SRI SANKARA ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

ENATHUR, KANCHIPURAM - 631561

B.Sc., PHYSICS

REGULATION & SYLLABUS

(Effective from the academic year 2022 – 2023)

Choice Based Credit System

UNIVERSITY OF MADRAS

SRI SANKARA ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

B.Sc., PHYSICS

(Effective from the academic year 2022 – 2023)

REGULATIONS

Choice based credit system.

1.DURATION OF THE PROGRAME

1.1. Three years (six semesters)

1.2. Each academic year shall be divided into two semesters. The odd semesters shall consist of the period from June to November of each year and the even semesters from December to April of each year.

1.3 There shall be not less than 90 working days for each semester.

2. ELIGIBILITY FOR ADMISSION

B.Sc., Physics – Pass in +2 with Physics and Mathematics as subjects

3. CREDIT REQUIREMENTS AND ELIGIBILITY FOR AWARD OF DEGREE

3.1. A Candidate shall be eligible for the award of the degree only if he/she has undergone the prescribed course of study in a College affiliated to the University for a period of not less than three academic years and passed the examinations of all the Six Semesters prescribed earning a minimum of

3.2. 140 credits as per the distribution given in Regulation 4 for PartI, II, III, IV& V and also fulfilled such other conditions as have been prescribed there of.

4. COURSE OF STUDY, CREDITS AND SCHEME OF EXAMINATION

4.1. The Course Components and Credit Distribution shall consist of the following:(Minimum Number of Credits to be obtained)

Course Component	Name of the Course	Credits
PART I	Tamil or Other Languages	**12**
PART II	English	**12**
PART III	Core Courses	**60**
	Allied Courses	**20**
	Project/ Three Elective Courses	**15**
PART IV	i. Basic Tamil/ Advanced Tamil/ NME	**04**
	ii. Soft Skill Courses	**12**
	iii. Environmental Studies	**02**
	iv. Value Education	**02**
PART V	Extension Activities	**01**
Total Credits		**140**

4.2. DETAILS OF COURSE OF STUDY OF PARTS I – V

4.2.1 PART I: Tamil and Other Languages: Tamil or Sanskrit any one of the following at the option of candidates and according to the syllabus and text-books prescribed from time to time:

4.2.2 PART II: English: According to the syllabus and text-books prescribed from time to time

4.2.3 PART III: Core, Allied and Project/Three Elective Courses: As prescribed by the concerned Board of Studies

4.2.4 PART IV:

i. **Basic Tamil/ Advanced Tamil/ NME:**

a. Students who have not studied Tamil up to XII STD and have taken any Language other than Tamil in Part I shall take Basic Tamil comprising of Two Courses (level will be at 6th Standard).

b. Students who have studied Tamil up to XII STD and have taken any Language other than Tamil in Part I shall take Advanced Tamil comprising of Two Courses.

c. Students who have studied Tamil up to XII STD and also have taken Tamil in Part I shall take Non-Major Elective comprising of TwoCourses.

ii. **Soft Skill Courses**

iii. **Environmental Studies**

iv. **Value Education**

4.2.5 PART V: Extension Activities:

Students shall be awarded a maximum of 1 Credit for Compulsory Extension Service. All the Students shall have to enroll for NSS /NCC/ NSO (Sports & Games) Rotract / Youth Red Cross or any other Service Organizations in the College and shall have to put in compulsory minimum attendance of 40 hours which shall be duly certified by the Principal of the College before 31st March in a year. If a student lacks 40 hours attendance in the first year, he or she shall have to compensate the same during the subsequent years.

Those students who complete minimum attendance of 40 hours in one year will get 'half-a- credit and those who complete the attendance of 80 or more hours in Two Years will get 'one credit'. Literacy and Population Education and Field Work shall be compulsory components in the above extension service activities.

4.2.6 Scheme of Examinations

Course Component Name of the course	Inst. Hour	Credits	Exam Hours	Max. Marks		
				Ext. mark	Int. mark	Total
PART-I **Language**				**75**	**25**	**100**
PART-II **English**				**75**	**25**	**100**
PART-III **Core subject:**				**75**	**25**	**100**
Core Subject				**75**	**25**	**100**
Allied Subject				**75**	**25**	**100**
PART – IV 1.(a) Those who have not studied Tamil up to XII Std. and taken a Non-Tamil Language under Part-I shall take Tamil comprising of two course (level will be at 6th Standard). (b) Those who have studies Tamil up to XII Std. and taken a Non-Tamil Language under Part-I shall take Advanced Tamil comprising of two courses. (c) Others who do not come under a + b can choose non-major elective comprising of two courses.						
2*Skill based subjects (Elective) – (Soft Skill)						

4.3. Inclusion of the Massive Open Online Courses (MOOCs) available on SWAYAM, NPTEL and other such portals approved by the University Authorities.

4.3.1

The Chairperson, Board of Studies consider the available MOOCs and choose the courses to be included under Core, Elective and Soft Skill category and also the number of credits for such courses based on the content and duration of course. The credit for such courses shall be included as part of the Core, Elective and Soft Skill to award the Degree. The number of credits will be decided at the University level for such courses which are relevant to more than one department such as soft skills and elective courses.

INSTRUCTIONAL (TEACHING) HOURS

5.1 For First, Second, Third and Fourth semesters:

Course	**B. Sc Physics**
Language	4 + 2 hours *****
English	4 + 2 hours **@**
Core Course I	5 hours Theory 3hours Practical
Allied Course	5 hours Theory 3 hours Practical
NME Course	2 hours
Total	30 hours

***** 2 hours for Part IV Basic Tamil/ Advanced Tamil/ Non-Major Elective Courses

@ 2 hours for Soft Skills Courses.

5.2 For Fifth and Six Semesters:

Course	**B.Sc Physics**
Core Course (each)	6 hours
Elective Course (each)	5 hours

5. REQUIREMENTS FOR PROCEEDING TO SUBSEQUENT SEMESTER

6.1 Eligibility: Students shall be eligible to go to subsequent semester only if they earn sufficient attendance as prescribed therefor by the Syndicate from time to time.

6.2 Attendance: All Students must earn 75% and above of attendance for appearing for the University Examination. (Theory/Practical)

6.3 Condonation of shortage of attendance: If a Student fails to earn the minimum attendance (Percentage stipulated), the principals shall condone the shortage of attendance up to a maximum limit of 10% (i.e. between 65% and above and less than 75%) after collecting the prescribed fee of Rs.250/-each for Theory/Practical examination separately, (Theory Rs.250/- Per semester/Per Student: Practical Rs.250/- Per semester/Per Student) towards the condonation of shortage of attendance. Such fees collected and should be remitted to the University.

6.4 Non-eligibility for condonation of shortage of attendance: Students who have secured less than 65% but more than 50 %of attendance are NOT ELIGIBLE for condonation of shortage of attendance and such Students will not be permitted to appear for the regular examination, but will be allowed to proceed to the next year/next semester of the program and they may be permitted to take next University examination by paying the prescribed condonation fee of Rs.250/- each for Theory/Practical separately. Such fees shall be remitted to the University. Name of such Students should be forwarded to the University along with their attendance details in the prescribed format mentioning the category (3 copies) Year wise/Branch wise/Semester wise together with the fees collected from them, so as to enable them to get permission from the University and to attend the Theory/Practical examination subsequently without any difficulty.

6.5 Detained students for want of attendance: Students who have earned less than 50% of attendance shall be permitted to proceed to the next semester and to complete the Program of study. Such Students shallhave to repeat the semester, which they have missed by rejoining after

completion of final semester of the course, by paying the fee for the break of study asprescribed by the University from time to time.

6.6 Condonation of shortage of attendance for married women students: In respect of married women students undergoing UG programs, the minimum attendance for condonation (Theory/Practical) shall be relaxed and prescribed as 55% instead of 65% if they conceive during their academic career**.** Medical certificate from the Doctor(D.G.O) attached to the Government Hospital and the prescribed fee of Rs.250/-therefor together with the attendance details shall be forwarded to the principal to consider thecondonation of attendance mentioning the category.

6.7 Zero Percent (0%) Attendance: The Students, who have earned 0% of attendance, have to repeat the program (by rejoining) without proceeding to succeeding semester and they have to obtain prior permission from the University immediately to rejoin the program.

6.8 Transfer of Students and Credits: The strength of the credits system is that it permits inter Institutional transfer of students. By providing mobility, it enables individual students to develop their capabilities fully by permitting them to move from one Institution to another in accordance with their aptitude and abilities.

6.8.1 Transfer of Students is permitted from one Institution to another Institution for the same program with same nomenclature.

Provided, there is a vacancy in the respective program of Study in the Institution where the transfer is requested.

Provided the Student should have passed all the courses in the Institution from where the transfer is requested.

6.8.2 The marks obtained in the courses will be converted and grades will be assigned as per the University norms.

6.8.3 The transfer students are eligible for classification.

6.8.4 The transfer students are not eligible for Ranking, Prizes and Medals.

6.8.5 Students who want to go to foreign Universities upto two semesters or Project Work with the prior approval of the

Departmental/College Committee are allowed to get transfer of credits and marks which will be converted into Grades as per the University norms and are eligible to get CGPA and Classification; they are not eligible for Ranking, Prizes and Medals.

6.9 Students are exempted from attendance requirements for online courses of the University and MOOCs.

6. EXAMINATION AND EVALUATION

7.1 Register **for all subjects:** Students shall be permitted to proceed from the First Semester up to Final Semester irrespective of their failure in any of the Semester Examination. For this purpose, Students shall register for all the arrear subjects of earlier semesters along with the current (subsequent) Semester Subjects.

7.2 Marks for Internal and End Semester Examinations for PART I, II, III, and IV

Category	Theory	Practical
Internal Assessment	25	40
End semester (University) Examination	75	60

7.3 Procedure for Awarding Internal Marks

Course	Particulars	Marks
Theory Papers	Tests (2 out of 3)	10
	Attendance	05
	Seminars	05
	Assignments	05
	Total	**25**
Practical Papers	Attendance	05
	Test best 2 out of 3	30
	Record	05
	Total	**40**

7.4 (i) Awarding Marks for Attendance (out of 5)

Attendance below 60% = 0 marks, 60 % to 75% = 3 marks,

75 % to 90% = 4 marks and above 90%= 5 marks

(ii) Conducting Practical and Project Viva-voce Examination:

By Internal and External Examiners

7.4.1 Improvement of Internal Assessment Marks.

a. Should have cleared end-semester University examination with more than 40 % Marks in UG.
b. Should have obtained less than 30 % marks in the Internal Assessment.
c. Should be permitted to improve internal assessment within N+2 years where N is denoted for number of years of the programme.
d. Chances for reassessment will be open only for 25% of all core courses in colleges and only one chance per course will be given.
e. The principal will decide based on the request for reassessment and designate a faculty member of the department to conduct the examination and evaluation.
f. The reassessment may be based on a written test / assignment or any other for the entire internal assessment marks.
g. The candidate must register for examination in the on- line system along with prescribed examination fee for that course.

7.5 Question Paper Pattern for End Semester (University) Examination

SECTION-A			
10 questions out of 12 Questions	30 words	10 X 2	20 Marks
SECTION-B			
5 questions out of 7 Questions	200 words	5 X 5	25 Marks
SECTION – C			
3 questions out of 5 Questions	500 words	3 X 10	30 Marks
Total			**75 Marks**

7.6 PASSING MINIMUM

7.6.1 There shall be no passing minimum for Internal.

7.6.2 For external examination, passing minimum shall be 40% [Forty Percentage] of the maximum marks prescribed for the paper for each Paper/Practical/Project and Viva-Voce.

7.6.3 In the aggregate [External/Internal] the passing minimum shall be of 40%.

7.6.4 He/She shall be declared to have passed the whole examination, if he/she passes in all the papers and practical wherever prescribed as per the scheme of the examinations by earning **140 CREDITS** in Part I, II, III, IV & V. He/she shall also fulfil the extension activities prescribed earning a minimum of 1 credit to qualify for the Degree.

7.7 INSTANT EXAMINATION: Instant Examinations is conducted for the students who appeared in the final semester examinations. Eligible criteria for appearing in the Instant Examinations are as follows:

7.7.1 Eligibility: A Student who is having arrear of only one theory paper in the current final semester examination of the UG Degree programme alone is eligible to appear for the Instant Examinations.

7.7.2 Non-eligibility for one arrear paper: A Student who is having more than one arrear paper at the time of publication of results is not eligible to appear for the Instant Examinations.

7.7.3 Non-eligibility for arrear in other semester: Student having arrear in any other semester is not eligible and a student who is absent in the current appearance is also not eligible for appearing for the Instant Examinations and those Student who have arrear in Practical/Project are not eligible for the Instant Examinations.

7.7.4 Non-eligibility for those completed the program: Students who have completed their Program duration but having arrears are not eligible to appear for Instant Examinations.

7.8 RETOTALLING, REVALUATION AND PHOTOCOPY OF THE ANSWER SCRIPTS:

7.8.1. Re-totaling: All UG Students who appeared for their Semester Examinations are eligible for applying for re-totaling of their answer scripts.

7.8.2. Revaluation: All current batch Students who have appeared for their Semester Examinations are eligible for Revaluation of their answer scripts. Passed out candidates are not eligible for Revaluation.

7.8.3. Photocopy of the answer scripts: Students who have applied for revaluation can download their answer scripts from the University Website after fifteen days from the date of publication of theresults.

7.9 The examination and evaluation for MOOCs will be as per the requirements of the Courses and will be specified at the beginning of the Semester in which such courses are offered and will be notified by the University

7. CLASSIFICATION OF SUCCESSFUL STUDENTS

8.1 PART I TAMIL / OTHER LANGUAGES; PART II ENGLISH AND PART III CORE SUBJECTS, ALLIED, ELECTIVES COURSES AND PROJECT: Successful Students passing the Examinations for the Part I, Part II and Part III courses and securing the marks (a) 60 percent and above and (b) 50 percent and above but below 60 percent in the aggregate shall be declared to have passed the examination in the **FIRST and SECOND** class respectively; all other successful candidates shall be declared to have passed the examination in the **THIRD Class.**

9. MARKS AND GRADES: The following table shows the marks, grade points, letter grades and classification to indicate the performance of the student:

RANGE OF MARKS	**GRADE POINTS**	**LETTER GRADE**	**DESCRIPTION**
90-100	9.0-10.0	O	Outstanding
80-89	8.0-8.9	D+	Excellent
75-79	7.5-7.9	D	Distinction
70-74	7.0-7.4	A+	Very Good
60-69	6.0-6.9	A	Good
50-59	5.0-5.9	B	Average
40-49	4.0-4.9	C	Satisfactory
00-39	0.0	U	Re-appear
ABSENT	0.0	AAA	ABSENT

9.1 Computation of Grade Point Average (GPA) in a Semester, Cumulative Grade Point Average (CGPA) and Classification

GPA for a Semester: = $\sum iCiGi \div \sum iCi$

That is, GPA is the sum of the multiplication of grade points by the credits of the courses divided by the sum of the credits of the courses in a semester.

CGPA for the entire programme: = $\sum n\sum iCniGni \div \sum n\sum iCni$

That is, CGPA is the sum of the multiplication of grade points by the credits of the entire programme divided by the sum of the credits of the courses of the entireprogramme

Where, Ci= Credits earned for course i in any semester,

Gi = Grade Points obtained for course i in any semester n = Semester in which such courses were credited.

9.2 Letter Grade and Class

CGPA	GRADE	CLASSIFICATION OF FINAL RESULT
9.5-10.0	O +	First Class - Exemplary *
9.0 and above but below 9.5	O	
8.5 and above but below 9.0	D + +	First Class with Distinction *
8.0 and above but below 8.5	D +	Excellent
7.5 and above but below 8.0	D	Distinction
7.0 and above but below 7.5	A + +	First Class
6.5 and above but below 7.0	A +	
6.0 and above but below 6.5	A	
5.5 and above but below 6.0	B +	Second Class
5.0 and above but below 5.5	B	
4.5 and above but below 5.0	C +	Third Class
4.0 and above but below 4.5	C	
0.0 and above but below 4.0	U	Re-appear

*****The Students who have passed in the first appearance and within the prescribed semester of the UG Programme (Major, Allied and Elective courses only) are eligible.

10. RANKING

Students who pass all the examinations prescribed for the Program in the **FIRST APPEARANCE ITSELF ALONE** are eligible for Ranking / Distinction, provided in the case of Students who pass all the examinations prescribed for the Program with a break in the First Appearance due to the reasons as furnished in the Regulations **6** supra are only eligible for Classification.

11. CONCESSIONS FOR DIFFERENTLY-ABLED STUDENTS

11.1 Dyslexia students: For students who are mentally disabled, learning disability and mental retardation, who are slow learners, who are mentally impaired having learning disorder and seizure disorder and students who are spastic and cerebral Palsy, the following concessions shall be granted:

i) Part I Foundation course Tamil or any other Language can be exempted.

ii) One-third of the time of paper may be given as extra time in the examination.

iii) Leniency in overlooking spelling mistakes, and

iv) Amanuensis for all courses provided the request is duly certified by the Medical Board of the Government Hospital/ General Hospital/ District headquarters Hospitals and they shall be declared qualified for the degree if they pass the otherexaminations prescribed for the degree.

