student will gain hands-on experience of using various optical instruments and making finer measurements of wavelength of light using Newton Rings experiment, Fresnel Biprism etc.

B.Sc. Physical Science
SEMESTER –II
SPH 102: Differential Equations

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40
Marks

Preamble: Many physical laws and relations can be expressed mathematically in the form of differential equations. Thus it is natural that this course opens with the study of differential equations and their solutions. Indeed, many engineering problems appear as differential equations. The main objectives of this course are twofold: the study of ordinary differential equations and their most important methods for solving them and the study of modeling.

Objective:

- To Identify the type of a given differential equation and apply the appropriate analytical technique for finding the solution of first order and higher degree ordinary differential equations.
- To Solve second order and higher order linear differential equations.
- To Solve non-homogeneous differential equations
- To Solve the Simultaneous differential equations and Total differential equations.
- To formulate first order partial differential equations
- To solve the non-linear first order Partial differential equation by Charpit's method
- To classify second order partial differential equations into elliptic, parabolic and hyperbolic
- To transform the second order partial differential equations to Normal forms

UNIT-I

First order exact differential equations. Integrating factors, rules to find an integrating factor. First order higher degree equations solvable for x , y , p . Methods for solving higher-order differential equations.

Learning Outcomes:

- Distinguish between linear, nonlinear, partial and ordinary differential equations.
- Recognize and solve an exact differential equation.
- Recognize and solve a non-exact differential equation by finding integrating factor.
- Recognize and solve First order higher degree equations solvable for x , y , p
- Evaluate basic application problems described by first order differential equations

UNIT-II

Basic theory of linear differential equations, Wronskian, and its properties. Solving a differential equation by reducing its order. Linear homogenous equations with constant coefficients, Linear non-homogenous equations, The method of variation of parameters, The Cauchy-Euler equation, Simultaneous differential equations, Total differential equations.

Learning Outcomes:

Use the existence theorem for boundary value problems to determine uniqueness of solutions.

Use the Wronskian condition to determine if a set of functions is linearly independent.

Determine the complete solution of a homogeneous differential equation with constant coefficients by examining the characteristic equation and its roots.

Evaluate the complete solution of a non-homogeneous differential equation as a linear combination of the complementary function and a particular solution.

Determine the complete solution of a non-homogeneous differential equation with constant coefficients by the method of undetermined coefficients.

Find the complete solution of a differential equation with constant coefficients by variation of parameters and also solve Cauchy-Euler Equation

Evaluate Simultaneous differential equations and total differential equation

Evaluate basic application problems described by second order linear differential equations with constant coefficients.

UNIT-III

Order and degree of partial differential equations, Concept of linear and non-linear partial differential equations, Formation of first order partial differential equations

Learning Outcomes:

Recognize the concept of linear and non-linear partial differential equations.

Recognize the concept of order and degree of partial differential equations

Construct a first order partial equation by elimination of arbitrary constants

Construct a first order partial equation by elimination of arbitrary functions of specific functions

Construct a first order partial equation by Elimination of Arbitrary Functions

Construct a physical or biological model to a first order partial differential equations

UNIT-IV

Linear partial differential equation of first order, Lagrange's method, Charpit's method.

Learning Outcomes:

Distinguish between general solution and complete solution

Recognize and solve Lagrange's equation

Find Lagrange's multipliers

Recognize and solve first order non linear partial differential equation by Charpit's method.

Recognize and reduce the first order partial different equation to different forms

UNIT-V

Classification of second order partial differential equations into elliptic, parabolic and hyperbolic through illustrations only.

Learning Outcomes:

. Recognize the second order partial differential equations into elliptic, parabolic and hyperbolic

Construct the different example for elliptic, parabolic and hyperbolic

Transform the second order partial differential equations into normal form

Solve basic application problems like one dimensional wave equation and heat equation

Text Books:

A Text Book of B.Sc. Mathematics Volume-I, V.Venkateswara Rao , N Krishna Murthy, B.V.S.S. Sarma and S. Anjaneya Sastry, S.Chand& Company Ltd., New Delhi.
Differential Equation , Shepley L. Ross^{3rd} Edition, John Wiley and Sons, 1984
Elements of Partial Differential Equations,Ian N Sneddon, International Edition, 1967, Dover Publications.

B.Sc. Physical Science
SEMESTER –II
SPH 120 Differential Equations Tutorial

Hours per week: 2
Credits: 2

Continuous Evaluation: 100 Marks

Solving first order and first degree differential equations

Solving first order and higher degree differential equations

Solving linear differential equations with constant coefficients

Solving differential equations with variation of parameters

Solving Cauchy-Euler equation

Solving Simultaneous differential equations

Solving total differential equations

Formation of first order partial differential equations

Problems using Lagrange's method

Problems using Charpit's method

Classification of second order partial differential equations

Course Learning Outcomes:

On successful completion of this course, students will be able to:

Evaluate first order and first degree differential equations

Solve problems on first order and higher degree differential equations

Explain linear differential equations with constant coefficients

Explain the methods to solve partial differential equations

Classify second order partial differential equations

B.Sc. Physical Science
SEMESTER –II
SPH 108: Electronic Devices & Circuits

Hours per week: 4

End Examination: 60 Marks

Credits: 4

Sessionals: 40 Marks

Preamble: Understanding of Basics of Electronic Circuits and mathematical and graphical solutions to Electrical Circuits.

Objective: To explain the basics of Electronic devices and applications

UNIT - I

Junction Diodes

PN junction diode - P-N junction theory-depletion region, barrier potential, working in forward & reverse bias condition, Junction capacitance, Diode current equation (no derivation), Effect of temperature on reverse saturation current, V-I Characteristics, Zener and Avalanche Break down, Zener diode - V-I characteristics, regulated power supply using Zener diode, Varactor Diode, Tunnel Diode - Principle, Working & Applications.

Learning Outcomes:

Understanding of Basic Semiconductor physics, doping and formation of PN Junction

Understand the V-I characteristics of different types of Junction diodes and Applications

UNIT - II

Bipolar Junction Transistors (BJT)

PNP and NPN transistors, current components in BJT, BJT static characteristics (Input and Output), Early effect, CB, CE, CC Configurations (Cut-off, Active and saturation regions) Determination of h-parameters from the characteristics, Concept of amplification-voltage and current amplifier. The C.E amplifier-analysis and parameters, Transistor as a switch.

Learning Outcomes:

Understand the Basic Construction and working principle of BJT

Able to Connect the BJTs in different configurations and their analysis as amplifier.

UNIT - III

Field Effect Transistors & UJT:

FET - Construction - Working - Drain & Transfer characteristics - Parameters of FET - FET as an amplifier - MOSFET-Enhancement MOSFET-Depletion MOSFET-Construction & Working-Drain characteristics of MOSFET - Comparison of FET & BJT and JFET & MOSFET.

UJT Construction-working, V-I Characteristics.

Learning Outcomes:

Understand the Basic working, V-I characteristics of FETs and their applications and also able to differentiate the BJT, FET and MOSFET.

Understanding the working principle and applications of UJT

UNIT - IV

Photo Electric Devices

Structure and operation, characteristics, spectral response and applications of LDR, Photo Voltaic cell, Photo diode, Photo transistor, LED and LCD.

Learning Outcomes:

Understand the applications of Semiconductor devices as Photo devices

Understand the V-I characteristics of Different photo electric devices.

UNIT - V

Power Supplies

Rectifiers - Half wave, full wave and bridge rectifiers - Efficiency - Ripple factor - Regulation. Types of filter- Choke input (Inductor) filter - Shunt capacitor filter - L-Section and π section filters - Three terminal fixed voltage I.C regulators (78XX and 79XX) - Principle and working of switch mode power supplies (SMPS).

Learning Outcomes:

Basic Understanding of AC to DC conversion and different methods of conversion
Designing of IC regulated power supply and analysis

Course Outcomes:

- 1.To interpret the characteristics of junction diode with its limitations
- 2.To interpret the characteristics of junction transistor and compare these configurations
- 3.To demonstrate and categorize the FET and UJT
- 4.To explain and compare the characteristics of photo devices
- 5.To outline rectifiers compare them and understand power supplies

Text Books:

Electronic Devices and Circuits David A.Bell, Fifth edition. Oxford university press
A.P Malvino, "Principles of Electronics", TMH, 7th edition
T.F. Bogart, Beasley, "Electronic Devices and circuits", Pearson Education, 6th Edition
N.N. Bhargava, D.C Kulshreshta, and S.C Gupta , "Basic Electronics and Linear Circuits" TMH
T.L.Floyd, "Electronic Devices and circuits", PHI, fifth edition
V.K. Metha, "Principle of Electronics", S CHAND Co. New edition
Godse A.P., Bakshi U.A (1st edition), Electronics Devices, Technical Publications pune.

References:

- I. Sedha R.S., A TextBook of Applied Electronics, S. Chand & Company Ltd.
Jacob Millman and Christos C. Halkias (2008) Integrated Electronics, Tara Mcgraw-Hill
Robert L. Boylestad, Louis Nashelsky (10th edition). Electron Devices and Circuit Theory, Dorling Kindersley (India Pvt. Ltd.)
Unified Electronics (Circuit analysis and electronic devices) by Agarwal-Arora.

B.Sc. Physical Science
SEMESTER –II

SPH 126: Electronic Devices & Circuits Lab

Hours per week: 6
Credits: 2

Continuous Evaluation: 100 Marks

Preamble: Understand and realize the working of Semiconductor Devices and graphical representation of V-I Characteristics and also results analysis.
Objective: To design and obtain the V-I characteristics of Semiconductor devices

List of Experiments

- V-I Characteristics of Junction Diode.
- V-I Characteristics of Zener Diode.
- Regulated Power Supply using Zener Diode.
- IC Regulated Power Supply
- BJT input and output Characteristics (CE Configuration) and determination of h-parameters.
- Characteristics of UJT.
- Characteristics of JFET
- LDR characteristics
- Characteristics of L and π section filters using full wave rectifier.

Course Outcomes:

- 1.To explain various electronic devices with its characteristics and measure its threshold voltages
- 2.Working of P and N type semiconductors, P-N junctions, Forward and Reverse biased junctions, LEDs, photodiode and solar cells.
- 3.Use the principles of filters in communication .
- 4.Understand the working of digital and analog instruments like CRO.
- 5.Student will gain hands-on experience of using various digital and analog instruments.

B.Sc. Physical Science
SEMESTER –II

SPH 106: Chemical Energetics, Equilibria & Functional Organic Chemistry

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Preamble: The students of undergraduate program in science need to be conversant with the various aspects of energetic and chemical equilibria. Functional group chemistry forms the foundation for training a undergraduate students as organic chemist.

Objective: To introduce the concept of chemical reaction equilibrium and reaction energetics in general and physical chemistry to the undergraduate students.

The students will learn the essential functional groups in organic chemistry, their reactions, and properties.

UNIT-I

Section A: Physical Chemistry-1

Chemical Energetics: Review of thermodynamics and the Laws of Thermodynamics. Important principles and definitions of thermochemistry. Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and dilution. Calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data. Variation of enthalpy of a reaction with temperature – Kirchhoff's equation. Statement of Third Law of thermodynamics .

Chemical Equilibrium:

Free energy change in a chemical reaction. Thermodynamic derivation of the law of chemical equilibrium. Le Chatelier's principle. Relationship between K_p , and K_c

Learning Outcomes

The student will learn about the essential concepts of thermo-chemistry and chemical thermodynamics The student will learn the calculation of bond energy, bond dissociation energy and resonance energy from thermo-chemical data.

The students will learn Le Chatelier's principle and applications.

UNIT-II

Ionic Equilibria:

Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect. Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Solubility and solubility product of sparingly soluble salts

Learning Outcomes

The students will learn the elementary concepts of ionic chemical equilibrium with respect to acid – base, salt hydrolysis and solubility of ionic substances.

Section B: Organic Chemistry-2

UNIT-III

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

Aromatic hydrocarbons

Preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzenesulphonic acid.

Reactions: (Case benzene): Electrophilic substitution: nitration, halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation) (upto 4 carbons on benzene). Side chain oxidation of alkyl benzenes (upto 4 carbons on benzene).

Alkyl Halides

Preparation: from alkenes and alcohols.

Reactions: hydrolysis, nitrite & nitro formation, nitrile & isonitrile formation.

Williamson's ether synthesis: Elimination vs substitution. **Learning Outcomes**

The students will learn the concept of Functional group approach for aromatic hydrocarbon and alkyl halide.

UNIT-IV

Aryl Halides Preparation : (Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer & Gattermann reactions.

Reactions (Chlorobenzene): Aromatic nucleophilic substitution (replacement by -OH group) and effect of nitro substituent. Benzyne Mechanism: KNH_2/NH_3 (or $\text{NaNH}_2/\text{NH}_3$).

Alcohols: Preparation: Preparation of 1°, 2° and 3° alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters.

Reactions: With sodium, HX (Lucas test), esterification, oxidation (with PCC, alk. KMnO_4 , acidic dichromate, conc. HNO_3). Oppenauer oxidation Diols: (Upto 6 Carbons) oxidation of diols. Pinacol-Pinacolone rearrangement.

Learning Outcomes

The student shall learn the elementary reactions and properties, mechanism of aryl halides and alcohol. The students will learn differentiation between, primary, secondary and tertiary alcohol.

UNIT-V

Phenols: (Phenol case) Preparation: Cumene hydroperoxide method, from diazonium salts. Reactions: Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer-Tiemann Reaction, Gattermann-Koch Reaction, Houben-Hoesch Condensation, Schotten-Baumann Reaction.

Ethers (aliphatic and aromatic): Cleavage of ethers with HI.

Aldehydes and ketones (aliphatic and aromatic): (Formaldehyde, acetaldehyde, acetone and benzaldehyde)

Preparation: from acid chlorides and from nitriles.

Reactions – Reaction with HCN, ROH, NaHSO_3 , $\text{NH}_2\text{-G}$ derivatives. Iodoform test. Aldol Condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation. Clemmensen reduction and Wolff Kishner reduction. Meerwein-Ponndorf Verley reduction.

Learning Outcomes

The students will learn about reactions and properties of aromatic alcohols, ethers, aldehydes and ketones

Reference Books:

Graham Solomon, T.W., Fryhle, C.B. & Snyder, S.A. Organic Chemistry, John Wiley & Sons (2014).

McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition, 2013.

Sykes, P. A Guidebook to Mechanism in Organic Chemistry, Orient Longman, New Delhi (1988).

Finar, I.L. Organic Chemistry (Vol. I & II), E.L.B.S.

Morrison, R.T. & Boyd, R.N. Organic Chemistry, Pearson, 2010.

Bahl, A. & Bahl, B.S. Advanced Organic Chemistry, S. Chand, 2010.

Barrow, G.M. Physical Chemistry Tata McGraw-Hill (2007).

B.Sc. Physical Science
SEMESTER –II

SPH 124: Chemical Energetics, Equilibria & Functional Organic Chemistry Lab

Hours per week: 4

Continuous Evaluation: 100 Marks

Credits: 2

Preamble: The students of undergraduate program in science in Chemistry need to be conversant with the various basic methodologies of chemistry. Therefore, one module each on inorganic, physical and organic chemistry is introduced which helps the student familiarize with the techniques essential for developing the foundation of practical chemistry

Objective: student will be familiarized with the practical applications of thermo-chemistry and ionic equilibrium.

Section A: Physical Chemistry

Thermochemistry

Determination of heat capacity of calorimeter for different volumes.

Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide.

Determination of enthalpy of ionization of acetic acid.

Determination of integral enthalpy of solution of salts (KNO₃, NH₄Cl).

Determination of enthalpy of hydration of copper sulphate.

Study of the solubility of benzoic acid in water and determination of H.

Ionic Equilibria pH Measurements

Measurement of pH of different solutions like aerated drinks, fruit juices, shampoos and soaps (use dilute solutions of soaps and shampoos to prevent damage to the glass electrode) using pH-meter.

Preparation of buffer solutions:

- (i) Sodium acetate-acetic acid (ii) Ammonium chloride-ammonium hydroxide

Measurement of the pH of buffer solutions and comparison of the values with theoretical values.

Learning Outcomes

The student will learn determination of heat of neutralization and enthalpy. The students will also learn to apply concept of ionic equilibrium for determination of pH. The students will also learn to prepare the solution of buffer and determination of its pH.

Section B: Organic Chemistry

Purification of organic compounds by crystallization (from water and alcohol) and distillation.

Criteria of Purity: Determination of melting and boiling points.

Preparations: Mechanism of various reactions involved to be discussed. Recrystallisation, determination of melting point and calculation of quantitative yields to be done.

- (a) Bromination of Phenol/Aniline (b) Benzoylation of amines/phenols
Oxime and 2,4-dinitrophenylhydrazone of aldehyde/ketone

Learning Outcomes

The students will familiarize the concept of measurement of melting point, boiling point and re-crystallization essential for organic synthetic chemistry

Reference Books:

Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G.,
Textbook of Practical Organic Chemistry, Prentice-Hall, 5th edition, 1996.

Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960.

Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011).

B.Sc. Physical Science
SEMESTER –II

SPH 110: Data Structures and File Processing

Hours per week: 4

End Examination: 60 Marks

Credits: 4

Sessionals: 40 Marks

Preamble: In the field of Computer Science, data structures provides an efficient way to handle data efficiently. With a single variable it is an unfeasible task to store huge amount of data. Storing data in a file provides a flexible approach where data is stored in a disk.

Enable the student to learn about linear and non linear data structures.

Understand searching and sorting algorithms.

Learn to store data in a sequential file and access the data.

Use direct file access and Indexed sequential file organization.

UNIT-I

Fundamental Concepts: Introduction to Data Structures, Types of Data Structures.

Linear Data Structure Using Sequential Organization: Arrays, Arrays as an Abstract Data Type, Memory Representation and Address Calculation, Class Array, Pros and Cons of Arrays.

Searching and Sorting: Sequential Search, Binary Search, Types of Sorting, General Sort Concepts, Bubble Sort, Insertion Sort, Selection Sort.

Learning Outcomes:

By the end of this Unit, the student will be able to Infer

Linear and Nonlinear data structures. (L2)

Apply sequential search and Binary search on data sets. (L2)

Infer the general sorting methods. (L4)

UNIT-II

Stacks: Concept of Stacks and Queues, Stacks, Stack Abstract Data Type, Representation of Stacks Using Arrays.

Queues: Concept of Queues, Queue Abstract Data Type, Realization of Queues Using Arrays, Circular Queue, Dequeue, Priority Queue.

Learning Outcomes:

By the end of this Unit, the student will be able to

develop stack using arrays. (L3)

interpret application of stack. (L2)

build queue using array. (L3)

make use of circular queue, deque, priority queue. (L3)

UNIT-III

Linked Lists: Introduction, Linked List, Realization of Linked Lists, Dynamic Memory Management, Linked list Abstract Data Type, Doubly Linked List, Circular Linked List.

Trees: Introduction, Types of Trees, Binary Tree, Binary Tree Abstract Data Type, Realization of a Binary Tree, Binary Tree Traversal.

Learning Outcomes:

By the end of this Unit, the student will be able to
utilize the concept of dynamic memory allocation.(L3)
develop doubly linked list, circular linked list. (L3)
Inspect Binary tree traversal algorithms. (L4)

UNIT-IV

Hashing: Introduction, Hash Functions, Collision Resolution Strategies, Extendible Hashing, Dictionary.

Indexing and Multiway Trees: Introduction, Indexing, Types of Search Trees- Multiway Search Tree, B-Tree, B+ Tree.

Learning Outcomes:

By the end of this Unit, the student will be able to
outline Hash Functions. (L2)
develop B tree and B+ Trees. (L3)

UNIT-V

Files: Introduction, External Storage Devices, File Organization, Files Using C++, Sequential File Organization, Direct Access File Organization, Indexed Sequential File Organization. (10)

Learning Outcomes:

By the end of this Unit, the student will be able to
experiment with sequential file organization and random file organization. (L3)
demonstrate indexed sequential file organization. (L2)

Course Outcomes:

Upon completion of the course, the student is able to
To illustrate array data structure and perform searching and sorting. (L2)
To write programs to create, insert, delete and display the elements of stack, queue, linked list. (L2)
To develop tree and perform traversals. (L3)
To utilize sequential and direct access files. (L3)

Text Books:

Data Structures Using C++ by Varsha H. Patil, Oxford University Press,2012.

Reference Books:

Data Structures and Algorithms in C++, Adam Drozdek, Cengage Learning,3rd Edition, 2006.

Data Structures and Algorithms in C++, Brijendra Kumar Joshi, Tata McGraw Hill,2010.

B.Sc. Physical Science
SEMESTER—III

SPH 128: Data Structures and File Processing Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

Write a C++ program to convert a sentence from lower case to upper case, count number of vowels and delete blank spaces.

Write a C++ program to implement Stack operations.

Write a C++ program to implement queue operations.

Write a C++ program to implement the operations in Linked list

Write a C++ program to concatenate two files and copy the contents of one file to another file.

Write a C++ program for direct access of records in a file.

Write a C++ program to implement field organization using length indicator.

Write a C++ program for fixed length field organization.

Write a C++ program for index access of records in a file.

Write a C++ program for accessing records in a file using index (record organization).

Write a C++ program to print a line if it contains more than 80 characters.

Write a C++ program for reading and writing contents to a file from console.

Write a C++ program to reverse the contents of the given file.

Write a C++ program to search for a given record using sequential search

Write a C++ program to search for a given record using simple Hashing.

Write a C++ program to sort records in a file.

Text Books:

Data Structures Using C++ ,
Varsha H. Patil, Oxford University Press,2012.

Reference Books:

Data Structures and Algorithms in C++ ,

Adam Drozdek, Cengage Learning,3rd Edition,2006.

B.Sc. Physical Science
SEMESTER—III

SPH 203: Thermal Physics and Statistical Mechanics

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Preamble: The course provides an introduction to the basic concepts in thermodynamics, various thermodynamic transport phenomena, general thermodynamic property relations and different law for energy spectrum emitted by black body. It develops the problem solving skills in problems in basic thermodynamics.

Objective: To understand the basic laws of thermodynamics and their application to the non-flow and flow processes, thermodynamic properties of ideal and real gases and thermodynamic probability in gaseous medium

UNIT I

Kinetic theory of gases

Introduction –Deduction of Maxwell’s law of distribution of molecular speeds, experimental verification. Toothed wheel experiment. Transport Phenomena-Viscosity of gases-thermal conductivity-diffusion of gases.

Learning Outcomes

Understanding molecular speed distribution in gases. (L2)

Understanding transport phenomena of gases. (L2)

UNIT II

Thermodynamics

Introduction- Isothermal and adiabatic process- Reversible and irreversible processes- Carnot’s engine and its efficiency-Carnot’s theorem-Second law of thermodynamics. Kelvin’s and Clausius statements-Thermodynamic scale of temperature-Entropy, physical significance –Change in entropy in reversible and irreversible processes-Entropy and disorder-Entropy of Universe-Temperature-Entropy (T-S) diagram-Change of entropy of a perfect gas- change of entropy when ice changes into steam.

Learning Outcomes

Understanding basic concepts in thermodynamic and Carnot’s heat ideal heat engine.(L2)

Develop the problem solving skill in basic thermodynamics.(L3)

UNIT III

Thermodynamic potentials and Maxwell’s equations

Thermodynamic potentials-Derivation of Maxwell’s thermodynamic relations-Clausius-Clayperon’s equation-Derivation for ratio of specific heats-Derivation for difference of two specific heats for perfect gas.Joule Kelvin effect-expression for Joule Kelvin coefficient for perfect and Van der waal’s gas.

Learning Outcomes

Understanding and applying Maxwell thermodynamic relations.(L2 and L3)

Examine temperature change by using Joule – Kelvin effect(L4)

UNIT IV

Black body radiation

Blackbody-Ferry's black body-distribution of energy in the spectrum of black body-Wein's displacement law, Wein's law and stefans law Rayleigh-Jean's law-Quantum theory of radiation-Planck's law-Measurement of radiation.

Learning Outcomes

- Understanding different law for energy spectrum emitted by black body.(L2)
- Determine measurement of radiation by different techniques. (L5)

UNIT V

Introduction to Statistical Mechanics

Phase space, Macrostate and Microstate Statistical basis, Probability, Principle of equal apriori probability, Maxwell-Boltzmann statistics, Bose-Einstein statistics, Fermi-Dirac statistics (qualitative treatment), Entropy and Thermodynamic probability.

Learning Outcomes

1. Understanding basic concepts of statistical thermodynamics.(L2)
2. Analyzing the average distribution of non-interacting material particles over various energy states in thermal equilibrium by using different laws.(L4)

Course Outcomes:

- 1.Understanding molecular speed distribution and transport in gases.
2. Understanding basic concepts in thermodynamics and solve basic equations
- 3.Understanding and applying Maxwell thermodynamic relations and examine temperature change by using Joule – Kelvin effect
- 4.Understanding and measuring the energy spectrum emitted by black body.
- 5.Understanding basic concepts of statistical thermodynamics and analyzing the average distribution of non-interacting material particles

Text Books:

BSc Physics, Vol.2, Telugu Akademy, Hyderabad
Thermodynamics, R.C. Srivastava, Subit K. Saha &Abhay K. Jain Eastern
Economy Edition.
Unified Physics Vol.2, Optics & Thermodynamics, Jai Prakash Nath&Co.Ltd.,
Meerut
Heat ,Thermodynamics and Statistical Physics, Brij lal, Dr.N Subrahmanyam,
P.S. Hemne, S Chand & Co
A text Book of Heat J.B.Rajam

Fundamentals of Physics. Halliday/Resnick/Walker.C. Wiley India Edition 2007

Heat, Thermodynamics and Statistical Physics-N Brij Lal, N Subrahmanyam, PS
Hemne, S.Chand& Co.,2012

Heat and Thermodynamics- MS Yadav, Anmol Publications Pvt. Ltd, 2000

University Physics, HD Young, MW Zemansky,FW Sears, Narosa Publishers, New
Delhi

Text Book of +3 Physics – Samal, Mishra &Mohanty, National Library, Min.of
Culture, Govt of India.

Modern Engineering Physics, A.S. Vasudeva, S.Chand& Co.,

B.Sc. Physical Science
SEMESTER –III

SPH 223: Thermal Physics and Statistical Mechanics Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

Preamble: Determination and analyzing of thermo dynamical parameters.

Objective: To find thermo dynamical constants and analyze for its accuracy.

List of Experiments

Specific heat of a liquid –Joule’s calorimeter –Barton’s radiation correction
Thermal conductivity of bad conductor-Lee’s method
Measurement of Stefan’s constant.
Specific heat of a liquid by applying Newton’s law of cooling correction.
Heating efficiency of electrical kettle with varying voltages.
Thermoemf- thermo couple potentiometer
Coefficient of thermal conductivity of copper- Searle’s apparatus.
Thermal behavior of an electric bulb (filament/torch light bulb)
Temperature variation of resistance- thermistor.

