Placed at the meeting of
Academic Council
held on 26.03.2018

APPENDIX - BG

MADURAI KAMARAJ UNIVERSITY

(University with Potential for Excellence)

B.Sc. Physics (Semester)

CHOICE BASED CREDIT SYSTEM

(Revised Syllabus with effect from the academic year 2018-2019 onwards)

ANCILLARY – APPLIED ELECTRONICS AND INSTRUMENTATION for B.Sc., (PHYSICS)

SCHEME OF EXAMINATIONS AND REGULATIONS

1. INTRODUCTION OF THE PROGRAMME

Physics is one of the basic and fundamental sciences. A bachelor degree in Physics is a great foundation for career in government jobs, industries, government labs and in the astronaut corps. Physics brings a broad perspective to any problem. This intensive thinking makes the physicist desirable in any field. That's why physics graduates can expect career salaries similar to those of computer science and engineering major.

2. ELIGIBILITY FOR ADMISSION

A pass in +2 examination conducted by the Board of Higher Education, Government of Tamil Nadu with Physics & Mathematics OR any other examination accepted by the syndicate, as equivalents thereto are eligible to join this course.

2.1 Duration of the Course : 3 Years

2.2. Medium of Instructions : English / Tamil

3. OBJECTIVES OF THE PROGRAMME

The UG course in Physics helps the students to understand the world around us, the world inside us and the world beyond us. Physics encompasses the study of the universe from the smallest subatomic particles to the largest galaxies. Moreover it is the basis if many other sciences like chemistry, oceanography, seismology and can be applied to biology or medical sciences. All are easily accessible to a bachelor's degree in physics.

Physics challenges our imagination with concepts like relativity and string theory. It leads to great discoveries like computers and lasers that lead to technologies

which change our lives – from healing joints to curing cancer and to develop sustainable energy solutions.

4. OUTCOME OF THE PROGRAMME

The Syllabus for B.Sc., Physics degree under semester system has been designed on the basis of Choice Based Credit System, (CBCS) which would focus on job oriented programmes and values added education. It will effect from June 2018 onwards. Duration of the course is three years. The students who are joining the B.Sc., (Physics) degree shall undergo a study period of three academic years – Six Semesters.

While preparing the syllabus, care is taken to provide the requirements of students who opt physics, for developing their skill and competence in their career. Hence after completion of the course, the student will be enriched with recent trends in Physics and be motivated towards higher studies and research activities. During the preparation of the syllabus and curriculum, the UGC model curriculum and syllabi of world best universities were considered.

5. CORE SUBJECT PAPERS

The core subject papers offered in major physics for six semesters are given below.

Core subject	Semester	Subject/ Title of the paper
CS 1	**I**	Mechanics and Properties of matter
CS 2	**II**	Thermal Physics and Acoustics
CS 3	**III**	Electricity and Electromagnetism
CS 4	**IV**	Optics and Spectroscopy
CS 5	**V**	Modern Physics
CS 6	**V**	Nuclear Physics
CS 7	**V**	Analog Electronics
CS 8	**VI**	Classical and Statistical Mechanics
CS 9	**VI**	Solid State Physics
CS 10	**VI**	Digital Electronics

6. SKILL BASED PARERS

The Skill Based subject papers offered in major physics for six semesters are given below.

Skill Based Subject	Semester	Subject/ Title of the paper
SB 1	**I**	Programming in C
SB 2	**I**	Solar Energy
SB 3	**II**	Astrophysics
SB 4	**II**	Medical Physics
SB 5	**V**	Nanophysics
SB 6	**VI**	Optoelectronics

7. NON MAJOR ELECTIVE PARERS (NME)

The Non Major Elective papers offered in Physics department for students studying other than physics are given below.

Non Major Elective	Semester	Subject/ Title of the paper
NME 1	**I**	Fundamentals of Physics I
NME 2	**II**	Fundamentals of Physics Ii

8. UNITIZATION

The important concepts of each subject is uniformly distributed in five units and properly required hours to teach are allotted

9. PATTERN OF SEMESTER EXAMINATION

The semester examination comprises of two parts i) internal assessment and ii) External examination. The maximum marks for the internal and external examinations are 25 and 75 respectively.

10. THE SCHEME FOR INTERNAL ASSESSMENT

The Pattern for internal valuation

- Two tests will be conducted (10 mark each). The average of the two is taken – **10 marks**

- 3rd test may be allowed for absentees of any one of the two tests.
- Group Discussion / Seminar / Quiz – **5 marks.**
- For Quiz, 2 Quiz should be conducted.
- 2 Assignments : 5 mark each ; average **5 marks**
- Peer team teaching and Peer group learning **– 5 marks**
  (Students should be grouped into 5 or 6 members. 10% of each subject shall be taught through peer team teaching and learning method and appropriate hours should be allotted.

11. EXTERNAL EXAMINATION

Student should appear for the external examination at the end of each semester. The University semester examinations will be conducted in the month of November and April for odd and even semesters respectively. He /she must satisfy the minimum attendance as prescribed by the University.

12. QUESTION PAPER PATTERN

The pattern of Question paper will be as follows.

EXTERNAL

Time : 3 hours **Max.Marks:75**

SECTION A (10 X1 =10 Marks)

Question No. 1 to 10 (Multiple Choices)

- Two questions from each unit
- Four choices in each question
- No ‘ none of these ‘ choice.

SECTION B : (5 X 7 = 35 marks)

- Answer all questions choosing either (a) or (b)
- Answer not exceeding two pages. (One question from each unit)

Question No : 11 – 15

11	(a)	or	11	(b)
12	(a)	or	11	(b)
13	(a)	or	11	(b)
14	(a)	or	11	(b)
15	(a)	or	11	(b)

SECTION C (3 X 10 = 30 marks)

- Answer not exceeding four pages.
- Answer any three out of five (1 Question from each unit)

Questions 16 -20

There must be at least one problem in section B and section C
Blue Print of the Question Paper external – Core Subjects

Maximum Marks: 75

Section	Types of questions	No. of questions	No. of Questions to be answered	Marks For Each question	Total Marks
A	Multiple Choice. Two questions from each unit	10	1	1	10
B	Not exceeding 2. Pages (either or type) – One from each unit *	5	5	7	35
C	Not exceeding 4 Pages (any three out of five – one from each unit*	5	3	10	30

***** There must be at least one problem in Section B and Section C

6.**There will be Two Allied subjects to fulfill the course during three years.**

Subject	Maximum marks	Credit	Year of study
Mathematics	400	18	I & II
Chemistry / Applied Electronics	600	18	I & II

- The syllabus for the ancillary subjects can be got from the Ancillary Department of Mathematics, Chemistry / Applied electronics.

- Practical : Record Note Book / Internal 10 + 30 = 40
  Examination external = 60

  Total 100
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13. SCHEME OF EVALUATION :

For the University theory examination the question paper setter should submit the scheme of valuation along with the question paper for each subject.

14. PASSING MINIMUM :

i) A candidate will be eligible for the B.Sc., degree by completing three years (six semesters) and passing all the prescribed examinations.

ii) A candidate shall be declared as passed the course, if he/she scored a minimum of 40% marks in each paper of all the subjects. He/ She must score a minimum of 27 marks out of 75 in the external examination and a minimum of 40 (internal + external) out of 100.

14.1. Classification

Sl. No	Range of CCPA	Class
1	40 & above but below 50	III
2	50 & above but below 60	II
3	60 & Above	I

15. MODEL QUESTIONS :

Model question papers for a few core subject and skilled based papers of Physics are given below.

MODEL QUESTION PAPERS
MECHANICS AND PROPERTIES OF MATTER
(For those who joined in June 2018)

Time: Three hours Maximum: 75 Marks

Section-A – (10x1=10 Marks)
Answer all questions

Choose the correct answer:

1. In the case of elastic collision _____ energy of the particle is fully conserved.
(a) Potential (b) Kinetic (c) Thermal (d) Electrical

2. According to Newton's law _____
(a) $F = \frac{d}{dt}(mv)$ (b) $F = \frac{d}{dt}(mp)$ (c) $F = \frac{dy}{dt}$ (d) $F=0$

3. Moment of inertia of circular disc about an axis through it's centre and perpendicular to its plane
(a) $I = \frac{MR^2}{4}$ (b) $I = MR^2$ (c) $I = \frac{MR^2}{2}$ (d) $I = M^2R$

4. The dimensions of torque is _____

(a)MLT^{-2} (b)ML^2T^{-2} (c)ML^2T^{-3} (a)ML^2T^{-1}

5. _____ discovered the universal law of gravitation
(a) Newton (b) Planck (c) Curie (d) Kepler
6. Gravitational field is a _____
(a) Vector quantity (b) Scalar quantity (c) Zero at earth crust (d) Infinity at earth crust
7. _____ substances regain their original dimension after the removal of force
(a) Plastic (b) Elastic (c) Plasto elastic (d) Rigid
8. Maximum stress upto which the body exhibits the property of elasticity is _____ limit
a) Elastic (b) Plastic (c) Tangent (d) Infinite
9. Excess of pressure in a cylindrical drop is_____
(a) σ^r (b) $\sigma/4r$ (c) $\sigma . r$ (d) σ/r
10. Bernoulli's theorem is applicable in
(a) Bunsen burner (b) Filter pump (c) Wings of aero plane

(d) All of these

Section-B (5x7=35 Marks)

Answer ALL questions choosing either (a) or (b)

11. (a) What is collision and explain its types?

(or)

(b) Write short notes on Newton's law of motion and law of conservation of linear momentum.

12. (a) Explain briefly about the torque

(or)

(b) Deduce an expression for moment of inertia of a circular disc.

13. (a). State Newton's gravitational law and discuss its applications.

(or)

(b) How will you determine the mass of Earth?

14. (a). Calculate the $\eta = 8x10^{10}$ N/m^2 work done in twisting a steel wire of radius 10^{-3} m and length 0.25m through an angle of 45°

(or)

(b) Explain the term Poisson's ratio and discuss its limiting values.

15. (a) Discuss viscosity, Co-efficient of viscosity and streamlined and turbulent motion.

(or)

(b) What is a venturimeter? Explain about its operation.

Section-C (3x10=30 Marks)

Answer any THREE questions

16. When two smooth spheres undergo direct impact calculate the loss of energy involved?
17. (a) Deduce an expression for the moment of inertia of a solid sphere about the diameter. (5)

(b) Derive the relation between angular momentum and torque. (5)

18. Calculate the gravitational potential at a point outside the spherical shell.
19. Describe the excess of pressure in a synclastic and anticlastic surface.
20. State and explain Bernoulli's theorem.

Model question paper
Programming in C
(For those who joined in June 2018)

Time: Three hours **maximum: 75 Marks**

Section-A – (10x1=10 Marks)
Answer all questions

Choose the correct answer:

1. Which one of the following is not a key word in C?

   (c) print f (b) scan f (c) end (d) include

2. For integer data type _____ formal is used

   (a) % f (b) % s (c) % d (d) % 0
3. _____ is a conditional operator used in C
   (a) = (b)? (c) ! (d) <

4. _____ is used to input a character

   (a) putchar (b)get ch (c) getchar ( ) (a) gets( )

5. Pick the odd one out
   (a) if (b) if else (c) for (d) continue
6. _____ is an unconditional control statement

   (a) if (b) if else (c) break (d) go to

7. The calling of a function within the same function is called _____

   (a) Summation (b) recursion (c) declaration (d) include

8. The built in functions are also called as _____ function

a) library (b) string (c) user defined (d) math

9. Array is a_____ variable

(a) simple (b) structure (c) subscripted (d) pointer

10. int a [10] [20] is a _____ dimensional array

(a) one (b) two (c) three (d) four

Section-B (5x7=35 Marks)

Answer ALL questions choosing either (a) or (b)

11. (a) Write the various keywords in C

(or)

(d) Explain the various types of constants in C.

