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:

14.1 A 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.

14.2 A 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:

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

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	≥ 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.

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	20	CE	SE	Total Marks
GEL 131	Communicative English	AECC	2	2	3	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
GEL 131	Communicative English	AECC	2	2	3	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
GEL 131	Communicative English	AECC	2	2	3	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	20	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	100	--	100
SPH 108	Electronic Devices & Circuits	CC	4	0	4	40	60	100
SPH 126	Electronic Devices & Circuits 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, 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	100	--	100
SPH 102	Differential Equations	CC	4	0	4	40	60	100
SPH 120	Differential Equations Tutorial	PPC	2	0	2	100	--	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	100	--	100

III SEMESTER

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

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P	22	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	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 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**	**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								
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**	**21**	**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
GEL131 COMMUNICATIVE ENGLISH

Hours per week: End Examination: 60
2(L) + 2(P) MarksSessionals: 40 M
Credits: 3

Preamble

The course is a unified approach to enhance language skills of learners with an aim to hone their social skills and to increase their employability. The course is designed to acquaint the learners with the necessary LSRW (Listening/ Speaking / Reading/ Writing) skills needed either for recruitment or further studies abroad for which they attempt international exams like TOEFL, IELTS and GRE. It enables the learners improve their communication skills which are crucial in an academic environment as well as professional and personal lives.

Course Objectives

- To enable learners to develop listening skills for better comprehension of academic presentations, lectures and speeches.
- To hone the speaking skills of learners by engaging them in various activities such as just a minute (JAM), group discussions, oral presentations, and role plays.
- To expose learners to key Reading techniques such as Skimming and Scanning for comprehension of different texts.
- To acquaint the learners with effective strategies of paragraph and essay writing, and formal correspondence such as email, letters and resume.
- To provide learners with the critical impetus necessary to forge a path in an academic environment, in the professional life and in an increasingly complex, interdependent world.

UNIT I

LISTENING: Listening for gist and specific information
SPEAKING: Introducing self and others; Developing fluency through JAM
READING: Skimming for gist and Scanning for specific information
WRITING: Paragraph writing-writing coherent and cohesive paragraph (narrative and descriptive); use of appropriate Punctuation.
GRAMMAR & VOCABULARY: Articles &Prepositions;
Word Families (Verbs, Nouns, Adjectives, Adverbs; Prefixes and Suffixes)

Learning Outcomes:

After completion of this unit, the learners will be able to

- Apply the requisite listening skills and comprehend at local and global level. (L4 and L2) (L5)
- Introduce themselves with accurate structure in diverse social and professional contexts. (L3)
- Apply relevant reading strategies for comprehension of any given text(L3)
- Write a paragraph using cohesive devices maintaining coherence (L3)
- Understand the Use of Articles and Prepositions, and apply appropriately for meaningful communication (L3)

Understand the relevance of various categories in word family and apply them meaningfully in context (L3)

UNIT II

LISTENING: Listening for Note taking and Summarizing
SPEAKING: Role plays and Oral Presentations.
READING: Intensive Reading-Reading for implicit meaning
WRITING: Note making and summarizing

GRAMMAR & VOCABULARY: Verb forms-Tenses; synonyms to avoid repetition in speech and writing.
Learning Outcomes:

After completion of this unit, the learners will be able to

- Employ note taking and summarizing strategies to comprehend the listening text (L2)
- Use strategies for successful and relevant oral presentation (L3, L4)
- Demonstrate effective communication skills by applying turn-taking and role distribution techniques for meaningful and contextual Speaking (L3 and L4)
- Apply various reading strategies imbibing inferential and extrapolative comprehension of any given text. (L2, L3)
- Apply various note-making techniques while comprehending the reading text to present a complete and concise set of structured notes (, L3, L4, L5)
- Apply the notes to draft a summary (L3)
- Use correct tense forms and appropriate structures in speech and written communication (L3)
- Context specific use of Prefixes and Suffixes for meaningful communication (L3)

UNIT III
LISTENING: Listening for presentation strategies: introducing the topic, organization of ideas, conclusion.
SPEAKING: Aided presentations
READING: Inferring using textual clues
WRITING: Formal Letter and Email writing
GRAMMAR & VOCABULARY: Active and Passive Voice; linkers and discourse markers.
Learning Outcomes:

After completion of this unit, the learners will be able to

- Notice and understand effective listening strategies to identify discourse markers in presentations. (L1, L2)
- Make formal oral presentations using effective strategies such as audio – visual aids (L3)
- Infer meaning and inter – relatedness of ideas (L4)
- Understand relevant structures and draft formal letters in suitable format (L3, L4)
- Construct relevant sentences in active and passive voice for meaningful communication (L2, L3)
- Comprehend and apply available vocabulary items relevant to the context (L1, L2, L3)

UNIT IV
LISTENING: Listening for labeling-maps, graphs, tables, illustrations
SPEAKING: Aided group presentation using charts, graphs etc.
READING: Reading for identification of facts and opinions
WRITING: Information transfer (writing a brief report based on information from graph/chart/table)
GRAMMAR & VOCABULARY: Subject-verb agreement; language for comparison and contrast; Antonyms
Learning Outcomes:

After completion of this unit, the learners will be able to

- Match visual and auditory inputs and use the information comprehensively and will adequately demonstrate important relationships or patterns between data points (L2)
- choose and coordinate resources appropriate to context and speak intelligibly (L3, L4)
- Develop advanced reading skills for analytical and extrapolative comprehension (L4, L5)
- Make decisions on arrangement of ideas and transfer them from visual to verbal form using context appropriate structure. (L3, L4)
- Demonstrate ability to use task specific grammatically correct structures (L3)

Comprehend and use expressions for negation/contradiction ((L2, L3)

UNIT V

LISTENING: Listening to discussions for opinions

SPEAKING: Group Discussion

READING: Reading for inferences

WRITING**:** Guided Essay Writing (argumentative)

GRAMMAR & VOCABULARY: Editing short texts: correcting common errors in grammar and usage; Action verbs for fluency and effective writing.

Learning Outcomes:

After completion of this unit, the learners will be able to

- Apply analytical and problem-solving strategies to identify and interpret facts and opinions from a dialogue. (L3)
- Able to administer group dynamics to contribute valid ideas to a discussion with clarity and precision (L3)
- Demonstrate techniques to analyze contextual clues(L4)
- Compare and correlate ideas and facts to produce an organized essay with adequate supporting evidences (L4, L5)
- Organize the available structural/grammatical knowledge and apply them in a real time context (L3)
- Comprehend meaning for new words/phrases used and apply them in a new context. (L2, L3)

Course Outcomes

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

- Think critically, analytically, creatively and communicate confidently in English in social and professional contexts with improved skills of fluency and accuracy.
- Write grammatically correct sentences employing appropriate vocabulary suitable to different contexts.
- Comprehend and analyze different academic texts.
- Make notes effectively and handle academic writing tasks such as Paragraph writing and Essay writing.
- Effectively handle formal correspondence like e-mail drafting and letter writing .

Reference Books:

1.Arosteguy, K.O. and Bright, A. and Rinard, B.J. and Poe, M. ***A Student's Guide to Academic and Professional Writing in Education***, UK, Teachers College Press,2019

2.Raymond Murphy, ***English Grammar in Use A Self-Study Reference and Practice Book for Intermediate Learners of English*** : Cambridge University Press;2019

3.Peter Watkins, ***Teaching and Developing Reading Skills***: UK, CUP, 2018

4.Deeptha Achar et al. ***Basic of Academic Writing***. (1and 2) parts New Delhi: Orient BlackSwan. (2012& 2013).

5.Kumar S and Lata P, ***Communication Skills***: New Delhi Oxford University Press, 2015

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, Curvillinear 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

Applying different type of operators and understanding coordinate systems(L2 and L3)

Understand motion of particles and interpret its conservation laws(L2 and L5)

Realize rigid bodies for its equation of motion(L3)

Analyze equation of motion of strings and bars(L4)

Understand the concept of relativity(L2)

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 Continuous Evaluation: 100 Marks
Credits: 2

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-T^2 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:

Enable to determine physical constants estimate with illustration (L4 and L5)

B.Sc. Physical Science
SEMESTER –I

SPH 101: Differential Calculus

Hours per week: 4 End Examination: 60 Marks
Credits: 4 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(l+x), $(l+x)^m$, 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, 9^{th} edition.

B.Sc. Physical Science
SEMESTER –I

SPH 121 Differential Calculus Tutorials

Hours per week: 2 Continuous Evaluation: 100 Marks
Credits: 2

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 theorm

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 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 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:
□Ā□Ā Understand the distribution of currents and voltages in electrical circuits
□Ā□Ā 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, Fluoroscent 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 (L1).