Course Outcomes:

1. Learn the basic concepts of thermodynamics.
- 2: Learn the basic concepts of the Thermal Conductivity.
- 3: Have a knowledge of the real gas equations, Van der Waal equation of state, the Joule-Thompson effect.
- 4: Learn about the black body radiations, Stefan- Boltzmann’s law, Rayleigh-Jean’s law and Planck’s law and their significances.
- 5: The students are expected to perform the experiments related to heat transfer.

B.Sc. Physical Science
SEMESTER –III

SPH 201: Real Analysis

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Preamble: Real Analysis studies the behaviour of real numbers, functions, sequences, series and sets on the real line. The focus of the course is to study the properties of fields of real numbers, convergence/divergence of sequences, series of numbers and functions.

Objective:

To introduce

- basic properties of fields of real numbers
- sequences and discuss about their convergence
- infinite series and the tests of convergence
- Alternating series, absolute and conditional convergence of infinite series
- Point wise and uniform convergence of sequence and series of functions

UNIT-I

Finite and infinite sets, examples of countable and uncountable sets. Real line, bounded sets, suprema and infima, completeness property of \mathbb{R} , Archimedean property of \mathbb{R} , intervals. Concept of cluster points and statement of Bolzano-Weierstrass theorem.

Learning Outcomes:

The student will be able to:

- Define and recognize the basic properties of field of real numbers
- Find suprema and infima of sets
- Discuss the cluster points of sets

UNIT-II

Real Sequence, Bounded sequence, Cauchy convergence criterion for sequences. Cauchy's theorem on limits, order preservation and squeeze theorem, monotone sequences and their convergence (monotone convergence theorem without proof).

Learning Outcomes:

The student will be able to:

- Define sequences and its properties
- Verify the convergence of sequence
- Prove fundamental theorems on convergence

UNIT-III

Infinite series. Cauchy convergence criterion for series, positive term series, geometric series, comparison test, convergence of p-series.

Learning Outcomes:

The student will be able to:

- Define Infinite series and its properties
- Discuss the convergence of Geometric series
- Verify the convergence of series

UNIT-IV

Root test, Ratio test, alternating series, Leibnitz's test (Tests of Convergence without proof).
Definition and examples of absolute and conditional convergence.

Learning Outcomes:

The student will be able to:

- Define alternating series
- Explain the absolute and conditional convergence of the series
- Explain the Root, Ratio and Leibnitz's test

UNIT-V

Sequences and series of functions, Pointwise and uniform convergence. M -test, Statements of the results about uniform convergence and integrability and differentiability of functions, Power series and radius of convergence.

Learning Outcomes:

The student will be able to:

- Define sequence and series of functions
- Understand the difference between point wise and uniform convergence
- Apply M-test

Course Learning Outcomes:

On successful completion of this course, students will be able to:

- Write precise proofs
- Recognize convergent, divergent, bounded, Cauchy and monotone sequences and their properties
- Calculate the infima, suprema and limit points of a set
- Recognize alternating, conditionally and absolutely convergent series
- Apply the ratio, root, Leibnitz's test
- Test the pointwise and uniform convergence of sequences and series of functions

Text Books:

- Calculus Vol.I : One Variable Calculus, with an Introduction to Linear Algebra, Tom. M. Apostol, published by John Wiley and Sons (Asia) P. Ltd., 2002.
- Introduction to Real Analysis" by Robert.G. Bartle and Donald. R Sherbert, John Wiley and Sons(Asia) Ltd., 2000.
- Intermediate Real Analysis, Emanuel Fischer ,Springer Verlag, 1983.
- Elementary Analysis: The Theory of Calculus, Kenneth A. Ross, Springer Verlag, 2003.

B.Sc. Physical Science
SEMESTER –III

SPH 221: Real Analysis Tutorial

Hours Per Week :2 Continuous Evaluation:100 Marks Credits :2

Finding supremum and infimum of a set

Finding limit points of a set

Problems on sequences

Problems on Cauchy convergence

Problems on monotonic sequence

Problems on infinite series

Convergence or divergence of Geometric series

Convergence or divergence using comparison test

Convergence or divergence of p-series

Problems on root test

Problems on Ratio test

Problems on alternating series

Course Learning Outcomes:

On successful completion of this course, students will be able to:

Calculate the infima, suprema and limit points of a set.

Apply tests to verify the convergence or divergence of sequences.

Verify the convergence, divergence, absolute convergence, conditional convergence of infinite series.

B.Sc. Physical Science
SEMESTER –III

SPH-207: Digital Electronics

Hours per week: 4

End Examination: 60 Marks

Credits: 4

Sessionals: 40 Marks

Preamble: This course was introduced to explain the concepts of Digital Electronics

Objective: To explain the basics of Digital circuits

UNIT- I

Number Systems and Codes

Decimal, Binary, Octal, Hexa Decimal numbers, conversion from one to another-codes, BCD, excess 3, gray codes conversion from one to another - Error detection codes.

Learning Outcomes:

To analyze the number systems

Solve the different number conversions

UNIT - II

Boolean Algebra And Theorems

Basic & Universal logic gates - Boolean Identities - Boolean theorems De Morgan's Theorem sum of products, products of sums expressions, simplification by Karnaugh Map method, simplification based on basic Boolean theorems - don't care conditions.

Learning Outcomes:

Analyzing of Universal gates

Simplification of Karnaugh maps

UNIT – III

Combinational Digital Circuits

Arithmetic Building blocks, Half & Full Adders and Half & Full Subtractions, BCD adders - multiplexers, De-multiplexers, encoders, decoders - Characteristics for Digital ICs -RTL, DTL, TTL, ECL CMOS (NAND & NOR Gates).

Learning Outcomes:

To design combinational circuits

Explains the logic families

UNIT- IV

Sequential Digital Circuits

Flip-flops, RS, Clocked SR, JK, D, T, Master-Slave Flip flop -Conversion of Flip flops – shift registers - ripple counters - synchronous counters and asynchronous counters (4-bit counter).

Learning Outcomes:

Analyze the various sequential circuits

To design the synchronous and asynchronous counters

UNIT- V

Memory Devices

ROM Organization - PROM Organization – PLA (Programmable Logic Array) - PAL (Programmable Array Logic) - Realization of functions using PROM

Learning Outcomes:

- To construct the memory devices
- To explain the programmable logic devices

Course Outcomes:

- 1.Learn the number systems in digital systems
- 2.Acquire the knowledge on simplification gates
- 3.Learn about the designing of combinational circuits
- 4.Learn about the designing of sequential circuits
- 5.Learn the basics of organization of memory devices

Textbooks:

- R.P. Jain, "Modern digital Electronics", 3rd Edition, TMH, 2003.
- Puri, V.K., Digital Electronics, Tata McGraw Hill, 2nd Edition, 2011
- Morris mano M., Computer System Architecture, 2nd Edition, Prentice Hall, 1998
- Malvino and Leach, Digital Principles and applications, McGraw Hill, 1996, 4th Edition

Reference Books:

- Millman 1. Micro Electronics, McGraw Hill International Book Company, New Delhi.
- Morris Mano M., "Digital Logic and Computer Design" PHI, 2005.
- Godse A.P., Digital Electronics, Technical Publications.
- Unified Electronics (Digital Electronics and Microprocessors) by Agarwal- Agarwal

B.Sc. Physical Science
SEMESTER –III
SPH 227: Digital Electronics Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

Preamble: This course was designed to construct and verify Digital circuits
Objective: The student analyze and design the Digital circuits

List of Experiments

Verification of I C (basic) logic Gates

Universality of NAND & NOR Gates.

Verification of Boolean laws using NAND Gates (Associative, Commutative & Distributive Laws)

Study of RS, D, T and JK Flip-Flops with IC's

Half and Full Adders using Simple & NAND Gates.

6.4-bit binary parallel adder and Subtractor IC 7483 using PSPICE simulation

Study of 7490 BCD Counter - MOD Counters using PSPICE simulation.

BCD to Seven segment decoder 7447/7448 using PSPICE simulation.

Course Outcomes:

After the completion of this course, the student will be able to design the electronic circuits (L3 and L4)

B.Sc. Physical Science
SEMESTER –III
SPH 205: Solutions, Phase Equilibrium, Conductance, Electrochemistry & Functional
Group Organic Chemistry-II

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Preamble: The students of undergraduate program in science need to be conversant with the various aspects of solution chemistry, phase equilibrium, electrochemistry and Functional group chemistry forms the foundation for training a undergraduate students as analytical and synthetic chemist.

Objective: To introduce the concept of solution phase chemistry in physical chemistry and functional group chemistry in organic chemistry to the undergraduate students.

The students will learn the essential functional groups in organic chemistry, their reactions, and properties.

UNIT-I

Section A: Physical Chemistry-2

Solutions

Thermodynamics of ideal solutions: Ideal solutions and Raoult's law, deviations from Raoult's law – non-ideal solutions. Vapour pressure-composition and temperature- composition curves of ideal and non-ideal solutions. Distillation of solutions. Lever rule. Azeotropes.

Phase Equilibrium

Phases, components and degrees of freedom of a system, criteria of phase equilibrium. Gibbs Phase Rule and its thermodynamic derivation. Derivation of Clausius – Clapeyron equation and its importance in phase equilibria. Phase diagrams of one-component systems (water) and two component systems involving eutectics, congruent and incongruent melting points (lead- silver only).

Learning Outcomes

The student will learn about the essential concepts impotent principle and terms of phase rule. The students will be apple to apply phase rule to one component and two component systems

UNIT-II

Conductance

Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Kohlrausch law of independent migration of ions.

Transference number and its experimental determination using Hittorf and Moving boundary methods. Ionic mobility. Applications of conductance measurements: determination of degree of ionization of weak electrolyte, solubility and solubility products of sparingly soluble salts, ionic product of water, hydrolysis constant of a salt. Conductometric titrations (only acid- base).

Electrochemistry

Reversible and irreversible cells. Concept of EMF of a cell. Measurement of EMF of a cell. Nernst equation and its importance. Types of electrodes. Standard electrode potential. Electrochemical series. Thermodynamics of a reversible cell, calculation of thermodynamic properties: G, H and S from EMF data.

Calculation of equilibrium constant from EMF data. Concentration cells with transference and without transference. Liquid junction potential and salt bridge.

Learning Outcomes

The students will learn the elementary concepts of conductance and electrochemistry. The students will learn the applications of Kohlrausch law. They will be able to calculate thermodynamic properties: G, H and S from EMF data.

UNIT-III

Section B: Organic Chemistry-3

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

Carboxylic acids and their derivatives Carboxylic acids (aliphatic and aromatic) Preparation: Acidic and Alkaline hydrolysis of esters. Reactions: Hell – Vohlar - Zelinsky Reaction.

Carboxylic acid derivatives (aliphatic): (Upto 5 carbons)

Preparation: Acid chlorides, Anhydrides, Esters and Amides from acids and their interconversion.

Reactions: Comparative study of nucleophilicity of acyl derivatives. Reformatsky Reaction, Perkin condensation.

Amines and Diazonium Salts

Amines (Aliphatic and Aromatic): (Upto 5 carbons)

Preparation: from alkyl halides, Gabriel's Phthalimide synthesis, Hofmann Bromamide reaction.

Reactions: Hofmann vs. Saytzeff elimination, Carbylamine test, Hinsberg test, with HNO₂, Schotten – Baumann Reaction. Electrophilic substitution (case aniline): nitration, bromination, sulphonation.

Diazonium salts: Preparation: from aromatic amines

Reactions: conversion to benzene, phenol, dyes.

Learning Outcomes

The students will learn the concept of synthesis and reactions of carboxyl functional group and derivatives.

UNIT-IV

Amino Acids, Peptides and Proteins:

Preparation of Amino Acids: Strecker synthesis using Gabriel's phthalimide synthesis. Zwitterion, Isoelectric point and Electrophoresis.

Reactions of Amino acids: ester of –COOH group, acetylation of –NH₂ group, complexation with Cu²⁺ ions, ninhydrin test.

Overview of Primary, Secondary, Tertiary and Quaternary Structure of proteins.

Determination of Primary structure of Peptides by degradation Edmann degradation (N-terminal) and C-terminal (thiohydantoin and with carboxypeptidase enzyme). Synthesis of simple peptides (upto dipeptides) by N-protection (t-butyloxycarbonyl and phthaloyl) & C-activating groups and Merrifield solid-phase synthesis.

Learning Outcomes

The student shall learn

the elementary reactions and properties, mechanism of amines and diazonium salts. The students will learn the concept of applications of diazonium salts in synthetic organic chemistry.

The students will also familiarize with synthetic approaches to simple amino acids and concept of proteins.

UNIT-V

Carbohydrates: Classification, and General Properties, Glucose and Fructose (open chain and cyclic structure), Determination of configuration of monosaccharides, absolute configuration of Glucose and Fructose, Mutarotation, ascending and descending in monosaccharides. Structure of disaccharides (sucrose, cellobiose, maltose, lactose) and polysaccharides (starch and cellulose) excluding their structure elucidation.

Learning Outcomes

The students will learn about the classification of carbohydrates. The students will familiarize the reactions and properties of mono, di and polysaccharides

Reference Books:

- Barrow, G.M. Physical Chemistry Tata McGraw-Hill (2007).
- Morrison, R. T. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Finar, I. L. Organic Chemistry (Volume 2), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Nelson, D. L. & Cox, M. M. Lehninger's Principles of Biochemistry 7thEd., W. H. Freeman.
- Berg, J.M., Tymoczko, J.L. & Stryer, L. Biochemistry, W.H. Freeman, 2002.

B.Sc. Physical Science
SEMESTER –III
SPH 225: Solutions, Phase Equilibrium, Conductance, Electrochemistry &
Functional Organic Chemistry-II Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

Preamble: The students of undergraduate program in science in Chemistry need to be conversant with the various basic methodologies of chemistry. Therefore, one module each on inorganic, physical and organic chemistry is introduced which helps the student familiarize with the techniques essential for developing the foundation of practical chemistry

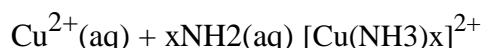
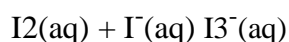
Objective: To make student learn the practical application of solution, phase and electrochemistry for quantitative analysis

He students also learn to differentiate between reducing and non-reducing sugars by qualitative analysis.

Section A: Physical Chemistry

Distribution

Study of the equilibrium of one of the following reactions by the distribution method:



Phase equilibria

Construction of the phase diagram of a binary system (simple eutectic) using cooling curves.

Determination of the critical solution temperature and composition of the phenol water system and study of the effect of impurities on it.

Study of the variation of mutual solubility temperature with concentration for the phenol water system and determination of the critical solubility temperature.

Conductance

Determination of cell constant

Determination of equivalent conductance, degree of dissociation and dissociation constant of a weak acid.

Perform the following conductometric titrations:

Strong acid vs. strong base

Weak acid vs. strong base

Potentiometry

Perform the following potentiometric titrations:

Strong acid vs. strong base

Weak acid vs. strong base

Potassium dichromate vs. Mohr's salt

Learning Outcomes

The student will learn determination of conductance, cell constant. The students will learn to apply the concepts of electrochemistry for redox titrations by instrumental methods of analysis

Section B: Organic Chemistry

I Systematic Qualitative Organic Analysis of Organic Compounds possessing monofunctional groups (-COOH, phenolic, aldehydic, ketonic, amide, nitro, amines) and preparation of one derivative.

II

Separation of amino acids by paper chromatography
Determination of the concentration of glycine solution by formylation method.
Titration curve of glycine
Action of salivary amylase on starch
Effect of temperature on the action of salivary amylase on starch.
Differentiation between a reducing and a nonreducing sugar.

Reference Books:

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

B.Sc. Physical Science
SEMESTER –III
SPH 209: Design and Analysis of Algorithms

Hours per week: 4

End Examination: 60 Marks

Credits: 4

Sessionals: 40 Marks

Preamble: Design and Analysis of Algorithm is very important for designing algorithm to solve different types of problems in the branch of computer science and information technology. This course deals the fundamental concepts of Designing Strategies, Complexity analysis of Algorithms, followed by problems on Graph Theory and Sorting methods.

Objectives:

To rephrase algorithms. (L2)

To demonstrate sorting techniques. (L2)

To emphasize graph traversals. (L3)

To illustrate challenges in numeric algorithms. (L2)

UNIT –I

Introduction: Algorithm Specification, Performance Analysis, Randomized Algorithms- Las Vegas, Monte Carlo Algorithm Definition, RQuick Sort.

Sorting Techniques: Selection Sort, Bubble Sort, Insertion Sort, Heap Sort, Shell Sort, Linear Search.

Learning Outcomes:

By the end of this Unit, the student will be able to

Specify algorithms and analyze performance of algorithm. (L2)

To develop sorting techniques. (L5)

UNIT - II

Divide and Conquer: General Method, Binary Search, Finding maximum and minimum, Merge Sort, Quick Sort, Strassen's Matrix Multiplication.

Basic Graph Traversal Techniques- Breadth First Search, Depth-First Search.

Learning Outcomes:

By the end of this Unit, the student will be able to

examine divide and conquer method. (L4)

adopt BFS and DFS algorithms. (L3)

UNIT- III

Greedy Method: General Method, Knapsack Problem, Minimum Cost Spanning Trees- Kruskal's, Prim Algorithms, Single Source Shortest Paths.

Learning Outcomes:

By the end of this Unit, the student will be able to

make use of minimum cost spanning trees. (L4)

explain Kruskal's, Prim's and single source shortest path algorithm. (L2)

UNIT – IV

Dynamic Programming: General Method, All pairs Shortest Paths, Travelling Salesperson Problem.

Transform and Conquer: Multiplication of Large Integers, Horner's Rule and Binary Exponentiation, Computing the least common multiple, counting paths in a graph, Reduction of Optimization Problem. (Anany Levitin chapter -6)

Learning Outcomes:

By the end of this Unit, the student will be able to

elaborate Travelling salesman problem. (L4)

solve Horner's rule and binary exponentiation, computer LCM. (L3)

UNIT – V

Input Enhancement in String Matching: Horspools Algorithm, Boyer- Moore Algorithm.

Limitations of Algorithm Power: Lower-Bound Arguments, Trivial Lower Bounds, Information-Theoretic Arguments, Adversary Arguments, Problem Reduction

Decision Trees: Decision Trees for Sorting, Decision Trees for Searching a sorted Array

P, NP, and NP-Complete Problems: Basic Concepts, P and NP Problems, NP-Complete Problems, Challenges in Numeric Algorithms (Anany Levitin – 11th chapter)

Learning Outcomes:

By the end of this Unit, the student will be able to

model Horspools Algorithm, Boyer- Moore Algorithm. (L4)

choose decision tree for sorting. (L3)

Course Outcomes:

Upon completion of the course, the student is able to

Learn to analyze performance of algorithm. (L2)

solve a given problem recursively dealing with sub-problems. (L3)

learn to solve notorious computational problems. (L4)

Text Books:

Fundamentals of Computer Algorithms – Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Second Edition, 2008, University Press,

Introduction to the Design and Analysis of Algorithms, Anany Levitin, 3rd Edition 2012, Pearson (Unit- IV,V)

B.Sc. Physical Science
SEMESTER –III

SPH 229: Design and Analysis of Algorithms Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

List of Experiments

- Write a C++ program to implement Bubble sort.
- Write a C++ program to implement Insertion Sort.
- Write a C++ program implement Selection Sort.
- Write a C++ program to implement Quick Sort.
- Write a C++ program to implement Merge Sort.
- Write a C++ program to implement Shell Sort.
- Write a C++ program to Find Maximum and Minimum using Divide and Conquer.
- Write a C++ program to implement Strassen's Matrix Multiplication.
- Write a C++ program to implement Breadth First Search, Depth First Search.
- Write a C++ program on Knapsack Problem.
- Write a C++ program to find Minimum Cost Spanning Tree.
- Write a C++ program to find All pairs Shortest Path.
- Write a C++ program to find Single Source Shortest Path.
- Write a C++ program to evaluate an expression using Horner's Rule.
- Write a C++ program to perform string matching – Horspools or Boyer- Moore algorithm.

Text Books:

Fundamentals of Computer Algorithms – Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Second Edition, 2008, University Press,
Introduction to the Design and Analysis of Algorithms, ,Anany Levitin, 3rd Edition 2012, Pearson (Unit- IV, V)

B.Sc. Physical Science
SEMESTER –III

SFC 203: English for Communication– II

Hours per week: 3

End Examination: 60 Marks

Credits: 2

Sessionals: 40 Marks

Preamble: This course has been designed to help students acquire English language skills for professional development. The students will be exposed to aspects of English language through some very interesting texts. Each unit of the book carries a very extensive and relevant explanation on pronunciation, grammar, vocabulary, spelling, punctuation, spoken dialogues, writing and reading.

Objective:

- To introduce students to Prosodic features for right speech
- To enable students to use English in day-to-day communication
- To build up their confidence in the usage of English
- To expose them to Group Discussion sessions
- To develop their written communicative competence
- To make them interview ready

UNIT- I The Open Window : Saki (H.H.Munro)

Pronunciation: Syllabification, **Grammar:** Non-infinite verbs, **Vocabulary:** Simile & Metaphor, **Spelling:** using 'ie' or 'ei', **Punctuation:** semi-colon, **Conversation:** Asking for advice/information,

Learning outcomes:

By the end of the course, the student will be able to:

- Improve their speaking ability in English both in terms of fluency and comprehensibility.
- Heighten their awareness of correct usage of English grammar in writing and speaking.
- Attain and enhance competence in the four modes of literacy: LSRW.
- Utilize phonetic dictionary symbols to continue to improve pronunciation.
- Punctuate quoted statements, sentences and questions correctly.

UNIT- II The Voice of Humanity – Rabindranath Tagore

Pronunciation: Word Stress, **Grammar:** Adjectives, **Vocabulary:** Oxymoron & Hyperbole, **Spelling:** using 'able' and 'ible', **Punctuation:** Colon & dash, **Group Discussion Learning outcomes:**

By the end of the course, the student will be able to:

- To use newly acquired vocabulary in classroom activities.
- Develop independent learning strategies and study skills.
- Have the ability to communicate effectively with others.
- Understand the rules of word stress
- Acquire the skills needed for a G.D and participate efficiently.

UNIT –III If – Rudyard Kipling

Pronunciation: Sentence Stress, **Grammar:** Articles, **Vocabulary:** Portmanteau and loan words, **Spelling:** using suffixes, **Punctuation:**Hyphen & dash, **Oral Presentation**

Learning outcomes:

By the end of the course, the student will be able to:

- Demonstrate command of the conventions of Standard English punctuation, and spelling when writing.
- Enable to discuss literary texts from various theoretical and critical perspectives.
- Formulate ideas and connections between literary concepts and themes.
- Establish a deeper appreciation of cultural diversity by introducing them to poetry.
- acquire effective presentation skills

UNIT -IV Riders to the Sea – JM Synge

Pronunciation – Intonation, **Grammar:** Adverbs, **Vocabulary:** Palindromes, **Spelling:** completing tables with nouns, verbs, adjectives, adverbs **Punctuation:** Inverted comma, **Conversation/Role play:** Appearing for a job interview/conducting a job interview

Learning outcomes:

By the end of the course, the student will be able to:

- Collaborate with peers for role-playing, story analysis, and presentation planning.
- Use comparative forms of high frequency adjectives and adverbs.
- Apply sentence mechanics and master spelling of high frequency words.
- Demonstrate increased understanding of English syntax and grammatical elements for effective writing.
- Understand and use intonation in spoken language.
- Develop the skills needed for attending an interview

UNIT- V Academic Writing: Letter Writing, Paragraph Writing, Essay Writing, Resume Preparation, Dialogue Writing, Precis

Learning outcomes:

By the end of the course, the student will be able to:

- Develop outlines, clusters, lists, or other graphic organizers to organize ideas for writing
- Format various types of writing such summaries, personal letters, formal letters and narrative, descriptive, and expository paragraphs on a variety of topics
- Develop own creativity and enhance their writing skills
- Paraphrase text appropriately.
- Write effective introductions and conclusions for paragraphs.
- Prepare a persuasive resume.

Text Books:

Part – 2 (English for Enhanced Competence (by Sumit Roy, A.Karunakar, A.Aruna Priya)

Supplementary Reading:

- Communicative skills for Technical Students, M. Faratullah. Orient longman
- Rizvi,MAshraf. **Effective Technical Communication.** McGraw - Hill.

B.Sc. Physical Science
SEMESTER –III

SSE 271: Physics Workshop Skill

Credits: 2

Continuous Evaluation: 100 Marks

- Preamble:** To introduce various measuring methods of mechanical and electrical circuits.
- Objective:** To understand the need of these measuring methods.

Introduction: Measuring units. conversion to SI and CGS. Familiarization with meterscale, Vernier calliper, Screw gauge and their utility. Measure the dimension of a solid block, volume of cylindrical beaker/glass, diameter of a thin wire, thickness of metal sheet, etc. Use of Sextant to measure height of buildings, mountains, etc.

Mechanical Skill: Concept of workshop practice. Overview of manufacturing methods: casting, foundry, machining, forming and welding. Types of welding joints and welding defects. Common materials used for manufacturing like steel, copper, iron, metal sheets, composites and alloy, wood. Concept of machine processing, introduction to common machine tools like lathe, shaper, drilling, milling and surface machines. Cutting tools, lubricating oils. Cutting of a metal sheet using blade. Smoothing of cutting edge of sheet using file. Drilling of holes of different diameter in metal sheet and wooden block. Use of bench vice and tools for fitting. Make funnel using metal sheet.

Electrical and Electronic Skill: Use of Multimeter. Soldering of electrical circuit having discrete components (R, L, C, diode) and ICs on PCB. Operation of oscilloscope. Making regulated power supply. Timer circuit, Electronic switch using transistor and relay.

Introduction to prime movers: Mechanism, gear system, wheel, Fixing of gears with motor axel. Lever mechanism, Lifting of heavy weight using lever. braking systems, pulleys, working principle of power generation systems. Demonstration of pulley experiment.

Reference Books:

A text book in Electrical Technology - B L Theraja – S. Chand and Company.
Performance and design of AC machines – M.G. Say, ELBS Edn.

Course Outcomes: At the end of the course

1. Learn the use of measurement and dimensional analysis.
- 2: Learn basic mechanical skills and use in daily life.
- 3: Have a knowledge of cutting the various metals.
- 4: Learn about the electrical and electronic skills and use in daily life.
- 5: Learn the concept of power generation systems

B.Sc. Physical Science
SEMESTER –III

SSE 273: Basic Analytical Chemistry

Credits :2

Continuous Evaluation:100 Marks

Introduction: Introduction to Analytical Chemistry and its interdisciplinary nature. Concept of sampling. Importance of accuracy, precision and sources of error in analytical measurements. Presentation of experimental data and results, from the point of view of significant figures.

Analysis of soil: Composition of soil, Concept of pH and pH measurement, Complexometric titrations, Chelation, Chelating agents, use of indicators

Determination of pH of soil samples.

Estimation of Calcium and Magnesium ions as Calcium carbonate by complexometric titration.

Analysis of water: Definition of pure water, sources responsible for contaminating water, water sampling methods, water purification methods.

Determination of pH, acidity and alkalinity of a water sample.

Determination of dissolved oxygen (DO) of a water sample.

Analysis of food products: Nutritional value of foods, idea about food processing and food preservations and adulteration.

