DWARAKA DOSS GOVERDHAN DOSS VAISHNAV COLLEGE
(Linguistic Minority Institution)
[AUTONOMOUS]
Accredited at 'A' Grade by NAAC

B. Sc. PHYSICS SYLLABUS
(Effective from 2015-2016 batch)

"Gokulbagh" 833, Periyar E.V.R. Salai,
Arumbakkam, Chennai – 600106

For updated information on Rules and Regulations, please see the University of Madras Website, College calendar and consult your teacher

UNIVERSITY OF MADRAS

BACHELOR DEGREE COURSES: UNDER THE FACULTY OF SCIENCE (B.Sc.)

B.SC PHYSICS

CHOICE BASED CREDIT SYSTEM

REGULATIONS

1. ELIGIBILITY FOR ADMISSION:

Candidates for admission to the first year of the Degree of Bachelor of Science courses shall be required to have passed the Higher Secondary Examinations **(with Mathematics, Physics and Chemistry)** conducted by the Government of Tamil Nadu or an Examination accepted as equivalent thereof by the Syndicate of the University of Madras. Provided that candidates for admission into the specific main subject of study shall be Possess such other qualifying conditions as may be prescribed by the University as given in the **APPENDIX-A.**

2. ELIGIBILITY FOR THE AWARD OF DEGREE:

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, passed the examinations all the Six-Semesters prescribed earning **140 Credits** (in Parts-I, II, III, IV & V).

3. DURATION:

a) Each academic year shall be divided into two semesters. The first academic year shall comprise the first and second semesters, the second academic year the third and fourth semesters and the third academic year the fifth and sixth semester respectively.

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

4. COURSE OF STUDY:

The main Subject of Study for Bachelor Degree Courses shall consist of the following and shall be in accordance with **APPENDIX-B**

PART – I TAMIL / OTHER LANGUAGES

PART – II ENGLISH*

PART – III CORE SUBJECTS / ALLIED SUBJECTS / ELECTIVES

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 SKILLS)

3. ENVIRONMENTAL STUDIES

4. VALUE EDUCATION

PART – V EXTENSION ACTIVITIES

5. EXTENTION ACTIVITIES:

A candidate shall be awarded a maximum of 1 Credits for Complusory Extension Service.

All the Students shall have to enrol for NSS /NCC/ NSO (Sports & Games) Rotract/ Youth Red cross or any other service organizations in the college and shall have to put in Complusory 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/she shall have to compensate the same during the subsequent years.

Students those 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 ONE CREDIT.

Literacy and population Education Field Work shall be compulsory components in the above extension service activities.

6. SCHEME OF EXAMINATION:

Scheme of Examination shall be given in **APPENDIX - C**

Model Scheme

Course Component Name of the course	Inst. Hour	Credits	Exam Hrs	Max. Marks		
				Ext. mark	Int. mark	Total
PART-I Language				60	40	100
PART-II English				60	40	100
PART-III Core subject				60	40	100
Core Subject				60	40	100
Allied Subject				60	40	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)						

7. REQUIREMENTS FOR PROCEEDING TO SUBSEQUENT SEMESTER:

i. Candidates shall register their names for the First Semester Examination after the admission in UG Courses.

ii. Candidates shall be permitted to proceed from the First Semester up to Final Semester irrespective of their failure in any of the Semester Examination subject to the condition that the candidates should register for all the arrear subject of earlier semesters along the current (subsequent) Semester Subjects.

iii. Candidates shall be eligible to go to subsequent semester, only if they earn, sufficient attendance as prescribed there for by the Syndicate from time to time.

8. PASSING MINIMUM:

A candidate shall be declared to have passed:

a) There shall be no Passing Minimum for Internal.

b) For External Examination, Passing Minimum shall be of 40%(Forty Percentage) of the maximum marks prescribed for the paper for each Paper/Practical/Project and Viva-voce.

c) In the aggregate (External + Internal) the passing minimum shall be of 40% .

d) He/She shall be declared to have passed the whole examination, if he/she passes in all the papers and practicals wherever prescribed / as per the scheme of examinations by earning 140 CREDITS in Parts-I, II, III, IV & V. He/she shall also fulfill the extension activities prescribed earning a minimum of 1 Credit to qualify for the Degree.