12. (a) Write down the arithmetic and relational operators used in C.

(or)

(b) Explain the priority of operators in C.

13. (a) Explain if-else statement with example.

(or)

(e) Write a program to find biggest of three numbers

14. (a) Explain various types of functions.

(or)

(b)Write about various library functions used in C.

15. (a) Explain how the arrays are defined and processed with example.

(or)

(b)Write a C program to add two matrices.

Section-C (3x10=30 Marks)
Answer any THREE questions

16. Explain various data types.
17. Describe about input and output functions used in C with examples.
18. Write a C program to solve the quadratic equations.
19. Write a C program to sum the numbers from 1 to n using recursion.
20. Write a C program to multiply 2 matrices.

Model Question Paper
ASTROPHYSICS
(For those who joined in June 2018)

Time: Three hours **maximum: 75 Marks**

Section-A (10x1=10 Marks)
Answer all questions

Choose the correct answer:

1. Which of these planets orbit is farthest from earth's orbit?
   (a) Mars (b) Jupiter (c) Uranus (d) Neptune

2. The length of an Earth day is determined by the time required for approximately one.
   (a) Earth rotation (b) Earth revolution
   (c) Sun rotation (d) Sun revolution.

3. Which of the following wavelength regions cannot be studied with telescopes on ground
   (a) radio waves (b) ultraviolet (c) X rays (d) both a & b.

4. The point at which the light is brought to a focus and the image is formed is called
   (a) focal point (b) focal length (c) focal ration (d) none.

5. The outer corona displays a continuous spectrum with many lines
   (a) absorption (b) emission (c) scattering (d) All of the above.

6. The proton-proton reaction is due to

   (a) Fusion of Hydrogen and helium (b) fusion of deuterium with helium
   (c)fusion of Tritium with helium (d) Fusion of Helium and Oxygen

7. As the mass of a white dwarf increases, its radius_____

   (a) Increases (b) Decreases (c) Constant (d) either increases or decreases
8. In Hertzsprung- Russel diagram the average stars like sun are located in the _____ of the main-sequence band.
   (a) Top (b) bottom (c) center (d) Both a and b.

9. Mass of our galaxy is about _____ billion times that of the Sun.
   (a) 200 (b) 250 (c) 150 (d) 100.

10. Pulsars are rapidly rotating_____ star.
    a) proton (b) electron (c) neutron (d) white dwarf.

Section – B (5 X 7 =35)

Answer the following questions choosing either (a) or (b)

11. (a) Explain geo centric and helio centric theories.

Or

(b) Write short notes on Asteroids.

12. (a) Explain the orientation of earth in space.

Or

(b) Write short notes on reflecting and refracting telescopes.

13. (a) Write short notes on Solar wind

Or

(b) Explain sunspot cycle with neat diagram.

14. (a) Explain the formation of neutron stars.

Or

(b) What are black holes? Explain. Explain its physical significance.

15. (a) Write short notes on Galactic clusters.

Or

(b) Explain star clusters in detail.

Section – C (3 X 10 =30)

16. Explain the following in detail
(i) Terrestrial and Jovian Planets (ii) Comets

17. Explain Spectrograph and its limitations.

18. Explain the two types of nuclear reactions take place in the sun and obtain the equation for them.

19. Explain the classification of stars- using Harvard classification system.

20. Draw and explain the Hubble's famous tuning fork diagram for classification of galaxies.

16. TEACHING METHODOLOGY:

Usual chalk and talk method may be followed. Apart from this seminar, Group Discussion, Peer Team Teaching and Peer Group Learning are practiced in the class room.

Teaching aids like Charts are also used in the classroom, Nowadays Computer Aided Technology, E-learning, Smart Class Room Practices with Power Point Presentations are also followed.

17. TEXT BOOKS

The list of text books prescribed for each subject is given under the syllabus of concerned subject.

18. REFERENCE BOOKS

The list of text books prescribed for each subject is given under the syllabus of concerned subject.

19. RE-TOTALING AND REVALUATION PROVISION

Students may apply for re-totaling and revaluation after declaration of result within 15 days

20. TRANSITORY PROVISION 3 + 3

The UG Physics syllabus will be revised once in three years and afterwards three years is allowed as transitory provision. i.e., the students joined before 2018 will be allowed to complete their degree within three years after the completion under old syllabus. Afterwards they have to appear the examination with the new syllabus.

21. SUBJECT AND PAPER RELATED WEBSITES:

Some of the free websites related to the subjects and papers are given below for the benefit of the student.

1) **http://www.infocobuild.com/education/audio-video-courses/physics/physics.html (This provides a comprehensive collection audio – video course and lectures in physics from educational institutions around the world. The courses and lectures covers various subjects in physics, general physics, classical mechanics, modern physics, quantum mechanics, statistical mechanics, astronomy & cosmology, electricity & magnetism etc.,)**

2) http://www.scottishschools.info/Websites/SchSecValeOfLeven/UserFiles/file/Learning/Physics/Higher/Unit%201%20-%20Outcomes%20&%20Summary%20Notes.pdf
3) http://www.physicsclassroom.com/class/thermalP
4) https://en.wikipedia.org/wiki/Solar_energy
5) https://www.livescience.com/47814-classical-mechanics.html
6) https://www.forbes.com/sites/chadorzel/2015/07/08/six-things-everyone-should-know-about-quantum-physics/#541c9a1d7d46
7) https://en.wikipedia.org/wiki/Astrophysics
8) https://en.wikipedia.org/wiki/Modern_physics

9) https://journals.aps.org/rmp/
10) https://learn.sparkfun.com/tutorials/analog-vs-digital/analog-and-digital-circuits
11) https://en.wikipedia.org/wiki/Analogue_electronics
12) https://www.sciencebuddies.org/science-fair-projects/references/electricity-magnetism-electromagnetism-tutorial

B.Sc., Semester – I

Part	Study Component	No. of Course	Credit	Hours
I	Tamil/other languages	**1**	**3**	**6**
II	English	**1**	**3**	**6**
III	Core Subject -1	**1**	**4**	**4+2(P)**
	Allied Subject –I – 1	**1**	**4**	**6**
IV	Skill Based Subject 1&2	**2**	**2+2**	**2+2**
	Non Major Elective 1	**1**	**2**	**2**
Total		**7**	**20**	**30**

B.Sc., Semester – II

Part	Study Component	No. of Course	Credit	Hours
I	Tamil/other languages	**1**	**3**	**6**
II	English	**1**	**3**	**6**
III	Core Subject – 2	**2**	**4+3***	**4+2(P)***
	Allied Subject -I - 2	**1**	**5**	**6**
IV	Skill Based Subject 3&4	**2**	**2+2**	**2+2**
	Non Major Elective 2	**1**	**2**	**2**
Total		**9**	**24**	**30**

***Major Practical - I**

B.Sc., Semester – III

Part	Study Component	No. of Course	Credit	Hours
I	Tamil/other languages	**1**	**3**	**6**
II	English	**1**	**3**	**6**
III	Core Subject – 3	**1**	**4**	**4+2(P)**
	Allied Subject -I - 3	**1**	**4**	**6**
	Allied Subject – II - 1	**1**	**4**	**4+2(P)**
Total		**5**	**18**	**30**

B.Sc., Semester – IV

Part	Study Component	No. of Course	Credit	Hours
I	Tamil/other languages	**1**	**3**	**6**
II	English	**1**	**3**	**6**
III	Core Subject – 4	**2**	**4+3**	**4+2(P)**
	Allied Subject -I - 3	**1**	**5**	**6**

	Allied Subject – II - 2	**2**	**4+1**	**4+2(P)**
	Extension activities	**1**	**1**	**0**
Total		**8**	**24**	**30**

***Major Practical - II**
***Ancillary Practical – 2 - 1**
B.Sc., Semester – V

Part	Study Component	No. of Course	Credit	Hours
III	Core Subject – 5,6&7	**3**	**12**	**12+8(P)**
	Allied Subject – II - 3	**1**	**4**	**4+2(P)**
IV	Skill Based Subject 5	**1**	**2**	**2**
	Environmental Studies	**1**	**1**	**2**
Total			**19**	**30**

B.Sc., Semester – VI

Part	Study Component	No. of Course	Credit	Hours
III	Core Subject –8,9&10	**3**	**12+15***	**12+8(P)**
	Allied Subject- II – 3	**1**	**4+1**	**4+2(P)**
IV	Skill Based Subject – 5	**1**	**2**	**2**
	Value Education	**1**	**1**	**2**
Total			**35**	**30**

***Major Practical – III, IV &V**
***Ancillary Practical – 2 - 2**
B.Sc., (Physics) Semester – 1

S. No.	Part	Subject	Hours	credit
1	III	Mechanics and Properties of matter – **CS1**	**4**	**4**
2	III	Physics Practical – I	**2**	**-**
2	III	Allied Paper – Mathematics 1	**6**	**4**
3	IV	Programming in C – **SB1**	**2**	**2**
4	IV	Solar Energy – **SB2**	**2**	**2**
5	IV	Non Major Elective – **NME I***	**2**	**2**

***Fundamentals of Physics – I as NME for those who study other than Physics.**
B.Sc., (Physics) Semester – 2

S. No	Part	Subject	Hours	credit
1	III	Thermal Physics and Acoustics – **CS2**	**4**	**4**
2	III	Physics Practical – I	**2**	**3**
3	III	Allied Paper – Mathematics 2	**6**	**5**
4	IV	Astrophysics – **SB3**	**2**	**2**
5	IV	Medical Physics – **SB4**	**2**	**2**
6	IV	Non Major Elective – **NME II***	**2**	**2**

*Fund*** Fundamentals of Physics – II as NME II for those who study other than Physics.**

B.Sc., (Physics) Semester – 3

S.No.	Part	Subject	Hours	credit
1	III	Electricity and Electromagnetism – **CS3**	**4**	**4**
2	III	Physics Practical – II	**2**	**-**
3	III	Allied Paper – Mathematics 3	**6**	**4**
4	III	Allied Paper – Chemistry 1 / Applied Electronics 1	**4**	**4**
5	III	Allied Paper – Chemistry 1 / Applied Electronics 1 Practical – I	**2**	**-**

B

B.Sc., (Physics) Semester – 4

S. No	Part	Subject	Hours	Credit
1	III	Optics and Spectroscopy – **CS4**	**4**	**4**
2	III	Physics Practical – II	**2**	**3**
3	III	Allied Paper – Mathematics 4	**6**	**5**
4	III	Allied Paper – Chemistry 1 / Applied Electronics 1	**4**	**4**
5	III	Allied Paper – Chemistry 1 / Applied Electronics 1 Practical - I	**2**	**1**

B.Sc., (Physics) Semester – 5

S. No	Part	Subject	Hours	Credit
1	III	Modern Physics – **CS5**	**4**	**4**
2	III	Nuclear Physics – **CS6**	**4**	**4**
3	III	Analog Electronics – **CS7**	**4**	**4**
4	III	Physics Practical – III	**2**	**-**
5	III	Physics Practical – IV	**3**	**-**
6	III	Physics Practical – V	**3**	**-**
7	III	Allied Paper – Chemistry 1 / Applied Electronics 1	**4**	**4**
8	III	Allied Paper – Chemistry 1 / Applied Electronics 1 Practical - I	**2**	**-**
9	IV	Nanophysics – **SB5**	**2**	**2**
10	IV	Environmental Studies	**2**	**2**

B

B.Sc., (Physics) Semester – 6

S.No.	Part	Subject	Hours	Credit
1	III	Classical and Statistical Mechanics– CS8	**4**	**4**
2	III	Solid State Physics – CS9	**4**	**4**
3	III	Digital Electronics – CS10	**4**	**4**
4	III	Physics Practical – III	**2**	**5**
5	III	Physics Practical – IV	**3**	**5**
6	III	Physics Practical – V	**3**	**5**
7	III	Allied Paper – Chemistry 1 / Applied Electronics 1	**4**	**4**
8	III	Allied Paper – Chemistry 1 / Applied Electronics 1 Practical – I	**2**	**1**
9	IV	Optoelectronics – SB6	**2**	**2**
10	IV	Value Education	**2**	**2**

SEMESTER – 1 CORE SUBJECT 1 CREDIT – 4

MECHANICS AND PROPERTIES OF MATTER

Objective:

- To study the motion of objects, understand the laws of motion and laws of gravitation. To know the principle of conservation of momentum, energy and their consequences.
- To identify the characteristics of solids and fluids in terms of their properties

Unit I: Laws of motion

Newton's laws of motion – Force- Impulse of a force - law of conservation of linear momentum –Collision – Elastic and in elastic collision – (Fundamental laws of impact) – Newton's law of impact – coefficient of restitution – Impact of a smooth sphere on a fixed plane – Direct impact between two smooth spheres – Oblique impact between two smooth spheres – Calculation of final velocities of the spheres – Loss of K.E due to impact.