11.2 Hearing, Speaking Impaired & Mentally retarded: For students who are hearing and speaking impaired and who are mentally challenged, the following concessions shall be granted:

i) One Language paper either Part I Foundation course Tamil or any other Language or Part II English or its equivalent can be exempted

ii) Part IV Non-Major Elective (NME) or Basic Tamil or Advanced Tamil can be exempted.

11.3 Visually Challenged students:

i) Exempted from paying examination fees.

ii) A scribe shall be arranged by the College and the scribe be paid as per the College decision.

12. MAXIMUM PERIOD FOR COMPLETION OF THE PROGRAMS TO QUALIFY FOR A DEGREE

12.1 A Student who for whatever reasons is not able to complete the **program** within the normal period (N) or the Minimum duration prescribed for the programme, may be allowed two years period beyond the normal period to clear the backlog to be qualified for the degree. (Time Span = N + 2 years for the completion of programme.)

12.2 In exceptional cases like major accidents and child birth an extension of one year be considered beyond maximum span of time (Time Span = N + 2n+1 years for the completion of programme).

12.3 Students qualifying during the extended period shall not be eligible for **RANKING.**

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UNIVERSITY OF MADRAS

SRI SANKARA ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

B.Sc., PHYSICS

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SYLLABUS

FIRST SEMESTER

S.NO	Name of the subject	Ins. Hours	Credit	Exam hours	External Mark	Internal mark	Total
1	Part I - Tamil - I / Sanskrit – I	**4**	**3**	**3**	**75**	**25**	**100**
2	Part II - English – I	**4**	**3**	**3**	**75**	**25**	**100**
3	Part III - Properties of Matter and Sound	**6**	**4**	**3**	**75**	**25**	**100**
4	Part III - Physics Practical – I	**3**		****			
5	Part III - Mathematics – I (Allied)	**9**	**5**	**3**	**75**	**25**	**100**
6	Part IV - Basic Tamil I (or) Non-Major Elective – Everyday Physics	**2**	**2**	**3**	**75**	**25**	**100**
7	Part IV - Soft Skill - Essentials of language and communication level-I	**2**	**3**	**3**	**75**	**25**	**100**
	TOTAL	**30**	**20**	**3**	**450**	**150**	**600**

**** Practical examination at the end of the even semester**

SECOND SEMESTER

S.NO	Name of the subject	Ins. Hours	Credit	Exam hours	External Mark	Internal mark	Total
1	Part I - Tamil II - / Sanskrit – II	**4**	**3**	**3**	**75**	**25**	**100**
2	Part II - English – II	**4**	**3**	**3**	**75**	**25**	**100**
3	Part III – Heat and Thermal Physics	**6**	**4**	**3**	**75**	**25**	**100**
4	Part III - Physics Practical – I	**3**	**4**	**3**	**60**	**40**	**100**
5	Part III - Mathematics - II (Allied)	**9**	**5**	**3**	**75**	**25**	**100**
6	Part IV - Basic Tamil II (or) Part IV - Non-Major Elective – Physics of everyday life	**2**	**2**	**3**	**75**	**25**	**100**
7	Part IV - Soft Skill – Essentials of language and communication level – II	**2**	**3**	**3**	**75**	**25**	**100**
	TOTAL	**30**	**24**	**3**	**510**	**190**	**700**

**** Practical examination at the end of the even semester**

THIRD SEMESTER

S.NO	Name of the subject	Ins. Hours	Credit	Exam hours	External Mark	Internal mark	Total
1	Part I - Tamil - III / Sanskrit - III	**4**	**3**	**3**	**75**	**25**	**100**
2	Part II - English – III	**4**	**3**	**3**	**75**	**25**	**100**
3	Part III - Mathematical Methods in Physics	**6**	**4**	**3**	**75**	**25**	**100**
4	Part III - Physics Practical – II	**3**		****			
5	Part III - Chemistry – I (Allied)	**6**	**3**	**3**	**75**	**25**	**100**
6	Part III - Allied Practical	**3**		****			
7	Part IV - Computing Skill level - I	**2**	**3**	**3**	**75**	**25**	**100**
8	Part IV – Environmental studies*	**2**					
	TOTAL	**30**	**16**	**3**	**375**	**125**	**500**

*Examination will be held only in IV semester

**** Practical examination at the end of the even semester**

FOURTH SEMESTER

S.NO	Name of the subject	Ins. Hours	Credit	Exam hours	External Mark	Internal mark	Total
1	Part I - Tamil - IV / Sanskrit - IV	**4**	**3**	**3**	**75**	**25**	**100**
2	Part II - English – IV	**4**	**3**	**3**	**75**	**25**	**100**
3	Part III – Mechanics	**6**	**4**	**3**	**75**	**25**	**100**
4	Part III - Physics Practical – II	**3**	**4**	**3**	**60**	**40**	**100**
5	Part III - Chemistry – II (Allied)	**6**	**3**	**3**	**75**	**25**	**100**
6	Part III - Allied Practical	**3**	**4**	**3**	**60**	**40**	**100**
7	Part IV - Computing skills level - II	**2**	**3**	**3**	**75**	**25**	**100**
8	Part IV – Environmental studies*	**2**	**2**	**3**	**75**	**25**	**100**
	TOTAL	**30**	**26**	**3**	**570**	**230**	**800**

FIFTH SEMESTER

S.NO	Name of the subject	Ins. Hours	Credit	Exam hours	External Mark	Internal mark	Total
1	Part III - Optics and Spectroscopy	**5**	**4**	**3**	**75**	**25**	**100**
2	Part III - Electricity and Electromagnetism	**5**	**4**	**3**	**75**	**25**	**100**
3	Part III - Quantum Mechanics	**5**	**4**	**3**	**75**	**25**	**100**
4	Part III - Basic Electronics	**5**	**4**	**3**	**75**	**25**	**100**
5	Part III - Physics Practical – III	**2**		**			
6	Part III - Physics Practical – IV	**2**		**			
7	Part III - Physics Practical – V (Elective Practical)	**2**		**			
8	Part III - Elective 1A - Numerical Methods (OR) 1B – Problem solving in Physics (OR) 1C – Geo Physics	**4**	**5**	**3**	**75**	**25**	**100**
9	Part IV - Value Education		**2**		**75**	**25**	**100**
	TOTAL	**30**	**23**	**3**	**450**	**150**	**600**

**** Practical examination at the end of the even semester**

SIXTH SEMESTER

S.NO	Name of the subject	Ins. Hours	Credit	Exam hours	External Mark	Internal mark	Total
1	Part III - Atomic Physics and Laser	**5**	**4**	**3**	**75**	**25**	**100**
2	Part III - Nuclear and Radiation Physics	**5**	**4**	**3**	**75**	**25**	**100**
3	Part III - Solid State Physics	**5**	**4**	**3**	**75**	**25**	**100**
4	Part III - Physics Practical – General	**2**	**4**	**3**	**60**	**40**	**100**
5	Part III - Physics Practical – Basic Electronics	**2**	**4**	**3**	**60**	**40**	**100**
6	Part III – Elective Practical – Applied Electronics & Microprocessor 8085	**2**	**4**	**3**	**60**	**40**	**100**
7	Part III - Elective 2A - Integrated Electronics (OR) 2B – Medical Physics (OR) 2C – Fiber Optics	**4**	**3**	**3**	**75**	**25**	**100**
8	Part III - Elective 3A - Microprocessor 8085 and Microcontroller (OR) 3B – Astro Physics (OR) 3C – Weather Forecasting	**4**	**3**	**3**	**75**	**25**	**100**
9	Part V - Extension Activities	**1**	**1**		**100**	**-**	**100**
	TOTAL	**30**	**31**	**3**	**655**	**245**	**900**

**** Practical examination at the end of the even semester.**

Total Credits = 20 + 24 + 16 + 26 + 23 + 31 = 140 Credits

Core Paper Theory – I				
Title of the paper	**Properties of Matter and Sound**			
Category of the course	Year	Semester	Credits	L T P E
Core	I	I	4	60 15 - 15
Pre- requisites	Knowledge of mechanics at higher secondary level			
Objectives of the course	To introduce the students to various motion of the system and acoustics of buildings			

Course focus on: Employability

Properties of Matter and Sound Course outcome

CO1: This course provides the student to analyse the strength of materials in terms of their size and shape.
CO2: This course provides the knowledge about the different experiment techniques to calculate the bending of beams.
CO3: Understand the fluid dynamics that gives the fundamental knowledge over many practical applications
CO4: Provides a fundamental understanding of waves and oscillations.
CO5: This course provides the basic principles of acoustics.

	CO-1	**CO-2**	**CO-3**	**CO-4**	**CO-5**
Unit-1	√				
Unit-2		√			
Unit-3	√		√		
Unit-4				√	
Unit-5		√			√

UNIT-I: ELASTICITY

Hooke's Law – Stress–Strain diagram –Elastic constants –Poisson's ratio – Relation between elastic constants and Poisson's ratio – Work done in stretching and twisting a wire – Twisting couple on a cylinder -Rigidity modulus by Static torsion– Torsional pendulum (with and without masses)

UNIT-II: BENDING OF BEAMS

Cantilever– Expression for Bending moment – Expression for depression at the loaded end of the cantilever–Oscillations of a cantilever – Expression for time period-Experiment to find Young's Modulus – Non-Uniform bending– Experiment to determine Young's Modulus by Koenig's method- Uniform Bending-Expression for elevation-Experiment to determine Young's Modulus using microscope

UNIT-III: FLUID DYNAMICS

Surface tension: Definition – Molecular forces– Excess pressure over curved surface – Application to Spherical and Cylindrical Drops and Bubbles-Variation of Surface Tension with Temperature —Jaegar's method.

Viscosity: Definition-Streamline and Turbulent motion – Rate of flow of liquid in a capillary tube-Poiseuille's formula –Corrections-Terminal Velocity and Stoke's formula– Variation of Viscosity of a liquid with Temperature

UNIT-IV: WAVES AND OSCILLATIONS

Simple Harmonic Motion – Differential Equation of SHM – Graphical representation of SHM – Composition of two S.H.M in a straight line-at right angles-Lissajous's figures-Free, Damped, Forced vibrations -Resonance and Sharpness of resonance. Laws of transverse vibration of strings- Sonometer-Determination of AC frequency using sonometer - Determination of frequency using Melde's apparatus.

UNIT-V: ACOUSTICS OF BUILDINGS AND ULTRASONICS

Intensity of sound – Decibel – Loudness of sound –Reverberation – Sabine's reverberation formula – Acoustic Intensity - Acoustics aspects of halls and auditoriums – Factors affecting the Acoustics of Buildings. Ultrasonic waves – Production of Ultrasonic Waves – Piezoelectric crystal method – Magnetostriction effect – Application of Ultrasonic Waves.

Books for Study:

1. Elements of Properties of Matter, D. S Mathur, S. Chand & Co (2010)
2. Properties of Matter, BrijLal and N. Subrahmanyam, S. Chand and Co (2003)
3. A Text Book of Sound, BrijLal and N. Subrahmanyam, Vikas Publishing House – Second revised edition (1995)
4. Properties of Matter ,R. Murugeshan, S. Chand & Co., New Delhi (2017).
5. Brijlal & N. Subramanyam, 'A Text Book of Sound', Vikas Publishing. Pvt. Ltd, 2008

Books for Reference:

1. Physics for Degree students, Volume – 2, C. L. Arora & P. S. Hemne, S. Chand & Company, 2019.
2. Refresher course in Physics, Volume – 1, C. L. Arora, S. Chand & Company, 2019.

3. Mechanics and General Properties of Matter by P.K. Chakrabarthy, Books and Allied (P) Ltd. (2001).
4. R.L. Saihgal, A Text Book of Sound, S. Chand & Co. Pvt. Ltd, New Delhi, 1979.
5. Feynman, Lectures on Physics. Vol. I & II by Richard P. Feynman, The New Millennium Edition, 2012.

Core Paper Practical – I				
Title of the paper	**Physics Practical - 1**			
Category of the course	Year	Semester	Credits	L T P E
Core	I	I & II	4	- - 30 15
Pre- requisites	Knowledge of basic measurements			
Objectives of the course	To motivate and educate the students to acquire skill in physics Experiments.			

Course focus on: Skill Development

Physics Practical-I Course outcome:

CO 1: Students can learn the modulus of elasticity through different experimental techniques.

CO 2: This course helps to understand the phenomena of simple harmonic motion and the properties of systems executing such motions

CO 3: Students got an idea about the different methods of young's modulus of the given material.

1. Measurement of length (or diameter) using Vernier calipers, Screw gauge and Travelling microscope.
2. Young's modulus – Non-uniform Bending – Pin and microscope.
3. Young's modulus – Uniform Bending – Scale and Telescope
4. Rigidity modulus – Torsional pendulum (without symmetrical masses)
5. Rigidity modulus and Moment of Inertia – Torsional pendulum (With symmetric masses)
6. Surface Tension and Interfacial Surface Tension – Drop Weight Method
7. Coefficient of Viscosity of Liquid – Graduated Burette (radius of capillary tube by Mercury pellet method).
8. Sonometer–Frequency of Tuning Fork
9. Sonometer – Relative Density of a Solid and Liquid
10. Cantilever – Scale and Telescope – Determination of Young's Modulus
11. Static Torsion – Determination of Rigidity Modulus
12. Focal length, Power, R and Refractive Index of a long Focus Convex Lens
13. Focal length, Power, R and Refractive Index of a Concave Lens

14. Comparison of Viscosities of two Liquids–Burette Method
15. Spectrometer – Refractive index of a Glass Prism
16. Spectrometer – Hollow Prism- Refractive index of a liquid.
17. Carey Foster's Bridge-Resistance and Specific Resistance
18. Potentiometer – Calibration of a Low Range Voltmeter
19. Deflection magnetometer – Tan A Position

Non-Major Elective				
Title of the paper	**Everyday Physics**			
Category of the course	Year	Semester	Credits	L T P E
Non-Major Elective	I	I	2	15 - - 15

Course focusing on: Entrepreneurship

Everyday Physics Course outcome:

CO1: Students can learn the basic laws of motion.

CO2: Understand the different properties of the matter.
CO3: Will able to gain basic knowledge of light and lenses.
CO4: This course enables students to learn about electricity.
CO5: This course gives an idea about Universe.

	CO-1	**CO-2**	**CO-3**	**CO-4**	**CO-5**
Unit-1	√				√
Unit-2		√			
Unit-3			√		
Unit-4				√	
Unit-5					√

UNIT-I: MOTION

Velocity, acceleration, momentum – inertia - force - laws of motion. Newton's law of gravitation - acceleration due to gravity- mass and weight, weightlessness.

UNIT-II: PROPERTIES OF MATTER

Different phases of matter - surface tension, viscosity- capillary rise-Heat, temperature-different temperature scales: degree Celsius, Fahrenheit and Kelvin-transverse and longitudinal waves, sound waves.

UNIT-III: LIGHT & LENSES

Reflection, refraction, diffraction, interference, scattering (elementary ideas only) – blue color of sky, twinkling of stars. Mirage –rainbow Concave and convex lenses – focal

length, power of a lens, refractive index-defects of the eye – myopia, hypermetropia, presbyopia and astigmatism and their correction by lens.

UNIT-IV: ELECTRICITY

Voltage and current, Ohms law. Electric power (EB Bill), calculation of energy requirement of electric appliances – transformer, generator. Magnetism: Electromagnetic induction-super conductivity-Meissner effect-Maglev train.

UNIT-V: OUR UNIVERSE

Galaxies- Stars, Planets & satellites – solar system, lunar and solar eclipses - black holes. Artificial satellites: Geo stationary and Polar satellites.

Books for study:

1. Elements of Properties of Matter, D. S Mathur, S. Chand & Co. (2010).
2. Fundamentals of Physics with Applications by Arthur Beiser
3. Optics by Ajay Ghatak, Tata McGraw-Hill publishing Co. Ltd., New Delhi (1998).
4. Electricity and Magnetism, A S Mahajan, A A Rangwala, McGraw Hill, New Delhi (2017).
5. An Introduction to Astrophysics, Baidyanath Basu, Tanuka Chattopadhyay, Sudhindra Nath Biswas, Second Edition (2010), PHI Learning Private Limited.

Core Paper Theory – II				
Title of the paper	**Heat and Thermal Physics**			
Category of the course	Year	Semester	Credits	L T P E
Core	I	II	4	60 15 - 15
Pre- requisites	Basic knowledge of laws of thermodynamics			
Objectives of the course	To make the students understand the various thermodynamical concepts and principles and to solve problems.			

Course focus on: Employability

Heat and Thermal Physics Course outcome:

CO1: This course offers student to acquire fundamental knowledge on basic concept of heat, temperature dependent state of mater and laws governing temperatures

CO2: From this course students can able to estimate the heat, temperature and decode the application of laws of thermodynamics.

CO3: This course provides the completeness of the physical properties based on temperature and underlying laws by studying the physical properties.

CO4: The student can understand the nature of ideal gas, kinetic theory of gases, second law of thermodynamics and thermodynamic temperatures.

CO5: This course provides the knowledge of entropy, thermo-dynamical potentials, and basic concepts of statistical mechanics from view point of Maxwell's thermodynamic.