9. CLASSIFICATION OF SUCCESSFUL CANDIDATES:

PART- I TAMIL / OTHER LANGUAGES:

TAMIL/OTHER LANGUAGES: Successful candidates passing the Exami-nations for the Language and securing the marks (1) 60 percent and above and (ii) 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.

PART – II ENGLISH:

ENGLISH: Successful candidates passing the examinations for English and securing the marks (i) 60 percent and above and (ii) 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.

PART – III consisting of CORE SUBJECTS, ALLIED SUBJECTS, ELECTIVES:

Successful candidates passing the examinations for Core Courses together and securing the marks (i) 60 percent and above (ii) 50 percent and above but below 60 percent in the aggregate of the marks prescribed for the Core courses together 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 examinations in the Third Class.

PART – IV (consisting of sub items 1 (a), (b) & (c), 2, 3 and 4) as furnished in the Regulations 4 Part-IV supra.

PART – V EXTENTION ACTIVITIES**:**

Successful Candidate earning of 1 credit SHALL NOT BE taken into consideration for Classification/Ranking/ Distinction.

10. RANKING:

Candidates who pass all the examinations prescribed for the course in the FIRST APPEARANCE ITSELF ALONE are eligible for Ranking/ Distinction.

Provided in the case of Candidates who pass all the examinations prescribed for the Course with a break in the First Appearance due to the reasons as furnished in the Regulations. 7 (iii) supra are only eligible for classification.

APPENDIX – A

ADDITIONAL ELIGIBILITY CONDITIONS FOR

ADMISSION TO THE FOLLOWING COURSE:

CANDIDATES FOR ADMISSION TO THE FOLLOWING COURSE SHALL HAVE PASSED THE QUALIFYING EXAMINATION WITH THE SUBJECTS NOTED AGAINST:

B.Sc PHYSICS : PHYSICS and MATHEMATICS

APPENDIX - B

COURSE OF STUDY

The Course of Study shall comprise the study of Part-I to Part-V Courses; .

PART - I TAMIL/OTHER LANGUAGES comprise the study of:

Tamil or any one of the following Modern (Indian or Foreign) or classical languages at the optional candidate, according to the syllabi and text-books prescribed from time to time.

(i) Modern (Indian) - Telugu, Kannada, Malayalam, Urdu & Hindi.

(ii) Foreign - Chinese, French, German, Italian, Japanese, & Russia

(iii) Classical - Sanskrit, Arabic & Persian.

AND

PART – II ENGLISH according to the syllabi and text-books prescribed from time to time.

PART – III CORE COURSES Comprise the study of (A) Main Subjects; (B) Allied Subjects; (C) Electives;

(A) MAIN SUBJECTS:

B.Sc DEGREE COURSE IN PHYSICS

(B) ALLIED SUBJECTS:

Each candidate shall choose the Allied subjects prescribed in the Scheme of Examinations.

(C) ELECTIVES:

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 6^{th} 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 SKILLS)

3. ENVIRONMENTAL STUDIES

4 VALUE EDUCATION

PART – V EXTENSION ACTIVITIES

SYLLABUS FOR B.Sc. PHYSICS DEGREE COURSE

(According to Choice Based Credit System)

[Effective from the academic year 2015-2016 batch]

The Regulations and syllabi for the B.Sc. Physics Degree course for the I to VI semesters as per the format given by the Tamilnadu State Council for Higher Education [TANSCHE], Chennai, under Choice Based Credit System with the minimum of 120 credits for the UG Degree Courses to be offered in the affiliated colleges, is given in Annexure – I.

Accordingly Choice Based Credit System is offered for B.Sc. Physics Degree Course.