Identification of adulterants in some common food items like coffee powder, asafoetida, chilli powder, turmeric powder, coriander powder and pulses, etc.

Analysis of preservatives and colouring matter.

Chromatography: Definition, general introduction on principles of chromatography, paper chromatography, TLC etc.

Paper chromatographic separation of mixture of metal ion (Fe^{3+} and Al^{3+}).

To compare paint samples by TLC method. **Ion-exchange:**

Column, ion-exchange chromatography etc.

Determination of ion exchange capacity of anion / cation exchange resin (using batch procedure if use of column is not feasible).

Analysis of cosmetics: Major and minor constituents and their function

Analysis of deodorants and antiperspirants, Al, Zn, boric acid, chloride, sulphate.

Determination of constituents of talcum powder: Magnesium oxide, Calcium oxide, Zinc oxide and Calcium carbonate by complexometric titration.

To study the use of phenolphthalein in trap cases.

To analyze arson accelerants.

To carry out analysis of gasoline.

**B.Sc. Physical Science
SEMESTER –III**

SSE 275: Logic and Sets

Credits: 2

Continuous Evaluation: 100 Marks

Introduction, propositions, truth table, negation, conjunction and disjunction. Implications, biconditional propositions, converse, contra positive and inverse propositions and precedence of logical operators.

Propositional equivalence: Logical equivalences.

Predicates and quantifiers: Introduction, Quantifiers, Binding variables and Negations.

Sets, subsets, Set operations, the laws of set theory and Venn diagrams. Examples of finite and infinite sets. Finite sets and counting principle. Empty set, properties of empty set. Standard set operations. Classes of sets. Power set of a set.

Difference and Symmetric difference of two sets. Set identities, Generalized union and intersections.

Relation: Product set, Composition of relations, Types of relations, Partitions, Equivalence Relations with example of congruence modulo relation.

Text Books:

Discrete and Combinatorial Mathematic, Ralph P. Grimaldi and B.V. Ramana
Pearson Education, 1998.

Naïve Set Theory, Paul R. Halmos, Springer, 1974.

Theory of Sets, E. Kamke, Dover Publications, 1950.

Course Learning Outcomes:

On successful completion of this course, students will be able to:

Explain propositional calculus

Evaluate problems on predicate functions

Explain different types of sets and operations on sets

Define relation between two sets

Explain different types of relations

**B.Sc. Physical Science
SEMESTER –III**

SSE 277: Computer Graphics

Credits :2

Continuous Evaluation:100 Marks

Preamble: Computer graphics is regarded as a branch of computer science that deals with the theory and technology for computerized image synthesis. The task of composing image on a computer is essentially a matter of setting pixel values. The field of computer graphics is characterized by rapid changes in how the technology is used in everyday applications and by constant evolution of graphics systems.

Course Objectives:

To familiarize with Raster Scan and Random Scan Systems.

To know about line drawing algorithms. To learn about polygon filling algorithm. To understand antialiasing techniques. **UNIT- I**

Development of Computer Graphics, Raster Scan and Random Scan graphics storages, display processor and character generators, color display techniques.

Learning Outcome:

By the end of this Unit, the student will be able to

- Show raster scan and random scan graphics storage. (L1)
- Explain display processor. (L1)
- Outline colour display techniques. (L3)

UNIT- II

Cathode Ray Tube (CRT) basics, Refresh Display, Direct View Storage Tube (DVST), Interactive input/output devices).

Learning Outcome:

By the end of this Unit, the student will be able to

- Outline CRT display. (L2)
- Explain DVST. (L3)
- Narrate interactive input output devices. (L2)

UNIT-III

Points, lines and curves, Scan conversion, Line-Drawing Algorithms, Circle and Ellipse Generation.

Learning Outcome:

By the end of this Unit, the student will be able to

- Know about scan conversion algorithms. (L3)
- Describe Line drawing Algorithms. (L2)
- Explain Circle generation and Ellipse generation algorithms. (L2)

UNIT- IV

Conic-section generation, polygon filling, anti aliasing.

Learning Outcomes:

By the end of this Unit, the student will be able to

Understand Conic Section generation. (L2)

Learn polygon filling algorithms. (L2)

Choose anti aliasing techniques. (L3)

UNIT - V

Two-dimensional viewing, Coordinate systems, linear transformations, line and polygon clipping algorithms.

Learning Outcomes:

By the end of this Unit, the student will be able to

Learn two dimensional viewing. (L3)

Make use of Coordinate systems. (L4)

Select line and Polygon clipping algorithms. (L3)

- Differentiate raster scan and random scan systems.
- Identify the CRT and DVD display.
- Know about line generation and Polygon filling algorithms.

Text Book:

1. Computer Graphics ,Amarendra N Sinha, Arun D Udai, Tata McGraw Hill, 2008.

Reference Books :

Computer Graphics, D. Hearn and M.P. Baker, Prentice–Hall of India, 2nd Ed., 2004.

Procedural Elements in Computer Graphics , D.F. Rogers, TMH, 2nd Ed., 2001.

B.Sc. Physical Science
SEMESTER –IV
SPH 204: Electricity & Magnetism

Hours per week: 4

End Examination: 60 Marks

Credits: 4

Sessionals: 40 Marks

- Preamble:** To introduce the concepts of electric charges, fields and to induce the magnetic field concepts and to understand the relation between electricity and magnetism via electromagnetic induction, waves etc.
- Objective:** To combine the understanding of fundamental concepts in Electricity and Magnetism more rigorously and their relation to understand the physical systems of dielectrics, magnetic materials etc...as needed for further studies in physics.

UNIT I

Electric field and potential:

Gauss's law statement and its proof- Electric field due to (1) Uniformly charged sphere (2) an infinite conducting sheet of charge and (3) Uniformly charged cylinder. Electrical potential – equipotential surfaces- potential due to i) a point charge, ii) charged spherical shell and uniformly charged circular disc. Electric field strength due to an electric dipole.

Learning Outcomes

Understands the concept of electric flux and apply Gauss's law to calculate electric flux (L2 and L3).

Understand electrostatic interactions of point charges physical parameters. (L2)

UNIT II

Capacitance and dielectrics:

Electric capacitance - Derivation of expression for capacity of (i) a parallel plate capacitor (ii) a spherical capacitor. Dielectrics- effect of dielectric on the capacity of a condenser, Energy stored in a capacitor. Electric dipole moment and molecular polarizability- Electric displacement D , electric polarization P – relation between D, E and P - Dielectric constant and susceptibility.

Learning Outcomes

Understand the working of capacitor and different types of capacitors and realize charge on a capacitor to the potential of a capacitor. (L2 and L4)

Construct about dielectrics, dielectric breakdown, and how dielectrics make capacitors more effective (L3)

UNIT III

Moving charges in electric and magnetic field

Hall effect, cyclotron, synchrocyclotron and synchrotron- Force on a current carrying conductor placed in a magnetic field, force and torque on a current loop, Biot-Savart's law, explanation and calculation of B due to long straight wire, a circular current loop and solenoid.

Electromagnetic induction

Faraday's law-Lenz's law-expression for induced emf-time varying magnetic field Betatron – Moving coil ballistic galvanometer-theory, working. Self and mutual inductance, coefficient of coupling.

Learning Outcomes

Construct cyclotron, synchrocyclotron and synchrotron and their working (L3).

Explain mutual relation between electric and magnetic fields (L2).

UNIT IV

Varying and alternating currents

Growth and decay of currents in LR,CR and LCR dc circuits-critical damping, Alternating current relation between current and voltage in pure R,C and L. LCR series and parallel resonant circuit, Q -factor.

Learning Outcomes

Interpret circuits with Capacitance (C) , inductor (L) and Resistor (R) during charging and discharging when connected or disconnected to a battery (L2).

Function of an LC circuit for the change in oscillations due to resistance (L4)

UNIT V

Maxwell's equations and electromagnetic waves

A review of basic laws of electricity and magnetism-displacement current. Maxwell's equations in differential form, Maxwell's wave equation, plane electromagnetic waves. Transverse nature of electromagnetic waves.Poynting theorem.

1. Outline Maxwell's equations of electromagnetic theory (L2)

Infer how Maxwell modified Ampere's law for wave equation for the transfer of electromagnetic energy (L4).

Course Outcomes

1.Understands the concept of electric flux, interactions of point charges and apply Gauss's law to calculate electric flux.

2.Understand capacitor its types and analyze to the potential of a capacitor.

3.Construct dielectrics, capacitors with dielectrics and particle accelerators

4.Explain mutual relation between electric and magnetic fields

5.Extend Maxwell's equations of electromagnetic theory and examine electromagnetic wave equation for the transfer of electromagnetic energy.

Textbooks:

BSc Physics, Vol.3, Telugu Akademy, Hyderabad

Electricity and Magnetism, D.N. Vasudeva. S. Chand & Co.

Unified Physics Vol.3, Electricity, Magnetism and Electronics, S.L. Gupta and Sanjeev Gupta, Jai PrakasahNath& Co., Meerut.

Reference Books:

Fundamentals of Physics- Halliday/Resnick/Walker - Wiley India Edition2007.

Berkeley Physics Course – Vol. II - Electricity and Magnetism – Edward M Purcell –The McGraw-Hill Companies.

Electricity and Magnetism Brijlal and Subramanyam. RatanPrakashanMandir.

Electricity and Magnetism, C.J. Smith, Edward Arnold Ltd.

B.Sc. Physical Science
SEMESTER –IV

SPH 222: Electricity & Magnetism Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

Preamble: Examine electrical circuits for relevant measurements

Objective: To analyze electrical circuits for determining electrical quantities

List of Experiments:

- Internal resistance of a cell by potentiometer.
- LCR circuit series/parallel resonance, Q factor.
- Determination of ac-frequency –sonometer.
- Conversion of galvanometer into ammeter
- Conversion of galvanometer into voltmeter.
- Verification of Kirchoff's laws and maximum power transfer theorem.
- Field along the axis of a circular coil carrying current.
- LCR circuits in series and parallel
- Hall probes-Magnetic field measurement

Course Outcomes:

- 1.Explain the working of Galvanometer.
- 2: Apply Gauss's law of electrostatics to solve a variety of problems.
- 3: Describe how magnetism is produced and list examples where its effects are observed.
- 4: Describe the magnetic field produced by magnetic dipoles and electric currents.
- 5: The student will get an opportunity to verify all theorems elaborated above, using simple electric circuits.

B.Sc. Physical Science
SEMESTER –IV

SPH 202: Algebra

Hours per week: 4

Credits: 4

End Examination: 60 Marks

Sessionals: 40 Marks

Preamble: This course aims to provide basic concepts of Abstract algebra. The focus of the course is to study the fundamental properties of Groups and its kind.

Course Objectives:

- To introduce groups, subgroups, permutation and cyclic groups with examples
- To discuss the fundamental properties of Groups, sub groups etc
- To study the structure preserving mappings, homomorphism and isomorphism, its properties.
- To increase mathematical maturity, including writing their own proofs

UNIT – I

Groups: Binary Operation – Algebraic structure – semi group-monoid – Group definition and elementary properties Finite and Infinite groups – examples – order of a group. Composition tables with examples.

Learning Outcomes:

The student will be able to:

- Explain algebraic structures
- Verify group properties of a given algebraic structure
- Define order of a group and order of an element

UNIT – II

Subgroups: Complex Definition – Multiplication of two complexes Inverse of a complex-Subgroup definition – examples-criterion for a complex to be a subgroups. Criterion for the product of two subgroups to be a subgroup-union and Intersection of subgroups.

Co-sets and Lagrange's Theorem :

Cosets Definition – properties of Cosets–Index of a subgroups of a finite groups–Lagrange's Theorem.

Learning Outcomes:

The student will be able to:

- Define and explain the properties of complexes, subgroups and co-sets
- Explain the index of a subgroups with examples
- Prove Lagranges theorem

UNIT –III

Normal Subgroups: Definition of normal subgroup – proper and improper normal subgroup–Hamilton group – criterion for a subgroup to be a normal subgroup – intersection of two normal subgroups – Sub group of index 2 is a normal sub group – simple group – quotient group – criteria for the existence of a quotient group.

Learning Outcomes:

The student will be able to:

- Explain normal subgroups and its properties
- Define quotient groups and criteria for the existence of a quotient group.

UNIT – IV

Homomorphism : Definition of homomorphism – Image of homomorphism elementary properties of homomorphism – Isomorphism – Automorphism definitions and elementary properties – kernel of a homomorphism – fundamental theorem on Homomorphism and applications.

Learning Outcomes:

The student will be able to:

- Discuss the structure preserving mappings
- Prove the properties of Homomorphism and Isomorphism
- Define Kernel of Isomorphism and its properties

UNIT –V

Permutations and Cyclic Groups: Definition of permutation – permutation multiplication – Inverse of a permutation – cyclic permutations – transposition – even and odd permutations – Cayley's theorem.

Cyclic Groups :

Definition of cyclic group – elementary properties – classification of cyclic groups.

Learning Outcomes:

The student will be able to:

- Define and give examples of permutation and cyclic groups
- Perform permutation multiplication
- Find generators of cyclic group
- Prove fundamental properties of permutation and cyclic groups

Course Outcomes:

On successful completion of this course, students will be able to:

- Write abstract mathematical proofs in logical manner
- Verify group properties for the given algebraic structure
- Prove fundamental theorems of group theory
- Explain the use of order of an element and group in finding generators of the group
- Discuss the structure preserving mappings and its importance

Text Books:

A Text Book of B.Sc. Mathematics Volume-I

V.Venkateswara Rao, N Krishna Murthy, B.V.S.S. Sarma and S. Anjaneya Sastry,
S.Chand & Company Ltd., New Delhi.

A First Course in Abstract Algebra, John B. Fraleigh, Narosa Publishing house.

Modern Algebr, M.L. Khanna, Jai Prakash Nath.

A First Course in Abstract Algebra, John B. Fraleigh ,7th Edition, Pearson, 2002.

Algebra, Micheal Artin, 2nd Edition, Pearson, 2011.

**B.Sc. Physical Science
SEMESTER –IV**

SPH 220: Algebra Tutorial

Hours per week: 2
Credits: 2

Continuous Evaluation: 100 Marks

Problems on Groups

Problems on subgroups

Problems on co-sets and Lagrange's theorem

Problems on normal subgroups

Problems on quotient group

Problems on homomorphism of groups

Problems on isomorphism of groups

Problems on permutation multiplication

Problems to find inverse of a permutation

Problems on cyclic permutation and transposition

Problems on Cayley's theorem

Problems on cyclic groups

Course Outcomes:

On successful completion of this course, students will be able to:

Verify group properties of given algebraic structure

demonstrate the subgroups, normal subgroups, quotient groups with examples

Recognize the structure preserving mappings

Find the generators of a group

Discuss about permutations and their product

B.Sc. Physical Science
SEMESTER –IV

SPH 208: Analog & Digital IC Applications

Hours per week: 4

End Examination: 60 Marks

Credits: 4

Sessionals: 40 Marks

Preamble: This course was introduced to understand the analog and digital applications

Objective: To Know the internal operations of analog and digital circuits

UNIT- I

Operational Amplifiers

Basic differential amplifier-Op-Amp supply voltages - IC identification - Internal blocks of Op-Amp, Op-Amp parameters-offset voltages and currents-CMRR-Slew rate, Virtual ground, Op-Amp as a voltage amplifier - Inverting amplifier - non-inverting amplifier - Voltage follower

Learning Outcomes:

To understand the Functional blocks of Op Amp

To demonstrate the working of Op Amp parameters

UNIT - II

OP-AMP Circuits

Summing amplifier - Differential amplifier - Op-amp frequency response - Comparator-Integrator- Differentiator - Triangular Wave generators - Square Wave generators - Active filter (Basics) – Low pass filter - High pass filter - Band pass filter, IC 555 applications - Astable, Mono stable and Schmitt trigger

Learning Outcomes:

To illustrate the Op Amp applications

To analyze the filters and timer applications

UNIT – III

Combinational & Sequential Circuits

Design of code converter: BCD to 7 segments, Binary/ BCD to Gray, Gray to Binary / BCD, Design of counters using state machine: asynchronous and synchronous counters, Modulo-n counter, presettable binary up/down counter, Design of Universal shift register

Learning Outcomes:

To design and analyze the combinational circuits

To design the sequential counters

UNIT- IV

Data Converters

Key Features, Advantages and applications of Digital to Analog Converters: Weighted resistive network and R-2R ladder type. Key Features, Advantages and Applications Specific selection of Analog to Digital Converters: Staircase, Ramp Type, Single Slope and dual slope, Successive approximation and Flash type.

Learning Outcomes:

- To illustrate the functioning of data converters
- To understand different types of data converters

UNIT- V**Digital System Interfacing And Applications**

Digital system interfacing of LEDs and Multi digit Seven segment LED display Driver. Interface considerations for ADC / DAC with digital systems. Applications of counters: Digital clock, Auto-parking system, Applications of shift registers: Time delay generator, parallel to serial converter, serial to parallel converter, UART and serial Key board encoder.

Learning Outcomes:

- To understand the functional block diagram of Digital Systems
- To discuss the applications of Digital systems

Course Outcomes:

1. Learn the basics of Op Amps
2. Understands the applications of Op Amps
3. Analyze the combinational and sequential circuits
4. Learn about the types and operation of data converters
5. Understand the interfacing concepts of digital systems

Text Books:

G.K.Kharate - Digital electronics-Oxford university press
Floyd Thomas L Digital Fundamentals Pearson Education
Microelectronic circuits by Sedra&Smith-6th edition-Oxford
Electronic Devices and Circuits David A.Bell, Fifth edition, Oxford university press

Reference Books:

Allen Mottershead, Electronic Devices and Circuits-an Introduction - Prentice Hall.
Mithal G.K., Electronic Devices and Circuits, Khanna Publishers.
Donald L.Schilling, Charles Belove, Discrete and Integrated Electronic Circuits,
McGraw Hill.

B.Sc. Physical Science
SEMESTER –IV

SPH 226: Analog & Digital IC Applications Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

Preamble: This course was designed to perform analog and digital circuits
Objective: The student will be able to understand the designing of analog and digital circuits

List of Experiments

OP-AMP -Inverting and Non-inverting amplifiers.
OP-AMP - Sine Wave Generator (weinbridge oscillator)
Binary to Grey and Grey to binary code converter
Design of 4-bit priority encoder
OP-AMP - Square wave generator using PSPICE simulation
Schmitt Trigger using IC 555 timer using PSPICE simulation
Study of presettable binary up/down counter using PSPICE simulation.
Design and verification of 4-bit ripple counter. Using PSPICE simulation.
OP-AMP integrator and differentiator.
AstableMultivibrator –determination of frequency (using IC-555)

Course Outcomes:

After the completion of this course, the student will be able to design the circuits in operational amplifiers (L4 and L2)

B.Sc. Physical Science
SEMESTER –IV

SPH 206: Coordination Chemistry, States of Matter & Chemical Kinetics

Hours per week: 4

End Examination: 60 Marks

Credits: 4

Sessionals:40 Marks

Preamble: The students of undergraduate program in science need to be conversant with the various aspects of coordination chemistry, chemical kinetics and states of matter for training a undergraduate students as synthetic chemist.

Objective: To introduce the concept of coordination chemistry and the essentials of inorganic chemistry.

Students will also learn reactions kinetics, and chemical concepts of states of matter.

UNIT-I

Transition Elements (3d series)

General group trends with special reference to electronic configuration, variable valency, colour, magnetic and catalytic properties, ability to form complexes and stability of various oxidation states (Latimer diagrams) for Mn, Fe and Cu.

Lanthanoids and actinoids: Electronic configurations, oxidation states, colour, magnetic properties, lanthanide contraction, separation of lanthanides (ion exchange method only).

Learning Outcomes

The students will learn the properties of transition elements , Lanthanides and Actinides.

UNIT-II

Coordination Chemistry

Valence Bond Theory (VBT): Inner and outer orbital complexes of Cr, Fe, Co, Ni and Cu (coordination numbers 4 and 6). Structural and stereoisomerism in complexes with coordination numbers 4 and 6.

Drawbacks of VBT.IUPAC system of nomenclature.

Crystal Field Theory

Crystal field effect, octahedral symmetry. Crystal field stabilization energy (CFSE), Crystal field effects for weak and strong fields. Tetrahedral symmetry.

Learning Outcomes

The students will know about Inner and outer orbital complexes Structural and stereoisomerism in complexes and Crystal Field Theory.

UNIT-III

Section B: Physical Chemistry-3

Kinetic Theory of Gases

Postulates of Kinetic Theory of Gases and derivation of the kinetic gas equation.

Deviation of real gases from ideal behaviour, compressibility factor, causes of deviation. van der Waals equation of state for real gases. Boyle temperature (derivation not required). Critical phenomena, critical constants and their calculation from van der Waals equation.

Maxwell Boltzmann distribution laws of molecular velocities and molecular energies (graphic representation – derivation not required) and their importance.

Temperature dependence of these distributions. Most probable, average and root mean square velocities (no derivation). Collision cross section, collision number, collision frequency, collision diameter and mean free path of molecules. Viscosity of gases and effect of temperature and pressure on coefficient of viscosity (qualitative treatment only).

Learning Outcomes

The student will learn about ideal gases, deviation from ideal behavior. van der Waals equation of state for real gases. The student will learn to calculate critical constants from Vander Waals equation.

UNIT-IV

Liquids

Surface tension and its determination using stalagmometer. Viscosity of a liquid and determination of coefficient of viscosity using Ostwald viscometer. Effect of temperature on surface tension and coefficient of viscosity of a liquid (qualitative treatment only).

Solids

Forms of solids. Symmetry elements, unit cells, crystal systems, Bravais lattice types. Miller indices. X-Ray diffraction by crystals, Bragg's law. Structures of NaCl, KCl and CsCl (qualitative treatment only). Defects in crystals.

Learning Outcomes

The student will learn about Surface tension & viscosity and their determination. The students will also be familiar with effect of temperature on viscosity.

The student will learn the essentials of solid-state chemistry like symmetry elements, unit cells, crystal systems, Bragg's equation. The student will learn to determine Miller indices. The student will also be familiar with crystal defects.

UNIT-V

Chemical Kinetics

The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction. Derivation of integrated rate equations for zero, first and second order reactions (both for equal and unequal concentrations of reactants). Half-life of a reaction. General methods for determination of order of a reaction. Concept of activation energy and its calculation from Arrhenius equation.

Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions.

Learning Outcomes

The student will learn concept of reaction rates, factors affecting reaction rates. Order and molecularity of a reaction.

The student will also learn derivation of integrated rate equations for zero, first and second order reactions and theories of reaction rates.

Reference Books:

- Barrow, G.M. Physical Chemistry Tata McGraw-Hill (2007).
- Castellan, G.W. Physical Chemistry 4th Ed. Narosa (2004).
- Kotz, J.C., Treichel, P.M. & Townsend, J.R. General Chemistry Cengage Learning India Pvt. Ltd., New Delhi (2009).
- Mahan, B.H. University Chemistry 3rd Ed. Narosa (1998).
- Petrucci, R.H. General Chemistry 5th Ed. Macmillan Publishing Co.: New York (1985).
- Cotton, F.A. & Wilkinson, G. Basic Inorganic Chemistry, Wiley.
- Shriver, D.F. & Atkins, P.W. Inorganic Chemistry, Oxford University Press.
- Wulfsberg, G. Inorganic Chemistry, Viva Books Pvt. Ltd.
- Rodgers, G.E. Inorganic & Solid State Chemistry, Cengage Learning India Ltd., 2008.

B.Sc. Physical Science
SEMESTER –IV

SPH 224: Coordination Chemistry, States of Matter & Chemical Kinetics Lab

Hours per week: 4

Continuous Evaluation: 100 Marks

Credits: 2

Preamble: The students of undergraduate program in science in Chemistry need to be conversant with the various basic methodologies of chemistry. Therefore, one module each on inorganic, physical and organic chemistry is introduced which helps the student familiarize with the techniques essential for developing the foundation of practical chemistry. **Objective:** To make student learn the practical application of Coordination Chemistry, States of Matter & Chemical Kinetics for quantitative analysis

List of Experiments:

Section A: Inorganic Chemistry

Semi-micro qualitative analysis using H₂S of mixtures - not more than four ionic species (two anions and two cations and excluding insoluble salts) out of the following:

Cations : NH₄⁺, Pb²⁺, Ag⁺, Bi³⁺, Cu²⁺, Cd²⁺, Sn²⁺, Fe³⁺, Al³⁺, Co²⁺, Cr³⁺, Ni²⁺, Mn²⁺, Zn²⁺, Ba²⁺, Sr²⁺, Ca²⁺, K⁺
Anions : CO₃²⁻, S²⁻, SO₃²⁻, S₂O₃²⁻, NO₃⁻, CH₃COO⁻, Cl⁻, Br⁻, I⁻, NO₂⁻, SO₄²⁻, PO₄³⁻, BO₃³⁻, C₂O₄²⁻, F⁻

(Spot tests should be carried out wherever feasible)

Estimate the amount of nickel present in a given solution as bis(dimethylglyoximate) nickel(II) or aluminium as oximate in a given solution gravimetrically.

Draw calibration curve (absorbance at λ_{\max} vs. concentration) for various concentrations of a given coloured compound (KMnO₄/ CuSO₄) and estimate the concentration of the same in a given solution.

Determine the composition of the Fe³⁺-salicylic acid complex solution by Job's method.

Estimation of (i) Mg²⁺ or (ii) Zn²⁺ by complexometric titrations using EDTA.

Estimation of total hardness of a given sample of water by complexometric titration.

Learning Outcomes

The student will learn semi-micro analysis

The students will learn to apply the concepts of coordination chemistry Job's method by instrumental methods of analysis

The student will also learn the concept of complexometric titration

Section B: Physical Chemistry

(I) Surface tension measurement (use of organic solvents excluded).

Determination of the surface tension of a liquid or a dilute solution using a stalagmometer.

(II) Viscosity measurement (use of organic solvents excluded).

Determination of the relative and absolute viscosity of a liquid or dilute solution using an Ostwald's viscometer.

(III) Chemical Kinetics

Study the kinetics of the following reactions.

Integrated rate method:

Acid hydrolysis of methyl acetate with hydrochloric acid.

Compare the strengths of HCl and H₂SO₄ by studying kinetics of hydrolysis of methyl acetate

Learning Outcomes

The students will learn to apply the principles of chemical kinetics for ester hydrolysis.

Reference Books:

Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012.

Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.

Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011).

B.Sc. Physical Science
SEMESTER –IV
SPH 210: Operating Systems

Hours per week: 4

End Examination: 60 Marks

Credits: 4

Sessionals: 40 Marks

Preamble: operating systems is an essential part of any computer science education. This field is undergoing rapid change, as computers are now prevalent in virtually every arena of day-to-day life—from embedded devices in automobiles through the most sophisticated planning tools for governments and multinational firms.

Objectives:

To cover both traditional PC and server operating systems, as well as operating systems for mobile devices.

To enlighten the concepts of distributed operating system, system calls and system programs.

To explain process scheduling algorithms.

To introduce memory management techniques.

To give an over view of mass storage structure.