	CO-1	CO-2	CO-3	CO-4	CO-5
Unit-1	√				√
Unit-2		√			
Unit-3			√		
Unit-4				√	
Unit-5	√				√

UNIT I: KINETIC THEORY OF GASES AND MEAN FREE PATH

Review of results of kinetic theory of gases: (Pressure exerted by gas -rms, average and most probable speed-Equipartition Theorem – Heat capacities) - Distribution of molecular velocities in a perfect gas-Distribution of molecular speeds-Mean free path (Zeroth and First order)

UNIT II: TRANSPORT PHENOMENA AND REAL GASES

Transport phenomena- Viscosity (Zeroth order approximation)- Effects of Temperature and Pressure on viscosity- Thermal Conductivity- Diffusion – Real gases - Deviations from Perfect gas behaviour- Regnault's Experiment – Vander Waals' equation of state – Discussion of Vander Waals' equation – Joule Experiment – Porous Plug experiment – Joule –Thomson Coefficient for Vander Waals' gas

UNIT III: THERMOMETRY AND CALORIMETRY

Platinum resistance thermometer – Calendar and Griffith's bridge – Thermistor – Specific heat capacity – Specific heat capacity of solids – Dulong and Petit's law – Specific heat capacity of liquid – method of mixtures – Barton's correction – Specific heat capacity of gases – Cp and Cv by Regnault's and Callendar & Barne's methods – Variation of Specific Heat Capacity of Diatomic Gases

UNIT IV: FIRST AND SECOND LAW OF THERMODYNAMICS

Thermodynamic system, surroundings, boundaries-State of system and Thermodynamic variables – Thermodynamic equilibrium- Processes- The Zeroth law and concept of temperature origin of the first law- Internal energy-Basic thermal, mechanical and diffusive interactions-the first law-applications of first law(heat capacities of gas, adiabatic equation of state and lapse rate)- Enthalpy- Second law –Origin of second law - Heat engines –The Carnot cycle- Carnot cycle as refrigerator –Kelvin, Planck and Clausius statements-Carnot's theorem

UNIT V: ENTROPY AND THERMODYNAMIC RELATIONS

Entropy- Entropy change in reversible processes – Reversible heat transfer- Clausius inequality - Entropy change in irreversible process-the principle of increase of entropy-Joule's expansion the entropy form of first law- Entropy of an Ideal gas- Entropy of mixing -

Unavailable energy: Thermal death of universe - Physical concept of entropy- Maxwell relations- Thermodynamic relations involving heat capacities- TdS equations.

Books for Study:

1. Heat and Thermodynamics, Brijlal and N. Subramanyam, S. Chand & Co, New Delhi (2000)
2. Heat and Thermodynamics by D. S. Mathur, 3rd edition S. Chand & Sons, New Delhi (1978).
3. Heat and Thermodynamics, Zemansky, McGraw – Hill Book Co. Inc., New York.
4. Thermal Physics, S.C.Garg, RM Bansal & CK Ghosh ,Tata McGraw Hill Publications, 2 ndedition. (2018).
5. Heat,M. Narayanamoorthy and N. Nagarathinam, National publishing Co, Chennai, Eight edition, 1987.

Books for Reference:

1. Heat and Thermodynamics, Zemansky, McGraw – Hill Book Co. Inc., New York.

2. Fundamentals of Physics, Resnick Halliday and Walker, 6th edition, John Willey and Sons, Asia Pvt. Ltd., Singapore.

3. Heat and Thermodynamics by J. B. Rajam and C. L. Arora, 8th edition, S. Chand & Co. Ltd., New Delhi (1976).

4. Heat, Narayana Moorthy and KrishnaRao, Triveni Publishers, Madras (1969).

5.**Thermodynamics Kinetic Theory** and **Statistical Thermodynamics,** Francis Weston Sears, Gerhard L. Salinger and John E. Lee.

6. https://swayam.gov.in/nd1_noc20_cy14/preview

Non Major Elective				
Title of the paper	**Physics of Everyday Life**			
Category of the course	Year	Semester	Credits	L T P E
Core	I	II	2	15 - - 15

Course focusing on : Entrepreneurship

Physics of Everyday Life Course outcome:

CO1: Students can learn about Fermi problems.
CO2: This course enables students to understand about electric bill.

CO3: This course enables students to know about car and microwave oven.
CO4: Will able to gain complete knowledge about digital memory devices.
CO5: This course gives an idea about mobile communication and GPS

	CO-1	CO-2	CO-3	CO-4	CO-5
Unit-1	√				√
Unit-2		√			
Unit-3			√		
Unit-4				√	
Unit-5	√				√

UNIT – I ART OF ESTIMATION AND FERMI PROBLEMS

The Fermi Rule-Gu estimation Techniques-Fermi problems in real life(Number of Popcorn venders in Tamilnadu, Delhi, India; how many people in your town own red colored car etc)

UNIT –II UNDERSTANDING YOUR ELECTRIC BILL

Basics of electricity- Ohms law, power consumption, Joule heating-saving electricity-ways to minimize power consumption.

UNIT – III YOUR CAR, REFRIGERATOR AND MICROWAVE OVEN

Concept of temperature& electromagnetic waves - Conversion of Work into Heat vice versa-Heat Engines- Carnot's Cycle, Carnot engine & efficiency- Refrigerator-magnetron-design of microwave ovens.

UNIT – IV PHYSICS OF DIGITAL MEMORY DEVICES

Photoelectric effect-recording of audio and video-Operating principles of magnetic hard disk drive-Charge coupled device (CCD)- principle of CCD camera.

UNIT – V MOBILE COMMUNICATION AND GLOBAL POSITIONING SYSTEM (GPS)

Wire and wire-less communication- Common cellular networks components-Protocols. Fundamentals of GSM & CDMA Network, GSM & CDMA Frequency Band. GPS: Operating principles of GPS-Accuracy and errors in GPS navigation.

Books for study:

1. Fundamentals of Physics by D. Halliday, R. Resnick, J. Walker, John Wiley & Sons
2. Mobile Cellular Telecommunications: Analog and Digital Systems by William C. Y. Lee; Tata McGraw Hill Publication.
3. Wireless Communications: Principles and Practice by Theodore S. Rappaport; Pearson / PHI Publication.

Books for References:

1. Wireless Communications and Networks: 3G and Beyond by ItiSahaMisra; Tata McGraw Hill Publication
2. Wireless and Digital Communications by Dr. KamiloFeher; PHI Publication.
3. H. Labiod, H. A33, C. De Santis: WI-FI, BLUETOOTH , ZIGBEE and WIMAXSpringer-2007.

Core Paper Theory – III				
Title of the paper	**Mathematical Methods in Physics**			
Category of the course	Year	Semester	Credits	L T P E
Core	II	III	4	60 15 - 15
Pre- requisites	Know the basics of vectors and matrices.			
Objectives of the course	To familiarize students with essential mathematical methods for solving advanced problems in theoretical physics.			

Course focusing on : Employability

Mathematical Methods in Physics Course Outcome:

CO1: Can acquire good knowledge of the basic elements and important theorems of vector, and complex analysis.
CO2: Can acquire the knowledge to solve quantum mechanical problems using special functions and polynomials.
CO3: Can acquire the knowledge of the complex number system, complex functions and also to map function from complex function to other complex function, which is need for the application of electronic circuits.
CO4: Use Matrices to solve simultaneous equations.
CO5: Apply Fourier series to simple circuits.

	CO-1	**CO-2**	**CO-3**	**CO-4**	**CO-5**
Unit-1	√				
Unit-2		√			
Unit-3			√		
Unit-4				√	
Unit-5					√

UNIT I: VECTOR CALCULUS

Scalar and Vector Fields - Gradient of a Scalar function - Divergence of a Vector function - Curl - Line Integral, Surface Integral and Volume Integral (Simple Problems) - Gauss Divergence Theorem - Stoke's Theorem and Green's Theorem (Statement and Proof)- Spherical Polar Coordinates - Expressions for Gradient, Divergence, Curl and Laplacian Operator in Cartesian and Spherical Polar Coordinates.

UNIT II: SPECIAL FUNCTIONS

Special Functions - Beta and Gamma Functions - Definitions - Symmetry Property of Beta function - Evaluation of Integrals using Beta function - Transformation of Beta function - Evaluation of Gamma Function - The value of $\Gamma\ 1/2$ - Transformations of Gamma function (Other forms) - Relation between Beta and Gamma functions - Simple Problems in beta and gamma functions - Series Solutions for Bessel, Legendre and Hermite Differential Equations.

UNIT III: MATRICES

Special Types of Matrices - Symmetric and Skew-symmetric Matrices -Hermitian and Skew Hermitian Matrices - Orthogonal Matrices - Unitary Matrices -Properties - Characteristic Equation - Determination of Eigen values and Eigen vectors - Properties - Statement and Proof of Cayley - Hamilton Theorem - Simple Problems - Inverse of Matrix by CH Theorem - Diagonalization of 2x2 Real Symmetric Matrices – Laplace integral.

UNIT IV: COMPLEX VARIABLES

Basics of Complex Numbers and their Graphical Representation - Euler's Formula, De-Moivre's Theorem - Functions of Complex Variables - Limit, Continuity and Differentiability - Analytic Function -Definition - Cauchy-Riemann Conditions - Examples of Analytic Functions (Analyticity) - Cauchy-Riemann Conditions in Polar Form

UNIT V: FOURIER SERIES

Fourier Series in the interval ($-\pi$ to π) - Definition – Dirichlet's Conditions (Statement Only) - Determination of Fourier Coefficients -Even and Odd Functions and their Fourier expansions. Sine and Cosine Periodic Functions - Simple Problems in Fourier Series in the interval ($-\pi$ to π) - Applications of Fourier series - Half Wave Rectifier and Saw Tooth Wave.

Books for Study:

1. Mathematical Physics, H. K. Dass, S. Chand & Co. Ltd. (2010).
2. Mathematical Physics, Sathya Prakash, Sultan Chand & Sons, New Delhi, Fifth Revised and Enlarged Edition, 2006, (Reprint 2007).
3. Mathematical Physics, B. D. Gupta, Vikas Publishing house Pvt. Ltd. (2010)
4. Mathematical Physics ,A.K. Sexena, (Narosa, New Delhi, 2015).
5. Mechanics and Mathematical Physics, R.Murugesan, S.Chand (2020)

Books for reference:

1. Mathematical Methods for Physicists, G. Arfken, Weber, Harris (7th Edition), Elsevier, (2012).

2. Mathematical Physics, B.S. Rajput, 8th Edition, Pragati Prakashan(1978).

3. Foundations of Mathematical Physics, Sadri Hassani, Second Edition.Springer

4. Mathematical methods for Physics and Engineering, K.F.Riley, M.P.Hobson &S.J.Bence , Cambridge University Press, 3rd Edition.
5. Applied Mathematics for Engineers and Physicists, L.A. Pipes and L.R. Harvill, (McGraw Hill, Singapore, 1967).
6. Mathematical Physics , The Basics, S.D Joglekar, University Press, (2005)

Core Paper Practical – II				
Title of the paper	**Physics Practical II**			
Category of the course	Year	Semester	Credits	L T P E
Core	II	III & IV	4	- - 30 15
Pre- requisites	Knowledge of basic laws of electricity.			
Objectives of the course	To enhance the knowledge in experimental physics.			

Course focus on : Skill Development
CO 1: Can acquire knowledge about the multimeter.
CO 2: This course enables the students to study the development of galvanometer
CO3: They will be able to perform Spectrometer and Magnetometer experiments
Physics Practical- II Course outcome:

1. Compound Pendulum-g and k
2. Sonometer-A.C. Frequency-Steel and Brass wires.
3. Melde's string- Frequency, Relative Density of a solid and liquid.
4. Emissivity of surface
5. Thermal conductivity of a bad conductor – Lee’s disc method
6. Conversion of galvanometer into voltmeter
7. Conversion of galvanometer into ammeter
8. Spectrometer-Grating N and λ-minimum deviation method.
9. Spectrometer-μ of a glass prism -i-d Curve
10. Airwedge-Thickness of a wire.
11. Deflection Magnetometer – Tan B position
12. m and BH -Deflection Magnetometer-Tan C position and vibration magnetometer
13. Carey Foster Bridge - Temperature coefficient of resistance of a coil.
14. Potentiometer – Specific resistance of the given wire.
15. Potentiometer-Ammeter calibration.
16. Potentiometer- Emf of thermocouple.
17. Figure of merit of galvanometer (Mirror or Table Galvanometer).
18. Surface tension – Capillary rise method.

Core Paper Theory – IV				
Title of the paper	**Mechanics**			
Category of the course	Year	Semester	Credits	L T P E
Core	II	IV	4	60 15 - 15
Pre- requisites	Knowledge of Newton's laws and relativity.			
Objectives of the course	To make the students understand the basic principles of mechanics and enable them to analyze and solve problems			

Course focusing on : Employability

Mechanics Course outcome:

CO1: The course demonstrates the completeness of Newtonian Mechanics of any shape of object, which demonstrate the concepts of centripetal, centrifugal and moment of inertia.
CO2: A student can realize the forces on linear motion and angular motional objects.
CO3: Acquire knowledge on the conservation law.
CO4: Provides a fundamental understanding of physical properties of materials.
CO5: Course can provide Understanding of the space - time concept through relativity

UPHM11D	**CO-1**	**CO-2**	**CO-3**	**CO-4**	**CO-5**
Unit-1	√				
Unit-2		√			
Unit-3	√		√		
Unit-4				√	
Unit-5		√			√

UNIT I: NEWTON'S LAWS OF MOTION

Introduction to Newtonian mechanics - Newton's Laws of Motion- Forces and Equations of Motion- Motion of a Particle in a Uniform Gravitational Field- Newtonian law of Universal Gravitation-Examples-Electric and Magnetic Forces on a Charged Particle-The Magnetic Field and Lorentz Force-Examples- Motion of Charged Particle in a Uniform Electric and Magnetic Field-Conservation of Momentum-Contact Forces: Friction- Problems

UNIT II: CONSERVATION LAWS

Definition of concepts-Conservation of Energy-Work-Kinetic and Potential energy-Examples Conservative Forces-Potential Energy and Conservation of Energy in Gravitational and Electric field- Examples. Conservation of Linear and Angular Momentum: Internal forces and Momentum conservation Center of mass- Examples- General Elastic Collision of Particles of Different Masses- System with Variable Mass-Examples- Conservation of Angular Momentum-Torque due to Internal Forces-Torque due to Gravity- Angular momentum about Center Of Mass- Proton scattering by heavy nucleus.

UNIT III: HARMONIC OSCILLATOR AND INVERSE SQUARE LAW OF FORCE

Mass on spring-Simple Pendulum (Force, energy and torque method)-Compound Pendulum-LC circuit- Motion of systems displaced from position of stable equilibrium-Average kinetic energy and potential energy. Inverse Square Law of Forces and Static Equilibrium- Orbits: Equation and Eccentricity-Circular orbit-Kepler's laws- Examples

UNIT IV: ELEMENTARY RIGID BODY DYNAMICS

The Equation of Motion-Angular Momentum and Kinetic Energy-Moment of inertia-Parallel Axis Theorem- Perpendicular Axis Theorem- Examples-Rotation about fixed axis: Time Dependence of Motion- Examples- Rolling without slipping (three methods)-Torque about Center of Mass-Examples.

UNIT V: SPECIAL RELATIVITY

Introduction to Four vectors - Constancy of Speed of light-Michelson-Morley Experiment-Invariance of 'c' – Basic assumptions- Lorentz Transformation- Length Contraction-Examples- Time Dilation of Moving Clocks–Examples–Velocity Transformation– Velocity Addition–Variation of Mass with Velocity-Aberration of light–Longitudinal Doppler Effect

Book for study:

1. Mechanics (in SI units) - (Berkley Physics course-volume 1), Charles Kittel, Walter D knight etc, Tata McGraw Hill publication, 2017, Second edition.
2. Mechanics, D.S. Mathur, S. Chand & Company Ltd., New Delhi - 1990.

Books for reference:

1. Newtonian Mechanics, A. P. French, Viva Books Private, (2011).
2. Introduction to Mechanics, Kleppner and Kolenkow, McGraw Hill Publishers (Special Indian edition), first edition (2010).
3.Classical Mechanics, N C Rana and P S Joag.

Core Paper Theory – V				
Title of the paper	**Optics & Spectroscopy**			
Category of the course	Year	Semester	Credits	L T P E
Core	III	V	4	60 - - 15
Pre- requisites	Knowledge of Lenses and electromagnetic spectrum			
Objectives of the course	To study the applications of Interference, diffraction and polarization and gain overall knowledge in spectroscopic techniques.			