Unit II Dynamics of rigid body

Moment of inertia – Theorems of perpendicular and parallel axex – M.I of a circular ring, disc, solid sphere, hollow sphere and cylinder about all axes – angular velocity, angular momentum and K.E of rotation – Torque and angular acceleration – Relation between then – Expression for a acceleration of a body rolling down an inclined body without slipping.

Unit III Gravitation

Newton's law of gravitation – G by Boy's method – Mass and density of earth – Acceleration due to gravity – Variation of g with altitude , depth and rotation of earth - Value of g at poles and equator.

Gravitational field – Gravitational potential – Gravitational potential due to spherical shell – Gravitational potential due to a solid sphere (inside and outside)

Unit IV Elasticity

Elasticity – Stress, Strain - Hooke's law – Elastic moduli – Poisson's ratio – Beams – bending of beams – Expression for bending moment – Theory of uniform and non – uniform bending - Determination of young 's modulus by uniform and non- uniform bending methods – Torsion of a body – Expression for couple per unit twist – Work done in twisting a wire – Torsional oscillations of a body - Rigidity modulus by dynamic torsion method (Torsional pendulum)

Unit V Surface Tension and Viscosity

Surface tension – definition – Molecular forces – Explanation of surface tension on kinetic theory – Surface energy – work done in increasing the area of a surface – Excess pressure inside a curved liquid surface – Excess pressure inside a liquid drop and soap bubble.

Viscosity – Co efficient of viscosity – Streamlined and turbulent motion – critical velocity – Bernoulli's theorem – Proof – Applications – Venturimeter – Pitot tube

Text Book

1. Mechanics: D.S. Mathur S. Chand & Co, Edition 2002.
2. Elements of properties of matter – D.S. Mathur – S. Chand & Co., 2004.
3. Properties of matter – R. Murugesan – S. Chand & Co., 2004.

Reference Books

1. Mechanics Part I and Part II, Narayanamoorthy National Publishing Company, 2001.
2. Fundamental of Physics, D. Hallidary , Resnick and J Walker, 6th Edition, Wiley, New York 2001.
4. Properties of matter – Brijlal and Subramanian S. Chand & Co., 2006.

SEMESTER I SKILL BASED -1 CREDIT -2

PROGRAMMING IN – C

Objective: The purpose of this course is to introduce students about the key features and implementation of C , which is a powerful general purpose programming language available in all platforms and provide an in depth knowledge and skill in it.

Unit I: Introduction to C

Basic structure of C programs –Character set – C tokens –keyword and identifiers – Constants – Variables – Data types – Declaring variables – Initializing variables – type conversions.

Unit II: Operators, Expressions & I/O functions

Types of operators – Arithmetic operators - Relational, logical, and assignment operators - Increment and decrement operators – Conditional operators – Bit wise and special operators – arithmetic expressions – Mathematical functions – priority of operators- Data input and output – getchar( ), putchar( ) , gets( ) , puts( ) - scanf( ), printf( ) - escape sequence

Unit III: Control Statements

Simple IF statement – Simple IF- ELSE statement – Block IF Statement – Block IF-ELSE statement – looping operation using while statement – for statement – Break statement – continue statement - Switch statement – Goto statement – Simple programs. (To find the solution of quadratic equation - Fibonacci series – To find the biggest of three nos, factorial of a no, odd or even.)

Unit IV: Functions

Defining a function – Accessing a function – Category of function – Passing arguments to function –Recursion- Library function. Programs using functions – Binomial coefficient, Sin series, summing the numbers 1 to n using recursion

Unit V: Arrays

Defining an Array – Processing an array – one, two dimensional arrays – Simple programs using arrays: - (addition of two matrices - subtraction of two matrices – Multiplication of two matrices- ascending and descending order.)

Text Book

1. Theory and problems of programming with C – By Byron Gottfried Second edition – Tata Megraw Hill, 2004.
2. Programming in C – Pradip Dey and Manas Ghosh, Oxford University Press, Second Edition.

Reference Books

1. Programming in C – By E. Balagurusamy – Third Edition – Tata Megraw Hill, 2004.
2. Programming in C by S. Ramasamy and P. Radhaganesan, Scitech Publications (India) Private Limited, Chennai and Hyderabad, 2006.

SEMESTER – I **SKILL BASED -2** **CREDIT -2**

SOLAR ENERGY

Objective: To make the students to understand the present day crisis and need for conserving energy alternatives are provided.

Unit I

Various forms of energy – renewable and non renewable energy system – Coal, oil and natural gas – availability – Merits and demerits.

Unit II

Solar energy– Nature of solar radiation– Components– Solar heaters– Crop dryers– space cooling.

Unit III

Solar ponds – Solar cooker – Water desalination – Photo voltaic basics – Merits and demerits.

Unit IV

Geothermal energy– Wind energy– Ocean thermal energy conversion (OTEC)– Energy from waves and tides– (Basic ideas, nature, application, merits & demerits.

Unit V

Biomass energy– classification– photo synthesis– Bio mass conversion– Gobar gas plants– ethanol from wood.

Text Book

1. Non – conventional energy resources B. Khan – Tata McGraw Hill – 2000.

Reference Books:

1. G.D. Rai – solar energy utilization – Edn – 1995.
2. S.P. Sukhetme – Solar Enegy Tata McGraw – Edn II 1995
3. Godfrey Byle – Renewable Energy Power for a sustainable nature: Alden Oess limited oxford 1996.

SEMESTER –I NON MAJOR ELECTIVE – 1 CREDIT – 2

FUNDAMENTALS OF PHYSICS –I

Objective: To introduce some basic concept of Physics like measurement of physical quantities, states of matter, kinds of energies and energy sources to students studying other than Physics.

Unit 1

S.I. Units – measurements of length, mass, time and other physical quantities – Dimensional formula for area, volume, density and force – Uses of dimension.

Unit II

Matter – Solid, Liquid, Gas and Plasma – Application of Plasma – change of state – specific heat capacity – specific latent heat of ice and steam.

Unit III

Kinds of energy – Mechanical energy, Thermal energy, Optical energy, Sound energy, Electrical energy, Atomic and Nuclear energy, (Examples) – Conservation of energy.

Unit IV

Renewable and non – renewable energy – Fossil fuel – coal Oil – Solar – Wind – Biomass – OTEC.

Unit V

Mirror – Laws of reflection – Image formation (Concave and Convex mirror) Lens – Law's of refraction – Image formation (Concave and Convex lens) – Defects of eye and rectification.

Book for Study

1. First Year B. Sc Physics – B.V. Narayan Rao, New Age International (P) Lt, 1998.

Reference Books

1. Mechanics – D.S. Mathur – S.Chand & Co., 2002.
2. Properties of matter – D.S. Mathur – S. Chand & Co., 2002.
3. Properties of matter – Brijlal Subramanian – S. Chand & Co., 2006.

SEMESTER II CORE SUBJECT – 2 CREDITS -4

THERMAL PHYSICS AND ACOUSTICS

Objective: To understand the phenomena connected with heat capacities, conduction, convection and radiation, the process of making use of heat energy to do mechanical work.

Unit I: Calorimetry

Isothermal and adiabatic change- derivation of equations for both- C_v and C_p of a gas- Relation between them- Experimental determination of C_v by Jolly's method- determination of Cp by Regnault's method- Specific heat of a gas by Calendar and Barnes method.

Unit II: Transmission of heat

Conduction- Coefficient of thermal conductivity- Lees disc method of determination of thermal conductivity of bad conductor- Convection current in atmosphere- lapse rate- stability of atmosphere- green house effect- atmospheric pollution- Radiation- Stefan's law of radiation- experimental determination of Stefan's constant- derivation of Newton's law from Stefan's law- solar constant- temperature of sun- Angstrom's Pyrheliometer.

Unit III: Kinetic theory of gases

Postulates of kinetic theory of gases- mean free path- Transport Phenomena- diffusion, viscosity and thermal conductivity of gases- derivation of ideal gas equation- degrees of freedom- Boltzmann's law of equipartition of energy- Maxwell's law of distribution of molecular speed- Atomicity of gases- ratio of specific heat capacity of gases- calculation for monoatomic and diatomic gases.

Unit IV: Thermodynamics

Zeroth law of Thermodynamics - First law of thermodynamics - Heat engines- Reversible and irreversible process – Carnot's Theorem- Second law of thermodynamics-

Entropy- change of entropy in reversible and irreversible process-change of entropy in converting ice to steam- Maxwell's thermodynamical relations- Clausius – Clapeyron latent heat equation.

Unit V: Acoustics

Expression for velocity of sound in fluid medium- Newton's formula- Laplace correction- effect of temperature, pressure, humidity, density of medium and wind- velocity of longitudinal wave in a rod- Kundt's tube experiment- Laws of transverse vibration in a string- sonometer- Melde's string.

Reverberation- Sabine's Reverberation formula (No derivation) - Acoustics of building- factors affecting acoustics of building- sound distribution in an auditorium- Requisites for good acoustics.

Text Book:

1. Heat and Thermodynamics : Brijlal & Subramanyam, Chand & co.
2. Heat and thermodynamics : R. Murugesan , S.Chand & co

Reference Book:

1. Heat and Thermodynamics : D.S Mathur , Chand & co
2. A text book of Sound : Brijlal & Subramanyam, Chand & co.

SEMESTER – II **SKILL BASED – 3** **CREDIT – 2**

ASTROPHYSICS

Unit I

Birth of Modern Astronomy – Geocentric and Heliocentric — Celestial sphere – Kepler's laws of planetary motion – Newtonian gravitation- Planets-Terrestrial and Jovian planets (Planets individual description is not required in detail) - Asteroids- Meteoroids- Comets.

Unit II

The orientation of Earth in space- Arc and time units- local time-Standard time Elements of the telescope-Properties of images - Kinds of Optical telescopes- Refracting and Reflecting telescopes- Radio telescope- Spectrograph – limitations.

Unit III

Sun- physical properties- composition- Core- Nuclear reactions- Photosphere- Chromo sphere- Corona- Sunspots- Sunspot cycle-Solar wind- Auroras.

Unit IV

Classification of Stars-The Harvard Classification system-Hertzprung-Russel Diagram-Luminosity of a Star-Stellar Evolution-White Dwarfs-Neutron stars-Black holes-Physics of Black Holes.

Unit V

Galaxy nomenclature-Types of Galaxies-Spiral-Elliptical-irregular galaxies- Milky Way and its structure- Star clusters-Galactic clusters-Pulsars.