The distribution of available 30 hours per week among various papers is given in Annexure – I.

The Question Paper pattern is shown in Annexure – II

The Internal Evaluation Pattern is shown in Annexure – III.

The department takes utmost care to maintain high academic standards. The Syllabi of the University of Madras, various autonomous colleges and the model curricula of UGC were referred to and all possible updations and upgradations have been effected.

All papers are unitized to 5 units as per UGC Norms.

The proposed new syllabus is submitted herewith.

NOTE : EXTRA credits for Online courses completed

B.Sc. Physics Students can register for various **Online courses** of their choice from **SWAYAM, NPTEL, IIRS- ISRO, SAKSHAT, or other online** courses from our **MHRD and MIT EDx, Couresera.** Those who **successfully complete** these courses will be **awarded EXTRA CREDITS,** along with their regular credits earned .

ANNEXURE – I

Distribution of Hours, Marks and Credits for B.Sc Physics Degree Course

SEMESTER 1

S.No.	Course Components	Subjects	Inst. Hrs	Credits	Exam Hrs	Max. Marks		
						Ext. Marks	Int. Marks	Total
1	PART I	Language Paper I	6	3	3	60	40	100
2	PART II	English Paper I	6	3	3	60	40	100
3	PART III Core Courses	**Core Paper I** Mechanics and Properties of Matter	5	5	3	60	40	100
		Core Practical I	3	Practical examination at the end of Semester II				
4	Allied Subject I	Allied Mathematics 1	6	5	3	60	40	100
5	Part IV Non-Major Elective/	Basic Tamil	2	2	3	60	40	100
6	Soft Skill I		2	2	3	60	40	100
	Total	6	30			360	240	600

SEMESTER 2

S.No.	Course Components	Subjects	Inst. Hrs	Credits	Exam Hrs	Max. Marks		
						Ext. Marks	Int. Marks	Total
1	PART I	Language Paper II	6	3	3	60	40	100
2	PART II	English Paper II	6	3	3	60	40	100
3	PART III Core Courses	**Core Paper II** Thermal Physics and Acoustics	5	5	3	60	40	100
		Core Practical I	3	4	3	60	40	100
4	Allied Subject II	Allied Mathematics II	6	5	3	60	40	100
5	Part IV Non-Major Elective/	Basic Tamil	2	2	3	60	40	100
6	Soft Skill II		2	2	3	60	40	100
	Total	6	30			420	280	700

SEMESTER 3

S.No.	Course Components	Subjects	Inst. Hrs	Credits	Exam Hrs	Max. Marks		
						Ext. Marks	Int. Marks	Total
1	PART I	Language Paper III	6	3	3	60	40	100
2	PART II	English Paper III	6	3	3	60	40	100
3	PART III Core Courses	**Core Paper III** Optics	5	5	3	60	40	100
		Core Practical II	3			Practical examination at the end of Semester IV		
4	Allied Subject I	Allied Chemsitry I		5	3	60	40	100
5		Allied Chemistry Practicals		Practical examination at the end of Even Semester				
6	E V S		2	Examination at the end of Even Semester				
7	Soft Skill III		2	2	3	60	40	100
	Total			18		300	200	500

SEMESTER 4

S.No.	Course Components	Subjects	Inst. Hrs	Credits	Exam Hrs	Max. Marks		
						Ext. Marks	Int. Marks	Total
1	PART I	Language Paper IV	6	3	3	60	40	100
2	PART II	English Paper IV	6	3	3	60	40	100
3	PART III Core Courses	**Core Paper IV** Atomic Physics	5	5	3	60	40	100
		Core Practical II	3	4	3	60	40	100
4	Allied Subject II	Allied Chemistry II		5	3	60	40	100
5		Allied chemistry Practicals		5	3	60	40	100
6	E V S		2	2	3	60	40	100
7	Soft Skill IV		2	2	3	60	40	100
	Total			29		480	320	800