Course focusing on: Employability

Optics & Spectroscopy Course outcome:

CO1: Understanding the defects in lenses and rectifying methods.
CO2: Distinguish between resolving power and dispersive power.
CO3: Understanding of the essence of light as beam, its behaviors interference, diffraction and polarization of light beams. Further, to analyze mathematically diffraction of single and double slits.
CO4: Understand the rectilinear propagation of light and acquire knowledge with production and detection of different types of polarized light
CO5: Extract the dynamic information about the molecules using the spectroscopic techniques

	CO-1	**CO-2**	**CO-3**	**CO-4**	**CO-5**
Unit-1	√				
Unit-2		√			
Unit-3			√		
Unit-4				√	
Unit-5					√

UNIT I: GEOMETRICAL OPTICS

Aberration in lenses - Spherical aberration in a lens - Methods of minimizing spherical aberration - Condition for minimum spherical aberration in the case of two lenses separated by a distance - Chromatic aberration in lenses - Condition for achromatism of two thin lenses (In and out of contact) - Dispersion produced by a thin prism - Achromatic prisms - Combination of prisms to produce (i) Dispersion without deviation (ii) Deviation without dispersion - Direct vision spectroscope. Eyepieces -Ramsden's and Huygens's eyepieces - Construction, Theory

UNIT II: INTERFERENCE

Analytical treatment of interference - Expression for intensity - Condition for maxima and minima in terms of phase and path difference - Coherent sources, Interference in thin

films – transmitted and reflected - Colour of thin films -Air wedge - Determination of diameter of thin wire - Test for optical flatness - Determination of wavelength of light using Newton's rings - Haidinger's fringes - Michelson's Interferometer – Theory - Applications - Determination of wavelength - Thickness of thin transparent material and resolution of interferometer.

UNIT III: DIFFRACTION

Fresnel diffraction - diffraction at a circular aperture and narrow wire – Fraunhofer diffraction - Single slit - Double slit - (Simple theory) - Plane diffraction grating – Plane transmission grating element – Missing order - Overlapping spectra - Maximum number of orders - Determination of wavelengths using grating - Normal incidence - Dispersive power of a grating - Rayleigh's criterion for resolution - Limit of resolution of the eye - Resolving power of Telescope and microscope - Resolving power of prism and grating - Difference between resolving power and dispersive power.

UNIT IV: POLARISATION

Double refraction - Nicol prism - Polarizer and analyser - Huygens explanation of double refraction in uni-axial crystals - Dichroism - Polaroids and their uses - Double image polarizing prisms - Quarter wave plate and Half wave plate - Plane, elliptically and circularly polarized light - Production and detection - Babinet's Compensator - Optical Activity - Fresnel's explanation of optical activity - Specific rotatory power - Determination using Laurent's half shade polarimeter.

UNIT V: SPECTROSCOPY

Introduction to spectroscopy - Electromagnetic spectrum - Characterization of electromagnetic radiation - Quantization of energy - Regions of the spectrum – Classification of molecules – Microwave spectroscopy – Rigid rotator - Vibrational spectroscopy – Harmonic oscillator - Raman effect - Experimental set up - Characteristics of Raman lines - Ultraviolet spectroscopy Origin and theory of ultraviolet spectra- Introduction to Nuclear Magnetic Resonance – Quantum description of NMR- Larmor equation - Chemical shift (Qualitative study)

Books for study:

1. Optics, AjayGhatak, Tata McGraw-Hill publishing Co. Ltd., New Delhi (1998).
2. A Text book of Optics, Subrahmanyam N., BrijLal and M. N. Avadhanulu, S. Chand & Co., New Delhi (2006).
3. Molecular Structure and Spectroscopy, Aruldhas, Prentice Hall of India Pvt. Ltd., New Delhi (2005).
4. Optics and Spectroscopy, R. Murugesan and Kiruthiga Sivaprasath, S. Chand & Co., New Delhi (2006).
5. Optics, Dr. N. Subramaniyam, Brijlal and Dr.M.N. Avathanulu, S. Chand & Co. Pvt. Ltd.- 9th revised edition, New Delhi ,2014.

Books for reference:

1. Optics, Khanna D. R. & Gulati H. R., S. Chand & Co., New Delhi (1979).

2. Fundamental of optics, Jenkins & White, McGraw Hill 4th edition (1981).
3. Fundamentals of Physics, D. Halliday, R. Resnick and J. Walker, Wiley, 6th Edition, New York (2001).
4. H. Lipson and D.S Tannhauser, S.G. Lipson, Optical Physics, (3rd edition), Cambridge University press (1995).
5. Miles V. Klein and Thomas E. Furtak, Optics, John Wiley & sons (2nd Edition) (1987)

Core Paper Theory – VI				
Title of the paper	**Electricity And Electromagnetism**			
Category of the course	Year	Semester	Credits	L T P E
Core	III	V	4	60 - - 15
Pre- requisites	Knowledge basics of Electricity and Magnetism.			
Objectives of the course	To familiarize the fundamentals of electromagnetic theory and applications of electromagnetic induction			

Course focusing on : Employability

Electricity and Electromagnetism Course outcome:

CO1: Acquire knowledge on the Gauss theorem, Coulomb's inverse square law for the electromagnetic field, for the application of capacitors.
CO2: Analyze physical situations involving static electric charges, alternating current circuits and direct current circuits.
CO3: Understand the electric current through different current elements and their applications.
CO4: Acquire the knowledge of Faraday's laws of electromagnetic induction, Anderson method and Absolute Mutual Induction and also to calibrate the Ballistic Galvanometer (BG).
CO5: Understand the knowledge of Maxwell's equation for the application of electromagnetic theory.

UPHM51C	**CO-1**	**CO-2**	**CO-3**	**CO-4**	**CO-5**
Unit-1	√				
Unit-2		√			
Unit-3			√		
Unit-4				√	
Unit-5					√

UNIT I: ELECTROSTATICS I

Properties of charges - Coulomb's law and its Validity –Superposition Principle – Electric field and Electric Potential – Relations between field and potential - Energy consideration – Flux – Gauss law – Linear, Surface and Volume charge distributions – Solutions of Laplace equation – Stability of Charges – Electric dipole – Multipole expansion

UNIT II: CONDUCTORS, CAPACITORS AND DIELECTRICS

Electrical Images and its Applications (Earthed sheet and earthed Spherical conductor) – Capacitance – Energy Consideration – Classical Radius of an Electron – Polarization Density – Polarization Charge Densities – Relation between D, E and P, Gauss's law in the presence of a dielectric – Boundary condition on D and E

UNIT III: MAGNETIC EFFECTS OF AN ELECTRIC CURRENT

Biot-Savart's law and its Application to Circular Loop-Helmholtz Galvanometer-Ampere's Circuital Law both in Integral and Differential Form and its Application to Current Carrying Loop, Solenoid and Toroid-Properties of B: Curl and Divergence - Force on a current element in a magnetic field-Moving coil Ballistic Galvanometer-Damping Correction-Figure of Merit-Determination of Absolute Capacitance of a capacitor

UNIT IV: ELECTROMAGNETIC INDUCTION

Faraday's law of Electromagnetic Induction (Differential and Integral form) - Lenz's law - Self Inductance – Mutual Inductance – Coefficient of Coupling - Self Inductance of a long solenoid - Mutual Inductance of two coils -Eddy current and its uses - Measurement of L and M using Ballistic Galvanometer Transformers - Construction and working - Efficiency and Energy loss

UNIT V: ELECTROMAGNETIC WAVES

Types of currents - Concept of Displacement Current – Maxwell's equations – Maxwell's equations in Free Space-Electromagnetic Waves Equations-Velocity of EM wave-Transverse nature of EM wave-Poynting vector and its significance-Reflection and Transmission of electromagnetic waves at an interface of non-conducting medium.

Books for Study:

1. Electricity and Magnetism, A S Mahajan, A A Rangwala, McGraw Hill, New Delhi (2017)
2. Introduction to Electrodynamics, David J. Griffith, PHI, New Delhi, (2012).
3. Electromagnetic theory, Chopra & Agarwal, K Nath & Co.
4. R. Murugeshan, Electricity and Magnetism (2008) S Chand & Co, New Delhi
5. Brij Lal & Subramanyam, Electricity and Magnetism, (2005) Ratan Prakashan Mandir Publishers, Agra

6. M. Narayanamurthy & N. Nagarathnam, Electricity & Magnetism, NPC pub., Revised edition.

Books for Reference:

1. Electricity and Magnetism, E M. Purcell, David Morin (3rd Edition), Cambridge University Press.
2. Basic laws of Electromagnetism, I E Irodov, New Age International Publishers, New Delhi, (2019).
3. Electricity and Magnetism, Navina Wadhwani, PHI, NewDelhi, (2007).
4. Electricity and Magnetism, K.K Tewari, S Chand & Co, NewDelhi, (2007).
5. Fundamentals of Physics – Electricity and Magnetism, Halliday – Resnick and Walker, Wiley India Pvt Ltd, (2011).

Core Paper Theory – VII				
Title of the paper	**QUANTUM MECHANICS**			
Category of the course	Year	Semester	Credits	L T P E
Core	III	V	4	60 - - 15
Pre- requisites	Knowledge of Classical mechanics			
Objectives of the course	To introduce students the development and formulation of Quantum Mechanics, its underlying Mathematical and Physical principles through exactly solvable problems.			

Course focusing on : Employability

Quantum Mechanics Course outcome:

CO1: Know the inadequacies of classical mechanics in explaining microscopic phenomena
CO2: Introduce with the concept of matter waves and their existence proved by experimental procedure and uncertainty principle in physical measurements
CO3: From this course students can able to estimate the Schrödinger equations.
CO4: Derive time dependent and independent Schrödinger equations
CO5: Find eigen values and eigen functions of one dimensional and three-dimensional problems

	CO-1	CO-2	CO-3	CO-4	CO-5
Unit-1	√				
Unit-2		√			
Unit-3			√		
Unit-4				√	
Unit-5					√

UNIT I: ORIGIN OF QUANTUM MECHANICS

Limitations of Classical Physics- Black – Body Radiation Curve- Optical Spectra- Photoelectric Effect- Specific Heat of Solids – Planck's Quantum Hypothesis - Compton Effect- Quantum Theory of Specific Heat-Bohr Atom Model of Hydrogen Atom- Franck and Hertz Experiment – Inadequacy of (Old) Quantum Theory.

UNIT II: WAVE MECHANICS

Wave Nature of Particles – Matter Waves – Diffraction Experiment- Heisenberg's Uncertainty Principle - Application of Uncertainty Relation – Principle of Super Position – Wave Packet - Time dependent Schrodinger Wave Equation- Interpretation of the Wave Function, Probability Interpretation, Probability Current Density and Equation of Continuity-

Ehrenfest theorem-Time Independent Schrodinger Wave Equation-Stationary States, Admissibility Conditions

UNIT III: FORMALISM OF QUANTUM MECHANICS

Linear Vector Space –Orthogonal Functions –Linear Operator -Eigen Functions and Eigenvalues- Hermitian Operator- Postulates of Quantum Mechanics – Simultaneous Measurability of Observables-Eigen Values of Angular Momentum Operators-Ladder Operators

UNIT IV: ONE DIMENSIONAL EIGEN VALUE PROBLEMS

Square Well Potential: Rigid Walls, Finite Walls and Potential Barrier – Alpha Emission - Linear Harmonic Oscillator (Series Method) – Free Particle

UNIT V: THREE-DIMENSIONAL ENERGY EIGEN VALUE PROBLEMS

Particle Moving in a Spherically Symmetric Potential – Radial and Angular Part of Schrodinger Equation - System of Two Interacting Particles -Rigid Rotator – Hydrogen Atom- Radial Equation –Solution to Radial Equation – Energy Eigen Values and Eigen Functions

Books for Study:

1. Quantum Mechanics, G Aruldhas, 2nd edn,PHI,(2013).
2. Introduction to Modern Physics, H. S. Mani & G. K. Mehta, East West press.
3. Concepts of Modern Physics, Arthur Beiser et al, 6thed, Tata McGraw Hill, (2009).
4. Quantum Mechanics I: The Fundamentals, S. Rajasekar and R. Velusamy, (CRC Press, Boca Raton, 2015).
5. Principles of Quantum Mechanics, R. Shankar, (Springer, New Delhi, 2007).

Books for Reference:

1. Quantum Mechanics, Leonard L. Schiff, 3rd edition, McGraw-Hill.
2. A Text book of Quantum Mechanics, PM Mathews & K Venkatesan, 2nded, Tata McGraw Hill, (2011).
3. Quantum Mechanics, V.Devanathan,Narosa Publications
4. Quantum Mechanics , Concepts and Applications, NouredineZettili, 2nded,Wiley(2009).
5. Introduction to Quantum Mechanics, David Griffiths, 2nd ed,Pearson,(2015).

Core Paper Theory – VIII				
Title of the paper	**Basic Electronics**			
Category of the course	Year	Semester	Credits	L T P E
Core	III	V	4	60 - - 15
Pre- requisites	Knowledge the semiconductors and basic electronic instrumentations.			
Objectives of the course	To study the characteristics and application of various semiconductor devices.			

Course focusing on: Employability

Basic electronics course outcome:

CO1: Handle basic electronic devices like diode and transistor.
CO2: Construct amplifiers of different specification.
CO3: Apply Barkhausen criteria to oscillators.
CO4: Acquire the basic knowledge on working of various semiconductor devices like transistor, Field effect transistor (FET), SCR and so on.

CO5: Can acquired knowledge about instrumentation.

	CO-1	CO-2	CO-3	CO-4	CO-5
Unit-1	√				
Unit-2		√			
Unit-3			√		
Unit-4				√	
Unit-5					√

UNIT I: SEMICONDUCTORS

Band gap-Forbidden Gap-Valence and Conduction Bands-Pure Semiconductors-Impurity in Semiconductors-Energy band Diagram and Fermi level-Fermi Energy and Carrier Concentration of Intrinsic and Extrinsic Semiconductors-PN junction- barrier- Voltage across the junction - Junction Diodes- Zener Diodes- V-I characteristics-Light Emitting Diodes-Photo Diodes

UNIT II: TRANSISTOR AMPLIFIER

Transistors- CB and CE modes-Characteristics-Two Port Representation of a Transistor- h parameters-AC equivalent circuit using 'h' parameters-Analysis of an Amplifier using h parameters (CE configuration only)-Expression for current gain, voltage gain, input impedance, output impedance and power gain- RC Coupled Amplifier - Frequency Response - Analysis of low, mid and high frequency regions - Classification of Amplifiers - Class A Power Amplifier – Push Pull- Class B Power Amplifier - Emitter Follower

UNIT III: OSCILLATORS AND MULTIVIBRATORS

Feedback in amplifiers - Effect of Negative Feedback- Barkhuesen Condition For Oscillations - Hartley and Colpit's Oscillators, Phase Shift and Wien's Bridge Oscillators - Expression for Frequency of Oscillation and condition for Oscillation in each case. Multivibrators - Astable, Monostable and Bistable Multivibrator - using transistors

UNIT IV: SPECIAL SEMICONDUCTOR DEVICES AND WAVE SHAPING CIRCUITS

Unipolar Devices- FET – Construction- Working -Characteristics - FET Amplifiers-UJT – Construction-Working- Characteristics - UJT-Saw Tooth Wave Generator- SCR – Characteristics – SCR as a Switch-SCR Rectifier. Clipping and Clamping Circuits - Biased Clipper - RC Time Constant -Integrating and Differentiating Circuits

UNIT V: BASICS OF INSTRUMENTATION

Definition of measurement and Instrument - Block Diagram of an Instrument – Components – Input, Output, Processing element of an instrument – Functional Elements of Pressure Thermometer– Types of instrument – Basic definition – Accuracy, Precision, Sensitivity, Threshold, Resolution, Drift, Dead Zone, Selectivity, Hysteresis, Range, Bias, Repeatability, Reproducibility – Errors.

Books for Study:

1. Electronic devices and circuits, Theodore F. Bogart, 6th edition, Pearson, 2004.
2. Electronic devices and circuit Theory 11th edition by Robert L. Bolysted and Louis Nashelsky, Pearson, 2017.
3. Elements of Electronics, M.K.Bagde and Singh S.P., S. Chand &Co., New Delhi(1990).

4. Principles of Electronics, V.K. Mehta, Rohit Mehta ,S. Chand & Co.(2006).
5. Applied Electronics , A. Subramanyam ,National Publishing Co.(1997).
6. Hand Book of Electronics, Gupta and Kumar ,PragatiPrakashan,Meerut(2002).
7. Electronics, M. Arul Thalapathi, Comptek Publishers(2005).
8. Elements of Electronic Instrumentation and Measurement, Joseph J Carr, Pearson Education.
9. A course in Electrical and Electronic Measurement and Instrumentation, A. K. Sawhney, DhanpatRai& Co. (Pvt.) Ltd, Nineteenth Revised Edition.(2012).

Books for Reference:

1. Electronic Devices ,Mittal.G.K., G.K. Publishers Pvt. Ltd., (1993).
2. Basic Electronics, B.L. Theraja, S. Chand & Co., (2008).
3. Solid State Electronics, Ambrose and Vincent Devaraj, Meera Publication.
4. Applied Electronics, R.S. Sedha, S. Chand & Co.(1990).
5. Digital Instrumentation, A. J. Bouwen, McGraw Hill,(1986).
6. Electronic Instrumentation andMeasurement Technique, W. D. Cooper and A. D. Helfrick III Edition, Prentice-Hall, India(1991).
7. Instrumentation, devices and systems, Rangan, Sarma and Mani, Tata Mc-Graw Hill
8. Electronic Instrumentation, H. S. Kalsi , Tata Mc-Graw Hill.