UNIT-I

Introduction

What Operating Systems do. Computer-System Architecture, Operating-System Structure, Operating-System Operations, Distributed Systems, Special-purpose Systems, Computing Environments.

System Structures: Operating-System Services, User Operating-System Interface, System Calls, Types of System Calls, System Programs. Operating-System Structure.

Learning Outcomes:

By the end of this Unit, the student will be able to

define what the operating system is.((L2)

what is the role of operating system in the computational environment. (L1)

what is the structure of operating system. (L1)

UNIT-II

Process Management

Process Concept, Process Scheduling, Operations on Processes.

Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling algorithms.

Learning Outcomes:

By the end of this Unit, the student will be able to

understand process scheduling. (L2)

explain process scheduling algorithms.(L2)

UNIT-III

Process Coordination

Synchronization: Background, The Critical-Section Problem.

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention.

Learning Outcomes:

By the end of this Unit, the student will be able to

- Summarize the methods to handle dead locks.(L3)
- Learn how to avoid dead lock condition. (L1)

UNIT-IV**Memory Management**

Memory-Strategies: Background, Swapping, Contiguous memory Allocation, Paging, Segmentation.

Virtual-Memory Management: Background, Demand Paging, Copy-on-write, page Replacement.

Learning Outcomes:

By the end of this Unit, the student will be able to

- explain contiguous memory.(L3)
- elaborate concept of paging.(L3)
- summarize virtual memory management, demand paging. (L3)

UNIT-V**File Management**

File Systems: File Concept, Access Methods, Directory and Disk Structure. Secondary-Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Scheduling.

Learning Outcomes:

By the end of this Unit, the student will be able to

- spell the concept of file system, access methods.(L1)
- make use of mass storage structure. (L3)

Course Outcomes:

Upon completion of the course, the student is able to

- understand the concepts of distributed operating system, system calls and system programs.(L3)
- explain process scheduling algorithms.(L3)
- relate memory management techniques.(L3)
- understand mass storage structure. (L2)

Text Book:

Operating System Concepts

Abraham Silberschatz, Peter B. Galvin, Greg Gagne, 8th Edition, 2011

Reference Books:

A.S. Tanenbaum, Modern Operating Systems, 3rd Ed., Prentice-Hall of India, 2008

Operating Systems: Internals And Design Principles William

Stallings, Prentice Hall Of India, 5th Edition, 2006.

Operating Systems: A Modern Approach Gary

Nutt, Addison Wesley, 3rd Edition, 2004.

Operating Systems: A Concept Based Approach

D.M.Dhamdhare, Tata Mcgraw-Hill, 2nd Edition, 2007.

**B.Sc. Physical Science
SEMESTER –IV**

SPH 228: Operating Systems Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

List of Experiments:

Usage of following commands: ls, pwd, tty, cat, who, who am I, rm, mkdir, rmdir, touch, cd.

Usage of following commands: cal, cat(append), cat(concatenate), mv, cp, man, date.

Usage of following commands: chmod, grep, tput (clear, highlight), bc.

Write a shell script to check if the number entered at the command line is prime or not.

Write a shell script to modify “cal” command to display calendars of the specified months.

Write a shell script to accept a login name. If not a valid login name display message – “Entered login name is invalid”.

Write a shell script to display date in the mm/dd/yy format.

Write a shell script to display on the screen sorted output of “who” command along with the total number of users .

Write a shell script to display the multiplication table of any number.

Write a shell script to find the sum of digits of a given number.

Write a shell script to find the factorial of a given number.

Write a shell script to check whether the number is Armstrong or not.

Text Books:

Unix Shell Programming

Stephan G Kochan, Patrick Wood, Sams, 3rd Edition, 2003.

Introduction to Unix and Shell Programming

M.G. Venkateshmurthy, Pearson, 1st Edition, 2005.

3. Unix Concepts and Applications, Sumitabha Das, 4th Edition, TMH, 2006.

B.Sc. Physical Science
SEMESTER –IV

SSE 272: Radiation Safety

Credits: 2

Continuous Evaluation: 100 Marks

Preamble: To explain the origin of radiation, its interaction and monitoring

Objective: To summarize radiation, its methods and safety measures.

UNIT-I

Basics of Atomic and Nuclear Physics

Basic concept of atomic structure; X rays characteristic and production; concept of bremsstrahlung and auger electron, The composition of nucleus and its properties, mass number, isotopes of element, spin, binding energy, stable and unstable isotopes, law of radioactive decay, Mean life and half life, basic concept of alpha, beta and gamma decay, concept of cross section and kinematics of nuclear reactions, types of nuclear reaction, Fusion, fission.

UNIT-II

Interaction of Radiation with matter

Types of Radiation: Alpha, Beta, Gamma and Neutron and their sources, sealed and unsealed sources, Interaction of Photons – Photoelectric effect, Compton Scattering, Pair Production, Linear and Mass Attenuation Coefficients, Interaction of Charged Particles: Heavy charged particles - Beth-Bloch Formula, Scaling laws, Mass Stopping Power, Range, Straggling, Channeling and Cherenkov radiation. Beta Particles- Collision and Radiation loss (Bremsstrahlung), Interaction of Neutrons- Collision, slowing down and Moderation.

UNIT-III

Radiation detection and monitoring devices

Radiation Quantities and Units: Basic idea of different units of activity, KERMA, exposure, absorbed dose, equivalent dose, effective dose, collective equivalent dose, Annual Limit of Intake (ALI) and derived Air Concentration (DAC). Radiation detection: Basic concept and working principle of gas detectors (Ionization Chambers, Proportional Counter, Multi-Wire Proportional Counters (MWPC) and Gieger Muller Counter), Scintillation Detectors (Inorganic and Organic Scintillators), Solid States Detectors and Neutron Detectors, Thermo luminescent Dosimetry.

UNIT-IV

Radiation safety management

Biological effects of ionizing radiation, Operational limits and basics of radiation hazards evaluation and control: radiation protection standards, International Commission on Radiological Protection (ICRP) principles, justification, optimization, limitation, introduction of safety and risk management of radiation. Nuclear waste and disposal management. Brief idea about Accelerator driven Sub-critical system (ADS) for waste management.

UNIT-V

Application of nuclear techniques

Application in medical science (e.g., MRI, PET, Projection Imaging Gamma Camera, radiation therapy), Archaeology, Art, Crime detection, Mining and oil. Industrial Uses: Tracing, Gauging, Material Modification, Sterization, Food preservation.

Course Outcomes:

1. identify the parts of the x-ray machine and explain their purpose and function.
2. Explain how x-rays are produced and how they travel.
3. Demonstrate use of the controls on a x-ray machine and explain how they influence the x-ray beam.
4. Compare the effects that x-radiation has on a variety of biological and non-biological materials.
5. Describe and follow the methods employed in veterinary hospitals and clinics to protect employees and veterinarians against radiation exposure.

**B.Sc. Physical Science
SEMESTER –IV**

SSE 274: Chemical Technology & Society

Credits :2

Continuous Evaluation:100 Marks

Chemical Technology

Basic principles of distillation, solvent extraction, solid-liquid leaching and liquid-liquid extraction, separation by absorption and adsorption. An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation columns, extruders, pumps, mills, emulgators. Scaling up operations in chemical industry. Introduction to clean technology.

Society

Exploration of societal and technological issues from a chemical perspective. Chemical and scientific literacy as a means to better understand topics like air and water (and the trace materials found in them that are referred to as pollutants); energy from natural sources (i.e. solar and renewable forms), from fossil fuels and from nuclear fission; materials like plastics and polymers and their natural analogues, proteins and nucleic acids, and molecular reactivity and interconversions from simple examples like combustion to complex instances like genetic engineering and the manufacture of drugs.

Reference Book:

John W. Hill, Terry W. McCreary & Doris K. Kolb, Chemistry for changing times 13th Ed

B.Sc. Physical Science
SEMESTER –IV

SSE 276: Vector Calculus

Credits: 2

Continuous Evaluation: 100 Marks

Limits of vector point functions

Scalar valued and vector valued point functions, limits, Directional derivatives along co-ordinate axis, along any line.

Vector differentiation

Vector Differentiation, Ordinary derivatives of vectors, Differentiability, Tangent vector of a curve, Unit tangent vector, Principle normal, curvature, Binormal, Torsion, Frenet -Serret formulae and applications

Vector identities

Gradient, Divergence, Cur, their geometrical interpretations and Successive operations

Line , surface and Volume integrals

Line Integral, Surface Integral, Volume Integral

Stokes theorem, Gauss divergence theorem and applications, Greens Theorem and applications.

Text Books:

A Text Book of Vector Calculus, Shanti Narayan, S.

Chand & Company Pvt. Ltd., New Delhi.

Vector Calculus, R. Gupta, Laxmi Publications.

Calculus and Analytic Geometry George B. Thomas, Jr. and Ross L. Finney,
Pearson Education, 2007, 9th edition.

Calculus Single Variable Howard Anton, Irl Bivens and Stephen Davis,
John Wiley and Sons, Inc., 2002.

Vector Calculus, Paul C. Matthews, Springer Verlag London Limited, 1998.

Course Learning Outcomes:

On successful completion of this course, students will be able to:

Define limit of vector function

demonstrate the vector differentiation with examples

define gradient of a scalar function, divergence and curl of a vector function

explain line, surface and volume integrals

evaluate applications on Stokes theorem, Gauss divergence theorem, and Greens theorem

**B.Sc. Physical Science
SEMESTER –IV**

SSE 278: Number Theory

Credits :2

Continuous Evaluation:100 Marks

Division algorithm, Lamé's theorem, linear Diophantine equation, fundamental theorem of arithmetic.

Prime counting function, statement of prime number theorem.

Goldbach conjecture, binary and decimal representation of integers, linear congruences, complete set of residues.

Number theoretic functions, sum and number of divisors, totally multiplicative functions, definition and properties of the Dirichlet product.

The Möbius inversion formula, the greatest integer function, Euler's phi-function.

Text Books:

- Elementary Number Theory, David M. Burton, Tata McGraw-Hill, 2007 6th edition.
- Applications of Abstract Algebra with MAPLE, Richard E. Klima, Neil Sigmon and Ernest Stitzinger, CRC Press, Boca Raton, 2000.
- Beginning Number Theory Neville Robbins, Jones and Bartlett publications, 2nd edition.

Course Learning Outcomes:

On successful completion of this course, students will be able to:

- Define division algorithm
- Demonstrate the fundamental theorem of arithmetic
- Explain prime number theorem
- Explain complete set of residues
- Evaluate problems using Möbius inversion formula
- Define Euler's phi-function

**B.Sc. Physical Science
SEMESTER – IV**

SSE 280 : E-Commerce

Credits :2

Continuous Evaluation:100 Marks

Introduction to E-Commerce- E-Commerce Business models and Concepts-Technology Infrastructure for E-commerce, The Internet and World Wide Web, E-Commerce Infrastructure, Building an E-Commerce website, Security and Payment .

Business Concepts and Social Issues-E-Commerce marketing Concepts, E-Commerce Marketing Communications, Ethical ,Social and Political Issues in E-commerce.

E-Commerce in Action – Online Retailing and Services, Online Content and Media, Social Networks, Auctions and Portals.

Text Books:

- Kenneth C.Laudon, Carol GuercioTravere, E-Commerce:Business, Technology, Society, 4th Edition, Pearson ,2008
P.T. Joseph, E-Commerce: An Indian Perspective, Prentice-Hall of India, 2007.
E.M. Awad, Electronic Commerce from Vision to Fulfillment, 3rd Ed., PrenticeHall of India, 2006
Scott Bonneau, Tammy Kohl, Jeni Tennison, Jon Duckett and Kevin Williams, XML Design Handbook, Wrox Press Ltd., 2003.
Michael Cheshar, Ricky Kaura, and Peter Linton, Electronic Business and Commerce, Springer, 2003.
W.J. Pardi, XML in Action: Learn to Quickly Create Dynamic, Data-driven Sites with the Web's Hottest New Technology, Prentice Hall of India, 1999.
P. Weill and M.R. Vitale, Place to Space: Migrating to eBusiness Models, Harvard Business School Press, 2001.
D. Whiteley, E-commerce: Strategy, Technologies and Applications, Tata McGraw-Hill Edition, 2001.
M. Fitzgerald, Building B2B Applications with XML: A Resource Guide, John Wiley and Sons, Inc., 2001.

B.Sc. Physical Science
SEMESTER – V
SPH 351: Elements of Modern Physics

Hours per week: 4

End Examination: 60 Marks

Credits: 4

Sessionals: 40 Marks

Preamble: This course imparts the knowledge on Modern Physics topics such as atomic models, atoms in fields, matter waves, Uncertainty principle and wave mechanics.

Objective: The students will understand the concepts of Modern Physics which will help as a bridge to understand the advanced physics courses such as atomic and molecular physics, quantum mechanics.

UNIT I

Atomic physics

Introduction –Drawbacks of Bohr’s atomic model-Sommerfeld’s elliptical orbits-relativistic correction (no derivation). Vector atom model and quantum numbers associated with it. L-S and j-j coupling schemes. Selection rules, intensity rules- Pauli’s Exclusion Principle, Larmor precession frequency. Fine structure of Sodium D lines. Stern and Gerlach experiment.

Learning Outcomes

To develop the atomic models (L3)

Pauli’s Exclusion Principle, Larmor precession are understood (L2)

UNIT II

Atoms in Electrical and Magnetic Fields

Zeeman Effect, Normal Zeeman Effect, Experimental arrangement, Explanation of Normal Zeeman Effect by Vector Atom Model. Anomalous Zeeman Effect. Paschen- Back Effect, Stark Effect Explanations (Elementary ideas only).

Vibrational Spectroscopy

Raman Effect-Stokes and Anti Stokes lines, Classical theory of Raman Effect, Quantum theory of Raman Effect, Experimental arrangement for Raman Effect, Applications of Raman Effect.

Learning Outcomes

Analyze influence of electric and magnetic effects on atomic models (L4)

Understanding Raman Effect (L2)

UNIT III

Matter waves and Uncertainty Principle

Matter waves, de Broglie’s hypothesis-wavelength of matter waves and their properties, Wave or Phase and group velocities- Davisson and Germer experiment-G.P.Thomson Experiment, de Broglie Standing waves of electron in Bohr orbits.

Heisenberg’s uncertainty principle for position and momentum (x and p), & energy and time (E and t). Gamma ray microscope. Diffraction by a single slit, position of electron in Bohr orbit, Complementary principle of Bohr.

Learning Outcomes

Interpret the concept of wave and particle nature (L2).

Experimental studies on de Broglie’s hypothesis and Heisenberg uncertainty principle. (L3)

UNIT IV

Wave mechanics

Basic postulates of quantum mechanics-Schrodinger time independent wave equation-derivation. Physical interpretation of wave function and its significance. Solution of Schrodinger Equations. Eigen functions, Eigen values. Application of Schrodinger wave equation to particle in one dimensional infinite box.

Learning Outcomes

Interpretation of quantum mechanics for probability (L2)

Explain equation of motion in quantum mechanics (L2)

UNIT V

Lasers and Fiber optics

Lasers: introduction, spontaneous emission, stimulated emission, Population Inversion, Types of lasers-He-Ne laser, Ruby laser, Applications of lasers.

Introduction- different types of fibers, rays and modes in an optical fiber, fiber material, advantages of fiber optic communication.

Learning Outcomes

Compare the process in LASERS (L2)

Outline optical fibers for Application in communication (L2 and L3)

Course Outcomes

- 1.To develop the atomic models and understand underlying principles in it
- 2.Analyze influence of electric and magnetic effects on atomic models and extend to scattering
- 3.Interpret the concept of wave and particle nature and related experimental studies
- 4.Interpretation of quantum mechanics for probability and its equation of motion
- 5.Compare the process in LASERS and outline optical fibres

Text Books:

B.Sc. Physics, Vol.4, Telugu Akademy, Hyderabad

Modern Physics by R. Murugesan and Kiruthiga Siva Prasath. S. Chand & Co.

Unified Physics Vol.4, S.L. Gupta and Sanjeev Gupta, Jai PrakasahNath& Co., Meerut.

Optics –Brijlal & Subrahmanyam, S Chand and Co

B.Sc. Physical Science
SEMESTER – V
SPH 355: Electronic Devices and Circuits

Hours per week: 4

End Examination: 60 Marks

Credits: 4

Sessionals: 40 Marks

Preamble: To explain various semiconductor devices with its schematic diagram and illustrate its characteristics

Objective: The student will understand role of various electronic devices and analyze it for present day technology.

UNIT- I

Junction Diodes

PN junction diode - P-N junction theory-depletion region, barrier potential, working in forward & reverse bias condition, Junction capacitance, Diode current equation (no derivation), Effect of temperature on reverse saturation current, V-I Characteristics, Zener and Avalanche Break down, Zener diode - V-I characteristics, regulated power supply using Zener diode, Varactor Diode, Tunnel Diode - Principle, Working & Applications

Learning Outcomes

To interpret the characteristics of junction diode and examine its limitations (L2 and L4)

UNIT- II

Bipolar Junction Transistors

PNP and NPN transistors, current components in BJT, BJT static characteristics (Input and Output), Early effect, CB, CE, CC Configurations (Cut-off, Active and saturation regions) Determination of h-parameters from the characteristics, Concept of amplification-voltage and current amplifier. The C.E amplifier-analysis and parameters, Transistor as a switch.

Learning Outcomes

To interpret the characteristics of junction transistor (L2)

Compare the three configurations with limitations (L4)

UNIT - III

Field Effect Transistors & UJT

FET - Construction - Working – Drain & Transfer characteristics -Parameters of FET - FET as an amplifier -MOSFET-Enhancement MOSFET-Depletion MOSFET-Construction & Working.

Learning Outcomes

To demonstrate the characteristics of FET and UJT (L2)

To categorize the configurations of FET (L4)

UNIT - IV

Photo Electric Devices

Photo diode, Photo transistor, solar cell, LED and LCD Structure and operation, characteristics, spectral response and applications

Learning Outcomes

To explain the characteristics of photo devices (L2)

To compare characteristics of photo devices. (L4)

UNIT - V

Power Supplies

Rectifiers - Half wave, full wave and bridge rectifiers - Efficiency - Ripple factor – Regulation. Types of filter- Choke input (Inductor) filter –Shunt capacitor filter -L-Section and π section filters - Three terminal fixed voltage I.C regulators (78XX and 79XX) - Principle and working of switch mode power supplies (SMPS).

Learning Outcomes

To outline various rectifiers and power supplies (L2)

To compare these rectifiers and explain power supplies (L4 and L2)

Course Outcomes

- 1.To interpret the characteristics of junction diode with its limitations
- 2.To interpret the characteristics of junction transistor and compare these configurations
- 3.To demonstrate and categorize the FET and UJT
- 4.To explain and compare the characteristics of photo devices
- 5.To outline rectifiers compare them and understand power supplies

Text Books:

Electronic Devices and Circuits David A.Bell, Fifth edition. Oxford university press

A.P Malvino, "Principles of Electronics", TMH, 7th edition

T.F. Bogart, Beasley, "Electronic Devices and circuits", Pearson Education, 6th Edition

N.N. Bhargava, D.C Kulshreshta, and S.C Gupta , "

Basic Electronics and Linear Circuits" TMH

T.L.Floyd, "Electronic Devices and circuits", PHI, fifth edition

V.K. Metha, "Principle of Electronics", S CHAND Co. New edition

Godse A.P., Bakshi U.A (1st edition), Electronics Devices, Technical Publications Pune.

Reference Books:

Sedha R.S., A TextBook of Applied Electronics, S. Chand & Company Ltd.

Jacob Millman and Christos C. Halkias (2008) Integrated Electronics, Tara Mcgraw-Hill

Robert L. Boylestad, Louis Nashelsky (10th edition). Electron Devices and Circuit

Theory, Dorling Kindersley (India Pvt. Ltd.)

Unified Electronics (Circuit analysis and electronic devices) by Agarwal-Arora.

B.Sc. Physical Science
SEMESTER – V
SPH 357: Materials Science

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Preamble: Aims in understanding the different phenomena of materials used in technology.

Objective: To impart knowledge in understanding crystals structures in terms of lattice parameters classification of magnetic materials, dielectric materials for synthesis and phase transitions in different types of materials.

Unit I

Crystal Structure

Solids: Amorphous and Crystalline Materials. Lattice Translation Vectors. Lattice with a Basis—Central and Non-Central Elements. Unit Cell.

Miller Indices. Reciprocal Lattice. Types of Lattices. Brillouin Zones. Diffraction of X-rays and neutrons by Crystals. Bragg's Law. Atomic and Geometrical factors, periodicity of wave functions.

Learning outcomes

To illustrate crystalline structures (L2)
Experimental studies of crystals (L3)

Unit 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.

Learning Outcomes

Explain various lattices and develop theories related to lattice (L2 and L3)

Unit III

Magnetic Properties of Matter and Superconductivity

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. **Basics of Superconductivity** Critical Temperature.

Critical magnetic field. Meissner effect. Type I and type II Superconductors and applications of superconductors.

Learning Outcomes

Classification of magnetic materials and explain related theories (L2 and L3)
Outline superconductors (L2)

Unit IV

Dielectric Properties of Materials

Polarization Local Electric Field at an Atom. Depolarization Field, Electric Susceptibility. Polarizability Clausius Mosotti Equation. Langevin Theory of Electric Polarizability. Complex Dielectric Constant. Optical Phenomena related to dielectrics.

Learning Outcomes

Develop dielectrics for polarizabilities (L3)

Unit V

Elementary band theory

Bloch theorem and Kronig Pennymodel. Band Gaps. Conductors, Semiconductors and insulators. P and N type Semiconductors. Conductivity of Semiconductors, mobility, HallEffect, Hallcoefficient.

Learning Outcomes

Construct model for band theory of solids (L3)

Classify various semiconductors (L2)

Course Outcomes

- 1.To illustrate crystalline structures and related experimental studies
- 2.Explain various lattices and develop theories related to lattice
- 3.Classification of magnetic materials and explain related theories
- 4.Outline superconductors
- 5.Develop dielectrics for polarizabilities
- 6.Construct model for band theory of solids
- 7.Classify various semiconductors

Text 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, PHI

Introduction to Solids, Leonid V.Azaroff, 2004, TataMc-Graw Hill
Solid State Physics, Neil W. Ashcroft and N. David Mermin, 1976, Cengage Learning
Elementary *Solid State Physics*: Principles and Applications Addison-Wesley Series 1993

B.Sc. Physical Science
SEMESTER – V
SPH 321: Modern Physics Lab

Hours per week: 4

Continuous Evaluation: 100 Marks

Credits: 2

Preamble: To perform experimental studies related to photons/particle and optical fibers

Objective: Enable to develop and explain properties related to solids

List of Experiments:

e/m of an electron by Thomson method.
Determination of Planck's Constant (photocell)
Franck and Hertz Experiment
Laws of Photoelectric effect –
Numerical aperture of optical fiber
Characteristics of optical fibers
Bending losses in Optical Fiber
Diffraction due to single slit.
Diffraction due to circular aperture.
Wavelength of He-Ne laser-Diffraction grating.

Course Outcomes:

1. Know main aspects of dual nature of matter.
- 2: Understanding the properties of nuclei like density, size, binding energy, nuclear forces and structure of atomic nucleus.
- 3: Understand fission and fusion well as nuclear processes to produce nuclear energy in nuclear reactor and stellar energy in stars.
- 4: Understand the spontaneous and stimulated emission of radiation, optical pumping and population inversion.
- 5: Student will gain hands-on experience of using various phenomena like photoelectric effect, planck's constant, pair production etc

B.Sc. Physical Science
SEMESTER – V
SPH 325: Electronic Devices & Circuits Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

Preamble: To verify characteristics of various semiconducting devices

Objective: To examine semiconductor device characteristics and their limitations

List of Experiments:

- V-I Characteristics of Junction Diode.
- V-I Characteristics of Zener Diode.
- Regulated Power Supply using Zener Diode.
- IC Regulated Power Supply
- BJT input and output Characteristics (CE Configuration)
- Characteristics of UJT.
- Characteristics of JFET
- LDR characteristics
- Characteristics of L and π section filters using full wave rectifier.

Course Outcomes

- 1.To explain various electronic devices with its characteristics and measure its threshold voltages
- 2.Working of P and N type semiconductors, P-N junctions, Forward and Reverse biased junctions, LEDs, photodiode and solar cells.
- 3.Use the principles of filters in communication.
- 4.Understand the working of digital and analog instruments like CRO.
- 5.Student will gain hands-on experience of using various digital and analog instruments.

B.Sc. Physical Science
SEMESTER – V
SPH 347: Materials Science Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

Preamble: To perform experimental studies related to different materials

Objective: Enable to develop and explain properties related to materials

List of Experiments:

Susceptibility of paramagnetic solution (Quinck's Tube Method)

Magnetic susceptibility of Solids by four probe method.

Coupling Coefficient of a Piezoelectric crystal.

Dielectric Constant of a dielectric Materials with frequency using LCR

Hysteresis loop of a Ferroelectric Crystal.

B-H curve

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.

Hall coefficient of a semiconductor.

Course outcomes:

1. A brief idea about crystalline and amorphous substances.
- 2: Knowledge of lattice vibrations, phonons of solids.
- 3: Knowledge of different types of magnetism from diamagnetism to ferromagnetism and hysteresis loops and energy loss.
- 4: Understand the basic idea about superconductors and their classifications.
- 5: To carry out experiments based on the theory that they have learned to measure the magnetic susceptibility, dielectric constant, trace hysteresis loop.

B.Sc. Physical Science
SEMESTER – V
SPH 361: Matrices

Hours per week: 4

Credits: 4

End Examination: 60 Marks

Sessionals: 40 Marks

Preamble : Matrix mathematics applies to several branches of science, as well as different mathematical disciplines. This course aims to provide basic concepts of vector spaces, matrix form of basic geometric transformations. The focus of the course is to study the fundamental properties of matrices and applications of matrices in geometry, physics, chemistry, combinatorics and statistics.

Objective:

To introduce vector spaces and subspaces

To discuss the fundamental properties of matrices , eigen values and eigen vectors

To study the rank of a matrix and its applications

To know the applications of matrices in geometry, physics, chemistry, combinatorics and statistics

UNIT I

\mathbb{R} , \mathbb{R}^2 , \mathbb{R}^3 as vector spaces over \mathbb{R} . Standard basis for each of them. Concept of Linear Independence and examples of different bases. Subspaces of \mathbb{R}^2 , \mathbb{R}^3 .

Learning Outcomes:

The student will be able to:

Define vector spaces over a field and subspaces

Learn the concept of linear independence of vectors and linear dependence of vectors

Define different bases of vector spaces

UNIT II

Translation, Dilation, Rotation, Reflection in a point, line and plane. Matrix form of basic geometric transformations. Interpretation of eigen values and eigen vectors for such transformations and eigen spaces as invariant subspaces.

Learning Outcomes:

The student will be able to:

Define translation, dilation, rotation, reflection

Evaluate eigen values and eigen vectors of a matrix

Explain eigen spaces as invariant subspaces

UNIT III

Types of matrices. Rank of a matrix. Invariance of rank under elementary transformations. Reduction to normal form, Solutions of linear homogeneous and non-homogeneous equations with number of equations and unknowns upto four.