TEXT BOOKS:

1. Niclolas. A. Pananides and Thomas Arny, 1979, Introductory Astronomy, Addison Wesley Publ. Co.
2. A. Mujiber Rahman, Introduction to Astrophysics, KAMS Publications, Uthamapalayam.

REFERENCES:

1. Abell, Morrison and Wolf, 1987, Exploration of the Universe, 5th ed., Saunders College Publ.
2. Carrol and Ostlie, 2007, Introduction to Modern Astrophysics, 2nd ed., Pearson International.
3. William J. Kaufmann, III, 1977, Macmillan Publishing company, London.
4. Abhyankar, K.D., Universities Press.

SEMESTER – II **SKILL BASED – 4** **CREDIT – 2**

MEDICAL PHYSICS

Objective: To understand the basics about the biological systems in our body, their behavior, and the diagnostic devices.

Unit I

Basic Anatomical Terminology- Modeling and Measurement – Forces on and in the Body – Physics of the Skeleton – Heat and Cold in Medicine- Energy work and Power of the Body

Unit II

Pressure system of the body- Physics of Cardiovascular system- Electricity within the Body – Applications of Electricity and Magnetism in Medicine.

Unit III

Sound in medicine- Physics of the Ear and Hearing- Light in medicine- Physics of eyes and vision.

Unit IV

X-rays- Production of X-rays- X-ray spectra- continues spectra and characteristic spectra- Coolidge tube- Electro Cardio Graph (ECG) - Block diagram- ECG Leads- Unipolar and bipolar-ECG recording set up.

Unit V

Electro Encephalo Graph (EEG) - origin- Block diagram- Electro Myogragh (EMG) – Block diagram- EMG recorder- Computer Tomography (CT) principle- Block diagram of CT scanner.

Text Books

1. Medical Physics –John R. Cameron and James G.Skofronick, 1978, John Willy & Sons.
2. Bio medical instrumentation – E D II, Dr M. Arumugam, Anuradha Agencies 1997.

SEMESTER –II NON MAJOR ELECTIVE- II CREDIT – 2

FUNDAMENTALS OF PHYSICS –II

Unit – I

Electric current- voltage and resistance- Ohm's law- Kirchhoff's law- Resistances in series and in parallel.

Unit – II

DC Source – Primary cells – Leclanche and Daniel cell – Secondary cells – Lead Acid Accumulator – DC generator.

Unit – III

Alternating current generation by hydro, thermal and atomic power stations– RMS value – Peak value (Quantitative) – AC generator – no derivation.

Unit – IV

Measurement of Electric power by Wattmeter- simple calculations- Induction coil- Wattless current- Power factor.

Unit – V

Simple electrical circuits – resistor, capacitor and inductor connected to AC source (independently) – Relationship between emf and current in each case. Diode – Bridge Rectifier.

Reference Books

1. Electricity and Magnetism – R. Murugesan – S. Chand & Co 2004.

SEMESTER – III CORE SUBJECT- 3 CREDIT – 4

ELECTRICITY AND ELECTROMAGNETISM

Unit I

Coulomb's law- Electric field- Electric field due to a point charge- Electric flux- Gauss law- its proof- Applications of Gauss law- Electric field due to a charged sphere- Electric field due to a plane sheet of charge- Coulomb's theorem- Mechanical force on the surface of a charged conductor- Electric potential- Relation between electric field and electric potential- Potential due to a charged spherical conductor.

Unit –II

Capacitance- Principle of capacitor- Expressions for the capacitance of i) spherical capacitor ii) cylindrical capacitor and iii) parallel plate capacitor with and without partly filled dielectrics- Energy of a capacitor- Loss of energy when two charged conductors share the charges- Types of capacitors- fixed capacitor, variable capacitor, electrolytic capacitor and sliding capacitor.

Unit – III

Kirchhoff's laws- Application of Kirchhoff's laws to Wheatstone's bridge- sensitiveness of the bridge- Carey Foster's bridge- Determination of the resistance of the given wire with the necessary theory.

Potentiometer- principle of potentiometer- comparison of emfs of two cells using potentiometer- Determination of internal resistance of the cell using potentiometer- Calibration of voltmeter(low range and high range)- Calibration of ammeter.

Unit IV

Faraday's laws of Electromagnetic induction, - Lenz's law – self inductance – energy stored in an inductance – Experiment to determine self inductance by Rayleigh method with theory – Mutual inductance – Determination of Mutual inductance using B.G. (with theory) Coefficient of Coupling – Eddy Currents.

Unit V

Mean value of alternating emf – RMS value of the alternating current/voltage- Alternating current applied to LR, Cr and LCR circuits – Series Resonance Circuit – Parallel Resonance Circuit – Power in an A.C. Circuit – Wattless Current – Power factor – Q factor – choke – skin effect – A.C. bridges – Maxwell's bridge – Anderson's bridge and owen's bridge.

Text Book

1. Electricity and Magnetism by Sehgal, Chopra & Sehgal Sultan, Chand & Sons. 1998.

Reference Books

1. Electricity and Magnetism 20th revised edition – Brijlal & Subramaniyam , Ravi Offset Printers & Publishers Pvt., Ltd., 1997.
2. Electricity & Electromagnetism – R. Murugesan
3. Electricity and Magnetism 2nd revised edition – Narayanamoorthy & Nagarathinam , National Publishing & Co. 1997.
4. Electricity & Magnetism – A. Ambrose and T. Vincent Devaraj

SEMESTER – IV CORE SUBJECT- 4 CREDIT – 4

OPTICS AND SPECTROSCOPY

Objective:

- To familiarize the fundamental laws concerning reflection and refraction.
- To understand the phenomena like, interference, diffraction, and polarization.
- To perceive the basic concept of spectroscopy.

Unit I:

Snell's law of reflection and refraction- reflection and refraction at spherical surfaces- Deviation produced by thin lenses- focal length of two thin lenses in and out of contact- Cardinal points- Refraction through a thin prism- Dispersion- deviation without dispersion- dispersion without deviation- Aberration- chromatic aberration in lenses- achromatic combination of two lenses- Spherical aberration and its removal- Aplanatic lenses- Oil immersion objective.

Unit II

Interference- Coherent sources- interference in thin films- Air wedge- Newton's rings- Michelson's interferometer and its application- Fabry- Perot interferometer- sharpness of fringes- Resolution- Holography- Construction and reconstruction of a hologram.

Unit III

Diffraction- Theory of plane diffraction grating(normal incidence only)- Experiment to determine wave length- Zonal plate- Theory- Comparison with convex lens- Fresnel's diffraction- Diffraction at a straight edge- circular aperture- rectangular aperture- Fraunhofer diffraction at a single slit- double slit- Cornu's spiral- Resolving power of optical instruments- Telescope and grating.

Unit IV

Polarization- Polaroid and its application- Double refraction- Nicol Prism- Nicol prism as Polarizer and Analyzer- Huygens explanation of double refraction- QWP and HWP- production and analysis of plane, circularly and elliptically polarized light- Optical activity- Fresnel's explanation- Specific rotation- Lorentz half shade polarimeter

Unit V

Spectroscopy- Introduction – Electromagnetic spectrum – IR radiations – properties, production, detection and uses – UV radiations – properties, production, detection and uses – Raman effect – Theory and experimental study – Applications.Electromagnetic spectrum- IR radiations- properties, production, detection and uses- UV radiations- properties, production, detection and uses – Raman effect – Theory and experimental study- Applications- Raman Effect- theory, experiment, characteristics of Raman lines- Applications- Doppler effect in optics and its application.

Text Book:

1. Optics and Spectroscopy – Kakani and Bhandari Sultan Chand & sons New Delhi.
2. Spectroscopy – B. K. Sharma, Goel Publising House, Meerut 2006

Reference Books:

1. Optics - Subramanium & Brijlal S. Chand & Co 2002
2. Optics and Spectroscopy – R. Murugesan, Vivekananda Press, Madurai.

SEMESTER – V CORE SUBJECT- 5 CREDIT – 4

MODERN PHYSICS

Objectives:

- To give an introductory account of the basic principles of atomic physics.
- .To impart knowledge on the theory of Relativity
- To introduce the origin of Quantum theory

Unit I

Bohr atom model –Bohr's theory of Hydrogen atom- Bohr - Sommerfeld theory – Somerfield's relativistic atom model – Critical potentials- Experimental determination Davis and Goucher's experiment- Explanation for the fine structure of H_α line- Relativistic variation of atomic mass– Vector atom model– Quantum numbers – coupling schemes – Pauli's exclusion principle – Arrangement of electrons in atoms- Magnetic dipole moment due to orbital motion of the electron – magnetic dipole moment due to electron spin - Stern and Gerlach experiment.

Unit II

Optical spectra – spectral terms and notations – selection rules -Fine structure of sodium D lines –Zeeman effect – theory and experiment – quantum theory of Zeeman effect – Anomalous Zeeman effect – Stark effect.

X – Ray spectra- Duane and Hunt law- Moseley's law- Bragg's law- Bragg's X-ray spectrometer- measurement of wave length- Compton effect- theory and experimental verification.

Unit III

Frames of reference- inertial frames of reference- Galilean transformation- Newtonian relativity- Michelson Morley experiment- Postulates of special theory of relativity- Lorentz transformation- Lorentz- Fitzgerald contraction- time dilation- relativistic addition of velocities- variation of mass with velocity- Mass-energy equivalence- Relation between total energy, rest mass energy and momentum

Unit IV

Planck's quantum theory of radiation – Dual nature of matter and radiation – De-Broglie's hypothesis of matter waves – Expression for wavelength – Davisson's and Germer experiment – G. P. Thomson experiment with relativistic correction- Concept of wave packet– Group velocity, wave velocity and their relation – Heisenberg's Uncertainty principle – Experimental illustration.

Unit V

Basic postulates of wave mechanics – Derivation of time dependent and time independent Schrodinger's wave equations– wave function - Physical significance of wave function– Eigen functions and Eigen values.

Schrodinger equation for a free particle in one dimensional potential well- Its Eigen function and Eigen value- Applications of Schrodinger wave equation- Particle in one dimensional Box –Barrier penetration problem - Linear harmonic oscillator – The rigid rotator.

Text Book:

Modern Physics (sixth revised edition 1998 – R. Murugesan, S. Chand & Company Ltd**.)**

Reference Books:

1. Modern Physics: Seighal Chopra and Seighal
2. Quantum Mechanics : Sathyaprakash, Ratan Prakasan Mandir 1994

SEMESTER – V CORE SUBJECT- 6 CREDIT – 4

NUCLEAR PHYSICS

Objective: The student must be able to

- Understand the basic properties of nuclei and the atomic nucleus
- Describe radioactivity and related phenomena
- Explain the various interactions of nuclear radiation with matter

Unit I

Isotopes – Isotones – Isobars – Atomic mass unit – Properties of the nucleus – Nuclear Binding Energy – Nuclear forces – Yukawa's theory (no derivations) – theories of nuclear composition – proton – electron hypothesis – Model of nuclear structure - the liquid droop model – Binding energy formula – Shell model – Collective model.

Unit II

Particle Accelerators – Synchro – cyclotron – Betatron – proton synchrotron – electron synchrotron – detectors – Wilson cloud chamber – bubble chamber – photographic emulsion technique – fundamental particles – particles and antiparticles – particles instability – conservation laws.

Unit III

Laws of radio activity – Half life period – Mean life – Radio Carbon dating – α rays – Geiger Nuttal law – experimental determination by Geiger- Nuttal law – a disintegration energy – theory of α decay, β decay – electron capture, γ rays – determination of wavelength by diamond crystal spectrometer – origin of rays – internal conversion.

Unit IV

Nuclear transmutations by α particles, protons, duetrons, neutrons and electrons – Photo disintegration – nuclear fission – energy release. Explanation – (C.N Cycle and P.P Cycle) Nuclear fusion – Thermo nuclear reaction – Controlled thermo nuclear reaction – Cosmic rays – origin – primary – secondary – Azimuthal effect – East-West effect pair production & annihilation - Van Allen Belt.