Elective paper- 1A				
Title of the paper	**Numerical Methods**			
Category of the course	Year	Semester	Credits	**L T P E**
Elective	III	V	5	45 - - 15
Pre- requisites	Knowledge of Numerical problem solving			
Objectives of the course	To study the computational techniques involved in different mathematical manipulation			

Course focusing on: Entrepreneurship

Numerical Methods Course outcome:

On completion of this course the students will able to

CO1: Solve simultaneous equations using method of triangularization.
CO2: Find the inverse of a matrix using Gauss Jordan method.
CO3: Solve Algebraic, Transcendental and Differential equation using different methods.
CO4: To fit a curve for the given data using principles of least square.
CO5: Integrate the function using different rules like Simpsons 1/3 rule.

	CO-1	**CO-2**	**CO-3**	**CO-4**	**CO-5**
Unit-1	√				√
Unit-2		√			
Unit-3			√		
Unit-4				√	
Unit-5	√				√

UNIT I: SIMULTANEOUS LINEAR ALGEBRAIC EQUATIONS

Method of Triangularisation - Gauss elimination method - Inverse of a matrix - Gauss- Jordan method

UNIT II : NUMERICAL SOLUTION OF ALGEBRAIC, TRANSCENDENTAL AND DIFFERENTIAL EQUATION

Bisection method – Regula falsi method - Newton - Raphson method - - Horner's method - Solution of ordinary differential equation - Euler's method.

UNIT III : INTERPOLATION

Finite differences – Operators Δ, ∇, D – Relation between operators –Linear interpolation – Interpolation with equal intervals – Newton forward interpolation formula – Newton backward interpolation formula.

UNIT IV: CURVE FITTING

Principles of least squares - fitting a straight line - linear regression - fitting an exponential curve.

UNIT V: NUMERICAL INTEGRATION

Trapezoidal Rule - Simpson's 1/3 rule and 3/8 rule - Applications - Weddle's rule

Books for Study:

1. Numerical methods, M.K.Venkatraman, National Publishing Company, (1990).
2. Numerical methods, V. Rajaraman, Prentice - Hall India Pvt. Ltd., (2003).
3. Numerical methods, P. Kandasamy, K. Thilagavathy and K. Gunavathy, S. Chand & Co. (2002).
4. Numerical Methods for Mathematics, J.H. Mathews, Science and Engineering (Prentice-Hall of India, New Delhi, 1998).

Books for References:

1. Numerical methods for Scientific and Engineering computation, Jain Iyenger and Jain, New Age International (P) Ltd.,(2004).
2. Numerical methods, S.S.Sastry, Prentice Hall of India Pvt. Ltd., NewDelhi(2003).
3. Numerical Methods, Dr.A.Singaravelu, Meenakshi Agency, 2020

Core Paper Practical – III				
Title of the paper	**Physics Practical III**			
Category of the course	Year	Semester	Credits	L T P E
Core	III	V & VI	4	- - 15 15
Pre- requisites	Knowledge of basics of galvanometer			
Objectives of the course	To promote scientific temper and to learn physical concepts through these experiments.			

Course focus on : Skill development

Physics Practical - III Course outcome:

CO 1: Can acquire knowledge about light experiments.
CO 2: This course enables the students to study the ballistic galvanometer.
CO3: They will be able to perform Spectrometer and Magnetometer experiments.

1. Young's modulus of the material of the beam- Non uniform Bending - Koenig's method.
2. Refractive index of the liquid using Travelling Microscope.
3. Newton's rings - R1, R2 and μ of convex lens.
4. Spectrometer - (i - i') curve - Refractive Index.

5. Spectrometer - Small angled prism - Normal incidence and emergence. Determination of the refractive index of the material of prism.
6. Spectrometer – Dispersive power of a prism.
7. Spectrometer – Dispersive power of a grating.
8. Spectrometer - Cauchy's constant.
9. Field along the axis of a circular coil – Deflection magnetometer - B_H and M.
10. Field along the axis of a circular coil- Vibration magnetic needle - B_H
11. B.G - Figure of merit (quantity of charge)
12. B.G - Internal resistance of a cell
13. B.G - High Resistance by leakage
14. B.G - Absolute capacitance
15. B.G - Comparison of mutual inductances
16. B.G - Absolute mutual inductance
17. B.G - Self inductance - Anderson method.

Core Paper Practical – IV				
Title of the paper	**Physics Practical IV**			
Category of the course	Year	Semester	Credits	L T P E
Core	III	V & VI	4	- - 15 15
Pre- requisites	Knowledge of basics of semiconductors			
Objectives of the course	To provide an indepth knowledge and skill in Electronics,			

Course focus on : Skill development

Physics Practical - IV Course outcome:

CO 1: Can acquire knowledge about diodes
CO 2: This course enables the students to study the characteristics of transistor.
CO3: They will be able to perform Trainer kits like UJT, FET and SCR

1. Realization of logic gates – AND, OR and NOT – using diodes, transistors etc.
2. I-V characteristics of Zener diode
3. Bridge rectifier - Zener regulated power supply - 9V characteristics.
4. Verification of Demorgan's theorem.
5. Emitter follower.
6. FET characteristics.
7. Common Source FET amplifier.
8. UJT characteristics
9. I-V characteristics of Junction diode.
10. SCR characteristics.
11. Transistor – Astable multivibrator.
12. Transistor – Bistable multivibrator.
13. Transistor – Phase shift oscillator.
14. Transistor – Wien's bridge oscillator.
15. NAND and NOR as universal gates.
16. Half Adder &Full adder (using basic logic gates and Ex-OR gate or NAND gates only).

17. Half Subtractor& Full subtractor (using basic logic gates and Ex-OR gate or NAND gates only).
18. RC coupled single stage CE Transistor amplifier – frequency response.
19. Construction of Half wave rectifier
20. OP AMP – Adder and Subtractor
21. OP AMP – Integrator and Differentiator.

Physics Practical – V (Elective Practical)				
Title of the paper	**Physics Practical V**			
Category of the course	Year	Semester	Credits	L T P E
Elective	III	V & VI	2	- - 15 15
Pre- requisites	Knowledge of basics of microprocessor			
Objectives of the course	To provide an indepth knowledge and skill in Microprocessor 8085 and Op – Amp			

Course focus on : Skill development

Physics Practical - V Course outcome:

CO 1: Can acquire knowledge about IC 741
CO 2: This course enables the students to study the Op-Amp.
CO3: They will be able to perform Trainer kits like Op-Amp.

1. Microprocessor – 8085 – 8 bit Addition
2. Microprocessor – 8085 – 8 bit Subtraction
3. Microprocessor – 8085 – 8 bit Multiplication
4. Microprocessor – 8085 – 8 bit Division
5. Microprocessor – 8085 – Sorting of given set of numbers in ascending order
6. Microprocessor – 8085 – Sorting of given set of numbers in descending order
7. Microprocessor – 8085 – Finding the largest no. in a given set of numbers.
8. Microprocessor– 8085 – Finding the smallest no. in a given set of numbers.
9. Microprocessor– 8085 – reversing the elements in an array.
10. Microprocessor – 8085 – Addition of N Number of single byte numbers
11. Conversion from decimal to hexadecimal number system
12. Conversion from hexadecimal to decimal system
13. Op amp 741 - Inverting, Non - Inverting amplifier, unity follower.
14. OP amp 741 – Solving simultaneous equations.
15. OP amp 741 – Astable multivibrator.
16. Op amp 741 – Wien's Bridge oscillator
17. Op amp 741 - Phase Shift oscillator
18. Op amp 741-Solving Simultaneous Equations
19. 555 - Timer - Schmitt Trigger
20. 555 - Timer - Astable operation
21. D/A Converter – 4 bit, binary weighted resistor method

Elective – 1B				
Title of the paper	**Problem Solving in Physics**			
Category of the course	Year	Semester	Credits	L T P E
Elective	III	V	5	45 - - 15
Pre- requisites	Knowing the basic formulas in Physics			
Objectives of the course	To inculcate the problem-solving skills in different areas of Physics			

Course focusing on : Entrepreneurship

Problem Solving in Physics Course outcome:

On completion of the course the students will be able to

CO1: Think Laterally and provide necessary solution
CO2: Use appropriate mathematical methods to given problem
CO3: Verify whether the answer obtained is correct or not
CO4: Use logical and other skills to solve problem
CO5: Clear all the entrance examinations leading higher education in premier institutions

	CO-1	**CO-2**	**CO-3**	**CO-4**	**CO-5**
Unit-1	√				√
Unit-2		√			
Unit-3			√		
Unit-4				√	
Unit-5	√				√

UNIT I: PROBLEMS IN MECHANICS

Newton laws of motion for various systems (1, 2 and 3 dimension), Conservation laws and collisions, Rotational mechanics, central force, Harmonic oscillator, special theory of relativity

UNIT II: PROBLEMS IN THERMAL PHYSICS

Kinetic theory– Laws of Thermodynamics – Ideal Gas law–Various Thermodynamic process– Entropy calculation for various process– Heat engine–TS and PV diagram–Free energies and various relations

UNIT III: PROBLEMS IN ELECTRICITY & MAGNETISM

Electrostatics– calculation of Electrostatic quantities for various configurations– Conductors, Magneto statics– Calculation of Magnetic quantities for various configuration, Electromagnetic induction, Poynting vector, Electromagnetic waves.

UNIT IV: PROBLEMS IN QUANTUM MECHANICS

Origin of Quantum mechanics– Fundamental Principles of Quantum mechanics– potential wells and harmonic oscillator– Hydrogen atom

UNIT V: PROBLEMS IN GENERAL PHYSICS & MATHEMATICS

Plotting the graphs for various elementary and composite functions–Elasticity– Viscosity and surface tension– fluids– Buoyancy–pressure–Bernoulli's theorem– applications–waves and oscillations, Errors and propagation of errors.

Books for Study:

1. Charles Kittel, Walter D knight, Mechanics (in SI units) (Berkeley Physics course–volume 1), Tata McGraw Hill publication ,second edition.
2. S.C.Garg, RM Bansal & CKGhosh, Thermal physics, (Tata McGraw Hill Publications), 1 stedition.
3. E.M.Purcell, Electricity & magnetism (in SI units), Tata Mcgraw hill Publication, 2 ndEdition.
4. N.Zettili, Quantum mechanics, Wiley Publishers, second edition.
5. David. J.Griffith, Introduction to quantum mechanics, Pearson Publications, second edition.

Books for Reference:

1. Halliday & Resnick, Fundamentals of Physics, Wiley Publications, 8th Edition
2. Nelkon and Parker, Advanced level physics, CBS publishers, 7th edition
3. Amith Agarwal, Play with graphs, Arihant Publications
4. D.S.Mathur, Properties of matter, S.Chand Publications, 11th edition.
5. Electrodynamics ,David Griffiths

Elective – 1C				
Title of the paper	**Geo Physics**			
Category of the course	Year	Semester	Credits	L T P E
Elective	III	V	5	45 - - 15
Pre- requisites	Knowing the basics of solar system			
Objectives of the course	To make the students understand the basic principles of geophysics, geomagnetism and concepts of earthquakes			

Course focusing on : Entrepreneurship

Geo Physics Course outcome:

On completion of the course the students will be able to

CO1: Understand the different layers of the atmosphere
CO2: Know the details about geophysical and chemical methods
CO3: Gain sufficient knowledge on the earthquakes and Tsunami warning systems
CO4: Have an idea on geomagnetism and gravity
CO5: Understand the radioactivity of the earth

	CO-1	**CO-2**	**CO-3**	**CO-4**	**CO-5**
Unit-1	√				√
Unit-2		√			
Unit-3			√		
Unit-4				√	
Unit-5	√				√

UNIT I: PHYSICS OF THE EARTH

Introduction to Geophysics- Earth as a member of the solar system-Atmosphere-Ionosphere Asthenosphere-Lithosphere-Hydrosphere and Biosphere-Meteorology-Oceanography and Hydrology.

UNIT II: GEOPHYSICAL AND GEOCHEMICAL METHODS

Geophysical methods: Geo referencing using Arc GIS software-Electrical Methods-Qualitative interpretation of Vertical Electrical Sounding curves –Preparing pseudo cross section for electrical resistivity data and interpretation. Geochemical methods: Introduction-Principles of groundwater chemistry-Sources of contamination- Ground water quality analysis using geochemical methods.

UNIT III: INTRODUCTION TO SEISMOLOGY

The earth's interior and crust as revealed by earthquakes-Rayleigh waves and Love waves Elastic rebound theory-Continental drift-Earthquake magnitude and intensity-Horizontal seismograph and seismograph equation-Tsunami-Causes and Impacts-Tsunami warning systems.

UNIT IV: GEOMAGNETISM AND GRAVITY

Historical introduction –The physical origin of magnetism-Causes of the main field-Dynamo theory of earth's magnetism. Gravitational potential-Laplace's equation and Poisson's equation-Absolute and relative measurements of gravity-Worden gravimeter

UNIT V: GEOCHROLOGY AND GEOTHERMAL PHYSICS

Radioactivity of the earth-Radioactive dating of rocks and minerals-Geological time scale-The age of the earth. Flow of heat to the surface of the earth –Sources of heat within the earth-Process and heat transport and internal temperature of earth.

Books for study:

1. Arthur W.Hounslow, Water quality data -Analysis and Interpretation, 1995, Lewis publishers, Washington D.C.
2. Cook,A.H , Physics of the Earth and Planets,McMillanPress,London 1973.
3. John Milsom, Field geophysics-The geophysical field guide III edition, Wiley publications, England.
4. Krauskopf.K.B, Introduction to Geochemistry, McGraw Hill,1967.
5. RamachandraRao, Outline of geophysical prospecting-a manual for geologists, University of Mysore,1975.

Books for reference:

1. Garland, Introduction to Geophysics 11 edition, WB Saunder Company, London, 1979.
2. William Lowrie, Fundamentals of Geophysics, 11Edition, Cambridge press, UK.
3. Nils-Axel Morne, Geochronology-Methods and case studies, INTECH publications.
4. John Raferty, Geochronology –Dating and Precambrian time –The beginning of the world as we know it, Britannica Educational publishers, New York-2011.
5. Don L.Anderson, Theory of the Earth, Blackwell scientific Publications-1989,UK

Core Paper Theory – IX				
Title of the paper	**Atomic Physics And Laser**			
Category of the course	Year	Semester	Credits	L T P E
Core	III	VI	4	60 - - 15
Pre- requisites	Knowing the basics of atoms and X-rays			
Objectives of the course	To study the atomic structure and spectral series with electric and magnetic fields and inculcate in depth knowledge in Lasers			

Course focusing on : Employability

Atomic and Laser Physics Course outcome:

On completion of the course the students will be able to

CO1: Understand the concepts of atomic and molecular Physics based on mathematics.
CO2: Analyze the fundamental principles governing the structure of the both atom and molecules and their interaction with electric and magnetic field.
CO3: Analyze the molecular structure from the knowledge of X-ray diffraction techniques.
CO4: Be familiar with X rays and its applications.
CO5: Distinguish different types of Lasers.

	CO-1	**CO-2**	**CO-3**	**CO-4**	**CO-5**
Unit-1	√				
Unit-2		√			
Unit-3			√		
Unit-4				√	
Unit-5					√

UNIT I: PHOTO-ELECTRIC EFFECT

Richardson and Compton experiment - Laws of Photoelectric emission - Einstein Photo Electric Equation - Millikan's Experiment - Verification of Photoelectric equation - Photo electric cells - Photo emissive cells - Photovoltaic cell - Photo conducting cell - Photomultiplier.

UNIT II: ATOMIC STRUCTURE

Bohr and Sommerfeld atom models - Vector atom model - Pauli's exclusion principle - Explanation of periodic table - various quantum numbers - angular momentum and magnetic moment - coupling schemes - LS and JJ coupling - special quantisation - Bohr magnetron – Stern and Gerlach experiments.

UNIT III: FINE STRUCTURE OF SPECTRAL LINES

Excitation and Ionization Potential – Frank and Hertz’s experiment - Davis and Goucher's method-Spectral terms and notions - selection rules - intensity rule and interval rule -fine structure of sodium D2 lines - Alkali Spectra - Fine Structure of Alkali Spectra -

Spectrum of Helium - Zeeman effect - Larmor's theorem - Debye's explanation of normal Zeeman effect Anomalous Zeeman effect - theoretical explanation - Lande's `g' factor and explanation of splitting of D1 and D2 lines of sodium - Paschen - Back effect - Stark effect (qualitative study only).

UNIT IV: X-RAYS

X-rays: Bragg's law - X-ray spectroscopy - characteristic X-ray spectra - continuous X-ray spectra - X-ray absorption and fluorescence - Moseley's law - width of spectral lines - Doppler broadening - uses of X-rays - Compton effect - Experimental verification of Compton effect.

UNIT V: Lasers

Basic principles of laser – Einstein Coefficients – Condition for light amplification - Population inversion - Threshold condition – Optical resonators (Qualitative only) -Types of Lasers –Solid State lasers - Ruby and Nd-YAG Laser - Gas lasers - He-Ne and Co2 Lasers- Construction and Working- Semiconductor lasers - (Homojunction & Heterojunction)- Industrial and Medical Applications.

Books for Study:

1. Concepts of Modern physics, A Beiser, Tata McGraw Hill, New Delhi (1997).
2. Modern Physics, R Murugeshan, S Chand & Co., New Delhi (2004).
3. Atomic and Nuclear Physics, N Subramanian and Brij Lal, S Chand & Co. (2000).
4. Atomic Physics, J. B. Rajam, S. Chand & Co, 20th Edition, New Delhi (2004)
5. Laser theory and applications, K. Thyagarajan and Ajoy Ghatak, Cambridge University Press, (1999).