Learning Outcomes:

The student will be able to:

Explain different types of matrices

Evaluate rank of matrix using various methods

Explain solutions of linear and non-homogeneous equations

UNIT IV

Matrices in diagonal form.Reduction to diagonal form upto matrices of order 3. Computation of matrix inverses using elementary row operations. Rank of matrix.

Learning Outcomes:

The student will be able to:

- Explain reduction of matrices to diagonal form
- Evaluate inverse of a matrix using elementary row operations
- Explain rank of a matrix using different methods

UNIT V

Solutions of a system of linear equations using matrices.Illustrative examples of above concepts from Geometry, Physics, Chemistry, Combinatorics and Statistics.

Learning Outcomes:

The student will be able to:

- Explain solutions of a system of linear equations using matrices
- Evaluate system of linear equations
- Explain the applications of matrices in Geometry, Physics, Chemistry, combinatorics and statistics

Text Books:

Introduction to Algebra, A.I. Kostrikin, Springer Verlag, 1984.

Linear Algebra, Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence,
Prentice Hall of India Pvt. Ltd., New Delhi, 2004.

Schaum's Outline of Matrix Operations: Theory and Problems of Matrix Operations
Richard Bronson, Tata McGraw Hill, 1989.

**B.Sc. Physical Science
SEMESTER – V**

SPH 333: Matrices Tutorial

Hours per week: 2
Credits: 2

Continuous Evaluation: 100Marks

Problems on vector spaces

Problems on linear independence and dependence of vectors

Problems on eigen values and eigen vectors

Find rank of a matrix

Reduction to normal form

Solutions of linear and nonlinear homogeneous equations

Reduction to diagonal form

Computation of matrix inversion using elementary row operations

Course Learning Outcomes:

On successful completion of this course, students will be able to:

Define vector space

Differentiate linear independent and linear dependent of vectors

Evaluate eigen values and eigen vectors of a matrix

Find rank of a matrix using different methods

Solve linear and nonlinear homogenous equations

B.Sc. Physical Science
SEMESTER – V

SPH 365: Linear Algebra

Hours per week: 4

Credits: 4

End Examination: 60 Marks

Sessionals: 40 Marks

Preamble : Linear algebra applies to several branches of science, as well as different mathematical disciplines. This course aims to provide basic concepts of matrices, rank of a matrix and consistency of matrices. The focus of the course is to study the fundamental properties of matrices, applications of matrices, vector spaces and inner product spaces.

To define rank of a matrix and its applications

To evaluate eigen values and eigen vectors of a matrix

To study vector spaces, subspaces, basis of a vector spaces and dimension of a vector space

To know the linear transformations of a vector space, product of linear transformations

To define inner product space

UNIT I

Matrices I

Rank of a matrix, Elementary transformations, normal form, Echelon form, Rank of product of matrices, System of homogeneous equations, Linear equations, Null space and nullity of matrices

Learning Outcomes:

The student will be able to:

Define rank of a matrix

Evaluate rank of a matrix using normal form and echelon form

Define rank of product of matrices

Explain the method to solve system of homogeneous equations

UNIT II

Matrices II

Condition for consistency, Crammer's rule, Characteristic values and characteristic vectors, Cayley- Hamilton theorem, Inverse of a matrix using Cayley- Hamilton theorem, Minimal polynomial of a matrix.

Learning Outcomes:

The student will be able to:

Explain consistency of matrices

Evaluate Crammer's rule

Explain characteristic values and characteristic vectors of a matrix

Evaluate minimal polynomial of a matrix

UNIT III

Linear Algebra -I

Vector spaces, General properties of vector spaces, Vector subspaces, Algebra of subspaces, linear combination of vectors. Linear span, linear sum of two subspaces, Linear independence and dependence of vectors, Basis of vector space, Finite dimensional vector spaces, Dimension of a vector space, Dimension of a subspace.

Learning Outcomes:

The student will be able to:

- Define vector spaces and vector subspaces with examples
- Explain linear combination of vectors
- Explain basis of vector space
- Explain dimension of a vector space

UNIT IV

Linear Algebra - II

Linear transformations, linear operators, Range and null space of linear transformation, Rank and nullity of linear transformations, Linear transformations as vectors, Product of linear transformations, Invertible linear transformation.

Learning Outcomes:

The student will be able to:

- Explain the concepts of linear transformations and linear operators
- Evaluate range and null space of linear transformation
- Explain rank and nullity of linear transformations

UNIT V

Inner product spaces

Inner product spaces, Euclidean and unitary spaces, Norm or length of a vector, Schwartz inequality, Orthogonality, Orthonormal set, complete orthonormal set, Gram - Schmidt orthogonalisation process.

Learning Outcomes:

The student will be able to:

- Define inner product spaces, Euclidean and unitary spaces
- Explain orthogonality, orthonormality of sets
- Explain Gram-Schmidt orthogonalisation process

Text Books:

- A Text Book of B.Sc. Mathematics Volume-III, V.Venkateswara Rao , N Krishna Murthy, B.V.S.S. Sarma and S. Anjaneya Sastry, S.Chand & Co.
- Linear Algebra, A.R. Vasishtha and J.N. Sharma, Krishna Prakashan Media (P) Ltd.
- Linear Algebra Kenneth Hoffman and Ray Alden Kunze, Pearson Education (low priced edition), New Delhi.
- Linear Algebra, Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, Prentice Hall of India Pvt. Ltd., 4th edition New Delhi, 2007.
- Rings and Linear Algebra, Pundir, Pundir, PragathiPrakashan

B.Sc. Physical Science
SEMESTER – V
SPH 337: Linear Algebra Tutorial

Hours per week: 2
Credits: 2

Continuous Evaluation: 100Marks

Find rank of a matrix

Reduction to normal form and Echelon form

Problems on eigen values and eigen vectors

Problems on Cayley-Hamilton theorem

Find inverse of a matrix using Cayley-Hamilton theorem

Problems on Vector spaces

Problems on subspaces

Problems on Linear independence and dependence of vectors

Problems on Basis of vector space

Problems on dimension of a vector space

Problems on linear transformations

Problems on inner product spaces

Course Learning Outcomes:

On successful completion of this course, students will be able to:

Define vector space

Differentiate linear independent and linear dependent of vectors

Evaluate eigen values and eigen vectors of a matrix

Find rank of a matrix using different methods

Solve problems on subspaces and dimension of a vector space

Define inner product space

SEMESTER –V
SSE 375: Theory of Equations

Credits :2

Continuous Evaluation:100 Marks

General properties of polynomials, Graphical representation of a polynomials, maximum and minimum values of a polynomials

Quadratic Equations, General properties of equations, Descarte's rule of signs positive and negative rule,

Relation between the roots and the coefficients of equations. Symmetric functions, Applications symmetric function of the roots.

Transformation of equations.Solutions of reciprocal and binomial equations.

Algebraic solutions of the cubic and biquadratic.Properties of the derived functions.

Text Books:

W.S. Burnside and A.W. Panton, The Theory of Equations, Dublin University Press, 1954.

C. C. MacDuffee, Theory of Equations, John Wiley & Sons Inc., 1954.

Course Learning Outcomes:

On successful completion of this course, students will be able to:

Explain properties of polynomials and graphical representation

Explain quadratic equations

Differentiate between roots and the coefficients of equations

Explain transformation of equations

Solve cubic and biquadratic equations.

SEMESTER –V
B.Sc. Physical Science

SSE 377: Probability and Statistics

Credits :2

Continuous Evaluation:100 Marks

Meaning and Scope of the Statistics Introduction, Frequency distribution, Graphic representation of a frequency distribution, measures of central tendency , measures of dispersion, coefficients of dispersion, moments, skewness, kurtosis

Introduction, meaning of correlation, Karl Pearson s coefficient of correlation, rank correlation.Linear regression, Curve fitting, fitting of straight line, fitting of second degree parabola.

Probability : Introduction, definition, axiomatic approach to probability, probability-mathematical notation, probability function, law of addition of probabilities, multiplication law of probability and conditional law of probability, independent events, Baye s theorem.

Random variables and distribution functions: One and two dimensional random variables (discrete and continuous).

Probability distribution: Discrete distributions Binomial, Poisson distributions and their properties and applications.

Text Books:

Fundamentals of Mathematical Statistics S.C. Gupta and V.K. Kapoor,
Sultan Chand & Sons

Statistical Methods Combined Edition (Volumes I & II) N G Das, McGraw Hill, 2008,1st edition.

Statistical Methods: Concepts, Application and Computation, Y.P. Aggarwal, Sterling Publishers, 1998.

Introduction to Mathematical Statistics, Robert V. Hogg, Joseph W. Mckean, Allen Thornton Craig, Pearson Education, Asia, 2007.

Mathematical Statistics with Applications, Irwin Miller and Marylees Miller, Pearson Education, Asia, 2006,7th edition.

Introduction to Probability Models, Sheldon M. Ross, Academic Press, IndianReprint, 2007, 9th edition.

Course Learning Outcomes:

On successful completion of this course, students will be able to:

Explain measures of central tendency

Explain measures of dispersion

Differentiate between correlation coefficient and regression

Define probability

Differentiate discrete probability distribution and continuous probability distribution

SEMESTER –V
B.Sc. Physical Science

SPH 371: Microprocessors (Intel 8085)

Hours per week: 4

End Examination: 60 Marks

Credits: 4

Sessionals: 40 Marks

Preamble: This course was introduced to understand the basics of Microprocessors (Intel 8085)

Objective: To understand the architecture and then programme it.

UNIT- I

Architecture of 8085 Microprocessor

Functional block diagram of Intel 8085-Register structure-multiplexing & De-multiplexing of address / data bus - Control Signal Generation and status signals - 8085 pin-out diagram & functions - Interrupts - Priority Concept

Instruction Set of 8085 -Instruction set classification - addressing modes

Learning Outcomes:

To understand the Functional block diagram of Intel 8085

To know the 8085 pin-out diagram

UNIT - II

Memory

Instruction cycle - machine cycle - T-state -Timing diagrams for Opcode Fetch Cycle Memory Read, Memory Write, I/O Read, I/O Write, - Functional explanation for RAM, ROM, EPROM, EEPROM

Learning Outcomes:

Must know different types of memory

Must draw the timing diagrams

UNIT – III

Programming 8085

Addition & subtraction(16-bit), multiplication, division, largest, smallest, block data transfer (all 8-bit data), Binary to BCD, BCD to Binary, Binary to ASCII, ASCII to Binary, BCD to ASCII, ASCII to BCD (all 8-bit data) - Stack & Subroutines Concept - time delay using single and double register & calculations – Debugging program

Learning Outcomes:

1. Able to write arithmetic and logical programmes

To apply Stack & Subroutines Concepts in writing the programmes

UNIT- IV

INTERFACING MEMORY

2K X 8, 4K X 8 ROM, RAM to 8085, interfacing an I/O portion Memory Mapped I/O and I/O Mapped I/O - Difference between I/O mapped and Memory Mapped I/O.

Learning Outcomes:

Able to understand, how to interface the memory

Lists the Differences between I/O mapped and Memory Mapped I/O

UNIT- V

Microprocessor Applications

Programmable peripheral devices (8255, 8253)- Pin functions, Different Modes & Block Diagram - Keyboard and Display Interface 8279 (Architecture) - Simple temperature controller- Simple traffic light controller-stepper motor control interface.

Learning Outcomes:

- To understand the Programmable peripheral devices
- To apply the written programs to control external interfacing devices

Course Outcomes:

1. Learn the architecture of 8085, its pin diagram
2. Learn about the microprocessors and the organization of microprocessor based systems
3. Acquire knowledge of microprocessor and their role in I/O port programming and their interface with peripherals
4. Learn about analog to digital and digital to analog convertors
5. Learn basics of programming and other microprocessors

Text Books

- Ramesh S. Gaonakar, Microprocessor Architecture, Programming and Application with the 8085-Penram International Publishing, Mumbai.
- Ram, Fundamentals of microprocessors and microcomputers - Dhanpat Rai Publications, New Delhi
- Microprocessors & Microcontrollers by N. Senthilkumar, M. Saravanan & S. Jeevananthan, 1st edition, Oxford press (Helpful for interfacing applications)
4. Microprocessors & Microcontrollers by B.P. Singh, Galgotia publications Pvt. Ltd.

References

- Mathur A.P., Introduction to Microprocessors. (3rd edn., Tata McGraw, New Delhi,
- Leventhal L.A., Microprocessor Organisation and Architecture, Prentice Hall India.
- Microprocessor lab premier by K.A. Krishnamurthy

SEMESTER –V
SPH 375: Consumer Electronics

Hours per week: 4

End Examination: 60 Marks

Credits: 4

Sessionals: 40 Marks

Preamble: This course was designed to understand the need of electronics in consumer electronics.

Objective: Application area of electronics: consumer electronics.

Unit-I

Microwave Ovens - Microwaves (Range used in Microwave Ovens) - microwave oven block diagram -LCD timer with alarm - Single-Chip Controllers - Types of Microwave oven - Wiring and Safety instructions -Care and Cleaning.

Learning Outcomes

To describe the operation of microwave ovens

To know the safety instructions of ovens

Unit-II

Washing Machines - Electronic controller for washing machines - Washing machine hardware and software- Types of washing machines - Fuzzy logic washing machines Features of washing machines.

Learning Outcomes

To understand the operation of washing machines

To know the types of washing machines

Unit-III

Air Conditioners and Refrigerators - Air Conditioning - Components of air conditioning systems - All water air conditioning systems - All air conditioning systems - Unitary and central air conditioning systems -Split airconditioners

Learning Outcomes

To know the mechanism of air conditioner

To discuss the types of air conditioners

Unit-IV

Home/Office Digital Devices - Facsimile machine - Xerographic copier - Calculators- Structure of a calculator - Internal Organization of a calculator - Servicing electronic calculators - Digital clocks - Block diagram of a digitalclock.

Learning Outcomes

To know the operation of different digital devices

To understand the block diagram of digitalclocks

Unit-V

Digital Access Devices - Digital computer -Internet access - Online ticket reservation - Functions and networks - Barcode Scanner and decoder - Electronic Fund Transfer - Automated Teller Machines (ATMs) - Set-Top boxes - Digital cable TV - Video on demand.

Learning Outcomes

To know the types of digital access devices

To understand the operation of ATMs

Course Outcomes

- 1.To describe the operation of microwave ovens
- 2.To know the types and workingof washing machines Understand the mechanism of air conditioners
- 3.Able to know the block diagram of digital clocks
- 4.To understand the operation of ATMs

Text Books:

- S.P. Bali, Consumer Electronics - Pearson Education, New Delhi,2005.
R. G. Gupta Audio and Video systems Tata McGraw Hill(2004)

SEMESTER –V
SPH 327: Microprocessors Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

Preamble: This course was designed to perform arithmetic, logical and interfacing programs
Objective: The student will be able to understand then applies the written programs.

List of Experiments

- Addition & Subtraction (8 &16-bits)
- Multiplication & Division (8 -bit)
- Largest & Smallest number in the given array.
- Ascending & Descending order.
- Binary to ASCII & ASCII to Binary, BCD to ASCII & ASCII toBCD.
- Block Transfer ofData.
- Waveform generation using DAC interface.
- Stepper motor interface.

Course Outcomes:

After the completion of this course, the student will be able to write the programs to control basic devices **(L2 and L3)**

SEMESTER – V
SPH 331: Consumer Electronics Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

Preamble: This course was designed for setup of electronics systems.

Objective: The student will be able to assemble and disassemble of electronic systems.

List of Experiments

Study of PA systems for various situations - Public gathering, closed theatre/Auditorium, Conference room, Prepare Bill of Material (Costing)

Installation of Audio /Video systems - site preparation, electrical requirements, cables and connectors

Market Survey of Products (at least one from each module)

Identification of block and tracing the system. Assembly and Disassembly of system using Toolkit

Assembly and Disassembly of system& printer

NOTE: One activity as directed in practical course is equivalent to 4 experiments

Course Outcomes:

After the completion of this course, the student will be able to assemble and disassemble of electronic systems (**L2 and L3**)

B.Sc. Physical Science
SEMESTER – V
SPH 381: Analytical Methods in Chemistry

Hours per week: 4

End Examination: 60 Marks

Credits: 4

Sessionals: 40 Marks

Preamble: The students of undergraduate program in science need to be conversant with the various instrumental and analytical techniques in analytical chemistry for training a undergraduate students as analytical chemist.

Objective: The concept of qualitative and quantitative methods in analytical chemistry will be introduced to undergraduate students.

Students will also learn the fundamental concepts of various instrumental methods for quantitative analysis, separation methods and solvent extraction.

UNIT -I

Qualitative and quantitative aspects of analysis

Evaluation of analytical data, errors, accuracy and precision, methods of their expression, statistical test of data; F, Q and t test, rejection of data, and confidence intervals.

Optical methods of analysis

Origin of spectra, interaction of radiation with matter, fundamental laws of spectroscopy and selection rules, validity of Beer-Lambert's law.

Learning Outcomes

The students will learn evaluation of analytical data and fundamental laws of spectroscopy.

UNIT -II

UV-Visible Spectrometry: Basic principles of instrumentation (choice of source, monochromator and detector) for single and double beam instrument;

Infrared Spectrometry: Basic principles of instrumentation (choice of source, monochromator & detector) for single and double beam instrument.

Learning Outcomes

The students will learn the concept and applications of UV Visible & Infra red spectrometry for quantitative analysis.

UNIT-III

Flame Atomic Absorption and Emission Spectrometry: Basic principles of instrumentation (choice of source, monochromator, detector, choice of flame and Burner designs. Techniques of atomization and sample introduction; sources of chemical interferences.

Techniques for the quantitative estimation of trace level of metal ions from water samples.

Learning Outcomes

The student will learn the concept of atomic spectrometry for quantitative analysis

UNIT-IV

Thermal methods of analysis

Theory of thermogravimetry (TG), basic principle of instrumentation.

Electroanalytical methods

Classification of electroanalytical methods, basic principle of pH metric, potentiometric and conductometric titrations.

Learning Outcomes

To familiarize with basic thermo and electro-analytical methods for chemical analysis.

UNIT-V

Separation techniques

Solvent extraction: Classification, principle and efficiency of the technique. Mechanism of extraction: extraction by solvation and chelation. Technique of extraction: batch, continuous and counter current extractions.

Chromatography: Classification, principle and efficiency of the technique. Mechanism of separation: adsorption, partition & ion exchange. Development of chromatograms: frontal, elution and displacement methods.

Learning Outcomes

The student will learn concept of separation methods in chemical analysis.

Reference Books:

- Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson, 2009.
- Willard, H.H. et al.: Instrumental Methods of Analysis, 7th Ed. Wardsworth Publishing Company, Belmont, California, USA, 1988.
- Christian, G.D. Analytical Chemistry, 6th Ed. John Wiley & Sons, New York, 2004.
- Harris, D.C.: Exploring Chemical Analysis, 9th Ed. New York, W.H. Freeman, 2016.
- Khopkar, S.M. Basic Concepts of Analytical Chemistry. New Age International Publisher, 2009.
- Skoog, D.A. Holler F.J. & Nieman, T.A.
Principles of Instrumental Analysis, Cengage Learning India Ed.
- Mikes, O. Laboratory Hand Book of Chromatographic & Allied Methods, Elsevier Harwood Series on Analytical Chemistry, John Wiley & Sons, 1979.
- Ditts, R.V. Analytical Chemistry; Methods of separation, van Nostrand, 1974

B.Sc. Physical Science
SEMESTER – V
SPH 339: Analytical Methods in Chemistry Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

Preamble: The students of undergraduate program in science in Chemistry need to be conversant with the various basic methodologies of chemistry. Therefore, one module each on inorganic, physical and organic chemistry is introduced which helps the student familiarize with the techniques essential for developing the foundation of practical chemistry. **Objective:** To make student learn the practical application of analytical techniques and Instrumental methods for quantitative analysis.

List of Experiments:

I. Separation Techniques

1. Chromatography:

(a) Separation of mixtures

2. Paper chromatographic separation of Fe^{3+} , Al^{3+} , and Cr^{3+} .

ÄÄÄÄ Separation and identification of the monosaccharides present in the given mixture (glucose & fructose) by paper chromatography. Reporting the R_f values.

ÄÄÄÄ Separate a mixture of Sudan yellow and Sudan Red by TLC technique and identify them on the basis of their R_f values.

ÄÄÄÄÄÄÄÄ Chromatographic separation of the active ingredients of plants, flowers and juices by
TLC

Solvent Extractions:

To separate a mixture of Ni^{2+} & Fe^{2+} by complexation with DMG and extracting the Ni^{2+} -DMG complex in chloroform, and determine its concentration by spectrophotometry.

Solvent extraction of zirconium with amberliti LA-1, separation from a mixture of irons and gallium.

Determine the pH of the given aerated drinks fruit juices, shampoos and soaps.

Determination of Na, Ca, Li in cola drinks and fruit juices using flame photometric techniques.

Analysis of soil:

Determination of pH of soil.

Total soluble salt

Estimation of calcium, magnesium, phosphate, nitrate

Ion exchange:

Determination of exchange capacity of cation exchange resins and anion exchange resins.
Separation of metal ions from their binary mixture.
Separation of amino acids from organic acids by ion exchange chromatography.

III Spectrophotometry

Determination of pKa values of indicator using spectrophotometry.
Structural characterization of compounds by infrared spectroscopy.
Determination of dissolved oxygen in water.
Determination of chemical oxygen demand (COD).
Determination of Biological oxygen demand (BOD).
Determine the composition of the Ferric-salicylate/ ferric-thiocyanate complex by Job's method.

Reference Books:

Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6thEd., Pearson, 2009.
Willard, H.H. et al.: Instrumental Methods of Analysis, 7th Ed. Wardsworth Publishing Company, Belmont, California, USA, 1988.
Christian, G.D. Analytical Chemistry, 6th Ed. John Wiley & Sons, New York, 2004.
Harris, D.C. Exploring Chemical Analysis, 9th Ed. New York, W.H. Freeman, 2016.
Khopkar, S.M. Basic Concepts of Analytical Chemistry.
New Age International Publisher, 2009.
Skoog, D.A. Holler F.J. and Nieman, T.A. Principles of Instrumental Analysis
Cengage Learning India Edition.

B.Sc. Physical Science
SEMESTER – V
SPH 383: Green Chemistry

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Preamble: The students of undergraduate program in science need to be conversant with the various green techniques in synthetic and analytical chemistry. This course will lay the foundation for the student to be able to appreciate eco-friendly methods in chemistry and develop as a responsible chemist for the benefit of the society and environment.

Objective: The concept of green chemistry encompassing green chemistry strategies, concepts and practices will be introduced to the undergraduate students.

Students will also learn the fundamental concepts of various green synthetic methods and techniques for quantitative analysis.

The student will also learn Green separation and extraction for sample preparation

UNIT I

Introduction to Green Chemistry

Green chemistry - Introduction - need for green chemistry - goals of green chemistry - Anastas' twelve principles of green chemistry - Designing a green synthesis (tools) - choice of starting materials, solvents, catalysts, reagents, processes with suitable examples.

Learning Outcomes

The students will learn the goals and principles of green chemistry

UNIT II

Ionic liquids

Synthesis, physical properties of ionic liquids - applications in alkylation, epoxidation, Friedel-Crafts reaction - Diels-Alder reactions – Knoevenagel condensations and Wittig reactions.

Phase Transfer Catalyst (PTC) - Definition - advantages, types of PTC reactions - synthesis of PTC, applications of PTC in organic synthesis - Michael reaction - alkylation of aldehydes and ketones. Wittig, generation of dihalocarbene, elimination reaction

Learning Outcomes

The students will learn the properties of ionic liquids and synthesis of molecules using the green solvents- ionic liquids.

UNIT III

Supercritical CO₂

phase diagram - uses in extracting natural products, dry cleaning, bromination, Kolbe-Schmidt synthesis - Friedel-Crafts reaction. Dimethyl carbonate as a methylating agent in green synthesis

Learning Outcomes

The student will learn the concept of atomic spectrometry for quantitative analysis.

UNIT IV

Microwave and Ultrasound Assisted Reactions

Microwave activation - advantages of microwave exposure - Microwave assisted reactions, condensation reactions - oxidation, reduction reactions, multicomponent reactions. **Sonochemistry** - use of ultrasound in organic synthesis (alternate source of energy) - saponification - substitution, addition, oxidation reactions, reductions.

Learning Outcomes

The student will familiarize with basic thermo and electro-analytical methods for chemical analysis.

UNIT V

Green Analytical Techniques

Micelle mediated extraction- Cloud point extraction and adsorptive micellar flocculation methods. Solid Phase Micro Extraction (SPME)

Learning Outcomes

The student will learn concept of separation methods in chemical analysis.

Text books:

- Paul T. Anastas and John C. Warner, "Green Chemistry", Oxford University Press, Indian Edition, 2008.
- V. K. Ahluwalia and M. Kidwai, "New Trends in Chemistry", Anamaya Publishers, 2nd Edition, 2007.
- V. Kumar, "An Introduction to Green Chemistry", Vishal Publishers, 1st Edition, 2007.
- V. K. Ahluwalia and R. S. Varma, "Green Solvents", Narosa Publishing, 1st Edition, 2009.
- V.K.Ahluwalia and Renu Aggarwal, "Organic Synthetic Special Techniques", Narosa, 2nd Edition, 2009.
- V. K. Ahluwalia, "Green Chemistry - Environmentally Benign Reactions", Ane books, India, 2006.
- Matlack, A.S. Introduction to Green Chemistry, Marcel Dekker (2001).

SEMESTER – V
SPH 341: Green Chemistry Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

Preamble: The students of undergraduate program in science in Chemistry need to be conversant with the various basic methodologies of green chemistry. Therefore, green chemistry is introduced which helps the student familiarize with the techniques essential for green chemistry.

Objective: To make student learn the practical application of green analytical and synthetic techniques for waste utilization a

List of Experiments:

1. Safer starting materials

Preparation and characterization of nanoparticles of gold using tea leaves.

2. Using renewable resources

Preparation of biodiesel from vegetable waste cooking oil.

3. Avoiding waste

Principle of atom economy.

Use of molecular model kit to stimulate the reaction to investigate how the atom economy can illustrate Green Chemistry.

Preparation of propene by two methods can be studied

Triethylamine ion + OH⁻ → propene + trimethylpropene + water H₂SO₄/

1-propanol $\xrightarrow{\square}$ propene + water

Other types of reactions, like addition, elimination, substitution and rearrangement should also be studied for the calculation of atom economy.

4. Use of enzymes as catalysts

Benzoin condensation using Thiamine Hydrochloride as a catalyst instead of cyanide.

5. Alternative Green solvents

Extraction of D-limonene from orange peel using liquid CO₂ prepared from dry ice. Mechanochemical solvent free synthesis of azomethines

Alternative sources of energy

Solvent free, microwave assisted one pot synthesis of phthalocyanine complex of copper (II).

Photoreduction of benzophenone to benzopinacol in the presence of sunlight.