Unit V

Utilisation of nuclear energy - principle and action of atom bomb & Hydrogen Bomb – production of electricity from energy – Nuclear reactors – General features of nuclear reactors – Different types of nuclear reactors – Pressurized water reactors – Boiling water reactors – Fast Breeder reactors – Radio isotopes and their application.

Text Book:

1. Modern Physics – R. Murugesan, S.Chand & Co., 1998.
2. Modern Physics by Seghal, Choptra and Seghal, Sultan Chand 1998.
3. Nuclear Physics by Keplan.I – Marosa Publishing House, 1995.

SEMESTER – I **CORE SUBJECT- 7** **CREDIT – 4**

ANALOG ELECTRONICS

Objective: To enable the students to understand the aspects of analog electronics in a lucid and comprehensive manner.

UNIT I:

Semiconductors- n type and p type- PN junction diode- characteristics- Zener diode characteristics- Full wave rectifiers- Bridge rectifier- Filter circuits- General theory- low pass, high pass, band pass and band elimination filters.

UNIT II

Transistors- three types of configuration- relation between α, β and γ - Biasing circuits- Field Effect Transistor (FET)- construction – n channel, p channel – FET polarities- working- FET characteristics- MOSFET- characteristics.

UNIT III

Amplification - small signal CE amplifier- input impedance, output impedance, current gain, voltage gain and power gain- single stage amplifier- frequency response - push-pull amplifier- Op-amp characteristics- application as adder, subtractor, integrator and differentiator.

UNIT IV

Feedback-positive & negative feedback- Barkhausen criteria- transistor oscillators- Hartley, Colpitt's, Phase shift oscillators with mathematical analysis.

UNIT V

Modulation-Types of modulation- Modulation Factor-Amplitude modulation-power in AM wave-block diagram of AM transmitters and receivers-Frequency modulation-block diagram of FM transmitters and receivers-Digital modulation(qualitative)-Pulse amplitude modulation-Pulse time modulation.

Text Book:

1. Principles of electronics - V.K.Mehta ; S.Chand &co
2. A textbook of applied electronics -R.S.Sedha ;S.Chand & co

Reference Books:

1. Basic electronics -B.L. Theraja; S.Chand & co
2. Electronic devices and circuits: Salivahanan, Sureshkumar Tata McGraw Hill
3. Electronic communication system - George Kennedy

SEMESTER – V **SKILL BASED - 5** **CREDIT – 2**

NANOPHYSICS

OBJECTIVES

- To create the basic knowledge in nano materials.
- To understand the scientific perspective of nanomaterials.
- To identify the techniques suitable for nanomaterial synthesis.
- To know the significance of nanomaterials.

Unit I Nanomaterials

History of Nanotechnology- Nanostructures- synthesis of oxide nano particles- Synthesis of semiconductor nano particles- Synthesis of metallic nano particles

Unit II Quantum Heterostructure

Super lattice- preparation of Quantum nanostructure- Quantum well laser- Quantum cascade laser-Quantum wire- Quantum dot- Application of Quantum dots

Unit III Carbon Nanotubes

Discovery of Nanotubes- Carbon Allotropes- Types of carbon Nanotubes- Graphene sheet to a single walled nanotube- Electronic structure of Carbon Nanotubes- Synthesis of Carbon Nanotube

Unit IV

Nanocrystalline soft material- Permanent magnet material- Theoretical background- Super paramagnetism- Coulomb blockade-Quantum cellular Automata

Unit V Application of nanotechnology

Chemistry and Environment – Energy applications of nanotechnology- Information and Communication- Heavy industry-Consumer goods- Nanomedicine - Medical application of Nanotechnology

Text Book:

1) Text book of Nanoscience and Nanotechnology – B. S. Moorthy, P. Sankar, Baldev Raj, B. B. Rath and James Murdy University Press – IIM
2) Nanophysics, Sr. Geradin Jayam, Holy Cross College, Nagercoil (2010)

Reference:

1) 'Nanoscience and Nanotechnology: Fundamentals to Frontiers' M.S. Ramachandra Rao, Shubra Singh, Wiley India pvt. Ltd., New Delhi. (2013).
2) 'Nano the Essentials' - T. Pradeep, Tata Mc.Graw Hill company Ltd (2007)
3) '*The Chemistry of Nano materials : Synthesis, Properties and Applications*', Volume 1 C. N. R. Rao, A. Mu¨ller, A. K. Cheetham, , Germany (2004).

SEMESTER – VI CORE SUBJECT- 8 CREDIT – 4

CLASSICAL AND STATISTICAL MECHANICS

Objective:

- To understand the mechanics of systems of particles and their equations of motion.
- To study the concept of statistics of molecules.

Unit I

External and Internal force, Centre of Mass – Conservation of Linear momentum- Conservation of Angular momentum –Conservation of Energy (K.E., P.E.) – Work-energy theorem- Conservative forces- examples- constrains- Types of Constraints- Examples- Degrees of freedom under constraints- Generalized Coordinates (Transformation Equations) – generalized velocities- generalized momentum.

Unit II

Principle of Virtual Work – D'Alembert's principle- Lagrangian Equations from D'Alembert's Principle (Derivation) – Simple applications- Newton's equation of motion, simple pendulum, Atwood's machine, compound pendulum- Hamilton's principle- deduction of Hamilton's principle from D'Alembert's principle- Lagrangian equation from Hamilton's principle- Deduction of Lagrangian equation of motion from variation principle- simple application- simple pendulum, Atwood's machine, compound pendulum.

Unit III

Hamiltonian Function H- conservation of energy(Jacobi's Integral) – Physical significance- Hamilton's Equations (Derivation) – variation principle- Hamilton's Equation of motion from variation principle- Applications- Harmonic oscillator, motion of a particle in central force field, Charged particle moving in an electromagnetic field, compound Pendulum, Two Dimensional Harmonic Oscillator

Unit IV

Classical statistics- microscopic and macroscopic systems- ensembles- Basic postulates of statistical mechanics- Probability- Thermodynamic probability- Boltzmann theorem on entropy and probability- Maxwell-Boltzmann statistics- Maxwell-Boltzmann energy distribution law- - Maxwell Boltzmann velocity distribution Law.

Unit V

Quantum statistics- introduction- phase space- Planck's law of black body radiation (derivation) - Deduction of Wien's and Rayleigh Jean's law- Bose-Einstein statistics- Bose-Einstein distribution law- Photon gas- Fermi-Dirac Distribution Law- Electron gas- Comparison of the three Statistics.

TEXT BOOKS:

1. J.C. Upadhyaya, July 2005, **Classical Mechanics**, Published by Himalya Publishing House, Mumbai

2. Brijlal & Subramaniam, Reprint 1998, **Heat & Thermodynamics**, S. Chand & Company Ltd

3. Agarwal, **'Statistical Physics'** S.Chand & co New Delhi 1996

REFERENCES:

1. Gupta,B.D., Satyaprakash, 1991, **Classical Mechanics**, 9th ed., Kadernath Ramnath Publ., Meerut

2. Gupta, Kumar, Sharma, 2005, **Classical Mechanics**, PragatiPrakashan Publ., Meerut.

3. Murray R.Spiegal, 1981, Theoretical Mechanics, Schaum's outline series, Mc Graw Hill Publ. Co., New Delhi.

SEMESTER – VI CORE SUBJECT- 9 CREDIT – 4

SOLID STATE PHYSICS

Objective:

- To understand the different types of bonding in solid substances,
- To understand the magnetic and dielectric properties of crystalline structures.

UNIT I:

Bonding in Solids – Types of bonding in solids – ionic, covalent, metallic, molecular and hydrogen bonds – Crystal Structure – Crystal lattice and crystal structure – unit cell – Bravi's lattice, classification of crystals – Miller indices – structure of diamond and zinc blende – Thermal Properties – Concept of phonon – Heat capacity of solids – Limitations of Einstein's theory, Debye's theory of lattice specific heat; thermal expansion of solids (qualitative).

UNIT II:

Free electron theory of metals; Electron drift, mobility, mean free path, relaxation time, Electrical ant Thermal conductivities of metals – Wiedmann Franz law; Sources of resistivity of metals – Metthiessen's rule; Super conductivity – applications, BCS theory.

UNIT III:

Different types of magnetism – dia, para, ferro, antiferro and fermagnetism: a. Langevin's theory of dia & para magnetism 2. Wie's theory of ferromagnetism – Magnetic materials – Properties and application – hard and soft magnetic materials, magnetostriction materials, ferrites and concepts of domains and hysteresis.

UNIT IV:

Dielectrics, polarization, polar and non-polar dielectrics – dielectric constant, Polarisability Clausius Mossotti relation – Different types of Polarization – electronic, ionic, orientational, space charge – Dependence of polarization on frequency and temperature; Dielectric loss sources; Dielectric strength and break-down – contributing.

UNIT V:

Laser materials – Instrumentation of radiation with matter (quantitative) – Emission and absorption of light spontaneous and stimulated emission; Laser Principle – Properties – applications; construction, working and characteristics of Ruby laser, He-Ne laser. Semiconductor laser.

Text Book:

1. Fundamentals of solid state physics by Saxena, Gupta Saxena – Pragati Prakashan X Revised Edition 1991.
2. Introduction to Solids by Azaraoff – TMH, Reprint 1978.

SEMESTER – VI CORE SUBJECT- 10 CREDIT – 4

DIGITAL ELECTRONICS

Objective: To enable the students to understand the aspects of Digital electronics in a lucid and comprehensive manner.

UNIT I: Number System

Number system-Binary, decimal, octal, hexadecimal (conversion from one to another)-binary addition- binary subtraction- binary subtraction by 1's and 2's complement method-Basic laws of Boolean Algebra-properties-Principle of duality- De-Morgan's theorem-proof.

UNIT II: Logic Gates

Positive and negative logic-logic gates-OR, AND, NOT, NAND and EX-OR gates-DRL-OR gate, AND gate-RTL NOT gate-DTL NOR gate- DTL NAND gate- NAND as universal gate- NOR as universal gate--Sum of products(SOP)- Karnaugh’s map-2 variable,3 variable and 4 variable-simplification using k-map.

UNIT III: Arithmetic circuits

Half adder- full adder- 4 bit binary adder- half subtractor- full subtractor- 4 bit binary subtractor- Multiplexer(MUX)- 4 to 1 MUX- Demultiplexer (DMUX)- 1 to 4 DMUX-Encoder- 8 to 3 encoder- decimal to BCD encoder- decoder- 3 to 8 decoder- BCD to decimal decoder-BCD to seven segment decoder.

UNIT IV: Timers, Flip-flops and registers

Timer- IC 555 monostable and astable multivibrators- flip flops- RS flip flops (using NAND and NOR)- edge triggered RS flip flop- JK flip flop- JK master slave flip flop- D flip flop- register- serial in serial out shift register.

UNIT V: Counters, memories and data converters

Counters- Ring counter- decade counter-semiconductor memories- ROM-PROM-applications- RAM- Dynamic RAM (DRAM)-Digital to analog converter(D/A)- binary ladder type-analog to decimal converter(A/D)- parallel A/D converter.

Text Book:

1. Digital principles and applications : Albert Paul Malvino , Donald P. Leach , Tata McGraw Hill
2. Digital logic circuits : P. Raja (second ed), Scitech Publications Pvt. Ltd.
3. Digital electronics and logic design :JaydeepChakravorty , University Press.

SEMESTER – V SKILL BASED - 6 CREDIT – 2

OPTO ELECTRONICS

Objective:

- To give an introductory account of the basic principles of Optoelectronic devices
- To understand the principle and working of LASER
- To gain information about fibre optic communication

Unit I

Introduction – PN junction as a Light Source (LED) – LED materials – Advantages – LCD _ Characteristics and action of LCD – Advantages.