Books for Reference:

1. Fundamentals of Physics, D Halliday, R Resnick and J Walker,6th edition, Wiley NY (2001).
2. Physics for Engineering, P.K. Palanisamy, Scitech Publishing Pvt. Ltd, Chennai.
3. Lasers and non-linear optics, B. B. Laud, New Age International (P) Ltd., 3rd Edn., (2011).
4. An Introduction to laser, Theory and Applications, M. N. Avadhanulu, S. Chand and Co., New Delhi (2001).
5. Atomic Physics, S.N .Ghoshal, S. Chand & Co Ltd., New Delhi, Revised edition, 2004.

Core Paper Theory – X				
Title of the paper	**Nuclear and Radiation Physics**			
Category of the course	Year	Semester	Credits	L T P E
Core	III	VI	4	60 - - 15
Pre- requisites	Knowing the basics of nucleus.			
Objectives of the course	To study the basic structure of nucleus and nuclear models and analyze the radioactivity of nuclear substances and radiation hazard			

Course focusing on : Employability

Nuclear and Radiation Physics Course outcome:

CO1: Understanding on nucleus size, charge, mass and different nuclear models.
CO2: Provide necessary understanding of natural radioactivity and various decay process
CO3: Acquire the knowledge of different types of radiation detectors and the particle accelerators
CO4: Realize the mechanism of different nuclear reactions involved in nuclear reactor and cosmos.
CO5: Learn about the concept of elementary particle and classification, Quark model.

	CO-1	CO-2	CO-3	CO-4	CO-5
Unit-1	√				
Unit-2		√			
Unit-3			√		
Unit-4				√	
Unit-5					√

UNIT I: GENERAL PROPERTIES OF NUCLEI

Nuclear size, charge, mass-Determination of nuclear radius-Mirror nucleus method-Mass defect and Binding energy-Packing Fraction - Nuclear Spin - Magnetic dipole moment -Electric quadrupole moment-Nuclear models-Liquid drop model-Weizacker semi empirical mass formula-Shell model and Magic numbers-Collective model-Nuclear forces-Meson theory of Nuclear Force (qualitative).

UNIT II: RADIOACTIVITY

Natural Radioactivity-Law of Disintegration-half life and mean life period-units of Radioactivity-Transient and Secular equilibrium-Radiocarbon Dating-Age of Earth - Alpha raysCharacteristics-Geiger-Nuttal law-α-ray Spectra-Gamow's Theory of α-decay (qualitative study)- Beta rays-Characteristics-Beta ray spectra-Neutrino hypothesis-Violation of Parity ConservationExperimental Verification with Co60-gamma rays and Internal conversion-Nuclear Isomerism.

UNIT III: RADIATION DETECTORS AND PARTICLE ACCELERATOR

Ionisation chamber-G.M.Counter-Quenching and Resolving time-Scintillation Counter-Photo Multiplier Tube – Thermoluminescence -Thermoluminescence Dosimetry (TLD)- Linear Accelerator-Cyclotron-Synchrocyclotron -Betatron.

UNIT IV: RADIATION PHYSICS

Nuclear fission - Chain reaction - Reactor theory – Critical size of a reactor - General aspect of reactor design - Classification of reactors - Pressurized heavy water reactor – Fast breeder reactor - Radiation hazards - Biological effects of radiation – Radiation sickness - Radiation units and Operational limits - Radiation Survey Meters -Pocket Dosimeter - Control of Radiation hazards - Radioisotopes used for therapy - Nuclear medicine - Industrial applications – Food preservatives.

UNIT V: ELEMENTARY PARTICLES

Classification of Elementary Particles-Fundamental Interaction-Elementary Particle-Quantum Numbers - Isospin and Strangeness - Conservation laws and Symmetry-Basic Ideas about Quark-Quark Model.

Books For Study:

1. Nuclear Physics ,Tayal D.C., Himalaya Publishing House, Mumbai(2006).

2. Elements of Nuclear Physics ,M L Pandya & R P S Yadav KedarNathRamNath (2000)
3. Atomic and Nuclear Physics, N. Subramanyam and Brijlal, S Chand & Co., New Delhi (1996).
4. Nuclear and Particle Physics-An Introduction, Satadal Bhattacharya, University Press (India) Pvt Ltd., Hyderabad.
5. Modern Atomic and Nuclear Physics, AB Gupta, Books andAllied 2014
6. Nuclear Physics, R.C.Sharma, K.Nath & Co., Meerut (2000)
7. Nuclear Physics, V Devanathan

Books For Reference:

1. Nuclear Physics, R.R.Roy and B.P.Nigam, New Age International (P) Ltd., New Delhi(1997).
2. Introduction to Modern Physics, H.S.Mani &G.K.Mehta, East West press
3. Fundamentals of Elementary Particle Physics, Longo, McGraw-Hill.
4. Nuclear Physics, S N Ghoshal, S Chand & Co. Edition, (2003).
5. Nuclei and Particles, Serge., W.A. Benjamin, USA

Core Paper Theory – XI				
Title of the paper	**Solid State Physics**			
Category of the course	Year	Semester	Credits	L T P E
Core	III	VI	4	60 - - 15
Pre- requisites	Knowing the basics of crystal system			
Objectives of the course	To understand the fundamental concepts of crystal structure and acquire knowledge on the basics of magnetic phenomena on materials and various types of magnetization.			

Course focusing on : Employability

Solid State Physics Course outcome:

CO1: Understand the clear concept of seven classes of crystal system and different types of crystal structure.

CO2: Calculate the bragg's conditions for X –ray diffraction in crystal and analysis the defect in solids.

CO3: Understand the different types of chemical bonds and gain basic knowledge of superconductivity.

CO4: Acquire the basic knowledge of dielectric and evaluate different types of polarization, Clausis – Mossoti relation.

CO5: Learn the Basics of the magnetic behavior of various types of Magnetic materials.

	CO-1	CO-2	CO-3	CO-4	CO-5
Unit-1	√				
Unit-2		√			
Unit-3			√		
Unit-4				√	
Unit-5					√

UNIT I: CRYSTAL STRUCTURE

Crystal lattice – Primitive and Unit cells – Bravais lattices: Two Dimensional and Three Dimensional Bravais lattices – Miller Indices – Structure of Crystals – Close Packing: Hexagonal close packing and Cubic close packing – Sodium chloride structure, Zinc Blende structure, Diamond structure.

UNIT II: X RAY DIFFRACTION AND DEFECTS IN SOLIDS

X ray diffraction – Bragg's law –Van Laue equations- Experimental methods: Laue method, Powder crystal method and Rotating crystal method. Defects in solids - Point defects - Frenkel and Schottky defects – Equilibrium concentrations - Line defects - Edge dislocation and Screw dislocation - Surface defects -Grain boundary - Effects of Crystal imperfections.

UNIT III: CHEMICAL BONDS

Interatomic forces –Condition for bonding - Different types of chemical bonds - Ionic bond – Cohesive energy of Ionic Crystals and Madelung constant - Born Haber cycle- Covalent bond - Metallic bond - van der Waals bond - Hydrogen bond.

UNIT IV: DIELECTRIC PROPERTIES

Dielectric materials - Polarization, Susceptibility and Dielectric constant - Local fieldor Internal field - Clausius - Mossotti relation - Sources of Polarizability– Electronic Polarizability–lonic Polarizability–Orientational Polarizability - Frequency and temperature effects on polarization - Dielectric Breakdown – Properties of different types of Insulating materials.

UNIT V: MAGNETISM AND INTRODUCTION TO SUPERCONDUCTORS

Different types of magnetic materials - Classical theory of Diamagnetism (Langevin theory) - Langevin theory of Paramagnetism - Weiss theory of Para magnetism– Heisenberg interpretation on Internal field and Quantum theory of Ferromagnetism –Anti ferromagnetism- Hard and soft Magnetic materials. Superconductivity - General properties – Critical Temperature and Critical Magnetic field - Type I and II Superconductors –Meissner effect - BCS theory - Applications of Super conductors.

Books for Study:

1. Introduction to Solid State Physics ,Kittel, Willey Eastern Ltd (2003).
2. Solid state Physics, Rita John ,1st edition, Tata McGraw Hill publishers (2014).
3. Solid State Physics, R L Singhal, Kedarnath Ram Nath& Co., Meerut (2003).
4. Solid State Physics, N.W, Ashcroft and N.D. Mermin, (Holt, Rinehart and Winston, Philadelphia, 1976).

Books for Reference:

1. Solid State Physics, S.O.Pillai, New Age International (P) Ltd.,(2002).
2. Solid State Physics, A. J.Dekker, Macmillan India(1985).
3. Solid State Physics, HC Gupta, Vikas Publishing House Pvt. Ltd., New Delhi (2001).
4. Materials Science and Engineering, V. Raghavan, Prentice Hall of India PrivateLimited, New Delhi (2004).

Elective – 2A				
Title of the paper	**INTEGRATED ELECTRONICS**			
Category of the course	Year	Semester	Credits	L T P E
Elective	III	VI	3	45 - - 15
Pre- requisites	Knowing the basics of Boolean laws			
Objectives of the course	To study the different number systems associated with digital computation and introduce the counters and registers.			

Course focusing on : Enterpreneurship

Integrated Electronics Course outcome:

CO1: Understand the common number systems like binary, decimal, hexadecimal, octal, and internal conversion of BCD code, Gray code.
CO2: Can acquire the basic knowledge of Boolean algebra, K-map.
CO3: Can model and design the adder and subtracter circuits
CO4: Can acquire the knowledge about the constructional details and principle of Flip-Flop and counter circuits.
CO5: Acquire the knowledge of designing, testing and application of OP-AMP circuits.

	CO-1	**CO-2**	**CO-3**	**CO-4**	**CO-5**
Unit-1	√				
Unit-2		√			
Unit-3			√		
Unit-4				√	
Unit-5					√

UNIT I: FUNDAMENTAL DIGITAL ELECTRONICS

Number systems – Binary – Hexadecimal – Binary addition – subtraction (1's and 2's compliment method) – Multiplication - Division - BCD – Conversion – Simplification of logic circuits - using (i) Boolean algebra, (ii) Karnaugh map – Demorgan's theorems -NAND and NOR as Universal Building Blocks.

UNIT II: COMBINATIONAL LOGIC CIRCUITS

Binary Half & Full adder and Subtractor Circuits - BCD Half & Full Adder and Subtractor Circuits – 4 Bit Binary Adder/Subtractor (IC 7483) - Encoder – Decoder - Multiplexer - Demultiplexer.

UNIT III: SEQUENTIAL LOGIC CIRCUITS

1 bit Memory-Latch –R-S flip flop- J-K flip flop, D flip flop and T-flip flops -Race around condition - J-K Master/Slave flip flop – Asynchronous and Synchronous Counters - BCD counter – Up/Down counters - Ring and Twisted Ring Counter-Shift Registers - Serial And Parallel Registers.

UNIT IV: OP-AMP- BASIC APPLICATIONS

Characteristics Parameters – Differential Gain – CMRR – Slew Rate – Bandwidth - Applications – Unity Follower, Inverter, Non-Inverter, Integrator, Differentiator, Summing, Difference and Averaging Amplifier - Solving Simultaneous Equations - Comparator - Square Wave Generator - Schmitt Trigger-Wien's Bridge Oscillator

UNIT V: TIMER, DAC/ADC

Timer 555 - Internal Block Diagram and Working – Astable Multivibrator– Monostable Multivibrator-Schmitt Trigger-D/A Converter - Binary Weighted Method - A/D Converter – Successive Approximation Method.

Books for Study:

1. Digital Principles and Application, Malvino Leach, Tata McGraw Hill, 4thEdition(1992).
2. Digital Fundamentals, Thomas L. Floyd, Universal Book Stall, New Delhi(1998).
3. Introduction to Integrated Electronics, V.Vijayendran, S. Viswanathan (Printersand Publishers) Pvt. Ltd., Chennai (2005).
4. OP - AMPs and Linear Integrated Circuits, Ramakant A. Gayakwad, Prentice Hall of India (1994).
5. Digital Electronics, W.H.Gothmann, Prentice Hall of India, Pvt. Ltd., New Delhi 1996.

Books for Reference:

1. Digital Electronics, Practice Using Integrated Circuits - R.P.Jain – Tata McGrawHill(1996).
2. Linear Integrated Circuits, D. Roy Choudhury and Shail Jain - New AgeInternational (P) Ltd.(2003).
3. Electronics, Analog and Digital by I.J. Nagrath - Prentice - Hall of India,NewDelhi(1999).
4. Integrated Electronics, J.Millman and C.Halkias, Tata McGraw Hill, New Delhi(2001)

Elective – 2B				
Title of the paper	**Medical Physics**			
Category of the course	Year	Semester	Credits	L T P E
Elective	III	VI	3	45 - - 15
Pre- requisites	Knowing the basics of radiation.			
Objectives of the course	To gain a broad and fundamental understanding in Physics while developing particular expertise in medical applications			

Course focusing on : Enterpreneurship

Medical Physics Course outcome:

CO1: Be familiar with X rays and its applications
CO2: Functional knowledge regarding the need of radiological protection.
CO3: Gain knowledge on diagnostic and therapeutic application like X-rays, Ultrasound imaging , Magnetic resonance imaging etc.,
CO4: Gets familiar with various detectors used in medical imaging
CO5: Hands on training which will be useful for the students to enter the job market

	CO-1	CO-2	CO-3	CO-4	CO-5
Unit-1	√				√
Unit-2		√			
Unit-3			√		
Unit-4				√	
Unit-5	√				√

UNIT I: X-RAYS

Electromagnetic Spectrum - Production of X-Rays - X-Ray Spectra -Brehmsstrahlung - Characteristic X-Ray - X-Ray Tubes - Coolidge Tube - X-Ray Tube Design - Tube Cooling - Stationary Mode - Rotating Anode X-Ray Tubes -Tube Rating - Quality and Intensity of X-Ray. X-Ray Generator Circuits - Half Wave and Full Wave Rectification - Filament Circuit - Kilo Voltage Circuit - High Frequency generator - Exposure Timers - HT Cables.

UNIT II: RADIATION PHYSICS

Radiation Units - Exposure - Absorbed Dose - Rad to Gray - Kera Relative Biological Effectiveness - Effective Dose: Sievert (Sv)- Inverse Square Law - Interaction Of radiation with Matter - Linear Attenuation Coefficient- Radiation Detectors -Thimble Chamber - Condenser Chambers - Geiger Counter - Scintillation Counter -Ionization Chamber - Dosimeters - Survey Methods - Area Monitors - TLD and semiconductor Detectors.

UNIT-III: MEDICAL IMAGING PHYSICS

Sphygmomanometer (BP) -Thermometer -Stethoscope - Radiological Imaging - Radiography - Filters - Grids - Cassette - X-Ray Film - Film processing - Fluoroscopy - Computed Tomography Scanner - Principle Function -Display - Generations - Mammography- Ultrasound Imaging - Magnetic Resonance Imaging - Thyroid Uptake System - Gamma Camera (Only Principle, Function and display)

UNIT-IV: RADIATION THERAPY PHYSICS

Radiotherapy - Kilo Voltage Machines - Deep Therapy Machines - Tele-Cobalt machines - Medical Linear Accelerator - Basics of Teletherapy Units - Deep X-Ray, Telecobalt Units, Medical Linear Accelerator - Radiation Protection - External Beam characteristics - Phantom - Dose Maximum And Build Up - Bolus – Percentage depth Dose - Tissue - Air Ratio - Back Scatter Factor.

UNIT-V: RADIATION PROTECTION

Principles of Radiation Protection - Protective Materials - Radiation Effects - Somatic, Genetic Stochastic and Deterministic Effect- Personal Monitoring Devices- TLD Film Badge - Pocket Dosimeter.

Books for study:

1. Basic Radiological Physics, Dr. K.Thayalan ,Jayapee Brothers MedicalPublishing Pvt. Ltd. New Delhi (2003)
2. Christensen's Physics of Diagnostic Radiology: Curry, Dowdey and Murry -Lippincot Williams and Wilkins (1990)
3. Physics of Radiation Therapy , FM Khan ,Williamd and Wilkins, Thirdedition (2003)
4. The essential Physics of Medical Imaging: Bushberg, Seibert, Leidhold

Elective – 2C				
Title of the paper	**Fiber Optics**			
Category of the course	Year	Semester	Credits	L T P E
Elective	III	VI	3	45 - - 15
Pre- requisites	Knowing the basics of optics.			
Objectives of the course	To gain in depth knowledge in optical fibres			

Course focusing on : Enterpreneurship

Fiber Optics Course outcome:

CO1: Understand the overview of communications signals transmitted over optical fibers and optical fiber communication devices.
CO2: Understand the importance of fiber optic material like GA As laser, LED, modulation formats and modulation and demodulation.
CO3: Understand and differentiate losses and couplers and its function
CO4: Understand the basic concepts in the process involving the parameters like modulation and demodulation.
CO5: Learn the various fiber optic materials.