Learning Outcomes:

The students will learn synthesis of nano material, biodiesel and simple organic molecules

Reference Books:

- Anastas, P.T & Warner, J.C. Green Chemistry: Theory and Practice, Oxford University Press (1998).
- Kirchoff, M. & Ryan, M.A. Greener approaches to undergraduate chemistry experiment. American Chemical Society, Washington DC (2002).
- Ryan, M.A. Introduction to Green Chemistry, Tinnesand; (Ed), American Chemical Society, Washington DC (2002).
- Sharma, R.K.; Sidhwani, I.T. & Chaudhari, M.K. I.K. Green Chemistry Experiment: A monograph International Publishing House Pvt Ltd. New Delhi. Bangalore CISBN978-93-81141-55-7 (2013).
- Cann, M.C. & Connelly, M. E. Real world cases in Green Chemistry, American Chemical Society (2008).

B.Sc. Physical Science

SEMESTER –V

SPH 391: Data Mining

Hours per week: 4

End Examination: 60 Marks

Credits: 4

Sessionals: 40 Marks

Preamble: Data mining techniques addresses the major latest techniques of discovering knowledge from a data warehouse. They contain algorithms for discovering association rules, decision trees, clustering neural networks, genetic algorithms.

Course Objectives:

To make the student to understand the major tasks performed in data mining.

To infer the statistical perspective of data mining.

To identify the clustering algorithms.

UNIT I

Introduction

Basic Data Mining Tasks, Classification, Regression, Time Series Analysis, Prediction, Clustering, Summarization, Association Rules, Data Mining Versus Knowledge Discovery in Databases.

Learning Outcomes:

By the end of this Unit, the student will be able to

Outline the data mining tasks. (L2)

Make use of prediction, Clustering, Summarization. (L3)

UNIT II

The Development of Data Mining

Data Mining Issues, Social Implication of Data Mining, Data Mining from a Database, Perspective Data Mining Techniques, Statistical Perspectives of Data Mining, Similarity Measures, Decision Trees.

Learning Outcomes:

By the end of this Unit, the student will be able to

Outline Perspective data mining techniques. (L2)

Apply similarity measure in clustering. (L3)

Develop Decision tree. (L3)

UNIT III

Classification

Issues in Classification, Statistical Based Algorithms, Distance Based Algorithms, Decision Tree Based Algorithms.

Learning Outcomes:

By the end of this Unit, the student will be able to

Illustrate Statistical Based Algorithms. (L3)

Make use of distance based algorithms. (L3)

Examine Decision tree based algorithms. (L4)

B.Sc. Physical Science
SEMESTER –V

Clustering

Introduction, Similarity and Distance Measures, Outliers, Hierarchical Algorithms, Partitional Algorithms, Minimum Spanning Tree, Squared Error Clustering Algorithm, K-Means Clustering, Nearest Neighboring Algorithm.

Learning Outcomes:

By the end of this Unit, the student will be able to

- Choose Hierarchical Algorithms.(L1)
- Summarize Partitional Algorithms. (L2)
- Organize clusters using K-Means Algorithm. (L3)

UNIT V

Association Rule:Introduction, Large Item Sets, Basic Algorithms, Apriori Algorithm, Sampling Algorithm, Partitioning, Parallel & distributed algorithms, Data parallelism, Task parallelism.

Learning Outcomes:

By the end of this Unit, the student will be able to

- Explain Apriori Algorithm. (L2)
- Identify Parallel and Distributed algorithms. (L3)

Course Outcomes:

Upon completion of the course, the student is able to

- relate the steps in knowledge discovery process. (L2)
- identify perspective data mining techniques. (L4)
- examine the data mining techniques. (L3)

Text Books:

- Data Mining- Introductory and Advanced topics, Margaret H.Dunham, Pearson Education, sixth impression, 2009.
- Data mining Techniques, Arun K. Pujari, University Press, 2001.
- Introduction to Data mining with Case Studies, G.K.Gupta, PHI India, 2006.

B.Sc. Physical Science
SEMESTER –V
SPH 393: Cryptography

Hours per week: 4

End Examination: 60 Marks

Credits: 4

Sessionals: 40 Marks

Preamble: Cryptography is the cornerstone of computer and communications security. Its foundation is based on various concepts of mathematics such as number theory, computational-complexity theory. The course explains how programmers and network professionals can use cryptography to maintain the privacy of computer data.

To brief the security goals, security services and mechanisms.

To outline different Ciphers.

To explain different data encryption techniques.

To brief public Key encryption algorithms.

To outline message authentication and Hash functions.

UNIT I

Introduction

Security Goals- Confidentiality, Integrity, Availability, Attacks- Attacks Threatening Confidentiality, Attacks Threatening Integrity, Attacks Threatening Availability, Passive Versus Active Attacks, Services And Mechanism - Security Services, Security Mechanisms, Relation Between Services And Mechanisms, Techniques- Cryptography, Steganography .

Learning Outcomes:

By the end of this Unit, the student will be able to

Spell security Goals.(L1)

Differentiate between Passive attacks and Active attacks.(L1)

Identify the relationship between Services and Mechanisms. (L2)

UNIT II

Traditional Symmetric Key Ciphers

Introduction- Kerckhoff's Principle, Cryptanalysis, Categories Of Traditional Ciphers, Substitution Ciphers- Mono Alphabetic Ciphers, Poly Alphabetic Ciphers, Transposition Ciphers- Keyless Transposition Ciphers, Keyed Transposition Ciphers, Combining Two Approaches.

Learning Outcomes:

By the end of this Unit, the student will be able to

Discover Traditional Ciphers. (L3)

Able to perform Cryptanalysis. (L3)

UNIT III

Data Encryption Techniques

Algorithms For Block And Stream Ciphers, Symmetric Key Encryption, Data Encryption Standard (DES), Advanced Encryption Standard.

Learning Outcomes:

By the end of this Unit, the student will be able to

Understand Block and Stream Ciphers. (L3)

Summarize Data Encryption Standards. (L2)

B.Sc. Physical Science
SEMESTER –V

Algorithms for Public Key Encryption

RSA, DH Key Exchange, Digital Signatures.

Learning Outcomes:

By the end of this Unit, the student will be able to

Explain RSA Encryption Algorithm. (L3)

Infer Digital Signature. (L3)

UNIT V

Message Authentication and Hash Functions

SHA, WHIRLPOOL .

Learning Outcomes:

By the end of this Unit, the student will be able to

Analyze message Authentication. (L3)

Appraise SHA, WHIRLPOOL. (L5)

Text Books:

Cryptography and Network Security, Behrouz A. Forouzan, TMH, Special Indian Edition, 2007 (Unit I and Unit II)

Cryptography and Network Security Principles and Practices, William Stallings, PHI, 4th Edition, 2006.(Unit III, Unit IV and Unit V)

Reference Books:

Cryptography and Network Security, William Stallings, Pearson Education, 4th Edition, 2006

Cryptography and Network Security, Atul Kahate, Tata McGraw-Hill, New Delhi, 2003

Course Outcomes:

By the end of the course the student is able to

Know the importance of security goals, security services and mechanisms.

Distinguish between plain text and Cipher text.

- Know RSA public Key encryption algorithm.

Explain message authentication and Hash functions

B.Sc. Physical Science
SEMESTER –V
SPH343: Data Mining Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

List of Experiments:

Introduction to the Weka machine learning toolkit
Performing data preprocessing for data mining in Weka
Classification using the Weka toolkit
Performing clustering in Weka
Association rule analysis in Weka
Data mining Case Study

B.Sc. Physical Science
SEMESTER – V
SPH 345: Cryptography Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

List of Experiments:

Study of various cryptographic techniques.
Problems on Substitution techniques.
Problems on Transposition techniques.
Introduction to Unix, Vi Editor.
Usage of the following commands in unix: ls, pwd, tty, cat, who, who am I, rm, mkdir, rmdir, cd.
Usage of following commands in unix : cal, cat(append), cat(concatenate), mv, cp, man, date.
Implement Substitution technique
Implement Transposition technique.
Study of Open SSL.
Implement Symmetric key Algorithm – DES using open SSL.
Implement Asymmetric key Algorithm – RSA using open SSL.
Implement Hash Algorithm – SHA using open SSL.

Text Books:

- 1.Cryptography and Network Security by Behrouz A. Forouzan, TMH, Special Indian Ed. 2007.
- 2.Unix Concepts and Applications ,Sumitabha Das, 4th Edition, TMH,2006.

Reference Books:

Introduction to Unix and Shell Programming M.G. Venkateshmurthy, Pearson, 1st Edition, 2005.

B.Sc. Physical Science
SEMESTER – V
SSE 371: Applied Optics

Credits: 2

Continuous Evaluation: 100 Marks

Preamble: To outline modern optics.

Objective: To interpret laser radiation and its role in modern optics.

Theory includes only qualitative explanation. Minimum five experiments should be performed covering minimum three sections.

(i) Sources and Detectors

Lasers, Spontaneous and stimulated emissions, Theory of laser action, Einstein's coefficients, Light amplification, Characterization of laser beam, He-Ne laser, Semiconductor lasers.

Experiments on Lasers:

- a. Determination of the grating radial spacing of the Compact Disc (CD) by reflection using He-Ne or solid state laser.
- b. To find the width of the wire or width of the slit using diffraction pattern obtained by a He-Ne or solid state laser.
- c. To find the polarization angle of laser light using polarizer and analyzer
- d. Thermal expansion of quartz using laser

Experiments on Semiconductor Sources and Detectors:

- V-I characteristics of LED
- Study the characteristics of solid state laser
- Study the characteristics of LDR
- Photovoltaic Cell
- Characteristics of IR sensor

(ii) Fourier Optics

Concept of Spatial frequency filtering, Fourier transforming property of a thin lens

Experiments on Fourier Optics:

a. Fourier optic and image processing

- Optical image addition/subtraction
- Optical image differentiation
- Fourier optical filtering
- Construction of an optical 4f system

b. Fourier Transform Spectroscopy

Fourier Transform Spectroscopy (FTS) is a powerful method for measuring emission and absorption spectra, with wide application in atmospheric remote sensing, NMR spectrometry and forensic science.

Experiment:

To study the interference pattern from a Michelson interferometer as a function of mirror separation in the interferometer. The resulting interferogram is the Fourier transform of the power spectrum of the source. Analysis of experimental interferograms allows one to determine the transmission characteristics of several interference filters. Computer simulation can also be done.

(iii) Holography

Basic principle and theory: coherence, resolution, Types of holograms, white light reflection hologram, application of holography in microscopy, interferometry, and character recognition

Experiments on Holography and interferometry:

- Recording and reconstructing holograms
- Constructing a Michelson interferometer or a Fabry Perot interferometer
- Measuring the refractive index of air
- Constructing a Sagnac interferometer
- Constructing a Mach-Zehnder interferometer
- White light Hologram

(iv) Photonics: Fibre Optics

Optical fibres and their properties, Principal of light propagation through a fibre, The numerical aperture, Attenuation in optical fibre and attenuation limit, Single mode and multimode fibres, Fibre optic sensors: Fibre Bragg Grating

Experiments on Photonics: Fibre Optics

- a. To measure the numerical aperture of an optical fibre
- b. To study the variation of the bending loss in a multimode fibre
- c. To determine the mode field diameter (MFD) of fundamental mode in a single-mode fibre by measurements of its far field Gaussian pattern
- d. To measure the near field intensity profile of a fibre and study its refractive index profile
- e. To determine the power loss at a splice between two multimode fibre

Reference Books:

- Fundamental of optics, F. A. Jenkins & H. E. White, 1981, Tata McGraw hill.
- LASERS: Fundamentals & applications, K.Thyagrajan & A.K.Ghatak, 2010, Tata McGraw Hill
- Fibre optics through experiments, M.R.Shenoy, S.K.Khijwania, et.al. 2009, Viva Books
- Nonlinear Optics, Robert W. Boyd, (Chapter-I), 2008, Elsevier.
- Optics, Karl Dieter Moller
- Learning by computing with model examples, 2007, Springer.
- Optical Systems and Processes, Joseph Shamir, 2009, PHI Learning Pvt. Ltd.
- Optoelectronic Devices and Systems, S.C. Gupta, 2005, PHI Learning Pvt. Ltd.
- Optical Physics, A.Lipson, S.G.Lipson, H.Lipson, 4th Edn., 1996, Cambridge Univ. Press

Course Outcomes:

1. Familiar with optical phenomena and technology.
2. Qualitative understanding of basic lasing mechanism, types of Lasers, characteristics of Laser Light, types of Lasers, and its applications in developing LED, Holography.
3. The idea of propagation of electromagnetic wave in a nonlinear media – Fibre optics as an example will enable the student to practice thinking in a logical process, which is essential in science.
4. Experiments in this course will allow the students to discuss in peer groups to develop their cooperative skills and reinforce their understanding of concepts.
5. Use the concepts of applied optics in daily life.

B.Sc. Physical Science
SEMESTER – V
SSE 373: Pharmaceutical Chemistry

Credits :2

Continuous Evaluation:100 Marks

Preamble: The students of undergraduate program in Chemistry need to be conversant with the various basic methodologies of pharmaceutical chemistry. Pharmaceutical Chemistry is a multifaceted field that deals with the principles and applications of natural, synthetic, computational and analytical chemistry in the discovery of chemical moieties for the prevention and cure of life threatening diseases.

Objective: To make student learn the basic principles of pharmaceutical chemistry with respect to Drug discovery, design and development

The idea of basic retrosynthetic approach for the synthesis of representative drugs of the different classes.

Drugs & Pharmaceuticals

Drug discovery, design and development; Basic Retrosynthetic approach. Synthesis of the representative drugs of the following classes: analgesics agents, antipyretic agents, anti-inflammatory agents (Aspirin, paracetamol, Ibuprofen); antibiotics (Chloramphenicol); antibacterial and antifungal agents (Sulphonamides; Sulphanethoxazol, Sulphacetamide, Trimethoprim); antiviral agents (Acyclovir), Central Nervous System agents (Phenobarbital, Diazepam), Cardiovascular (Glyceryl trinitrate), antilaprosy (Dapsone), HIV-AIDS related drugs (AZT- Zidovudine).

Fermentation

Aerobic and anaerobic fermentation. Production of (i) Ethyl alcohol and citric acid, (ii) Antibiotics; Penicillin, Cephalosporin, Chloromycetin and Streptomycin, (iii) Lysine, Glutamic acid, Vitamin B2, Vitamin B12 and Vitamin C.

Learning Outcome:

The students will learn synthetic route via retrosynthesis and fermentation methods to representative drugs and vitamins.

B.Sc. Physical Science
SEMESTER – V
SSE 373: Pharmaceutical Chemistry
SSE 375: Theory of Equations

Credits :2

Continuous Evaluation:100 Marks

Credits :2

Continuous Evaluation:100 Marks

General properties of polynomials, Graphical representation of a polynomials, maximum and minimum values of a polynomials

Quadratic Equations, General properties of equations, Descarte's rule of signs positive and negative rule,

Relation between the roots and the coefficients of equations. Symmetric functions, Applications symmetric function of the roots.

Transformation of equations.Solutions of reciprocal and binomial equations.

Algebraic solutions of the cubic and biquadratic.Properties of the derived functions.

Text Books:

W.S. Burnside and A.W. Panton, The Theory of Equations,Dublin University Press, 1954.
C. C. MacDuffee, Theory of Equations, John Wiley & Sons Inc., 1954.

Course Learning Outcomes:

On successful completion of this course, students will be able to:

- Explain properties of polynomials and graphical representation
- Explain quadratic equations
- Differentiate between roots and the coefficients of equations
- Explain transformation of equations
- Solve cubic and biquadratic equations.

B.Sc. Physical Science
SEMESTER – V
SSE 377: Probability and Statistics

Credits :2

Continuous Evaluation:100 Marks

Meaning and Scope of the Statistics Introduction, Frequency distribution, Graphic representation of a frequency distribution, measures of central tendency , measures of dispersion, coefficients of dispersion, moments, skewness, kurtosis

Introduction, meaning of correlation, Karl Pearson s coefficient of correlation, rank correlation.Linear regression, Curve fitting, fitting of straight line, fitting of second degree parabola.

Probability : Introduction, definition, axiomatic approach to probability, probability-mathematical notation, probability function, law of addition of probabilities, multiplication law of probability and conditional law of probability, independent events, Baye s theorem.

Random variables and distribution functions: One and two dimensional random variables (discrete and continuous).

Probability distribution: Discrete distributions Binomial, Poisson distributions and their properties and applications.

Text Books:

Fundamentals of Mathematical Statistics S.C. Gupta and V.K. Kapoor,
Sultan Chand & Sons

Statistical Methods Combined Edition (Volumes I & II) N G Das, McGraw Hill, 2008,1st edition.

Statistical Methods: Concepts, Application and Computation, Y.P. Aggarwal, Sterling Publishers, 1998.

Introduction to Mathematical Statistics, Robert V. Hogg, Joseph W. McKean, Allen Thornton Craig, Pearson Education, Asia, 2007.

Mathematical Statistics with Applications, Irwin Miller and Marylees Miller, Pearson Education, Asia, 2006,7th edition.

Introduction to Probability Models, Sheldon M. Ross, Academic Press, Indian Reprint, 2007, 9th edition.

Course Learning Outcomes:

On successful completion of this course, students will be able to:

Explain measures of central tendency

Explain measures of dispersion

Differentiate between correlation coefficient and regression

Define probability

Differentiate discrete probability distribution and continuous probability distribution

B.Sc. Physical Science
SEMESTER – V
SSE 377: Probability and Statistics
SSE 379: Combinatorial Optimization

Credits :2

Continuous Evaluation:100 Marks

Credits :2

Continuous Evaluation:100 Marks

Introduction

Optimization problems, neighbourhoods, local and global optima, convex sets and functions, simplex method, degeneracy; duality and dual simplex algorithm, computational considerations for the simplex and dual simplex algorithms-Dantzig-Wolfe algorithms.

Integer Linear Programming

Cutting plane algorithms, branch and bound technique and approximation algorithms for travelling salesman problem.

Text Books:

Combinatorial Optimization: Algorithms and Complexity by C.H. Papadimitriou and K. Steiglitz, Prentice-Hall of India, 2006

Optimization by K. Lange, Springer, 2004.

Linear Programming and Network Flows by Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali, John Wiley and Sons, 2004.

Operations Research: An Introduction by H.A. Taha, 8th Ed., Prentice Hall, 2006.

Course Learning Outcomes:

On successful completion of this course, students will be able to:

Explain formulation of mathematical problem for given business problem

Explain simplex method to solve linear programming problem

Differentiate between simplex and dual simplex algorithms

Explain integer linear programming

B.Sc. Physical Science
SEMESTER – VI
SPH 352: Digital and Analog Electronics

Hours per week: 4

End Examination: 60 Marks

Credits: 4

Sessionals: 40 Marks

Preamble: To explain various analog and digital devices with its schematic diagram

Objective: The student will understand role of analog and digital devices and analyze it for present day technology.

UNIT I

Basic Electronics

Intrinsic and Extrinsic semiconductors. Fermi level, continuity equation. PN junction diode, Zener diode characteristics, Zener breakdown and Avalanche breakdown. PNP and NPN transistors, Current components in transistors, CB, CE and CC configurations- transistor hybrid parameters, Determination of hybrid parameters from transistor (CE) characteristics. (No derivation) Current gains α and β - Relations between α and β .

Learning Outcomes

To interpret the characteristics of junction diode (L2)

Compare the three configurations with limitations (L4)

UNIT II

Rectifiers and Amplifiers

Half-wave Rectifier, Full-wave Rectifiers-Calculation of Ripple Factor and Rectification Efficiency, Basic idea about capacitor filter, L- type and π – type filters. Zener Diode as Voltage Regulator. Concept of feedback, feedback amplifiers-types of amplifiers-voltage series, current series, voltage shunt and current shunt.

Learning Outcomes

To outline various rectifiers and power supplies (L2)

To compare these rectifiers and explain power supplies (L4 and L2)

UNIT III

Operational Amplifiers

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.

Learning Outcomes

To demonstrate the characteristics of OPAMP (L2)

To categorize the configurations with applications of OPAMP (L4)

UNIT IV

Digital principles

Differences between analog and digital circuits-Binary number system, conversion of Binary to Decimal system and vice versa. Binary addition and subtraction (1's and 2's complement methods).

Learning Outcomes

To explain the different number systems (L2)

To distinguish number systems for application. (L4)

UNIT V

Logic Gates

Logic gates: OR,AND,NOT gates, truth tables, realization of these gates using discrete components. NAND, NOR as universal gates, exclusive-OR gate, De Morgan's Laws-statement and proof, Half adder and Full adder, Parallel adder circuits.

Learning Outcomes

To explain the different logic gates (L2)

To evaluate these gates for application.(L4)

Course Outcomes

- 1.To interpret the characteristics of junction diode and compare these configurations
- 2.To outline rectifiers compare them and understand power supplies
- 3.To demonstrate and categorize the OPAMP for application
- 4.To explain and distinguish number systems for its application
- 5.To explain and evaluate logic gates for its application

Text Books:

BSc Physics, Vol.3, Telugu Akademy, Hyderabad

Unified Electronics, Vol.3, Electronic Circuits and Digital Electronics, Agarwal and Agarwal, A.S. Prakasahan, Meerut.

Principles of Electronics, V.K. Mehta, S.Chand& Co.,

Digital Principles and Applications, A.P.Malvino and D.P.Leach, Mc GrawHill Edition.

Reference Books:

Electronic Devices and Circuits, Millman and Halkias, Mc GrawHill

Electricity, Magnetism with Electronics, K.K.Tewari, R.Chand& Co.,

Digital and analog systems circuits and Devices: An Introduction, Belov Schilling, Mc Graw Hill International Edition.

B.Sc. Physical Science
SEMESTER – VI
SPH 356: Electronic Communications

Hours per week: 4

End Examination: 60 Marks

Credits: 4

Sessionals: 40 Marks

Preamble: To explain role of signal parameters in communication.

Objective: The student will understand various techniques for propagation of information

UNIT I

Basics of Communication Systems and Noise

Block diagram of communication system. Types of Electronic Communication systems: Simplex, Duplex. Analog /Digital Signals. Basis in Noise - Thermal, Shot noise Bit rate, Baud rate, Bandwidth and signal to Noise Ratio. Frequency spectrum in communications

Learning Outcomes:

To introduce the nomenclature of signals and explain communication system (L2)

UNIT II

Amplitude Modulation

Need for modulation. Amplitude modulation, Modulation index, frequency spectrum, generation of AM (balanced modulator,), Amplitude Demodulation (diode detector), other forms of AM: Double side band suppressed carrier, DSBSC generation (Balanced modulator), Single side band suppressed carrier, SSBSC generation (Filter method, phase cancellation method, third method), SSB detection, Introduction to other forms of AM (Pilot carrier modulation, Vestigial side band modulation).

Learning Outcomes:

To illustrate generation and detection of AM systems (L2)

UNIT III

Angle Modulation

Frequency and phase modulation, modulation index and frequency spectrum, equivalence between FM and PM, Generation of FM (Direct and indirect methods), FM detector (Slope detector, balanced slope detector, PLL). Comparison between AM, FM and PM.

Learning Outcomes:

To outline generation and detection of Angle modulation systems (L2)

UNIT IV

Transmitters & Receivers

Transmitters: Communication channels for AM and FM broadcast, AM transmitter: Lowlevel and high level modulation, FM transmitter.

Receivers: Receiver parameters, sensitivity, selectivity and fidelity, Super Heterodyne receiver, AM receivers, FM receivers. Frequency division multiplexing.

Learning Outcomes:

To explain various modulation levels of transmitters and receivers (L2)

UNIT V

Electromagnetic Interference and

Sampling theorem, Pulse Amplitude Modulation (PAM), Time Division Multiplexing (TDM), Pulse Width Modulation (PWM) and Pulse Position Modulation (PPM), Pulse Code Modulation, Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation.

Learning Outcomes:

To explain digital communication systems (L2)

Course Outcomes

- 1.To introduce the nomenclature of signals and explain communication system
- 2.To illustrate generation and detection of AM systems
- 3.To outline generation and detection of Angle modulation systems
- 4.To explain various modulation levels of transmitters and receivers
- 5.To explain digital communication systems

Text Books:

- 1.H. Taub and D. Schilling, Principles of Communication Systems, TMH (1999)
- 2.W.Tomasi, Electronic Communication Systems, Pearson Education (2004)
- 3.L.E.Frenzel, Communication Electronics, Principle and Applications, TMH (2002)
- 4.L. W. Couch II, Digital and Analog Communication Systems, Pearson Education (2005)

Reference Books:

- S.Haykin, Communication Systems, Wiley India (2006)
- G. Kennedy and B. Davis, Electronic communication systems, TMH(1999)
- R. P. Singh and S. D. Sapre, Communication Systems: Analog and Digital, TMH
- L. E. Frenzel, Communication electronics: Principles and applications. TMH
- T.G. Thomas and S. Chandra Sekhar, Communication theory, TMH (2006)

B.Sc. Physical Science
SEMESTER – VI
SPH 358: Solid State and Nuclear Physics

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Preamble: To Study the general properties of solids and nucleus

Objective: Understanding and examine the solids with properties of crystals, electron theory and different magnetic materials. Interpret the general properties of nuclei and its radioactive properties.

UNIT I

Crystal Structure

Amorphous and Crystalline Materials, Unit Cell, Miller Indices, Reciprocal Lattice, Types of Lattices, Diffraction of X-rays by Crystals, Bragg's Law, Experimental techniques, Laue's method and powder diffraction method.

Learning Outcomes

To illustrate crystalline structures (L2)
Experimental studies of crystals (L3)

UNIT II

Introduction to Free electron and band theory

Free electron theory and its demerits, Bloch theorem and Kronig Penny model, Energy Bands in solids, Energy gaps, Conductors, Semiconductors and insulators, P and N type Semiconductors, P-N Junction diode, Half wave and Full wave rectifiers (qualitative).

Learning Outcomes

Construct model for band theory of solids (L3)
Classify various semiconductors (L2)

UNIT III

Magnetic Materials & Superconductivity

Dia, Para, Ferromagnetic Materials, Classical Langevin Theory of Paramagnetism, Curie-Weiss's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains- Basic concepts of superconductivity Experimental Results, Critical Temperature, Critical magnetic field- Meissner effect. Type I and type II Superconductors- applications of super conductors

Learning Outcomes

Classification of magnetic materials and explain related theories (L2 and L3)
Outline superconductors (L2)

Unit IV

General Properties of Nuclei

Basic ideas of nucleus -size, mass, charge density (matter energy), binding energy, angular momentum, parity, magnetic moment, electric moments, semi-empirical mass formula. Liquid drop model-Shell model- Collective model (qualitative), Magic numbers.

Learning Outcomes

To outline various properties of nuclei(L2)
To classify various Models of Nucleus(L4)

UNIT V

Radioactivity decay

Alpha decay: basics of α -decay processes, Gamow's theory of α -decay, Geiger Nuttal law, β -decay, Energy kinematics for β -decay, positron emission, electron capture, neutrino hypothesis. Detectors of nuclear Radiation -Ionization chamber, Proportional counter, GM Counter, scintillation counter.