Unit II

Laser- Introduction– characteristics of Laser– Spontaneous and stimulated emission– Einstein coefficients- condition for population inversion– three level scheme– semi conductor.

Unit III

Photo detector- characteristics of photo detectors– PN junction photo detector– PIN photo diode- Avalanche photo diode- Photo transistor.

Unit IV

Introduction – principle of optical fibre – light transmission in a optical fibre – Acceptance angle – Numerical aperture.

Unit V

Fibre index profiles – Step index, graded fibre (transmission of signals) – Advantages of fibre optic communications, optical switching – Logic gates.

Text Book:

1. Semiconductor physics and Optoelectronics – P. K. Palanisamy, SCITECH Publication, Chennai 2002.
2. Optical fibres and Fibre Optic Communication – Sabir Kumar Sarkar IV Revised Edition 2003.

Reference Books:

1. Opto Electronics – Wilson & Hawker, Prentice Hall of India 2004.

LIST OF EXPERIMENTS

SEMESTER I & II **PHYSICSPRACTICAL–I** **CREDIT - 3**

ANY FOURTEEN

1. Young's Modulus – Uniform bending – Pin & Microscope
2. Young's Modulus – Non-Uniform bending – Scale and Telescope
3. Young's Modulus – Cantilever – Pin & Microscope
4. Young's Modulus – Cantilever – Dynamic method
5. Rigidity Modulus – Static Torsion – Searle's method
6. Rigidity Modulus – Torsion Pendulum
7. Moment of Inertia – Torsion Pendulum
8. A.C. Frequency – Sonometer
9. Verification of laws – Sonometer
10. Frequency of tuning fork – Sonometer
11. Frequency of vibrator – Melde's Apparatus
12. Velocity of sound – Kundt's tube
13. Compound Pendulum – "g"
14. Thermal conductivity of bad conductor – Lee's Disc
15. Viscosity of liquid – Stoke's method
16. Viscosity of liquid – Burette method
17. Surface Tension – Capillary Rise
18. Surface Tension – Drop weight method

SEMESTER III & IV **PHYSICSPRACTICAL–II** **CREDIT - 3**

ANY FOURTEEN

1. Refractive Index : Spectrometer A and D
2. Grating : Spectrometer - N and λ
3. Air Wedge : Thickness of wire
4. Newton's Rings : Radius and Wavelength measurements
5. Carey Foster Bridge : Resistance and specific resistance

6. Carey Foster Bridge : Temperature coefficient
7. Potentiometer : Calibration of low range voltmeter
8. Potentiometer : Calibration of ammeter
9. Potentiometer : Comparison of EMF's
10. Determination of B_H : Axial coil
11. Determination of M : Axial coil
12. Determination of M and B_H : Tan C method
13. Spot Galvanometer : Figure of Merit
14. Spot Galvanometer : Charge sensitivity
15. Spot Galvanometer : Comparison of EMF's
16. Spot Galvanometer : Comparison of capacities
17. Owen's Bridge : C1/C2
18. De Sauty's Bridge : C1/C2

SEMESTER V & VI PHYSICSPRACTICAL–III CREDIT - 5

ANY FOURTEEN

1. LCR : Series Resonance circuit- L and Q
2. LCR : Parallel Resonance circuit- L and Q
3. Spot Galvanometer : Determination of mutual inductance
4.Spot Galvanometer : Comparison of mutual inductance
5.Spot Galvanometer : High Resistance by leakage
6. Spot Galvanometer : Internal Resistance of a cell
7. Anderson's Bridge : Self Inductance
8. Rayleigh's Bridge : Self Inductance
9. Maxwell's Bridge : Self Inductance
10. Small angled prism : Refractive Index
11. Spectrometer : i – d curve
12. Spectrometer : i - i' curve
13. Grating : Minimum deviation
14.Spectrometer : Cauchy's constant
15. Spectrometer : Hartmann's Interpolation Formula
16. Spectrometer : Small angled prism - refractive index
17.Impedance and power factor : LR circuit
18. Impedance and power factor : CR circuit

SEMESTER V & VI PHYSICSPRACTICAL–IV CREDIT - 5

ANY FOURTEEN

1. Transistor characteristics : Common Emitter
2. Zener diode characteristics
3. Zener voltage regulator

4. Single Stage Amplifier : gain and bandwidth
5. Clipper and Clamper : discrete components only
6. FET characteristics
7. Hartley Oscillator : Frequency and Inductance of coil
8. Colpitt's Oscillator : Frequency and Inductance of coil
9. Phase Shift Oscillator : Frequency

10. Wien's Bridge Oscillator : Frequency
11. Astable Multivibrator : using discrete components
12. Monostable Multivibrator : using discrete components
13. Integrator and Differentiator : using discrete components
14. Voltage Doubler and Voltage Tripler
15. Logic gates : using discrete components
16. Full wave rectifier : π filters
17. UJT characteristics
18. SCR characteristics

SEMESTER V & VI PHYSICSPRACTICAL–V CREDIT - 5

1. Logic Gates : IC
2. NAND as Universal gate : IC
3. NOR as Universal gate : IC
4. Dual Power Supply - IC 7812 and IC 7912
5. De-Morgan's Laws - Verification
6. Half Adder and Full Adder
7. Four bit binary adder
8. Half Subtractor and Full Subtractor
9. Four bit binary subtractor
10. Astable Multivibrator -IC 555
11 Schmitt Trigger - IC 555
12. BCD counter
13. Astable Multivibrator -IC 741
14. Integrator and Differentiator -IC 741
15. Adder and subtractor -IC 741
16. Four bit binary counter
17. Ring Counter
18. Voltage Regulator -IC 7805

B. Sc. ANCILLARY PHYSICS (SYLLABUS)

1. **Subjects of study and scheme of examination :**

The subjects offered in Ancillary physics for Two years and the schemes of examination are given.

2. **Question Paper Pattern :**

The Internal and External marks is **25**:**75**

External

The pattern of Question paper will be as follows:

Time: 3 hrs **Max.Marks:75**

Section: A (10 X1 =10 Marks)

Question No. 1 to 10 (Multiple Choices)

- Two questions from each unit
- Four choices in each question
- No ' none of these ' choice.

Section B : (5 X 7 = 35 marks)
Answer all questions choosing either (a) or (b)
Answer not exceeding two pages.
(One question from each unit)

Question No: 11 – 15	11	(a)	or	11	(b)
	12	(a)	or	11	(b)
	13	(a)	or	11	(b)
	14	(a)	or	11	(b)
	15	(a)	or	11	(b)

Section C: (3 X 10 = 30 marks)
Answer not exceeding four pages.
Answer any three out of five (Question from each unit)

Questions 16 -20

There must be at least one problem in section B and section C

Internal

The Pattern for internal valuation:

- Two tests – **10 marks** each : **average 10marks**
- Group Discussion / Seminar / Quiz – **5 marks**
- 2 Assignments : 5 mark each ; average **5 marks**
- 3rd test may be allowed for absentees of any one of the two tests.
- For Quiz, 2 Quiz should be conducted.
- Peer team teaching and Peer group learning **– 5 marks**
  (Students should be grouped into 5 or 6 members. One unit of each subject must be taught and learnt among them.)

Blue Print of the Question Paper external – Allied Subject

Maximum Marks : 75

Section	Types of questions	No. of questions	No. of Questions to be Answered	Marks For Each question	Total Marks
A	Multiple Choice. Two questions from each unit	10	1	1	10
B	Not exceeding 2. Pages (either or type) – One from each unit *	5	5	7	35
C	Not exceeding 4 Pages (any three out of 5 – one from each unit*	5	3	10	30

***** There must be at least one problem in Section B and Section C

Details of B.Sc., Ancillary physics papers – year wise

S. No.	Title of the Paper	Subject Code	Year of Study	Semester of Study	Exam Hour	Max. Marks	Min Marks for Pass	Hours per Week	Credit
1.	Mechanics Properties of matter and Sound		I/II	1	3	100	40	4	4
2.	Thermal Physics		I/II	2	3	100	40	4	4
3.	Practical I		I/II	End of the year	3	*100	40	2	1
4.	Electricity and Electronics		II/III	3	3	100	40	4	4
5.	Optics, Spectroscopy and Modern Physics		II/III	4	3	100	40	4	4
6.	Physics Practical II		II / III	End of the year	3	*100	40	2	1
	Total					600			18

Practical

Each student should submit the practical records at the time of practical examination. The maximum marks of 100 for the practical will be allotted as follows.

Practical record note / (internal)	-	10 + 30	=	40
Practical examinations	-		=	60
				100

B.SC., ANCILLARY PHYSICS (SEMESTER) SYLLABUS

SEMESTER – I **CREDIT – 4**

PAPER I : MECHANICS, PROPERTIES OF MATTERS AND SOUND

Unit I:

Forces in nature – Central forces – Gravitational and electromagnetic – Conservative and Non-Conservative forces – Examples – Nuclear force – Friction – Angle of friction – Motion of bodies along an inclined plane – Work done by a force – Work done by a varying force – Expression for Kinetic energy – Expression for potential energy – Power.

Unit II:

Angular velocity – Normal acceleration (no derivation) – Centrifugal and Centripetal forces – Torque and angular acceleration – Work and power in rotational motion – Angular momentum – K.E of rotation – Moment of Inertia – Laws of parallel and Perpendicular exes theorems – M.I of circular ring, Circular Disc, Solid sphere, hollow sphere and cylinder.

Unit III:

Kepler's laws of planetary motion – Laws of Gravitation – Boy' method for G – Compound pendulum – Expression for period – Experiment to find g - Variation of g with latitude, altitude and depth – Artificial Satellites.

Unit IV:

Elastic moduli – Poisson's ration – beams – Expression for bending moment – Determination of Young's modulus by uniform and non-uniform bending – I section girders. Torsion – Expression for couple per unit twist - Work done in twisting – Torsional pendulum – Derivation Poiseuille's formula (analytical method) – Bernoulli's theorem – Proof of Application – Venturimeter – Pitot tube.

Unit V:

Simple harmonic motions – Progressive Waves Properties – Composition of Two S.H.M and beats stationery waves – Properties – Melde's experiments for the frequency of electrically maintained tuning fork – Transverse and longitudinal modes - Acoustics – Ultrasonic – Properties and Application.

Reference Books

1. Mechanics by D.S. Mathur – S. Chand & Co., 2008.
2. Properties of matter by Brijlal & N. Subramanyam 2004, S. Chand.
3. A Text Book of Soud by Brijlal & N. Subramanyam, S. Chand &Co 2004.
4. University Physics by Sears Zemansky and Gound, 6th edition (Naresa Publishing House, Chennai 1996)

SEMESTER – II PAPER-II THERMAL PHYSICS CREDIT – 4

Unit I:

Expansion of Crystals – Determination of α by air wedge method – Expansion of anisotropic solids – solids of low expansivity and their uses – anomalous expansion of water – thermostats. Isolated and adiabatic changes – Derivation of equation for both C_v, and C_p of a gas – relation between them – experimental determination of C_v, by Joly's method- Determination of C_p by Regnault's method.

Unit II:

Lee's disc method for conductivity of bad conductor – air and cardboard / ebonite – analogy between heat flow and electric current Weidman – Franz law – Convection in atmosphere – lap rate – stability of atmosphere – green house effect – atmospheric pollution.

Unit III:

Radiation – Stefan's law – determination of Stefan's constant by filament heating method – solar constant measurement water flow Pyrheliometer – temperature of the Sun – Solar spectrum- energy distribution in black body spectrum – Planck's law (no derivation) – derivation of Wien's and Rayleigh Jeans laws from Planck's law.