	CO-1	**CO-2**	**CO-3**	**CO-4**	**CO-5**
Unit-1	√				√
Unit-2		√			
Unit-3			√		
Unit-4				√	
Unit-5	√				√

UNIT I: FIBER OPTICS – INTRODUCTION

Structure of Fiber-Why Silica (Sio2) as Fiber-Snell's Law- Total Internal Reflection-Meridional and Skew Rays- - Acceptance Angle and Cone- Numerical Aperture- Goos-Haenchen Shift-Step And Graded Index Fibers - Single Mode and Multimode Fiber – V-Number – Number Of Modes in Step and Graded Multimode Fibers- Analog& Digital Optical Fiber Communication (OFC) System- Advantages Of OFC.

UNIT II: TRANSMISSION CHARACTERISTICS OF OPTICAL FIBERS

Losses in Silica Glass Fibers-Intrinsic, Extrinsic and OH- Absorption Losses – Scattering Losses Linear: Rayleigh and Mie Scattering, Nonlinear: Stimulated Brillouin and Raman Scattering Intramodal and Intermodal Dispersion Losses-Micro and Macro Bending Losses-Evanescent Field-Attenuation Spectrum for an Ultra-Low-Loss Single Mode Fiber.

UNIT III: OPTICAL FIBER CONNECTION

Introduction - Multimode and Single Mode Fiber Joints–Fusion and Mechanical Splices– Cylindrical Ferrule & Duplex and Multiple Fiber Connectors –Grin-Rod Lenses-Three & Four Port and WDM Couplers.

UNIT IV: OPTICAL SOURCES

Basic Concepts of Absorption and Emission of Radiations-LED Power and Efficiency-Double Heterojunction LED-Surface & Edge Emitting LED–Optical Output Power-Output Spectrum Modulation Bandwidth-Reliability- LASER Diodes-Gain Guided Lasers-Quantum-Well Lasers Fiber Lasers.

UNIT V: OPTICAL DETECTORS

Optical Detection Principles-Quantum Efficiency-Responsivity-PIN Photodiode-Speed of Response-Noise-Avalanche Photodiodes (APD): Germanium APD-Merits and Demerits Multiplication Factor-Mid-Infrared Photodiodes – Photo Transistors-Photo Conductive Detectors-Eye Diagrams.

Books for Study:

1. Optical fiber communications: Principles and Practice, John M. Senior, 3rd Edition, Pearson-Prentice Hall, (2009). (unit I – V)
2. Optical Fiber Communications, GerdGeiser, 5th edition, Tata McGraw-Hill Education Pvt. Ltd., (2017). (unit IV-V)
3. Fiber optic essentials, K. Thyagarajan and AjoyGhatak, John Wiley (2007).

Books for Reference:

1. Fiber Optic Communication And Other Application, Henry Zanger and Cynthia Zanger, Merrill Pub. Co. (1991)
2. Fiber Optics in Telecommunications, N.Sharma, TataMcGraw Hill, (1987).
3. Optical Fiber Systems: Technology, Design and Applications, K.Kao Charles, McGraw-Hill, 1st Ed edition (1982).
4. Fiber-optic communication systems, Govind P Agrawal, John Wiley (2007).
5. Introduction to fiber optics, AjoyGhatakand K. Thyagarajan, Cambridge University Press (2004).

Elective – 3A				
Title of the paper	**Microprocessor 8085 And Microcontroller**			
Category of the course	Year	Semester	Credits	L T P E
Elective	III	VI	3	45 - - 15
Pre- requisites	Knowing the basics of microprocessor and microcontroller			
Objectives of the course	To study the architecture of the microprocessor 8085 and microcontroller 8051			

Course focusing on : Enterpreneurship

Microprocessor 8085 And Microcontroller Course outcome:

CO1: The student can understand the working of architecture of 8085.
CO2: From the course students can manipulate the basic logical operations using 8085.
CO3: Can analyze the assembly language of 8085.
CO4: Can discuss the input/ out-put /memory interface devices.
CO5: Understand the concepts of interrupts and microcontrollers

	CO-1	CO-2	CO-3	CO-4	CO-5
Unit-1	√				
Unit-2		√			
Unit-3			√		
Unit-4				√	
Unit-5					√

UNIT I: MICROPROCESSOR 8085 ARCHITECTURE

Introduction to Microprocessor – Architecture of Microprocessor 8085-Internal registers (8-bit & 16-bit)-CPU-ALU-Types of System Bus-Bus Structure- multiplexing and demultiplexing address/data bus-Instruction Register and Decoder - Timing and Control Unit-Interrupts and Serial I/O (principle only)-external memory – Block diagram of 8085-Programmer's model of 8085-pin configuration of 8085.

UNIT II: INSTRUCTION SET-I

Machine Language and Assembly Language-Addressing modes-types of instruction format-Data Transfer type instructions-Arithmetic and logical instructions–Branching instructions-looping and time delay -system clock-T-state-instruction and machine cycles-Timing diagram for MOV Rd, Rs - MVI A, data8 - LXI RP, 16bits, memory read and memory write cycle

UNIT III: INSTRUCTION SET-II AND PROGRAMMING

Special Instructions: Rotate instructions-stack and subroutine related instructions-PSW peripheral instructions-I/O and Machine Control Instructions. Assembly Language Programs – Addition– Subtraction– Multiplication (8-bit) – Division (8-bit) Ascending / Descending Order, Largest/Smallest (single byte)-Addition of N numbers (single byte)-code conversion program.

UNIT IV: MEMORY/IO INTERFACE

Memory Interface (Basics) – memory mapped I/O & I/O mapped I/O- Generating Control Signals – Interfacing 2KX8 EPROM – 2KX8 RAM -Interfacing I/O ports to 8085-Hand shake signals-Functional block diagram and working of PPI-8255-Interfacing 8255 to 8085-LED Interface.

UNIT V: INTERRUPTS AND INTRODUCTION TO MICROCONTROLLERS

Interrupts in 8085- Generation of RST codes-Hardware, software interrupts and their function Interrupts pulse width and Triggering levels-Interrupt priority-Vector interrupt model -SIM and RIM instructions-Simple polled and Interrupt controlled data transfer-Introduction to Microcontroller –Comparison of Microprocessor and Microcontroller.

Books for study:

1. Microprocessor Architecture, Programming and Application with the8085, Ramesh S. Gaonakar, PenramLnternational Publishing, Mumbai, (2011).

2. Fundamental of Microprocessor 8085: Architecture Programming, and Interfacing, V. Vijayendran,Viswanathan, S., Printers & Publishers Pvt. Ltd (2009).

3. The 8051 Microcontroller, Architecture, Program and application, Kenneth J Ayala, Pen ram.

4. Muhammed Ali Mazidi, Janice Gillispie Mazidi – The 8051 Microcontroller and Embedded systems.

5. Microprocessors & Microcontrollers by B.P.Singh, Galgotia publications Pvt.Ltd

Books for reference:

1. Microprocessor Organisation and Architecture, Leventhal L.A , Prentice Hall India.

2. Ram, Fundamentals of microprocessors and microcomputers - DhanpatRai Publications, New Delhi
3. The 8080/85 Family: Design, Programming & Interfacing,John Uffenbeck, , PHI India.
4. A. K. Ray & K. M.Bhurchandani, Advance Microprocessor and Peripherals, 2ndEdition, Tata McGraw Hill, 2006
5. Mathur A.P., Introduction to Microprocessors. 3rd edn., Tata McGraw, New Delhi.

Elective – 3B				
Title of the paper	**Astro Physics**			
Category of the course	Year	Semester	Credits	L T P E
Elective	III	VI	3	45 - - 15
Pre- requisites	Knowing the basics of universe.			
Objectives of the course	To study the importance and science behind the Astrophysics for the future invention and space research.			

Course focusing on : Enterpreneurship

Astrophysics Course outcome:

CO1: Understand the nature of universe from various theories and phenomena.
CO2: The Indian institute of Astrophysics and several other astronomical institutions offer the job opportunities based on this course.
CO3: There are many institutions have the department as Department of Physics and Astronomy that offers courses and jobs for the students those who study Astrophysics.
CO4: Can acquire knowledge about solar system.
CO5: Later in future after the study and experience, the job opportunities are available in famous Indian agencies like DRDO and ISRO and in foreign astronomical institutions and agencies

	CO-1	**CO-2**	**CO-3**	**CO-4**	**CO-5**
Unit-1	√				√
Unit-2		√			
Unit-3			√		
Unit-4				√	
Unit-5	√				√

UNIT I – EARLIEST ASTRONOMY AND THEORIES OF UNIVERSE

Origin – Earliest Astronomy (2500 – 100 BC) – Pythagorean Spherical Earth – Aristotle's Earth as Centre – Copernicus Theory – Kepler's Law – Galileo's observations – Newton's Synthesis. Origin of the universe–The Big Bang Theory– The steady state theory– The Oscillating Universe theory.

UNIT II – ASTRONOMICAL SCALES AND INSTRUMENTS

Astronomical Scales– Astronomical Distance – Mass and Time–Stellar Temperature– Astronomical Instruments–The Earth's Atmosphere and the Electromagnetic Radiation – Optical Telescopes–Radio Telescopes–The Hubble Space Telescope (HST)– Astronomical Spectrographs – Photographic Photometry –Photoelectric Photometry–Spectrophotometry.

UNIT III – SOLAR SYSTEM

The sun– Structure of the Sun – Nuclear reactions in sun – Photosphere – Chromosphere – corona – solar prominences –Sunspot cycle – Theory of sunspots – Solar flare– solar constant – Temperature of the sun–Solar energy–Solar wind –Other members of the solar system

UNIT IV – STELLAR EVOLUTION

Birth of a star– Death of a star –Red giant stars –Chandrasekhar limit – white dwarfs –Black holes – Quasars – Nebulae – Supernovae Binary stars – Origin of binary stars –Variable stars – Flare stars – Constellations – Zodiac –Magnitude and brightness –Luminosities of stars – Measurement of stellar distance – Geometrical parallax method – Distance from red shift measurement.

UNIT V – THE MILKY WAY GALAXY

The milky way – Basic Structure and Properties of the Milky Way–The General Rotation Law– Density Distribution of Gas and Spiral structure of the Galaxy– The Mass of the Galaxy – Magnetic Field in the Galaxy – Cosmic Rays –Continuous Radio Emission in the Galaxy– Hubble's law–Types of galaxies.

Books for Study:

1. An Introduction to Astro Physics, Baidyanath Basu,Tanuka Chattopadhyay,sudhindra Nath Biswas, Second Edition(2010), PHI Learning Private Limited.
2. Astro Physics a Modern Perspective, K.S. Krishnasamy,Reprint, New Age International (p) Ltd, New Delhi, 2002.
3. Textbook of Astronomy and Astrophysics with elements of cosmology,V.B. Bhatia, Narosa Publication.
4. Modern Astrophysics,B.W. Carroll & D.A. Ostlie, Addison-Wesley Publishing Co.
5. Introductory Astronomy and Astrophysics,M. Zeilik and S.A. Gregory, 4 th Edition, Saunders College Publishing.
6. Astrophysics for Physicists , Arnab Rai Choudhury

Books for Reference:

1. Astronomy,S. Kumaravelu,Janki calendar corporation, Sivakasi, 1993.
2. Physics of the Universe,Hewish. A, CSIR publication, New Delhi, 1992.
3. Inside Stars,BimanBasu, CSIR Publication, New Delhi, 1992.
4. Cosmic Vistas,BimanBasu, National Book Trust of India, 2002.
5. Space today, Mohan SundaraRajan, National Book Trust of India, 2000
6. The Cosmic Voyage through time and space,William K. Hartmann, Wads worth Publishing company, Californi, 1990.
7. Astronomy,Baker and Fredrick, ninth edition, Van No strand Rein hold, Co, New York - 1964.

Elective – 3C				
Title of the paper	**Weather Forecasting**			
Category of the course	Year	Semester	Credits	L T P E
Elective	III	VI	3	45 - - 15
Pre- requisites	Knowing the basics of weather and atmosphere			
Objectives of the course	To enable them to develop an awareness and understanding regarding the causes and effects of different weather phenomenon and basic forecasting techniques			

Course focusing on : Enterpreneurship

Weather Forecasting Course outcome:

CO1: To learn basic techniques to measure temperature and its relation with cyclones and anticyclones

CO2: Gain knowledge of simple techniques to measure wind speed and its directions, humidity and rainfall

CO3: Understand various causes of climate change like global warming, air pollution, aerosols, ozone depletion, acid rain

CO4: Develop skills needed for weather forecasting.

CO5: Uncertainties in predicting weather based on statistical analysis.

	CO-1	**CO-2**	**CO-3**	**CO-4**	**CO-5**
Unit-1	√				√
Unit-2		√			
Unit-3			√		
Unit-4				√	
Unit-5	√				√

UNIT I: INTRODUCTION TO ATMOSPHERE

Elementary idea of atmosphere-Physical structure and composition- compositional layering of the atmosphere-Variation of pressure and temperature with height- Air temperature-Requirements to measure air temperature- Temperature sensors- types; atmospheric pressure: its measurement-Cyclones and anticyclones- its characteristics.

UNIT II: MEASURING THE WEATHER

Wind- forces acting to produce wind; wind speed direction: units, its direction measuring wind speed and direction; humidity, clouds and rainfall, radiation: absorption, emission and scattering in atmosphere-Radiation laws.

UNIT III: WEATHER SYSTEMS

Global wind systems- air masses and fronts- classifications- jet streams- local thunderstorms- tropical cyclones: classification- tornadoes- hurricanes.

UNIT IV: CLIMATE AND CLIMATE CHANGE

Climate: its classification- causes of climate change-global warming and its outcomes- air pollution- aerosols, ozone depletion, acid rain, environmental issues related to climate.

UNIT V: BASICS OF WEATHER FORECASTING

Weather forecasting: analysis and its historical background- need of measuring weather types of weather forecasting- weather forecasting methods- criteria of choosing weather station- basics of choosing site and exposure- satellites observations in weather forecasting- weather maps- uncertainty and predictability- probability forecasts.

Books for Study:

1. Aviation Meteorology, I.C. Joshi, 3rd edition 2014, Himalayan Books
2. The weather Observers Hand book, Stephen Burt, 2012, Cambridge University Press.
3. Meteorology, S.R. Ghadekar, 2001, Agromet Publishers, Nagpur.

Books for Reference:

1. Text Book of Agrometeorology, S.R. Ghadekar, 2005, Agromet Publishers, Nagpur.
2. Why the weather, Charls Franklin Brooks, 1924, Chpraman & Hall, London.
3. Atmosphere and Ocean, John G. Harvey, 1995, The Artemis Press.

Allied Paper – I For B. Sc., Mathematics				
Title of the paper	**Allied Physics – I**			
Category of the course	Year	Semester	Credits	L T P E
Allied	I	I	4	60 15 - 15
Pre- requisites	Knowing the basics of Physics			
Objectives of the course	This paper introduces the students to the basic concepts of Elasticity, Rotational motion, Heat and thermodynamics, Sound, Optics, Atomic and Nuclear Physics			

Course focusing on : Employability

Allied Physics – I - Course outcome :

CO 1 : Explore the fundamental concepts of physics

CO 2 : Import knowledge about the importance of material properties, heat, sound, optics, atomic and nuclear physics

CO 3 : Understand the energy involved in nuclear reaction

CO 4 : Carry out the practical by applying these concepts

CO 5 : Get depth knowledge of physics in day today life

UNIT I: PROPERTIES OF MATTER

Young's modulus – Rigidity modulus – Bulk modulus – Poisson's ratio (definition alone) – Bending of beams – Expression for Bending Moment – Determination of Young's Modulus – Uniform and Non-Uniform bending. Expression for Couple per unit twist – Work done in twisting a wire – Torsional oscillations of a body– Rigidity modulus of a wire and M.I. of a disc by Torsion Pendulum.

UNIT II: VISCOSITY

Viscosity – Viscous force – Co-efficient of Viscosity – Units and Dimensions – Poiseuille's formula for co-efficient of viscosity of a liquid – determination of co-efficient of viscosity using burette and comparison of Viscosities - Bernoulli's theorem – Statement and proof – Venturi meter – Pitot tube.

UNIT III: CONDUCTION, CONVECTION AND RADIATION

Specific heat Capacity of Solids and Liquids – Dulong and Petit's law – Newton's law of Cooling – Specific Heat Capacity of a Liquid by Cooling – Thermal Conduction – Coefficient of Thermal Conductivity by Lee's disc Method. Convention Process – Lapse Rate – Green House Effect – Black Body Radiation – Planck's Radiation Law – Rayleigh Jean's Law, Wien's Displacement Law – Stefan's Law of Radiation. (No Derivations).

UNIT IV: THERMODYNAMICS

Zeroth and I Law of Thermodynamics – II law of Thermodynamics – Carnot's engine and Carnot's cycle – Efficiency of a Carnot's Engine – Entropy – Change in Entropy in Reversible and Irreversible Process – Change in entropy of a perfect gas – Change in Entropy when Ice is converted into steam.

UNIT V: OPTICS

Interference – Conditions for Interference Maxima and Minima – Air Wedge – Thickness of A Thin Wire – Newton's Rings – Determination of Wavelength Using Newton's Rings. Diffraction – Difference Between Diffraction and Interference – Theory of Transmission Grating – Normal Incidence – Optical Activity – Biot's Laws – Specific Rotatory Power – Determination of Specific Rotatory Power Using Laurent's Half Shade Polarimeter.