Apply the concept of Kirchhoff laws to solve the circuit currents and **make use of** network theorems (L3).

Understand **what** is the time response of RC networks and **apply** to solve the transient analysis problems (L1 and L3)

Analysis of RLC series and parallel circuit, understand the frequency selection circuit and **Compare** series and parallel resonance (L4 and L5)

Understanding of **How** the CRO works and **make use of** CRO for measuring the frequency voltage and phase of AC (L1 and L3)

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 Continuous Evaluation: 100 Marks
Credits: 2

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 Kirchhof's laws.

Course Outcomes:

Understand **How** Filters work, **classify** the filters **Distinguish** the high pass, low pass filters and Series and parallel resonance (L1, L2 and L3).

Make use of CRO for the AC measurements and **apply** the Kirchhoff's laws and Network theorems to solve the currents and voltages (L3).

Analyze the electrical circuits using network theorems (L4).

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 off 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 matterand 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 ml and ms. 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 ionicbonding, 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 basisof 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'ssynthesis, 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 ill familiarize with the elementary concept of saturated aliphatic hydrocarbons an reactions

UNIT- V

Alkenes: (Upto 5 Carbons)Preparation:Elimination reactions: Dehydration of alkenes anddehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (Partial catalytic hydrogenation) and trans alkenes (Birch reduction). Reactions: cis-addition (alk. KMnO4) and trans-addition (bromine), Addition of HX (Markownikoff's and anti-Markownikoff's addition), Hydration, Ozonolysis.

Alkynes: (Upto 5 Carbons)Preparation:Acetylene from CaC2and conversion into higheralkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides.

Reactions: formation of metal acetylides, addition of bromine and alkaline KMnO4,ozonolysis and oxidation with hot alk. KMnO4.

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 Continous 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 KMnO4.
Estimation of water of crystallization in Mohr's salt by titrating with KMnO4.
Estimation of Fe (II) ions by titrating it with K2Cr2O7 using internal indicator.
Estimation of Cu (II) ions iodometrically using Na2S2O3.

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 Rf 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., Textbookof 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 Continous Evaluation :100 Marks
Credits :2

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

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

□Ā□Ā Write a C++ program to demonstrate Control structures.

□Ā□Ā Write a C++ program to demonstrate operator overloading.

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

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

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

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

□Ā□Ā 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 Continuous Evaluation :100 Marks
Credits: 02

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
Commons 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

B.Sc. Physical Science
SEMESTER –II

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.

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

B.Sc. Physical Science
SEMESTER –II

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 End Examination: 60 Marks
Credits: 4 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

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

UNIT- I

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

Superposition of Harmonic Oscillations: Graphical and Analytical Methods. Lissajous Figures with equal an 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, Frenel's Biprism, determination of wavelength of light, determination of thickness of thin film, Llyod'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)

UNIT- IV **B.Sc. Physical Science**
SEMESTER –II

Diffraction:
Introduction,distinction between Fresnel and Fraunhoffer diffraction, Fraunhoffer 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 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:
Understanding superposition principle and Analyze the relation between inherent parameters of wave(L2 and L4)
Applying and analyze interference of light for optical parameters and construct optical instruments (L3 and L4)
Applying and analyze interference of light for optical parameters and fringes (L3 and L4)
To demonstrate the concept of diffraction and applying to different zones of diffraction (L2 and L3)
To understand polarization of light and utilize to different optical instrument (L2 and L3)

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

UNIT- IV **B.Sc. Physical Science**
SEMESTER –II

SPH 122: Waves and Optics Lab

Hours per week: 4 Continuous Evaluation: 100 Marks
Credits: 2

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:

Enable to determine optical constants, estimate and illustrate (L4 and L5)

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

Hours per week: 4 End Examination: 60 Marks
Credits: 4 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 integratingfactor. 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. Ross3rd Edition, John Wiley and Sons, 1984

Elements of Partial Differential Equations,Ian N Sneddon, International Edition, 1967, Dover Publications.