Unit IV:

Kinetic theory of gases – Mean free Path – transport phenomena – diffusion – viscosity and thermal conductivity – Maxwell's law of distribution of molecular speed – experimental verification – degree of freedom – Boltzmann's law of equipartition of energy – calculation of C_p for monatomic and diatomic gases.

Unit V:

Thermodynamics – Carnot's theorem – Derivation of Efficiency – Second law of thermodynamics – entropy – changes of entropy in Carnot's Cycle – Change of entropy in conversion of ice into steam – Joule – Kelvin effect – simple theory of Porous – Plug experiment adiabatic – diamagnetism – Curie's law Giauque's Methods Superconductivity.

Reference Books

1. Heat and Thermodynamics by Brijlal & N. Subramanyam – S. Chand & Co.2004.
2. Ancillary Physics Vol.II by A. Ubald Raj & Jose Robin, Indira Publications, 2002.

SEMESTER–III PAPER-III ELECTRICITY AND ELECTRONICS CREDIT – 4

Unit I:

Gaus's law – proof – Applications – Field due to a charged sphere and an infinite plane sheet – Field near a charged conducting cylinder – Coulomb's theorem – Electronic potential – Relation between potential and field – Capacitors – Expression for C of parallel plate spherical (outer sphere earthed) and cylindrical capacitors – Energy of charged capacitor – Loss of energy due to sharing of charges.

Unit II:

Kirchhoff's laws – application of wheatstone's network – sensitiveness of bridge – Carey Foster Bridge – Measurement of resistance and temperature – Coefficient of resistance – principle of potentiometer – Calibration of ammeter and voltmeter – low and high range – measurement of resistance using potentiometer.

Unit III:

Torque on a current loop – mirror galvanometer, dead beat and ballistic – Current sensitiveness – voltage sensitiveness I B.G. theory – damping correction – experiments for charge sensitiveness – comparison of emf's and comparison of capacitors.

Electro motive force generated in a coil rotating in a uniform magnetic field – R.M.S and mean values – LCR circuit – impedances - Series and Parallel resonant circuits – Power factor – Wattless current – Choke.

Unit IV:

Junction diodes – Froward and Reserve bias – Diode characteristics – Types of diodes – (LED and Zener) Bridge rectifier using junction – II filter – Transistors- Characteristics (CE modes only) – Biasing and action of a single transistor (CE) amplifier – Frequency response Hartley oscillator – Modulation (qualitative study) – Op-Amp and its characteristics – virtual earth – voltage amplifier in inverting mode - Op-Amp as adder and Subtractor.

Unit V:

Binary number system – reason for using binary numbers – binary to decimal and decimal to binary conversions – addition and subtraction of binary numbers. Logic circuits – Boolean algebra – De Morgan's theorem – OR, AND, NOT, NOR and NAND Gates – NOR and NAND gates as universal building blocks – Ex-Or gates.

Reference Books:

1. Solid State Electronics - B.L. Theraja S. Chand 2003.
2. Electricity and Magnetism - Brijlal & N. Subramanyam, S. Chand 2007.

SEMESTER– IV PAPER-IV **CREDIT – 4**

OPTICS,SPECTROSCOPY AND MODERN PHYSICS

Unit I:

Deviation produced by thin lens – Focal length of two thin lenses in and out of contract - Cardinal points – Refraction through a thin prism – Dispersion – Dispersive power – combination of thin prisms to produce (a) deviation without dispersion and (b) dispersion without deviation – Direct vision spectroscope – Chromatic aberration in lenses and its removal – Spherical aberration and its removal – Aplanatic surfaces – Oil immersion objective – Theory of primary and secondary rainbows.

Unit II:

Interference in thin films – Air wedge – Newton's rings (Reflected beam only) – Determination of wavelength – Jamin's Interferometer, principle and use. Diffraction; Theory of plane transmission grating (Normal incidence only) – Experiment to determine wavelengths.

Unit III:

Double refraction – Nicol prisms, constructions, action and uses – QWP and HWP – Optical activity (No theory) – Biot's laws – Specific rotator power – Half shade polarimeter – Determination of Specific rotator power – Fiber optics – Light propagation in fibers – Fiber optic communication system.

Unit IV:

Infra red radiations, Production, properties and uses – Ultra violet radiations sources, properties and uses. Quantum theory – Plank's quantum theory – Raman Effect – Simple theory Experimental study (Wood's apparatus) Application. Photo electricity – Laws of photo electricity – Einstein's equation Photocells and their uses, photo emissive, photoconductive and photo voltaic cells.

Unit V:

De Broglie's theory – Electron diffraction – G.P. Thomson's experiment. Michelson – Morley experiment – Significance of the negative results – Postulates of special theory of relativity – Lorentz transformation equations (No Derivation) – Length Contraction – Time dilation – Variation of mass with velocity and Mass – Energy relation (Simple derivation)

Reference Books:

1. A text book of Optics by Brijlal & N. Subramanyam, S.Chand 2002.
2. Optics and Spectrospcopy by R. Murugesan, Vivekananda Press, Madurai 2004.

LIST OF PRACTICAL

SEMESTER I & II **CREDIT – 1**

ANCILLARY PHYSICS PRACTICAL – I

Any 14 Experiments

1. Young's Modulus - Uniform bending – Pin & Microscope
2. Young's Modulus - Non-Uniform bending – Scale & Telescope
3. Acceleration due to gravity - Compound Pendulum
4. Determination of G and M. I - Torsion Pendulum
5. Verification of laws - Sonometer
6. Frequency of fork - Melde's Apparatus
7. Calibration of low range voltmeter - Potentiometer
8. Calibration of ammeter - Potentiometer
9. Resistance and specific resistance - Potentiometer
10. Comparison of capacities - Spot Galvanometer
11. Comparison of EMF's - Spot Galvanometer
12. Resistance and resistivity - Carey Foster Bridge
13. Refractive index of prism - Spectrometer
14. Thermal conductivity of bad conductor - Lee's Disc
15. Viscosity of liquid - Stoke's method
16. Comparison of viscosity - Ostwald's Viscometer

SEMESTER I & II **CREDIT – 1**

ANCILLARY PHYSICS PRACTICAL – II

Any 14 Experiments

1. Thickness of wire - Air Wedge
2. Radius of curvature - Newton's Rings
3. Determination of N and λ - Spectrometer/Grating(Normal incidence)
4. Dispersive power of a prism - Spectrometer
5. Transistor characteristics - Common Emitter
6. Bridge Rectifier along with π Filter
7. Single Stage Amplifier - Transistor
8. Frequency of oscillation - Hartley Oscillator
9. Verification of Truth table - Logic gates(AND, OR, NOT) discrete component
10. Verification of Truth table - Logic gates(NAND, NOR) discrete component
11. Static characteristics - Zener diode
12. Adder and subtractor -` Op-Amp
13. Comparison of capacities - De Sauty's Bridge
14. Determination of L and Q - LCR Series Resonance circuit
15. Determination of L and Q - LCR parallel Resonance circuit
16. Voltage and current sensitivity - Mirror galvanometer

Placed at the meeting of
Academic Council
held on 26.03.2018

APPENDIX - AK

MADURAI KAMARAJ UNIVERSITY

(University with Potential for Excellence)

ANCILLARY – APPLIED ELECTRONICS AND INSTRUMENTATION for B.Sc., (PHYSICS)

REVISED SYLLABUS

(Revised Syllabus with effect from the academic year 2018-2019)

1. Introduction of the Programme

Applied electronics and Instrumentation is ancillary paper for B.Sc., (PHYSICS) students, It spread over 4 semesters.. The programme of study shall consist of 4 Theory papers and 2 practicals. Each of these carries 100 marks. It has been developed to provide students the opportunity to be trained in recent development in Electronics and Instrumentation. The course is designed to impart the students a vigorous training in Electronics and Instrumentationboth in theory and experiments. Our approach is a comprehensive one. It is believed that teachingstudents both how to ask and address questions. Thisprogramme has been designed to expose students' knowledge in Electronics and Instrumentation to contemporary national and international problems. At the end of the course, students are expected to have state-of-the-art quantitative skills valued both in academia and in the corporate world. During the course time, one gets an in-depth knowledge in electronics and Instrumentation

2. Eligibility for Admission

It is ancillary papers for B.Sc., (PHYSICS) students.

3. Objectives of the Programme

- To offer knowledge, understanding and skills.
- To offer the knowledge towards the Electronics equipment's.
- To improve the employability of the studentsfocusing the needs of worlds various MNC's

4. Outcome of the Programme

- It serves as a basis to build a strong academic profile for further studies.
- On successful completion of this course, one can apply for the PG courses related to Electronics, Instrumentation and Computer Science.
- The degree holders can opt employment in various MNC's and industries.

5. Theory Papers

Subject papers shall consist of 4 papers as listed below.

Paper- I : Physics of Electronic Devices

Paper – II: Applications of Electronic Devices and Instrumentation
Paper – III: Linear Integrated Circuits
Paper – IV: Electronic Communication

6. Practical Papers

Practical Lab-I: Electronics Devices and Circuit Lab
Practical Lab-II: Linear and Digital ICs lab

7. Unitization

Each subject Paper shall consist of five units. One unit (preferably the 5th Unit) will be handled by the students as a part of peer team teaching / learning process.

8. Pattern of Semester Examination

Odd semester examinations shall be conducted in the month of November. The even semester examinations shall be held in the month of April. Each paper shall carry 100 marks of which 25 marks for internal assessment and 75 marks for external examinations for all the theory papers. For practical's, 40 marks for internal, 60 marks for external. Practical examination will be conducted at the end of each year.

9. Scheme of Internal Assessment

The components of Internal Assessment marks shall be as follows, for theory.

Test	:	10 Marks (Average of the best two tests)
Assignment	:	5 Marks
Seminar/ Group Discussion	:	5 Marks
Peer- team teaching	:	5 Marks
Total	**:**	**25 Marks**

For Practical, 40 marks for internal.

10. External Examinations

External examination for each Theory paper shall be conducted for 75 marks.

Section A: 10 Multiple choice questions (One question from each unit) (10 x 1 = 10 marks)
Section B: 5 Either / Or type questions (One question from Each Unit) (5 x 7 =35 marks)
Section C: 3 Out of 5 questions. (3 x 10=30 marks)
Total : 75 Marks.

For Practical's, 60 marks for external. Practical examination will be conducted at the end of year.

11. Question paper pattern

Internal Examination of each paper shall be for 10 marks having the following question pattern.

Section A	:	6 Objective type questions	(6 x 1=6 marks)
Section B	:	2 questions (either or type)	(2 x 7=14 marks)
Section C	:	One out of 2 questions	(1 x 10=10 marks)

Total : 30 marks which shall be converted into 10 marks.

External examination of each paper shall be for 75 marks having the following question paper pattern, for theory papers.

Section A: 10 Objective type questions (2 questions from Each unit) (10 x 1=10 marks)

Section B: 5 questions, either or type (one question from Each unit) (5 x 7=35 marks)

Section C: 3 out of 5 questions (one question from Each unit) (3 x10=30 marks)

Total: 75 marks

12. Scheme of Evaluation

Students shall be evaluated on the basis of internal tests, seminars, and assignments, peer-teaching and external examinations. Question paper setters shall be requested to prepare scheme of valuation for all the papers.