Learning Outcomes

To outline various properties of and theories of radioactive radiation (L2)

Experimental studies of detectors of radiation (L3)

Course Outcomes

- 1.To illustrate crystalline structures and experimental studies of crystals
- 2.Construct model for band theory of solids, Classify various semiconductors
- 3.Classification of magnetic materials and explain related theories
- 4.Outline superconductors
- 5.To outline properties of nuclei and related models

Text Books:

Elements of Solid State Physics, J.P.Srivastava, Prentice Hall of India Pvt., Ltd.

Modern Physics, R.Murugesan and Kiruthiga Siva Prasath, S.Chand & Co.

3.Unified Physics, Vol.4., S.L.Gupta & Sanjeev Gupta, Jai Prakash Nath & Co. Meerut.

4.Nuclear Physics, D.C.Tayal, Himalaya Publishing House.

Reference Books:

Concepts of Modern Physics, Arthur Beiser Tata McGraw Hill Edition.

Nuclear Physics, Irving kaplan, Narosa publishing House.

Introduction to Solid State Physics, C.Kittel, John Wiley & Sons.

Solid State Physics, A.J.Dekker, McMillan India.

Physics of Magnetism Sushin Chikazumi, Stanley H. Charap, Krieger Pub Co (June 1978)

B.Sc. Physical Science
SEMESTER – VI

SPH 320: Solid State and Nuclear Physics Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

- Preamble:** To perform experimental studies related to solids state and radioactive sources.
- Objective:** To develop and explain properties related to solids state and radioactive sources.

List of Experiments

Ultrasonic Interferometer
Rigidity modulus-Internal friction
B-H Curve- Determination of Curie temperature
Thermo EMF
Dielectric Constant
Plateau Characteristics
Intensity variation of radiation
Absorption Coefficient of material
Statistical Aspects of Radiation
Beta back scattering factor
Gamma ray Spectrometer Energy resolution characteristics

Course Outcomes:

1. Learn the ground state properties of a nucleus.
- 2: Learn about the process of radioactivity, the radioactive decay law, the emission of alpha, beta and gamma rays.
- 3: Learn the basic aspects of measurements
- 4: Learn about the detectors of nuclear radiations.
- 5: Gain knowledge on the how to measure properties of radiation

B.Sc. Physical Science
SEMESTER – VI

SPH 322: Digital and Analog Electronics Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

Preamble: To measure and compare analog and digital devices from its characteristics

Objective: The student will understand role of analog and digital devices and analyze it for application

List of Experiments

Energy gap of semiconductor using a junction diode.
PN Junction Diode Characteristics
Zener Diode Characteristics
Zener Diode as Voltage Regulator
Transistor CE Characteristics- Determination of Hybrid Parameters
Logic Gates- OR,AND,NOT and NAND gates. Verification of Truth Tables.
Verification of De Morgan's Theorems
RC Circuit –Frequency response.
LR circuit-frequency response.
Full Wave Rectifier- C- type, L- type and π - type filters
Field Effect Transistor (FET) Characteristics

Course Outcomes

1. Difference between analog and digital circuits.
2. Working of P and N type semiconductors, P-N junctions, Forward and Reverse biased junctions, LEDs, photodiode and solar cells.
3. Use the principles of digital electronics to explain the Physics of daily life.
4. Understand the working of digital and analog instruments like CRO.
5. Student will gain hands-on experience of using various digital and analog
6. To understand analog and digital devices and analyze it for application

B.Sc. Physical Science
SEMESTER – VI

SPH 326: Electronic Communications Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

Preamble: To illustrate various modulation for generation and detection of signals

Objective: The student will realize importance of various communication systems

List of Experiments

- Amplitude Modulation and Demodulation.
- Frequency Modulation and Demodulation
- Pulse Amplitude Modulation
- Pulse Width Modulation
- Pulse Position Modulation
- 6. Pulse Code Modulation
- 7. AM modulation and Demodulation
- 8. FM modulation and Demodulation
- 9. Calculation of EMI Components

Course Outcomes

1. Implement analog and digital modulation methods
2. Realize changes in the parameters in modulation methods
3. Design for various input signals or data signals
4. Observe the variations between input and output
5. Application of these methods

B.Sc. Physical Science
SEMESTER – VI

SPH 362: Numerical Methods

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Preamble: Numerical analysis is the study of algorithms that use numerical approximation for the problems of mathematical analysis. Numerical analysis naturally finds application in all fields of engineering and the physical sciences. Numerical analysis can only be applied to real-world measurements by translation into digits; it gives approximate solutions within specified error bounds.

Objective: The course is framed to extend the student's knowledge about understanding numerical techniques to solve various categories of problems. It will also help in developing deep understanding of the approximation techniques and problem solving capabilities.

UNIT-I

Errors in Numerical Computations: Errors and their accuracy, Mathematical Preliminaries, Errors and their Analysis, Absolute, Relative and Percentage Errors, A general error formula, Error in a series approximation.

Learning Outcomes:

After studying this unit the student can

- Understand the different types of errors in numerical computation
- Know the rules to round off a given number
- Understand a general error formula and also error in a series approximation

UNIT-II

Solution of Algebraic and Transcendental Equations: The bisection method, The iteration method, The method of false position, Newton Raphson method, Generalized.

Learning Outcomes

After studying this unit the student can

- Understand the usage of intermediate value theorem in locating the roots of an equation
- Understand the techniques of bisection method, iteration method, method of false position and also Newton-Raphson method and generalized Newton-Raphson method to find a real root of the given equation.

UNIT-III

System of Simultaneous Equations: Direct methods, Gauss Elimination Method, LU decomposition; Iterative Methods: Gauss-Jacobi, Gauss-Siedel and SOR iterative methods.

Learning Outcomes

After studying this unit the student can

- Understand the direct methods such as Gauss elimination method and LU decomposition method to solve the given system of equations
- Understand the iterative techniques such as Gauss-Jacobi, Gauss-Siedel and SOR iterative methods to solve the given system of equations numerically

UNIT-IV

Lagrange and Newton Divided difference interpolation: linear and higher order,
Finite difference Operators: Newton forward and backward Interpolations, Central Difference Interpolation Formulae, Gauss's central difference formulae, Stirling's central difference formula, Bessel's Formula

Learning Outcomes

After studying this unit the student can

Understand the problem of interpolation

Know the interpolation techniques when the nodes are evenly spaced

Know the interpolation techniques when the nodes are unevenly spaced

UNIT-V

Numerical differentiation: forward difference, backward difference and central Differences.

Numerical Integration: Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule

Learning Outcomes

After studying this unit the student can

Understand the problem of numerical differentiation and numerical integration

Know the techniques for numerical differentiation with finite difference operators

Know the techniques of Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule

Text Books:

Introductory Methods of Numerical Analysis" by S.S.Sastry published by Prentice Hall of India Pvt. Ltd., New Delhi. (Latest Edition)

"Higher Engineering Mathematics" by B.S. Grewal published by Khanna Publishers

"Mathematical Methods" by G. Shanker Rao published by I.K. International Publishing House Pvt. Ltd.

"Finite Differences and Numerical Analysis" by H.C Saxena published by S. Chand and Company, Pvt. Ltd., New Delhi.

Course Outcomes:

Able to understand the numerical techniques for various category of problems

Able to develop algorithms for approximation techniques

B.Sc. Physical Science
SEMESTER – VI
SPH 364: Complex Analysis

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Preamble: Complex analysis is the branch of mathematical analysis that investigates functions of complex numbers and it is known as the theory of functions of a complex variable. Complex analysis naturally finds application in all fields of engineering and the physical sciences. Complex analysis can be applied to real-world problems

Objectives: To introduce

- Basic properties of complex numbers
- Cauchy-Riemann equations
- Analytical functions
- Contours and their properties
- Expansion of the function using Taylor's series

UNIT-I

Limits, Limits involving the point at infinity, continuity. Properties of complex numbers, regions in the complex plane, functions of complex variable, mappings. Derivatives, differentiation formulas, Cauchy-Riemann equations, sufficient conditions for differentiability.

Learning Outcomes:

The student will be able to:

- Define limits and continuity
- Explain properties of complex numbers
- Evaluate problems using Cauchy Riemann equations
- Explain differentiation formulas and conditions for differentiability

UNIT-II

Analytic functions, examples of analytic functions, exponential function, Logarithmic function, trigonometric function, derivatives of functions.

Learning Outcomes:

The student will be able to:

- Define analytical function with examples
- Evaluate analytical functions for exponential, logarithmic, and trigonometric
- Explain derivatives of functions

UNIT-III

Definite integrals of functions. Contours, Contour integrals and its examples, upper bounds for moduli of contour integrals.

Learning Outcomes:

The student will be able to:

- Explain definite integrals of functions
- Describe contours, contour integrals and its properties
- Evaluate problems on upper bounds for moduli of contour integrals

UNIT-IV

Cauchy-Goursat theorem, Cauchy integral formula, Liouville's theorem and the fundamental theorem of algebra. Convergence of sequences and series, Taylor series and its examples.

Learning Outcomes:

The student will be able to:

- Explain Cauchy Goursat theorem and its applications
- Explain Cauchy integral formula with applications
- Evaluate problems on convergence of sequences and series
- Explain Taylor's series with examples

UNIT-V

Laurent series and its examples, absolute and uniform convergence of power series.

Learning Outcomes:

The student will be able to:

- Evaluate problems on Laurent series
- Explain absolute convergence of power series
- Explain uniform convergence of power series

Text Books:

Complex Analysis for Mathematics and Engineering,

John H. Mathews and Russell W. Howell, Jones and Bartlett Publishers, 5th edition.

Complex Variables and Applications James Ward Brown and Ruel Vance Churchill

Mc Graw-Hill Higher Education, 8th edition.

Complex Analysis, Joseph Bak and Donald J. Newman, Springer-

Verlag New York, Inc., New York, 1997, 2nd edition.

B.Sc. Physical Science
SEMESTER – VI
SPH 366: Linear Programming

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Preamble: Linear programming is a mathematical technique for maximizing or minimizing a linear function of several variables, such as output. Linear programming is a part of operations research. Linear programming finds application in all fields of engineering, physical sciences and life sciences. Linear programming can be applied to solve real world problems.

Course Objectives:

- To introduce formulation of linear programming model
- To discuss the methods to solve linear programming problems
- To study the optimality and unboundedness in a linear programming problem
- To know the applications of sensitivity analysis

Unit-I

Linear Programming Problems, Graphical Approach for Solving some Linear Programs. Convex Sets, Supporting and Separating Hyperplanes.

Learning Outcomes:

The student will be able to:

- Formulate linear programming model for a business problem
- Explain graphical approach to solve linear programming problem
- Evaluate problems on convex sets
- Explain about hyperplanes

Unit-II

Theory of simplex method, optimality and unboundedness, the simplex algorithm, simplex method in tableau format

Learning Outcomes:

The student will be able to:

- Explain simplex method to solve linear programming problem
- Evaluate optimality and unboundedness in a linear programming problem
- Evaluate problems using simplex algorithm

Unit-III

Introduction to artificial variables, two-phase method, Big-M method and their comparison.

Learning Outcomes:

The student will be able to:

- Solve problems on two phase method
- Explain problems on Big-M method
- Compare two phase method and Big-M method

Unit-IV

Duality, formulation of the dual problem, primal- dual relationships, economic interpretation of the dual.

Learning Outcomes:

The student will be able to:

- Explain duality and formulation of the dual problem
- Differentiate primal- dual problems
- Explain economic interpretation of the dual problem over primal problem

Unit-V

Sensitivity analysis.

Learning Outcomes:

The student will be able to:

- Study the uncertainty in the output of a mathematical model which can be divided and allocated to different sources of uncertainty in its inputs
- Provide examples using sensitivity analysis
- Apply sensitivity analysis on various problems

Text Books:

Operations Research” by S.D. Sharma , Kedarnath and Ramnath Co.

Linear Programming and Network Flows, Mokhtar S. Bazaraa, John J. Jarvis and Hanif

D. Sherali , John Wiley and Sons, India, 2004, 2nd edition.

Introduction to Operations Research, Frederick S. Hiller and Gerald J. Lieberman

TataMcGraw Hill, Singapore, 2004, 8th edition.

Operations Research: An Introduction, Hamdy A. Taha ,

Prentice-HallIndia, 2006, 8th edition.

**B.Sc. Physical Science
SEMESTER – VI**

SPH 334: Numerical Methods Tutorial

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

Problems on absolute , relative and percentage errors

Find a root of an equation using bisection method

Find a root of an equation using the iteration method

Find a root of an equation using the method of false position

Find a root of an equation using Newton Raphson method

Solving system of simultaneous equations using Gauss elimination method

Solving system of simultaneous equations using LU decompoostion method

Solving system of simultaneous equations using Gauss-Jacobi method

Solving system of simultaneous equations using Gauss-Siedel method

Problems using Newton's forward and backward interpolation formulae

Problems using divided difference and Lagrange's interpolation formulae

Problems using Stirling's and Bessel's formulae

Problems on Trapezoidal and simpson's rules for Numerical integration

Course Learning Outcomes:

On successful completion of this course, students will be able to:

Evaluate solution of algebraic and transcendental equations

Understand the numerical techniques for various category of problems

Evaluate problems on system of simultaneous equations

Solve problems on interpolation to estimate the function and function value.

Solve problems on Numerical integration

**B.Sc. Physical Science
SEMESTER – VI**

SPH 333: Complex Analysis Tutorial

Credits: 2

Continuous Evaluation: 100 Marks

Problems on Cauchy-Riemann equations

Problems on analytical functions

Problems on contour integration

Problems on Cauchy Goursat theorem

Problems on Cauchy integral formula

Problems on Taylor's series

Problems on Laurent series

Problems on absolute and uniform convergence of power series

Course Learning Outcomes:

On successful completion of this course, students will be able to:

Define analytic function

Evaluate problems on analytic functions

Understand contour integration

Evaluate problems on Cauchy Goursat theorem and Cauchy integral formula

Solve problems on Taylor's series

Solve problems on Laurent series

**B.Sc. Physical Science
SEMESTER – VI**

SPH 338: Linear Programming Tutorial

Credits :2

Continuous Evaluation:100 Marks

Formulation of Linear programming problem

Graphical approach to solve LP problem

Problems on convex sets

Simplex method to solve LPP

Two Phase method to solve LPP

Big-M method to solve LPP

Formulation of dual problem

Problems on primal –dual

Course Learning Outcomes:

On successful completion of this course, students will be able to:

Formulate Linear Programming Model

Evaluate Linear programming problems using graphical approach

Understand convex sets with examples

Evaluate LP problems using simplex method

Solve LP problems using two phase method and Big- M method

Solve problems on primal and dual

B.Sc. Physical Science
SEMESTER – VI

SPH 372: Microcontrollers & Applications

Hours per week: 4

End Examination: 60 Marks

Credits: 4

Sessionals: 40 Marks

Preamble: This course was introduced to understand the basics of Microcontroller and its applications

Objective: To understand the architecture and then programme it

UNIT- I

8051 Architecture

Introduction to Microcontroller - Comparison of Microcontroller & Microprocessor-8051
Microcontroller - Block diagram - I/O pins, ports and circuits - External memory - Counter and Timers - Serial data I/O - Interrupts

Learning Outcomes:

- To understand the Functional block diagram of 8051
- To know the 8051's I/O pin-out diagram

UNIT - II

8051 Instruction Set

Classification of instruction set-Addressing Modes – Logical operation: Byte level - Bit level- Rotate and Swap operation. **ARITHMETIC OPERATIONS**- Instructions affecting flags - Incrementing and Decrementing - Addition -Subtraction - Multiplication and Division - Example Programs

Learning Outcomes:

1. To learn the classification of instruction set and addressing modes
2. Must understand the arithmetic operations

UNIT – III

Jump and Call Instruction

Introduction - The Jump and Call program Range- Jumps: Bit - Byte Unconditional: Calls and Subroutine -Interrupts and Returns – Example programs. Time delay generation and calculation, Timer/Counter programming, accessing a specified port terminal and generating a rectangular waveform.

Learning Outcomes:

- Able to know the range of jumps
- To understand the time delay generation and calculation for waveform generation

UNIT- IV

Interfacing

Keyboards - Displays - Stepper motor - ADC & DAC

Learning Outcomes:

- Able to understand, how to interface external devices
- Writing programs for interfacing devices

UNIT- V

B.Sc. Physical Science SEMESTER –VI

Introduction to Other Microcontrollers 6509 - PIC controllers -6575 series - Introduction to Embedded Systems.

Learning Outcomes:

- To understand the functional block diagram of 6509
- To know, what is an embedded system and its applications

Course Outcomes:

- 1.Learn the architecture of 8051, its pin diagram
- 2.Learn about the microcontrollers and the organization of microcontroller based systems
- 3.Acquire knowledge of microcontrollers and their role in I/O port programming and their interface with peripherals
- 4.Learn about analog to digital and digital to analog convertors
- 5.Learn basics of programming and other controllers

Text Books:

- Kenneth 1. Ayala, "The 8051 Microcontroller, Architecture, Program and Application"
Pen ram International.
- Muhammed Ali Mazidi, Janice GillispieMazidi "The 8051 Microcontroller and
Embedded Systems" -Low PriceEdition.
- Microprocessors & Microcontrollers by N. Senthikumar, M. Saravanan & S.
Jeevananthan, 1edition. Oxford press (Helpful for interfacingapplications)
- Microcontrollers: Theo & App by Ajay V. Deshmuk Tata McGraw-Hill Education, 2005.

References:

- Programming and customizing the 8051 Microcontroller- byMykePredko-TMH
- Design with Microcontrollers by-J.B.PeatmaTMH
- Microcontroller Hand Book, INTEL,2008.
- Microprocessor, Microcontroller & Applications by D.A Godse A.P Godse Technical
Publications 2008.

UNIT- V

B.Sc. Physical Science SEMESTER –VI

SPH 374: VLSI Design

Hours per week: 4

End Examination: 60

Marks

Credits: 4

Sessionals: 40 Marks

Preamble: This course was designed to learn the basics of VLSI technology

Objective: To understand various technologies of VLSI design

UNIT- I

CMOS Technology

brief History-MOS transistor, Ideal I-V characteristics, C-V characteristics, Non ideal I-V effects, DC transfer characteristics - CMOS technologies, Layout design Rules, CMOS process enhancements, Technology related CAD issues, Manufacturing issues.

Learning Outcomes:

To understand the MOS technology

To know the technology related issues

UNIT - II

Circuit Characterization and Simulation

Delay estimation, Logical effect and Transistor sizing, Power dissipation, Interconnect, Design margin, Reliability, Scaling- SPICE tutorial, Device models, Device characterization, Circuit characterization, Interconnect simulation.

Learning Outcomes:

To study various device models

Must understand the simulation

UNIT – III

Combinational and Sequential Circuit Design

Circuit families -Low power logic design - comparison of circuit families - Sequencing static circuits, circuit design of latches and flip flops, Static sequencing element methodology-sequencing dynamic circuits – synchronizers

Learning Outcomes:

Able to know the low power logic design

To understand the circuit design

UNIT- IV

CMOS Testing

Need for testing- Testers, Test fixtures and test programs- Logic verification- Silicon debug principles- Manufacturing test - Design for testability - Boundary scan.

Learning Outcomes:

Able to understand, how to test devices

To know how to handle the test fixtures

UNIT- V

B.Sc. Physical Science SEMESTER –VI

Specification Using Verilog HDL

Basic concepts- identifiers- gate primitives, gate delays, operators, timing controls, procedural assignments conditional statements, Data flow and RTL, structural gate level switch level modeling, Design hierarchies, Behavioral and RTL modeling, Test

Benches, Structural gate level description of decoder, equality detector, comparator, priority encoder, half adder, full adder, Ripple carry adder, D latch and D flip flop.

Learning Outcomes:

To understand the basic concepts of VHDL language

To develop the design skills by writing the VHDL programmes

Course Outcomes:

- 1.To understand the MOS technology
- 2.Must understand the simulation process
- 3.Able to know the low power logic design
- 4.Learn the basics of programming
- 5.Learn by writing the VHDL programmes

Text Books:

- 1.Weste and Harris: CMOS VLSI DESIGN (Third edition) Pearson Education.
- 2.Uyemura J.P: Introduction to VLSI circuits and systems, Wiley.

References:

- D.A Pucknell& K. Eshraghian Basic VLSI Design, Third edition, PHI
Wayne Wolf, Modern VLSI design, Pearson Education
M.J.S. Smith: Application specific integrated circuits, Pearson Education
J.Bhasker: Verilog HDL primer, BS publication
Ciletti Advanced Digital Design with the Verilog HDL, Prentice Hall of India

UNIT- V

B.Sc. Physical Science SEMESTER –VI

SPH 376: Mathematical Methods and Analysis Using MATLAB

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

UNIT I

Introduction to MATLAB and Graphics

Preliminary, workspace, variables, simple arithmetic problems, symbolic calculations. Matrices, Vectors operations, Operators .Introduction to graphics: 2-D and 3-D plots, types & features, overlays, scripts and functions, M-files, special function variable loops, branch, control, flow statements, structures and cells. File handling, input and output.

UNIT II

Laplace Transforms

Signals and systems: continuous time and discrete time signals.

Laplace Transform: definition, Laplace transform of simple function, properties of L T (linearity, shifting, change of scale), Inverse LT, partial fraction technique to find Inv of L T transfer functions.

UNIT III

Laplace Transforms Applications.

Series RC circuit, RL circuit, RLC circuit,

Poles and Zeros stability criteria, Low pass and High pass filters.

MATLAB Exercises

3. CT and DT signals plotting

4. To find Laplace Transform and I LT of any given function. RC / RL/RLC (series) circuit analysis for DC input Transfer Function, Pole and Zero stability criteria and filters

UNIT IV

Fourier series and Transform

Fourier Series Definition, Evaluation of Fourier Co-efficient, Fourier series for Square, Triangular waves, Half Wave, Full wave rectifiers, Fourier Transform: Definition and examples.

MA TLAB Exercises:

1. To evaluate Fourier Co-efficient for given waveform function.

2. To find Fourier Transform for given function.

UNIT V

Mathematical Application

Solution of differential equation using separation of variable method (Laplace, Poisson and Schrodinger equations in Cartesian co-ordinate system),

Curve fitting (Straight line, Exponential & Cubic Spy .line) and its application to

Diode characteristics

Ohm's Law

Filters, Phasors as per AC circuits

MATLAB Exercises

Real root of algebraic equation, curve fitting

Diode/BJT characteristics. Ohm's law filters performance.

Text Books:

RudraPratap Getting Started with MATLAB ,7th Edition Oxford University Press
New Delhi
MATLAB and Simulink for engineers, Agamkumartyagi-Oxford University press.
Amos Gilat MATLAB : An introduction with applications, Wiley India
Stephen 1. Chapman MATLAB Programming for Engineers. Thomas Learning.

Reference Books:

G K Mittal Network Analysis KhannaPublishers, NewDelhi
Van Valkenberg Network Analysis, 3rd Edition DorlingKindersley(India) Pvt Ltd.,
Umesh Sinha Network Analysis and Synthesis Satya Prakashan. Delhi.

B.Sc. Physical Science
SEMESTER –VI
SPH 328: Microcontrollers & Applications Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

- Preamble: This course was designed to perform arithmetic, logical and interfacing programs.
- Objective: The student will be able to understand then applies the written programs.

List of Experiments

- Multiplication of two numbers using MUL Command (later using counter method for repeated addition)
- Division of two numbers using DIV command (later using counter method for repeated subtraction)
- Pick Largest & smallest number among a given set of numbers
- Interface a DAC & Generate a stair case wave form with step duration and no. of steps as variables.
- Interface a stepper motor and rotate Clockwise or anti clockwise through given angle step.
- Using Keil software, write a program to pick the smallest among a given set of numbers.
- Using Keil software, write a program to pick the largest among a given set of numbers.
- Using Keil software, write a program to generate a rectangular wave form at a specified port terminal.

Course Outcomes:

After the completion of this course, the student will be able to write the programs and also controls basic interfacing devices (**L2 and L3**)

B.Sc. Physical Science
SEMESTER –V
SPH 330: VLSI Design Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

Preamble: This course was designed to perform simulation programmes in VHDL
Objective: The student will be able to understand then applies the written programs

List of Experiments

Study of Simulation using tools

Design Entry and Simulation of Combinational Logic Circuits

- a) Basic logic gates
- b) Half adder and full adder
- c) Half Subtractor and full sub tractor
- d) 8 bit adder

3. Design Entry and Simulation of Combinational Logic Circuits

- a) 4 bit multiplier
- b) Encoder and Decoder
- c) Address Decoder
- d) Multiplexer

4. Design Entry and Simulation of Sequential Logic Circuits

- a) Flip-Flops
- b) Counter

Study of Synthesis tools

Place and Route and Back annotation for FPGAs

Schematic Entry and SPICE Simulation

- a) CMOS Inverter
- b) Universal Gate
- c) Differential Amplifier

8. Layout of a CMOS Inverter

Course Outcomes:

After the completion of this course, the student will be able to write the programs to simulate basic combinational and sequential circuits (**L2 and L3**)

B.Sc. Physical Science
SEMESTER – VI
SPH 332: MATLAB

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

List of Experiments

CT and DT signals plotting

To find Laplace Transform and IL T of any given function.

RC / RL/RLC (series) circuit analysis for DC input

Transfer Function, Pole and Zero stability criteria and filters

To evaluate Fourier Co-efficient for given waveform Function.

To find Fourier Transform for given function.

Real root of algebraic equation, curve fitting

Diode/BJT characteristics. Ohm's law, filters performance

B.Sc. Physical Science
SEMESTER – VI
SPH 382: Industrial Chemicals and Environment

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Preamble: With industrial development in gigantic proportions, the onus of safeguarding the environment from the hazard of the chemicals synthesis, usage and disposal lies a great deal on every individual. It becomes imperative to inculcate the education related to safe use of handling of chemicals. An understanding of the potential hazards and precautions required in handling of chemicals is of utmost importance in preventing exposure to chemicals and mishaps.

Objective: Individual and material safety is of utmost importance in any organization. Many times accidents take place due to unsafe working in environment. Wide ranges of chemicals are used in universities, national laboratories and industries, each with its own inherent hazards.

The course is designed to impart basic knowledge of production, uses, storage and hazards in handling industrial gases and chemicals.

Essential knowledge of the components of the environment, sources of pollution and pollutants shall be imparted to the students

Unit I

Industrial Gases and Inorganic Chemicals

Industrial Gases: Large scale production, uses, storage and hazards in handling of the following gases: oxygen, nitrogen, argon, neon, helium, hydrogen, acetylene, carbon monoxide, chlorine, fluorine, sulphur dioxide and phosgene.

Inorganic Chemicals: Manufacture, application, analysis and hazards in handling the following chemicals: hydrochloric acid, nitric acid, sulphuric acid, caustic soda, common salt, borax, bleaching powder, sodium thiosulphate, hydrogen peroxide, potash alum, chrome alum, potassium dichromate and potassium permanganate.

Learning Outcomes

The students will learn about the production, uses, storage and hazards in handling industrial gases and chemicals.

Unit II

Environment and its segments

Ecosystems. Biogeochemical cycles of carbon, nitrogen and sulphur.