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

Hours per week: 2 Continuous Evaluation: 100 Marks
Credits: 2

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

Soving 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 currentamplifier.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:

Understanding basics of basic semiconductor physics **Recall** previous knowledge, understand **how** the depletion layer forms and **explanation** capability on the working of different diodes characteristics (L1 and L2)

Understanding the basic construction of semi conductor devices like BJT and FET, **classification** of Devices and **compare** the VI characteristics of BJT and FET in different configurations (L2).

Understand the basic optical devices operation and **how** they work, and how to **make use of** photo electronic devices as sensors and **apply** the knowledge in real time applications (L1, L3).

Understand the **classification** of Rectifiers; identify the merits and demerits of different filters. **Apply** the basic rectifier, **Analyze** and compare the working of SMPS (L2 L4).

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 rune.

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 Continuous Evaluation: 100 Marks
Credits: 2

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:

Understand the characteristics of Basic semiconductor devices and **Analyze** the results (L4)
Make use of IC regulators to **construct** the Regulated power supply (L3 and L4)
Able to **identify** the different kind of semiconductor devices, and can be able to distinguish the input and out characteristics and **analyze** the data to get the h-parapets (L3 and L4)

B.Sc. Physical Science
SEMESTER –II

SPH 106: Chemical Energetics, Equilibria &Functional Organic 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 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 equiribrium 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 Kp, and Kc
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 andsulphonation. 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'sether 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: KNH2/NH3 (or NaNH2/NH3).

Alcohols: Preparation:Preparation of 1^{o}, $2^{o}$and 3^{o}alcohols: using Grignard reagent, Esterhydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters.

Reactions: With sodium, HX (Lucas test), esterification, oxidation (with PCC, alk. KMnO4,acidic dichromate, conc. HNO3). Oppeneauer 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): (Formaldehye, acetaldehyde, acetone andbenzaldehyde)

Preparation: from acid chlorides and from nitriles.

Reactions – Reaction with HCN, ROH, NaHSO3, NH2-G derivatives. Iodoform test.AldolCondensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation.Clemensen reduction and Wolff Kishner reduction.Meerwein-Pondorff 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. & Dnyder, 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 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: 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 lear 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., Textbookof 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 Continuous Evaluation: 100 Marks
Credits: 2

Write a C++ program to convert a sentence from lower case to 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 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 | End Examination: 60 Marks
Credits: 4 | 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-Carnnot's engine and its efficiency-Carnot's theorem-Second law of thermodynamics. Kelvin's and Claussius 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 Carnnot'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:

Understanding molecular speed distribution and transport in gases. (L2)
Understanding basic concepts in thermodynamics and solve basic equations (L2 and L3)
Understanding and applying Maxwell thermodynamic relations and examine temperature change by using Joule – Kelvin effect(L2 and L4)
Understanding and measure energy spectrum emitted by black body.(L2 and L5)
Understanding basic concepts of statistical thermodynamics and analyzing the average distribution of non-interacting material particles (L2 and L4)

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 Continuous Evaluation: 100 Marks
Credits: 2

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:

Enable to determine thermo dynamical constants, analyze and illustrate (L4 and L5)

B.Sc. Physical Science
SEMESTER –III

SPH 201: Real Analysis

Hours per week: 4 End Examination: 60 Marks
Credits: 4 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 R, Archimedean property of 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 anddifferentiability 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:
Ä□Ā□Ā□ To design combinational circuits
Ä□Ā□Ā□ 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:

Learn the number systems in digital systems (L2)

Acquire the knowledge on simplification gates (L5)

Learn about the designing of combinational circuits (L4)

Learn about the designing of sequential circuits (L4)

Learn the basics of organization of memory devices (L3)

Textbooks:

R.P. Jain, "Modem digital Electronics", 3rd Edition, TMH, 2003.

Puri, V.K., Digital Electronics, Tata McGraw Hill,2nd Edition,2011

Marris 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 Continuous Evaluation: 100 Marks
Credits: 2

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 of7490 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 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 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 kolhlrausch 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 – Vohlard - Zelinsky Reaction.

Carboxylic acid derivatives (aliphatic): (Upto 5 carbons)
Preparation: Acid chlorides, Anhydrides, Esters and Amides from acids and theirinterconversion.
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 Bromamidereaction.
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 nd reactions 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 –NH2group, complexationwith Cu^{2+} 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 amono acids and concept of proteins.