Books For Study:

1. Properties of matter, Brijlal and Subramanyam, Eurasia Publishing co., New Delhi, III Edition 1983
2. Element of properties of matter, D.S.Mathur, S.Chand & Company Ltd, New Delhi, 10th Edition 1976
3. Heat and Thermodynamics, Brijlal &Subramanyam, S.Chand& Co, 16th Edition 2005
4. Heat and Thermodynamics, D.S. Mathur, Sultan Chand& Sons, 5th Edition 2014.
5. Optics and Spectroscopy, R.Murugeshan, S.Chand and co., New Delhi, 6thEdition 2008.
6. A text book of Optics, Subramanyam and Brijlal, S. Chand and co., New Delhi, 22nd Edition 2004.
7. Optics, Sathya Prakash, Ratan Prakashan Mandhir, New Delhi, VII Edition 1990.

Allied Paper – II For B. Sc., Mathematics				
Title of the paper	**Allied Physics – II**			
Category of the course	Year	Semester	Credits	L T P E
Allied	I	I	4	60 15 - 15
Pre- requisites	Knowing the basics of semiconductors			
Objectives of the course	This paper introduces the student to the basic concepts of current electricity, electronics and digital electronics.			

Course focusing on : Employability

Allied Physics – II Course outcome :

CO 1 : Acquire knowledge on elementary ideas of electricity and magnetism

CO 2 : Emphasize the significance of laws involved in electric circuits

CO 3 : Understand the basics of operational amplifier

CO 4 : Apply the principles of electronics in day to life

CO 5 : Apply the characteristics of electronic devices in practicals

UNIT I: CURRENT ELECTRICITY

Ohm's law – Law of resistance in series and parallel – Specific resistance – capacitors – capacitors in serial and parallel – Kirchoff's laws – Wheatstone's network – condition for balance Carey-Foster's bridge – measurement of resistance – measurement of specific resistance – determination of temperature coefficient of resistance – Potentiometer – calibration of Voltmeter.

UNIT II: ELECTROMAGNETISM

Electromagnetic Induction – Faraday's laws – Lenz law – Self Inductance – Mutual Inductance – Experimental Determination-Coefficient of Coupling A.C. Circuits – Mean value – RMS value – Peak value – LCR in series circuit – impedance – resonant frequency – sharpness of resonance.

UNIT III: ATOMIC AND NUCLEAR PHYSICS

Bohr's atom model – radius energy – Atomic excitation – Ionization potential – Frank and Hertz Method – Nucleus – Nuclear properties – Mass defect – Binding energy. Radio isotopes – Uses of radio isotopes – Nuclear fusion and Nuclear fission – X-rays – Production – properties –Derivation of Bragg's law – uses of X-raysin industrial and medical fields.

UNIT IV: ANALOG ELECTRONICS

Semiconductor – PN junction diode – Bridge rectifier – Zener diode – Regulated power supply. Transistor – Working of a transistor – Transistor characteristics: CE Configuration – current gain relationship between α and β – Transistor Characteristics – CE Configuration only – CE amplifier – feedback – Hartley oscillator – Colpitt's oscillator.

UNIT V: DIGITAL ELECTRONICS

Number system – Decimal – Binary – Octal and Hexadecimal system – Double Dabble method – Binary addition, subtraction and multiplication– conversion of binary number to octal and hexadecimal numbers and vice versa. Logic gates – OR, AND, NOT, XOR, NAND and NOR gates – truth tables – Half adder and Full adder circuits – Laws and theorems of Boolean's algebra – De Morgan's theorems.

Books For Study:

1. Electricity and Magnetism – R. Murugesan, S. Chand & co, 2001.
2. Modern Physics – R. Murugesan, S. Chand & co, 1998.
3. Basic Electronics – B.L. Theraja, S. Chand & co, 2003.

Allied Practical For B. Sc., Mathematics				
Title of the paper	**Allied Physics Practical**			
Category of the course	Year	Semester	Credits	L T P E
Allied	I	I & II	2	- - 30 15
Pre- requisites	Knowing the basics of mathematical calculations.			
Objectives of the course	To acquire basic understanding of laboratory technique and to educate and motivate the students in the field of Physics.			

Course focusing on : Skill development

Allied Physics Practical - Course outcome:

CO 1 : Get depth knowledge of physics instruments.

CO 2 : Import knowledge about the electrical instruments.

CO 3 : Practically understand the concepts of semiconductor

1. Measurement of length (or diameter) using Vernier calipers, Screw gauge and Travelling microscope
2. Young's Modulus by Non-uniform bending using Pin and Microscope
3. Young's Modulus by Non-uniform bending using Optic lever–Scale and telescope
4. Rigidity modulus by Torsional oscillations without mass
5. Surface tension and Interfacial Surface tension–Drop Weight method
6. Comparison of Viscosities of two liquids–Burette method
7. P.O BOX – Specific resistance
8. Sonometer – Determination of a.c frequency
9. Newton's rings-Radius of curvature
10. Air wedge–Thickness of a wire.

11. Spectrometer–Grating–Wavelength of Mercury lines–Minimum deviation method
12. Potentiometer–Voltmeter Calibration
13. B.G.–Figure of Merit (table galvanometer)
14. Construction of AND, OR, NOT gates–using diodes and Transistor
15. Junction Diode–Characteristics
16. NAND gate as a universal gate

Allied Paper – I for M. Sc Computer Science and Technology				
Title of the paper	**Applied Physics – I**			
Category of the course	Year	Semester	Credits	L T P E
Allied	I	I	5	60 15 - 15
Pre- requisites	Knowing the basics of semiconductors			
Objectives of the course	This paper introduces the student to the concepts of Transistor, semiconductors and Laser.			

Course focusing on : Employability

Applied Physics – I - Course outcome:

CO 1 : Acquire knowledge of semiconductors

CO 2 : Understand the basics of transistors.

CO 3 : Emphasize the significance of electronics instruments.

CO 4 : Can acquire knowledge about Lasers

CO 5 : Understand the fiber optic communication

Unit 1:- SEMICONDUCTOR DIODE

Introduction - on junction - current voltage characteristic of a semiconductor diode - Zener diode as a voltage Regulator - Tunnel diode - Schottley diode - optoelectronic devices - light emitting diode - photo diodes.

Unit 2:- THE BASIC TRANSISTORS

The bipolar junction transistor - transistor biasing - transistor circuit configurations - common base (CB) Common emitter (CE) Common collector (CC) configurations - CB,CE,CC static characteristics - construction of OR, AND and NOR gates using transistors - logic gate parameters - logic families - resistor transistor logic (RTL) - diode transistor logic (DTL) -transistor transistor logic (TTL) - fabrication of ICS.

Unit 3:- ELECTRONIC INSTRUMENTS

Introduction - multimeter - multimeter as voltmeter - multimeter as ammeter - multimeter as ohm meter - applications of multimeter - sensitivity of multimeter - merits and demerits of multimeter - cathode ray oscilloscope.

Unit 4:- LASERS

Atomic structure - Bohr's atomic model - energy levels - energy bands in solids - basic principle of laser operation - population inversion - construction and working of He-Ne laser - CO_2 laser - Ruby laser - semiconductor laser – applications.

Unit 5:- FIBER OPTIC COMMUNICATION SYSTEMS

Introduction to communication - types of optical fibers - single and bundled fibers - fibers materials – attenuation - dispersion fiber optic light sources – detectors - fiber optic communications.

BOOKS FOR STUDY & REFERENCE:-

1. Elements of Electronics, M.K.Badge and S.P.Singh, S.Chand & Co, 1987
2. Basic Electronics Solid state, B.C.Theraja, S.Chand & Co, 1995
3. Principles of Electronics-V.K.Metha, S.Chand & Co, 1997.

Allied Paper – II for M. Sc Computer Science and Technology				
Title of the paper	**Applied Physics – II**			
Category of the course	Year	Semester	Credits	L T P E
Allied	I	I	5	60 15 - 15
Pre- requisites	Knowing the basics of materials			
Objectives of the course	This paper introduces the student to the concepts electric , dielectric and magnetic materials			

Course focusing on : Employability

Applied Physics – I - Course outcome:

CO 1 : Acquire knowledge of electrical properties

CO 2 : Understand the basics of magnetic materials

CO 3 : Learn about dielectric materials

CO 4 : Can acquire knowledge about super conductors

CO 5 : Learn about modern engineering materials

Unit 1:- ELECTRICAL PROPERTIES

Free electron of Drude and Lorentz - Weidman Franz Law - Distinction between Conductor, Semiconductors, Insulators on the basis of band theory - Factors affecting resistivity of a conductor: Temperature, Allowing, Pressure, Strain, Magnetic field and environment.

Unit 2:- MAGENETIC MATERIALS

Magnetic material - classification of magnetic materials, ferromagnetism: Domain theory - Hysteresis - Hard and Soft magnetic materials - Curie - Weiss law - Magnetostriction, Ferrites: Preparation, Properties, Applications - Magnetic bubble memory,

Magnetic recording - Writing magnetic data – Reading magnetic data - Storage of magnetic data.

Unit 3:- DIELECTRIC MATERIALS

Qualitative study of three types of polarization - effect of temperature and frequency on dielectric constant - dielectric loss - Ferro electric materials - Behaviour of barium titanate - Pieze - electric materials - Breakdown mechanism - Classification of insulating materials on temperature basis.

Unit 4:- SUPER CONDUCTORS

Qualitative study of the Phenomenon - Critical temperature and critical field. Meissner effect - Type I and II superconductors. BCS theory of superconductivity (Qualitative) - High temperature superconductor. Applications: Crypton, magnetic levitation - Superconducting magnets.

Unit 5:- MODERN ENGINEERING MATERIALS

Metallic glasses as transformer core material - Nanophase materials - Synthesis - Variation of physical properties with Geometry - Shape memory alloys - Characteristics of SMA - Thermomechanical behavior - commercial SMA - Applications - Biomaterial.

BOOK FOR STUDY AND REFERENCE: -

1. R. Raghavan V; “Material Science and Engg A first Course”; PHI; 1991.
2. Arumugam M; “Material Science”; Anuradha Pub. 1994.
3. P.K. Palanisamy; “Material Science”; Scitech; 2002.
4. Setha & Gupta; “Course in electrical Engg materials”; Dhanpat Raj & Sons 1990.

SRI SANKARA ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

ENATHUR, KANCHIPURAM - 631561

DEPARTMENT OF PHYSICS

PROGRAM OUTCOMES FOR UNDER-GRADUATE DEGREE

1. Enriching the knowledge in theoretical and practical aspects at the undergraduate level.
2. Developing curiosity in the subject and encouraging them to pursue higher studies.
3. Enabling the students to come out successfully in competitive examinations.
4. Developing students' skills, based on current trends by offering Job oriented, Entrepreneurial, certificate courses and Value-added courses.

PROGRAMME SPECIFIC OUTCOMES
B.Sc., PHYSICS

Programme Specific Outcomes

PSO 1: This course provides the students to acquire the fundamental concepts of Physics, including the major premises of Mechanics, Thermal Physics, Optics, Atomic and Molecular physics, quantum mechanics, Electronics etc. and also students are also expected to develop a written and oral communication skills in communicating physics-related topics.

PSO 2: Apply conceptual understanding of physics to general real-world situations and describe the methodology of science and the relationship between observation and theory.

PSO 3: Students should learn how to design and conduct a series of experiments demonstrating their understanding of the scientific method and processes and also expected to have an understanding of the analytical methods.

PSO 4: Apply one's knowledge of Physics theoretical and laboratory skills to new/unfamiliar contexts to identify and analyse problems and issues and solve complex problems in Physics and related areas with well-defined solutions.

PSO 5: The outcome of the course would enlighten the students with the fundamental of Classical and modern physics to grow as a medical physicist, Technical and scientific assistants and also prepare them for the competitive exam related to physics for their higher studies.

PSO-PO MATRIX

Program Outcome	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
PO-1	✓				
PO-2			✓		
PO-3		✓		✓	
PO-4					✓

PSO –CO MATRIX

Course	Course outcome	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
PROPERTIES OF MATTER AND SOUND	CO-1	√				
	CO-2		√			
	CO-3			√		
	CO-4			√	√	
	CO-5					√
PHYSICS PRACTICAL - I	CO-1	√			√	
	CO-2		√			
	CO-3			√		√
NON MAJOR ELECTIVE- EVERYDAY PHYSICS	CO-1	√				
	CO-2		√			
	CO-3		√	√		
	CO-4				√	
	CO-5					√
HEAT AND THERMAL PHYSICS	CO-1	√				
	CO-2		√			
	CO-3	√		√		
	CO-4				√	
	CO-5					√
NON-MAJOR ELECTIVE- PHYSICS OF EVERYDAY LIFE	CO-1	√				
	CO-2		√			
	CO-3			√		
	CO-4				√	
	CO-5	√				√
MATHEMATICAL METHODS IN PHYSICS	CO-1	√				
	CO-2		√			√
	CO-3			√		
	CO-4				√	
	CO-5	√				√
PHYSICS PRACTICAL -II	CO-1	√			√	
	CO-2		√			
	CO-3			√		√

Course	Course outcome	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
MECHANICS	CO-1	√				√
	CO-2		√			
	CO-3		√	√		
	CO-4				√	
	CO-5	√				√
OPTICS AND SPECTROSCOPY	CO-1	√		√		
	CO-2		√			
	CO-3		√	√		
	CO-4				√	√
	CO-5					√
ELECTRICITY AND ELECTROMAGNETISM	CO-1	√	√			
	CO-2		√			√
	CO-3	√		√		
	CO-4				√	
	CO-5					√
QUANTUM MECHANICS	CO-1		√			
	CO-2		√			
	CO-3			√		
	CO-4			√	√	
	CO-5		√		√	
BASIC ELECTRONICS	CO-1	√				√
	CO-2		√			
	CO-3	√		√		
	CO-4		√		√	
	CO-5	√				√
PHYSICS PRACTICAL –III	CO-1	√			√	
	CO-2		√			
	CO-3			√		√
PHYSICS PRACTICAL- IV	CO-1	√			√	
	CO-2		√			
	CO-3			√		√

Course	Course outcome	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
PHYSICS PRACTICAL- IV	CO-1	√			√	
	CO-2		√			
	CO-3			√		√
ELECTIVE-1 NUMERICAL METHODS	CO-1	√	√			
	CO-2		√			
	CO-3			√		
	CO-4				√	√
	CO-5					√
ATOMIC PHYSICS AND LASER	CO-1	√	√		√	
	CO-2		√			
	CO-3			√		√
	CO-4				√	
	CO-5	√			√	
NUCLEAR AND RADIATION PHYSICS	CO-1		√			
	CO-2		√			
	CO-3			√		√
	CO-4			√	√	
	CO-5				√	
SOLID STATE PHYSICS	CO-1	√				√
	CO-2		√			
	CO-3	√		√		
	CO-4		√		√	
	CO-5	√				√
ELECTIVE-2 INTERGRATED ELECTRONCS	CO-1	√			√	
	CO-2		√			
	CO-3			√		√
	CO-4	√				
	CO-5			√		
ELECTIVE-3 MICROPROCESSOR 8085 AND MICROCONTROLLER	CO-1	√			√	
	CO-2		√			
	CO-3			√		√
	CO-4		√			
	CO-5			√		

SRI SANKARA ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

EANTHUR, KANCHIPURAM - 631561

PROGRAM WISE LIST OF COURSES HAVING FOCUS ON EMPLOYABILITY/ENTREPRENEURSHIP/ SKILL DEVELOPMENT IN UNDER GRADUATES CURRICULUM

B.Sc., Physics

Serial No	Name of the Course	Focus on employability/ entrepreneurship/ skill development
1	Properties of Matter and Sound	Employability
2	Heat and Thermal Physics	Employability
3	Mathematical Methods in Physics	Employability
4	Mechanics	Employability
5	Optics and Spectroscopy	Employability
6	Electricity and Electromagnetism	Employability
7	Quantum Mechanics	Employability
8	Basic Electronics	Employability
9	Numerical Methods	Entrepreneurship
10	Atomic Physics and Laser	Employability
11	Nuclear and Radiation physics	Employability
12	Solid State Physics	Employability
13	Integrated Electronics	Entrepreneurship
14	Microprocessor 8085 and Microcontroller	Entrepreneurship
15	Physics Practical -I	Skill Development

16	Physics Practical -II	Skill Development
17	Physics Practical -III	Skill Development
18	Physics Practical -IV	Skill Development
19	Physics Practical -V	Skill Development

Total = 19 (Employability = 11, Skill Development = 05 and Entrepreneurship -03)

Soft Skills for UG Degree Courses

Serial No	**Name of the Course**	**Focus on employability/entrepreneurship/ skill development**
1	Essentials of Language and Communication - Level- I	Skill development
2	Essentials of Language and Communication - Level- II	Skill development
3	Computing Skills - Level - I	Skill development
4	Computing Skills - Level – II	Skill development

Total = 04

Non Major Elective subjects for UG Degree Courses

Serial No	**Name of the Course**	**Focus on employability/entrepreneurship/ skill development**
1	Everyday Physics	Entrepreneurship
2	Physics of everyday life	Entrepreneurship

Total = 02