Air Pollution: Major regions of atmosphere. Chemical and photochemical reactions in atmosphere. Air pollutants: types, sources, particle size and chemical nature; Photochemical smog: its constituents and photochemistry. Environmental effects of ozone, Major sources of air pollution.

Pollution by SO₂, CO₂, CO, NO_x, H₂S. Methods of estimation of CO, NO_x, SO_x and control procedures.

Learning Outcomes

The students will learn about the biogeochemical cycles in environment and air pollution : sources and pollutants

Unit III

Greenhouse effect and Global warming, Ozone depletion by oxides of nitrogen, chlorofluorocarbons and Halogens, removal of sulphur from coal. Control of particulates.

Water Pollution : Hydrological cycle, water resources, aquatic ecosystems, Sources and nature of water pollutants, Techniques for measuring water pollution, Impacts of water pollution on hydrological and ecosystems.

Learning Outcomes

The student will learn the concept of global warming.

The students will also learn about water

Unit IV

Water purification methods. Effluent treatment plants (primary, secondary and tertiary treatment). Industrial effluents from the following industries and their treatment: textile, tannery, dairy, petroleum and petrochemicals.

Industrial waste management, incineration of waste. Water treatment and purification (reverse osmosis, electro dialysis, ion exchange). Water quality parameters for waste water, industrial water and domestic water.

Learning Outcomes

The student will familiarize with water quality parameters, water and wastewater treatment and industrial waste treatment.

Unit V

Energy & Environment

Sources of energy: Coal, petrol and natural gas. Nuclear Fusion / Fission, Solar energy, Hydrogen, geothermal, Tidal and Hydel, etc.

Nuclear Pollution: Disposal of nuclear waste, nuclear disaster and its management.

Learning Outcomes

The student will learn about sources of energy. The students will also learn about nuclear pollution and waste management.

Reference Books:

- E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK.
- R.M. Felder, R.W. Rousseau: Elementary Principles of Chemical Processes, Wiley Publishers, New Delhi.
- J. A. Kent: Riegel's Handbook of Industrial Chemistry, CBS Publishers, New Delhi.
- S. S. Dara: A Textbook of Engineering Chemistry, S. Chand & Company Ltd. New Delhi.
- K. De, Environmental Chemistry: New Age International Pvt., Ltd, New Delhi.
- S. M. Khopkar, Environmental Pollution Analysis: Wiley Eastern Ltd, New Delhi.
- S.E. Manahan, Environmental Chemistry, CRC Press (2005).
- G.T. Miller, Environmental Science 11th edition. Brooks/ Cole (2006).
- A. Mishra, Environmental Studies. Selective and Scientific Books, New Delhi (2005).

B.Sc. Physical Science
SEMESTER – VI
SPH 384: Instrumental Methods of Analysis

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Preamble: The students of undergraduate program in science need to be conversant with the various instrumental and analytical techniques in analytical chemistry for training a undergraduate students as analytical chemist.

Objective: The concept of qualitative and quantitative methods in analytical chemistry will be introduced to undergraduate students.

Students will also learn the fundamental concepts of various instrumental methods for quantitative analysis, separation methods and solvent extraction.

UNIT I

Thermal methods of analysis

Thermo gravimetry - theory, instrumentation, applications with special reference to $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ and CaCO_3 . Basic idea of differential thermal analysis: principle and instrumentation. Difference between TGA and DTA. Differential scanning calorimetry: principle and instrumentation.

Learning Outcome: The students will learn the fundamentals of thermo analytical technique.

UNIT II

Flame photometry

Theory and instrumentation. Analyses of Na, K, Ca, and Mg.

Atomic Absorption Spectrometer: Theory, instrumentation, chemical and spectral interferences, Applications

Induced couple plasma spectroscopy: Theory, Instrumentation and applications of ICP-OES

Learning Outcome: The student will learn the concept of atomic spectrometry for quantitative analysis

UNIT III

Principles of chromatography

Classification of different chromatographic methods, adsorption and partition isotherms, column capacity, retardation factor, retention time and retention volume, gradient elution, height equivalent theoretical plate (HETP)

High performance liquid chromatography: Theory and instrumentation: pumps, column, detectors-UV detector, refractive index detector, Fluorescence detector, photo diode array detector and applications.

Gas liquid chromatography: Theory and instrumentation: columns (packed and capillary columns), detector: thermal conductivity detector, flame ionization detector, electron capture detector, nitrogen-phosphorus detector, photo ionization detector, and applications.

Learning Outcome:

The students will learn about the details of a gas chromatograph and applications of gas chromatography.

UNIT IV

Voltametry

Principle of polarography residual current, migration current, diffusion current, half-wave potential, Ilkovic equation. Instrumentation: Dropping mercury electrode (DME), advantages and disadvantages of DME, qualitative and quantitative analysis of inorganic ions - Cu, Pb Cd and Zn. Anode Stripping Voltametry: Principle and instrumentation.

Hanging drop mercury electrode, application in the analysis of some selected metals.

Learning Outcome:

The student will familiarize electro-analytical methods for chemical analysis with reference to voltametry

UNIT V

X-ray Spectroscopy: X-ray spectrometers, energy dispersive and wavelength dispersive techniques, instrumentation, matrix effects and applications.

Learning Outcome:

The student will learn applications and details of the X-ray spectrometer in chemical analysis.

Text books:

Instrumental methods of analysis - H.H. Willard, Meritt Jr. and J.A. Dean
CBS Publishers and distributors, 6th edition, 1986.

Principles of instrumental analysis – Douglas A. Skoog, F. James Holler and R.
Crouch, Cengage Learning, 6th edition, 2006.

Vogel's textbook of Quantitative Inorganic Analysis - J. Basset, R.C.

Denney, G.H. Jeffery and J. Mendham, Prentice Hall, 6th edition, 2000

Industrial methods of analysis - B.K. Sarma, Goel Publishing House, Meerut, 1997

Instrumental methods of Analysis – G.R. Chatwal and S. Anand, Himalaya
publishing House, 13th reprint, 1999.

Analytical Chemistry – S. Usha Rani, Macmillan India Limited, 2001.

Reference Books:

Instrumental methods of Analysis – Galen S. Ewing, McGraw Hill Higher Education,
5th edition, 1985

Handbook of Instrumental techniques for Analytical Chemistry, Frank
Settle, Prentice Hall, 1997.

B.Sc. Physical Science
SEMESTER – VI
SPH 340: Industrial Chemicals & Environment Lab

Hours per week: 4

Credits: 2

Continuous Evaluation: 100 Marks

Preamble: Application of basic chemistry and chemical calculations to measure chemical, parameters of water and wastewater. Laboratory methods and interpretation of results with regard to environmental analysis are important for studying the pollution trend .

Objective: To introduce students to how the common environmental experiments relating to water and wastewater quality are performed. This course will help students know which tests are appropriate for given environmental problems and apply the laboratorial results to problem identification, quantification and basic solutions.

List of Experiments

1. Determination of dissolved oxygen in water.
Determination of Chemical Oxygen Demand (COD)
Determination of Biological Oxygen Demand (BOD)
Percentage of available chlorine in bleaching powder.
Measurement of chloride, sulphate and salinity of water samples by simple titration method (AgNO₃ and potassium chromate).
Estimation of total alkalinity of water samples (CO₃²⁻, HCO₃⁻) using double titration method.
Measurement of dissolved CO₂.
Study of some of the common bio-indicators of pollution.
Estimation of SPM in air samples.
Preparation of borax/ boric acid.

Learning Outcome:

Students who successfully complete this course will be able to perform environmental experiments relating to water and wastewater quality, and know which tests are appropriate for given environmental problems.

Reference Books:

- E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK.
- R.M. Felder, R.W. Rousseau: Elementary Principles of Chemical Processes, Wiley Publishers, New Delhi.
- J. A. Kent: Riegel's Handbook of Industrial Chemistry, CBS Publishers, New Delhi.
- S. S. Dara: A Textbook of Engineering Chemistry, S. Chand & Company Ltd. New Delhi.
- K. De, Environmental Chemistry: New Age International Pvt., Ltd, New Delhi.
- S. M. Khopkar, Environmental Pollution Analysis: Wiley Eastern Ltd, New Delhi.

B.Sc. Physical Science

SEMESTER – VI

SPH 342: Instrumental Methods of Analysis Lab

Hours per week: 4

Continuous Evaluation: 100 Marks

Credits: 2

Preamble: The students of undergraduate program in science in Chemistry need to be conversant with the various instrumental method of analysis in chemistry. Therefore, It helps the student familiarize with the techniques essential for developing the foundation of Instrumental methods in analytical chemistry.

Objective: To make student learn the practical application of Instrumental methods for quantitative analysis.

To make the students learn separation methods of analysis including planar, gas and liquid chromatography.

To make students learn quantitative analysis using atomic absorption spectroscopy

List of Experiments

Safety Practices in the Chemistry Laboratory

Titration curve of an amino acid.

Determination of a Mixture of Cobalt and Nickel (UV/Vis spec.)

IR Absorption Spectra (Study of Aldehydes and Ketones)

Determination of Calcium, Iron, and Copper in Food by Atomic Absorption

Quantitative Analysis of Mixtures by Gas Chromatography (i.e., chloroform and carbon tetrachloride)

Separation of Carbohydrates by HPLC

Potentiometric Titration of a Chloride-Iodide Mixture

Laboratory analysis to confirm anthrax or cocaine

Detection in the field and confirmation in the laboratory of flammable accelerants or explosives

Detection of illegal drugs or steroids in athletes

Detection of pollutants or illegal dumping

At least 8-10 experiments to be performed.

Reference Books:

Skoog, D.A. Holler F.J. & Nieman, T.A. Principles of Instrumental Analysis, Cengage Learning India Ed.

Willard, H.H., Merritt, L.L., Dean, J. & Settoe, F.A. Instrumental Methods of Analysis, 7th Ed. Wadsworth Publishing Company Ltd., Belmont, California, USA, 1988.

B.Sc. Physical Science
SEMESTER –VI
SPH 392: Information Security

Hours per week: 4

End Examination: 60 Marks

Preamble:

Information security (IS) is designed to protect the confidentiality, integrity and availability of computer system data from those with malicious intentions. Confidentiality, integrity and availability are sometimes referred to as the CIA Triad of information security. This course gives an overview of security issues, cryptography and public key encryption methods.

Objectives:

- To introduce critical characteristics of Information.
- To emphasize the need for security.
- To elaborate security threats.
- To explain classical encryption techniques.

UNIT I

Introduction to Information Security

Introduction, The History of Information Security, What Is Security? Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing Components, Balancing Information Security and Access.

Learning Outcomes:

By the end of this Unit, the student will be able to

- Familiarize with the history of information security.
- Understand balance between information security and information access.

UNIT II

Approaches to Information Security Implementation

The Systems Development Life Cycle, The Security Systems Development Life Cycle, Security Professionals And The Organization, Is It An Art Or A Science? Information Security Terminology. **The Need For Security:** Introduction, Business Needs First, Threats, Attacks.

Learning Outcomes:

By the end of this Unit, the student will be able to

- Illustrate Security System Life Cycle. (L2)
- Know the difference between a threat and an attack. (L2)

UNIT III

Overview of Security

Protection Versus Security, Aspects Of Security – Data Integrity, Data Availability, Privacy, Security Problems, User Authentication. **Security Threats:** Program Threats, Worms, Viruses, Trojan horse, Trap Door, Stack and Buffer Overflow. **System Threats:** Intruders, Communication Threats-Tapping and Piracy.

Learning Outcomes:

By the end of this Unit, the student will be able to

- Distinguish Protection and Security. (L3)
- Identify different security threats. (L2)
- Explain the System Threats. (L2)

UNIT IV

Cryptography: Classical Encryption Techniques, Substitution and Transposition Techniques.

Symmetric Key Algorithms: Data Encryption Standard, Advanced Encryption Standards.

Learning Outcomes:

By the end of this Unit, the student will be able to

Take part of classic Encryption Techniques. (L4)

Construct Symmetric Key Algorithms. (L3)

UNIT V

Public Key Encryption: RSA, Diffie Hellman Key Exchange, ECC Cryptography, Digital Signatures.

Message Authentication: MAC, Hash Functions. Message Digests, SHA, WHIRLPOOL.

Learning Outcomes:

By the end of this Unit, the student will be able to

Demonstrate Public Key Encryption. (L2)

Label Message Authentication. (L1)

Text Books:

Principles of Information Security By Michael E. Whitman And Herbert J.Mattord, Thomas India Edition, 2011.

Cryptography And Network Security Principles and Practices By William Stallings Prentice-Hall Of India ,4th Ed, 2006.

Reference Books:

Computer Security: Art And Science, Mathew Bishop, Addison-Wesley, 2003.

Computer Security Principles And Practice By William Stallings, Lawrie Brown, 2/E, Pearson, 2012.

Course Outcomes:

By the end of the course the student is able to

Identify critical characteristics of Information.

The necessity of security.

Name different security threats.

Know classical encryption techniques.

Perform Message Authentication

B.Sc. Physical Science SEMESTER –VI SPH 394 : Database Applications

Hours per week: 4

Credits: 4

End Examination: 60 Marks

Sessionals: 40 Marks

Preamble

Database management has evolved from a specialized computer application to a central component of a modern computing environment. The knowledge about database systems has become an essential part of an education in computer science.

Objectives

- To explain the purpose of data base system.
- To design data base.
- To build ER model.
- To write SQL queries.
- To write application programs in JSP

Introduction: Database-Systems Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture.

- After completion of this unit, student will be able to understand database, data storage and querying.(L3)
- Know about transaction management.(L2)

Database Design and E-R Model: Overview, Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity Relationship Diagrams, Reduction to Relational Schemas, Entity-Relationship Design Issues, Extended E-R Features, Other Aspects of Data Design. **Introduction to Relational Model:** Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Operations.

- After completion of this unit, student will be able to learn entity, relationship.(L1)
- write database schema.(L2)
- perform relational operations. (L3)

Unit -III

SQL: Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub queries, Modification of the Database. **Intermediate SQL:** Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schemas, Authorization.

Learning Outcomes:

- After completion of this unit, student will be able to to perform aggregate functions.(L4)
- to execute schemas .(L4)

Advanced SQL: Functions and Procedures, Triggers, Advanced Aggregate Features.

Query Processing: Steps In Query Processing, Measures Of Query Cost, Selection Operation – Basic Algorithm, Selection Using Indices, Selections Involving Comparisons, Implementation of Complex Selections, Sorting, Join Operation – Nested Loop Join, Block Nested Loop Join, Evaluation of Expressions.

- After completion of this unit, student will be able to to implement triggers.(L5)
- to execute nested loops.(L5)

Unit – V

Application Design and Development: Application Programs and User Interfaces, Web Fundamentals, Servlets and JSP, Application Architecture, Rapid Application Development, Application Security, Encryption and its applications.

Learning Outcomes:

After completion of this unit, student will be able to
Develop application programs and user interface.(L4)
Understand encryption and its applications.(L3)

Course Outcomes:

Upon completion of the course, the student is able to
Know about data base and its architecture. (L2)
Learn transaction management.(L2)
Use SQL Queries in retrieving data from data base. (L4)

Text Book:

Database System Concepts, 6th Edition, Avi Silberschatz, Henry F. Korth, S. Sudarshan Tata McGraw-Hill, 2011.

Reference Books:

SQL, PL/SQL- The Programming Language of Oracle Ivan Bayross, BPB, 4th Edition.

Fundamentals of Database Systems by Ramez Elmasri, Shamkant B Navathe, 7th Edition, Pearson, 2015.

B.Sc. Physical Science
SEMESTER –VI
SPH 396: Computer Networks

Hours per week: 4

End Examination: 60 Marks

Credits: 4

Sessionals: 40 Marks

Preamble: A computer network defined as a set of computers connected together for the purpose of sharing resources. With the result of rapid technological progress in the 21st century there is a lot progress in collecting, transporting, storing, and processing information. Organizations with hundreds of offices spread over a wide geographical area routinely expect to be able to examine the current status of even their most remote outpost at the push of a button.

To introduce the connecting devices and IEEE standards

To illustrate transmission modes, Multiplexing.

To analyze network addressing.

To introduce about primary and secondary servers

UNIT-I

Connecting Devices: Passive Hubs, Repeaters, Active Hubs, Bridges, Two-Layer Switches, Routers, Three-Layer Switches, Gateway. Backbone Networks – Bus Backbone, Star Backbone, Connecting Remote LANs. Virtual LANs : Membership, Configuration, Communication Between Switches, IEEE Standard, Advantages. (10)

Learning Outcomes:

By the end of this Unit, the student will be able to

Summarize Hubs, repeaters, Bridges, switches. (L2)

Understand virtual LANS, IEEE standards. (L3)

Develop communication between switches. (L3)

UNIT- II

Digital Transmission: Transmission Modes - Parallel Transmission, Serial Transmission.

Multiplexing : Frequency Division Multiplexing, Wavelength Division Multiplexing, Synchronous Time Division Multiplexing, Statistical Time Division Multiplexing. (12)

Understand transmission modes

Infer Multiplexing

UNIT-III

Network Layer : Logical Addressing – IPv4 Addresses : Address Space, Notations, Classful Addressing, Classless Addressing, Network Address Translation. IPv6 Addresses: Structure, Address Space.

Internet Protocol : Internetworking , Need for Network Layer, Internet as a Datagram

Network, Internet as a Connectionless Network. IPv4 : Datagram, Fragmentation, Checksum,

Options. (12)

Learning Outcomes:

By the end of this Unit, the student will be able to

- Distinguish IPv4 and IPv6 addressing modes. (L4)
- Identify fragmentation and checksum. (L3)

UNIT-IV

Transport Layer: Process-to-Process Delivery - Client/Server Paradigm, Multiplexing and Demultiplexing, Connectionless versus Connection Oriented Service, Reliable Versus Unreliable, Three protocols.

User Datagram Protocol : Well-Known Ports for UDP, User Datagram, Checksum, UDP Operation, Use of UDP. (10)

Learning Outcomes:

By the end of this Unit, the student will be able to

- Able to understand connectionless and connection oriented services.
- Distinguish between reliable and unreliable services.
- Understand the three protocols. (L3)

UNIT-V

Congestion Control and Quality of Service: Data Traffic -Traffic Descriptor, Traffic Profiles. **Congestion :** Network Performance, Congestion Control - Open Loop Congestion Control, Closed Loop Congestion Control.

Application Layer: Domain Name System - Name Space - Flat Name Space, Hierarchical Name Space. Domain Name Space - Label, Domain Name, Domain.

Distribution of Name Space: Hierarchy of Name Servers, Zone, Root Server, Primary and Secondary Servers. (10)

Learning Outcomes:

By the end of this Unit, the student will be able to

- Outline data traffic and traffic profiles.(L2)
- Distinguish open loop congestion and closed loop congestion. (L3)
- Identify primary and secondary Servers. (L4)

Course Outcomes:

Upon completion of the course, the student is able to

- To spell how the connecting devices works.
- To distinguish connection oriented and connectionless services.
- To describe congestion control

Text Book :

Data Communication and Networking by Behrouz A Forouzan, Tata McGraw Hill, 4th Edition, 2006.

Reference Books :

- Data and Computer Communications ,William Stallings, Pearson, 9th Edition,2013.
- Computer Networks ,Andrew S. Tanenbaum, Prentice Hall, 5th Edition,2013.

B.Sc. Physical Science
SEMESTER – VI
SPH344: Information Security Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

List of Experiments

Study of various cryptographic techniques

Problems on Substitution techniques.

Problems on Transposition techniques

Introduction to Unix, Vi Editor.

Usage of the following commands in unix: ls, pwd, tty, cat, who, who am I, rm, mkdir, rmdir, cd.

Usage of following commands in unix : cal, cat(append), cat(concatenate), mv, cp, man, date.

Implement Substitution technique

Implement Transposition technique

Study of Open SSL

Implement Symmetric key Algorithm – DES using open SSL

Implement Asymmetric key Algorithm – RSA using open SSL

Implement Hash Algorithm – SHA using open SSL

Text Books:

Cryptography and Network Security, Behrouz A.

Forouzan, TMH, Special Indian Edition, 2007.

Unix Concepts and Applications, Sumitabha Das, 4th Edition, TMH,2006.

Reference Books:

Introduction to Unix and Shell Programming by M.G.

Venkateshmurthy, Pearson, 1st Edition, 2005.

B.Sc. Physical Science
SEMESTER – VI
SPH346: Database Applications Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

List of Experiments

- Perform Table Creation using SQL.
- Perform Insertion, Deletion, Updation using SQL.
- Perform Table Creation using Constraints Specification.
- Perform Simple SQL Queries.
- Perform Simple Queries using Logical operators.
- Perform Simple queries using Date functions.
- Perform Simple queries using String Functions.
- Perform Simple PL/SQL program.
- Perform PL/SQL programs using if, for, while.
- Perform Grant, Revoke privileges.
- Perform Programs on Exception Handling.
- Create a Database- define Procedures, Functions, Triggers.

Text Books:

1. SQL, PL/SQL- The Programming Language Of Oracle, Ivan Bayross , BPB, 4th Ed. 2010.
2. Oracle Database 11g- The Complete Reference , Kevin Loney, TMH, Indian Edition, 2008.

B.Sc. Physical Science
SEMESTER – VI
SPH 348: Computer Networks Lab

Hours per week: 4
Credits: 2

Continuous Evaluation: 100 Marks

List of Experiments:

Study of Network Devices in detail.

Study of different types of Network Cables and practically implement the cross-wired cable and straight cabling.

Study of Network IP.

Study of Basic Network Commands and Network Configuration commands.

Network Sharing.

Connect Two Computers (One to One).

Connect Computers in a LAN.

Configuring a Switch.

Client – Server configuration.

Study of Network tools.

B.Sc. Physical Science
SEMESTER –VI
SSE 372: Basic Instrumentation Skills – II

Hours per week: 2

Sessionals: 100 Marks

Credits: 2

Preamble: This course was designed to learn the instrumentation skills

Objective: Able to handle various instruments

UNIT- I

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

Learning Outcomes:

To understand signal generation instruments

To know their specifications

UNIT - II

Impedance Bridges: Block diagram of bridge, working principles of basic balancing type) RLC bridge, Specifications of RLC bridge

Learning Outcomes:

1. To study different bridge circuits

2. Must understand their operation

UNIT – III

Q-Meters: Block diagram & working principles of a Q-Meter, Digital LCR bridges.

Learning Outcomes:

Able to understand the block diagrams

To know their principle of working

UNIT- IV

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

Learning Outcomes:

Able to understand the digital technology

To know how to handle the digital instruments

UNIT- V

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.

Learning Outcomes:

To understand the basic concepts of digital multimeter

To develop the skills to make measurements using digital multimeter

Course Outcomes:

- 1.To understand signal generation instruments
- 2.Must understand the operation of various instruments
- 3.To study different bridge circuits
- 4.Able to know the digital technology
- 5.To know how to handle the digital instruments

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, SubrataGhoshal, 2012, Cengage Learning.
Electronic Devices and circuits, S. Salivahanan& N.S. Kumar, 3rd Ed., 2012, Tata McGraw Hill.
Electronic circuits: Handbook of design and applications, U. Tietze, Ch.Schenk, 2008, Springer
8. Electronic Devices, 7/e Thomas L. Floyd, 2008, Pearson India

B.Sc. Physical Science
SEMESTER – VI

SSE 374 :Pesticide Chemistry

Credits :2

Continuous Evaluation:100 Marks

General introduction to pesticides (natural and synthetic), benefits and adverse effects, changing concepts of pesticides, structure activity relationship, synthesis and technical manufacture and uses of representative pesticides in the following classes: Organochlorines (DDT, Gammexene,); Organophosphates (Malathion, Parathion); Carbamates (Carbofuran and carbaryl); Quinones (Chloranil), Anilides (Alachlor and Butachlor).

B.Sc. Physical Science
SEMESTER – VI

SSE 376: Transportation and Game Theory

Credits: 2

Continuous Evaluation: 100 Marks

Transportation problem and its mathematical formulation, northwest-corner method, Least cost method and Vogel approximation method for determination of starting basic solution, algorithm for solving transportation problem.

Non- Degeneracy and Degeneracy in transportation Problems.

Assignment problem and its mathematical formulation, Hungarian method for solving assignment problem, Travelling Salesman Problem.

Game theory: formulation of two person zero sum games, solving two person zero sum games, games with mixed strategies, Dominance principle, Graphical solution procedure.

Game theory: Mixed strategies using Linear Programming techniques, Algebraic Methods, Matrix method and short cut method.

Text Books :

- “Linear Programming and Network Flows” by Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali, John Wiley and Sons, India, 2004, 2nd edition.
- Introduction to Operations Research, Frederick S. Hiller and Gerald J. Lieberman, Tata McGraw Hill, Singapore, 2009, 9th edition.
- Operations Research: An Introduction, Hamdy A. Taha PHI 2006, 8th edition.

Course Outcomes:

On successful completion of this course, students will be able to:

- Develop a transportation model
- Evaluate non- Degeneracy and Degeneracy in transportation Problems
- Explain assignment problem and its mathematical formulation and travelling salesman problem
- Understand concept of two person zero sum games
- Evaluate mixed strategies using linear programming techniques

B.Sc. Physical Science
SEMESTER – VI

SSE 378: Graph Theory

Credits :2

Continuous Evaluation:100 Marks

Definition, examples and basic properties of graphs, pseudo graphs.

Complete graphs, bi-partite graphs, isomorphism of graphs

Paths and circuits Eulerian circuits, Hamiltonian cycles, the adjacency matrix

Weighted graph, Spanning trees, Kruskal's algorithm , Travelling salesman's problem

Shortest path algorithms :Dijkstra's algorithm, Floyd- Warshall algorithm.

Text Books:

Discrete Mathematics with Graph Theory, Edgar G. Goodaire and Michael M. Parmenter,
Pearson Education (Singapore) P. Ltd., Indian Reprint, 2003, 2nd edition.

Applied Abstract Algebra, Rudolf Lidl and Gunter Pilz,
Springer (SIE), Indian reprint, 2004, 2nd edition .

Course Outcomes:

On successful completion of this course, students will be able to:

Define graph and its properties

Explain different types of graphs

Explain Eulerian circuits and Hamiltonian cycles

Understand kruskal's algorithm to find minimum spanning tree

Evaluate problems on Dijkstra's algorithm

**B.Sc. Physical Science
SEMESTER – VI**

SSE 380 : Concepts of Ethical Hacking

Credits :2

Continuous Evaluation:100 Marks

Ethical Hacking overview - Hacking Laws - Footprinting - Google Hacking – Scanning – Enumeration -System Hacking - Trojans and Backdoors -Viruses and Worms - Sniffers - Social Engineering -Denial of Service - Buffer Overflows -Web Servers and Applications - Hacking Wireless Networks - Cryptography - Hacking with Linux - IDS, Firewalls, Honeypots - Penetration Testing.

Text Books:

Hands-On Ethical Hacking and Network Defense – By Michael T. Simpson, Kent Backman, James Corley , Cengage Learning, 2010.

Official Certified Ethical Hacker Review Guide – By Steven DeFino, Barry Kaufman, Nick Valenteen, Cengage Learning, 2009.

The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy By Patrick Egebretonson ,Second Edition 2013.