13. Passing Minimum

Total Passing Minimum	:	40 Marks out of 100 Marks
Internal Assessment	:	No minimum pass mark out of 25 Marks
External Assessment	:	27 Marks out of 75 Marks

14. Model Question Paper

Maximum Time: 3 hrs Maximum Marks: 75

Section A (10 x 1 = 10 Marks)

Answer All Questions

All Multiple Choice Questions

Two Questions from each Unit

(Questions are numbered from 1 to 10)

Section B (5 x 7 = 35 Marks)

Answer all the Questions

(Either / Ortype: Either (a) or (b))

One question from each Unit

(Questions are numbered from 11 to 15)

Section C **(3 x 10 = 30 Marks)**

Answer any three Questions

One question from each Unit

(Questions are numbered from 16 to 20)

15. Teaching Methodology

Methodology shall consist of stimulation of students' interest, presentation of teaching material, team formation and activities' determination, conduction of activities and discussions and assessments. For the sake of simplicity and easy understanding, the methods like problem solving, discussion, lab demonstration and lecture shall be adopted. The use of ICT shall be co-opted for the visual presentation of the lessons. One unit (mostly 5th unit will be handled by the students).

16. Text Books

The list of text books is given at the end of syllabus of each paper.

17. Reference Books

The list of reference books is given at the end of syllabus of each paper.

18. Re-totalling and Revaluation Provision

Students shall be provided the facility of applying for re-totalling the marks within 15 days after the publication of results on payment of a minimum fee fixed by the University and they shall be allowed to apply for revaluation of their papers within 15 days after the publication of results on payment of a fee to be fixed by the University.

19. Transitory Provision (3+3)

Syllabus revision shall be done once in 3 years and afterwards 3 years shall be under transitory provision.

20. Subjects and paper related websites.

The related websites for each paper shall be provided at the end of the syllabus wherever necessary.

Paper –I
Physics of Electronic Devices

UNIT- I: **Energy Band and Charge Carrier in Semiconductors**

Energy band in solids: Energy band – Metal, Semiconductor and Insulators – Direct and Indirect Semiconductors.**Charge Carriers in Semiconductor:** Electron and Holes – Effect Mass in intrinsic semiconductors, dependence of Fermi level on temperature and doping concentration.**Carrier concentration**: The Fermi level – electron and hole concentrations at equilibrium – temperature dependence of carrier concentration.**Drift of carriers in electric**

field: conductivity and mobility – drift – effect of temperature and doping on mobility. (qualitative only)

UNIT-II: Excess Carriers in Semiconductors

Luminescence: Photoluminescence – Electroluminescence – Carrier Lifetime and Photoconductivity – direct recombination of electrons and holes – indirect recombination; trapping – photoconductivity devices – Diffusion of Carriers – diffusion processes – diffusion and drift of carriers; built-in field – diffusion and recombination –Diffusion length.

UNIT-III: **p-n junction diodes**

PN JUNCTION DIODES: P-N Junction Diode, Depletion region, Barrier Potential, Working in Forward and Reverse bias condition – Junction capacitance, Diode current equation– Effect of temperature on reverse saturation current – construction, working, V-I characteristics and simple applications of varactor diode, Zener diode and Tunnel diode.

UNIT-IV: Optoelectronic Devices

Photodiodes: Current and Voltage in an illumination junction – Solar Cells – Photodetectors - Light Emitting Diodes: Light – Emitting materials – Semiconductor Lasers: population inversion at a junction – Basic of Semiconductor Laser – materials for semiconductor Lasers.

UNIT-V:

Types of FET-Characteristics and Principles of operation of JFET -JFET as an amplifier- CS, CD, CG configuration-Operation of MOSFET as a switch – as a variable resistor – UJT-SCR and it's Characteristics

TEXT BOOKS:

1. Ben G Streetman and Sanjay Kumar Banerjee, "Solid State Electronics" 6thEdn PHI
   Unit I – Chapter 3 (relevant sections)
   Unit II – Chapter 4 (relevant sections)
   Unit IV – Chapter 8 (relevant sections)
2. Electronic Devices and Circuit Theory --- Robert L. Boylestad& Louis Nashelsky. 2.
3. Electronic Devices and Circuits I – T.L.Floyd- PHI Fifth Edition

BOOKS FOR REFERENCE:

1. S.Salivahanan, N. Suresh Kumar and A. Vallavaraj "Electronic divces and circuits" TMH(1998)
2. Millman and Halkias, "Electronics Devices and Circuicts"- McGraw Hill, V reprint 1993,
3. Boylestsd. L.Robert and Nashalsky Louis, "Electronic devices and Circuit theory", PHI 1997.

PAPER – II

APPLICATION OF ELECTRONICS DEVICES AND INSTRUMENTATION

UNIT- I:

DC indicating instruments- Galvanometer- Moving coil mechanism- Sensitivity and resolution – DC ammeter and voltmeter- Ohmmeter-Multimeters, DVM - AC indicating instruments-electrodynamometer- Moving iron and rectifier types - electrostatic voltmeter-Watt-hour meter, Principles and applications.

UNIT- II:

Oscilloscope – Basic operation – Detection and sensitivity - Principles of storage oscilloscope and sampling Oscilloscope. Use of oscilloscope in measurement of Waveform, frequency, phase difference - lock-in amplifier, frequency, response analyser.

UNIT- III:

Transducer and sensors: Classification of Transducers –Active, Passive transducers- Basic Requirements of Transducers- Strain gauge – Types of strain gauges-Operation of Strain gauge – Piezo electric pressure Transducers – thermistors- thermocouple- Resistive type thermometer- platinum resistance thermometer.

UNIT- IV:

Bio-potential Recorder: Characteristic recording system-Electrocardiography(ECG) Electroenchalograph(EEG)- Electromyograph(EMG)-Electroretinograph(ERG) and Electroculograph(EOG) – Ultrasound scanner.

UNIT- V:

Electrical Appliances: Refrigerator,air conditioner(both Window and Split), Home security System, CCTV, Vacuum Cleaner, Microwave Oven-Electric water heater - General principles and working.

BOOKS FOR STUDY/ REFERENCE

1. M. Arumugam – Biomedical instrumentation
2. A.K Sawhney –couse in electrical and electronic measurements and instruments
3. V.K Metha- Principles of Electronics
4. J.J Brophy – Basic electronics for Scientist
5. W.D. Cooper – Electronic instrumentation and measurements techniques.
6. C.S Rangan, V.S.T.V Mani and G.K Sharma – Instrumentation devises and system
7. S.Salivahanan. N.sureshkumar – Electronic devices and circuits
8. R.P Bali consumer Electronics Pearson Edition (2008)

PAPER-III

LINEAR INTEGRATED CIRCUITS

UNIT- I:

Operational Amplifier: Functional Block diagram- Characteristics of an ideal operational amplifier.**Operational Amplifier Characteristics:** Open loop gain-CMRR-offset current-Input and output offset voltages - Offset compensation techniques – frequency response characteristics – stability- limitation –Frequency compensation-Slew rate - transfer characteristics.

UNIT-II:

Application of Operational Amplifier I: Inverting and Non-Inverting amplifiers - voltage follower- Summing amplifier-Differential amplifier-Instrumentation amplifier-Integrator and Differentiator- Voltage to Current, Current to Voltage convertors.

UNIT-III:

Application of Operational amplifiers II: Sinusoidal oscillator-Active filter-Design of low pass - high pass - wide band pass - narrow band pass - notch and band stop filters.

UNIT-IV:

Application of Operational amplifiers III: Voltage regulator - Comparators- Zero crossing detector-Sample and hold circuit- Precision rectifier- Active peak detector - Clipper and Clamper - Logarithmic and Exponential amplifier.

UNIT-V:

IC 555 Timer: Timer functional block diagram and description –Monostable – Astable– bistableoperations – Voltage Controlled Oscillator – Digital to Analog convertor - Comparator – Voltage to Frequency convertor – Frequency to Voltage convertor.

BOOKS FOR STUDY/ REFERENCE

1. Gayawad A.R " OP-Amps and linear Integrated Circuits", Prentice Hall of India. Third Edition, New Delhi, 1993.
2. Coughlin F.R and Driscoll F.F " Operational Amplifiers and linear Integrated Circuits"PHI. III Ed, 1997.
3. Miliman and Halkias- McGrawHill.-Integrated Electrtonics-Analog and Digital circuits & System.
4. Roy Choudhury and shail Jain "linear Integrated Circuits".Wiley Eastern Ltd.1991.

PAPER – IV
ELECTRONIC COMMUNICATION

UNIT-I:

Introduction and block diagram of generalized communication system, role of each block viz. Information source, transmitter, channel/ communication media and receiver.Types of communication systems–simplex and duplex systems, analog and digital systems.Electromagnetic spectrum used in communication, concept of bandwidth.

UNIT-II:

Modulation - Need of modulation and types of modulation. Amplitude Modulution-Principle -mathematical expression- modulation index- percentage (%) modulation- side bands and frequency spectrum- power distribution. Concepts ofDSB, SSB & VSB.

UNIT-III:

Frequency Modulation – Principle - mathematical expression, modulation index, side bands.Comparison of AM and FM.**AM & FM Broadcast Transmitters** – Block diagram and working of each block.**Demodulation -** Amplitude demodulation (Diode detector), Frequency demodulation (Foster Seeley discriminator)

UNIT-IV:

Digital communication-baseband transmission and reception-digital carrier system-PCM, Delta modulation, generation and demodulation, Signal to Noise ratio - Digital modulation schemes-ASK, FSK, PSK, WDM(Qualitative Only)

UNIT-V:

(Block diagram approach only) **Microwave communication** – transmitter-receiver - repeater, Satellite communication-Optical fibre link, satellite system - Cellular radio system-**Global system for mobile(GSM)** – CDMA-GPRS-EDGE-Miscellaneous Mobile system

BOOKS FOR STUDY/ REFERENCE

1. Communication Electronics – Frenzel 3rd Edition (MGH)
2. Electronic Communication – Roddy&Colins (PHI)
3. Principles of Communication – Anokh Singh
4. W. Tomasi, Electronic Communication System, Pearson Education, Delhi, 2001
5. K.N.Hari Bhatt, Analog Communications, Sanguine Technical Publishers,2008
6. D. Patranabis, Telemetry principles, Tata McGraw Hill, New Delhi, 1999
7. Mobile Cellular Telecommunication William C.Y Lee-II Edition -2006 –TMH(Unit-V)

PRACTICAL – LABI
ELECTRONICS DEVICES AND CIRCUIT LAB

Any 12 experiments

1. Measurements of R,C,L
2. Measurements of R,C,L using bridge

3. Measurement of Voltage, Frequency, Period and Phase using CRO
4. Wave Shaping circuits
5. LDR characteristics
6. UJT characteristics
7. UJT Relaxation Oscillator
8. Load line analysis of transistor amplifier
9. LED and seven segment display
10. Photodiode characteristics
11. Bridge rectifier –Output characteristics and percentage of regulation
12. Constructions of RC low pass filter and its characteristics.
13. Constructions of RC high pass filter and its characteristics.
14. SCR Characteristics.
15. Zener diode Characteristic
16. Thermistor Characteristics – Temperature coefficient
17. Full wave rectifier with filter
18. Voltage Regular using IC – load characteristic
19. Voltage regulator using Zener diode – load characteristic

PRACTICAL - LAB-II

LINEAR AND DIGITAL ICS LAB

Any 12 experiments

1. Op-amp characteristics
2. Half Adder (using NOR and NAND gate only)
3. Half Subtractor(using NOR and NAND gate only)
4. Schmitt trigger using IC 741
5. Op-amp Oscillator
6. Logarithmic amplifier
7. Exponential amplifier
8. Low pass filter and High pass filter using Op-Amp
9. Study of Amplitude Modulation
10. Study of Frequency Modulation
11. Comparator and voltage follower using Op-Amp
12. 555 timer characteristics
13. Current to Voltage converter using op- amp
14. D-A converter using op- amp
15. Voltage Control Oscillator using 555 timer
16. Stain gauge Characteristic
17. MonostableMultivibrator
18. BistableMultivibrator
19. Saw tooth wave generation using 555 timer
20. Schmitt trigger using 555 timer
21. Voltage to Current convertor using IC 741