UNIT-V

Carbohydrates: Classification, and General Properties, Glucose and Fructose (open chainand cyclic structure), Determination of configuration of monosaccharides, absolute configuration of Glucose and Fructose, Mutarotation, ascending and descending in monosaccharides. Structure of disacharrides (sucrose, cellobiose, maltose, lactose) and polysacharrides (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 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 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:

$I_2(aq) + I^-(aq)\ I_3^-(aq)$

$Cu^{2+}(aq) + xNH_2(aq)\ [Cu(NH_3)_x]^{2+}$

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 possessingmonofunctional 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.,
Textbookof 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 Krushkl's, Prims 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, Horners 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 Horners rulw 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 Continuous Evaluation: 100 Marks
Credits: 2

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 solidblock, volume of cylindrical beaker/glass, diameter of a thin wire, thickness of metalsheet, 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 weldingdefects. Common materials used for manufacturing like steel, copper, iron, metal sheets,composites and alloy, wood. Concept of machine processing, introduction to commonmachine tools like lathe, shaper, drilling, milling and surface machines.Cutting tools,lubricating oils.Cutting of a metal sheet using blade.Smoothening of cutting edge ofsheet 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 circuitshaving discrete components (R, L, C, diode) and ICs on PCB. Operation of oscilloscope.Making regulated power supply. Timer circuit, Electronic switch using transistor andrelay.

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

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

Will demonstrate and compare various measuring methods with respective methods(L2)

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. Conceptof 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, Complexometrictitrations, 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 foodpreservations 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, paperchromatography, 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 hoe 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 ant aliasing
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

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

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

Understand capacitor its types and analyze to the potential of a capacitor.(L2 and L4)

Construct dielectrics, capacitors with dielectrics and particle accelerators (L3)

Explain mutual relation between electric and magnetic fields (L2)

Interpret and examine RLC circuits with battery connected and battery disconnected(L2 and L4)

- Extend Maxwell's equations of electromagnetic theory and examine electromagnetic wave equation for the transfer of electromagnetic energy.(L2 and L4)

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 Continuous Evaluation: 100 Marks
Credits: 2

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:

Enable to analyze, determine electrical quantities with illustration (L4 and L5)

B.Sc. Physical Science
SEMESTER –IV

SPH 202: Algebra

Hours per week: 4 End Examination: 60 Marks
Credits: 4 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 – aultomorphism 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 Isomporphism
- Define Kernal 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 Learning 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 Continuous Evaluation: 100 Marks
Credits: 2

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 Learning 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:

Learn the basics of Op Amps (L3)
Understands the applications of Op Amps (L2)
Analyze the combinational and sequential circuits (L6)
Learn about the types and operation of data converters ((L4)
Understand the interfacing concepts of digital systems (L2)

Text Books:

G.K.Kharate - Digital electronics-Oxford university press
Floyd Thomas L Digital FundamenZtals 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.Schillling, 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 Continuous Evaluation: 100 Marks
Credits: 2

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.

O**bjective:** 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 ill 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 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 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 : $NH4^{+}$, Pb^{2+}, Ag^{+}, Bi^{3+}, Cu^{2+}, Cd^{2+}, Sn^{2+}, Fe^{3+}, Al^{3+}, Co^{2+}, Cr^{3+}, Ni^{2+}, Mn^{2+}, Zn^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, K^{+}
Anions : $CO3^{2-}$, S^{2-}, SO^{2-}, $S2O3^{2-}$, $NO3^{-}$, $CH3COO^{-}$, Cl^{-}, Br^{-}, I^{-}, $NO3^{-}$,$SO4^{2-}$, $PO4^{3-}$, $BO3^{3-}$,$C2O4^{2-}$, F^{-}
(Spot tests should be carried out wherever feasible)

- Estimate the amount of nickel present in a given solution as bis(dimethylglyoximato) nickel(II) or aluminium as oximate in a given solution gravimetrically.
- Draw calibration curve (absorbance at λmax 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 Fe^{3+}-salicylic acid complex solution by Job's method.
- Estimation of (i) Mg^{2+} or (ii) Zn^{2+} 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 H_2SO_4 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.Dhamdhere, Tata Mcgraw-Hill, 2nd Edition, 2007.

B.Sc. Physical Science
SEMESTER –IV

SPH 228: Operating Systems Lab

Hours per week: 4 Continuous Evaluation: 100 Marks
Credits: 2

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:

Enables to compare various radiation, its methods for detection and safety (L2)