SEMESTER 5

S.No.	Course Components	Subjects	Inst. Hrs	Credits	Exam Hrs	Max. Marks		
						Ext. Marks	Int. Marks	Total
1	PART III Core Courses	**Core Paper V** Electricity and Electromagnetism	5	5	3	60	40	100
2		**Core Paper VI** Mathematical methods in Physics	5	5	3	60	40	100
3		**Core Paper VII** Solid State Physics	4	5	3	60	40	100
4		**Core Paper VIII** Basic Electronics	4	5	3	60	40	100
5		**Elective I** Applied Electronics	4	5	3	60	40	100
6		Core Practical III	3	Practical examination at the end of Semester VI				
7		Core Practical IV	3					
8		Core Practical V	2					
9		Value Education		2				100
	Total		30	27				600

SEMESTER 6

S.No.	Course Components	Subjects	Inst. Hrs	Credits	Exam Hrs	Max. Marks		
						Ext. Marks	Int. Marks	Total
1	PART III Core Courses	**Core Paper IX** Relativity and Quantum Mechanics	6	5	3	60	40	100
2		**Core Paper X** Nuclear and Particle Physics	6	5	3	60	40	100
3		**Elective II** Digital Electronics	5	5	3	60	40	100
4		**Elective III** Microprocessor Fundamentals	5	5	3	60	40	100
6		Core Practical III	3	4	3	60	40	100
7		Core Practical IV	3	4	3	60	40	100
8		Core Practical V	2	4	3	60	40	100
	Total		30	32		480	220	700

ALLIED PHYSICS

S.No.	Semester	Subjects	Inst. Hrs	Credits	Exam Hrs	Max. Marks		
						Ext. Marks	Int. Marks	Total
1	Odd Semester	Allied Physics I	5	5	3	60	40	100
2		Allied Practicals	3	Practical Examination at the end of Even semester				
3	Even Semester	Allied Physics II	5	5	3	60	40	100
4		Allied Physics Practicals	3	4	3	60	40	100

No. of Credits earned from Department of Physics by B.Sc. Physics Students

Semester	Paper		Marks			Credits
	Theory	Practical	Theory	Practical	Total	
I	1	-	100	-	100	5
II	1	1	100	100	200	9
III	1	-	100	-	100	5
IV	1	1	100	100	200	9
V	5	-	500	-	500	25
VI	4	3	400	300	700	32
IV	EVS		75	25	100	2
Total			1575	525	2100	91

No. of Credits earned from Department of Physics by B.Sc. Maths /Chemistry students

Semester	Paper		Marks			Credits
	Theory	Practical	Theory	Practical	Total	
Odd Semester	1	-	100	-	100	5
Even Semester	1	1	100	100	200	9
Total	2	1	200	100	300	14

No. of Credits earned from Department of Physics by B.Com. students from 2019-20

Semester	Paper	Marks	Credits
I	Non major Elective	100	2
II	Non Major Elective	100	2
Total	2	200	4

ANNEXURE – II

Question Paper Pattern for B.Sc Physics Degree Course based on CBCS Pattern (except non-major elective)

THEORY

Maximum Ext. Marks: 100
Duration: 3 hours

PART A (50 words)

To answer 10 questions
out of 12 questions (at least two questions from each unit) 10x2marks=20 marks

PART B (200 words)

To answer 5 questions
out of 7 question (at least one question from each unit) 5X7 marks=35 marks

PART C (500 words)

To answer 3 questions
out of 5 question (at least one question from each unit) 3X15marks=45 marks

Total 100 marks

Question paper pattern for non-major elective
THEORY

Maximum Ext. Marks: 100
Duration: 3 hours

PART A

To answer 10 questions
out of 12 questions (at least two questions from each unit) 10x2marks=20 marks

PART B

To answer 5 questions
out of 7 question (at least one question from each unit) 5X7 marks=35 marks

PART C

To answer 2 questions
out of 5 question (at least one question from each unit) 3X15marks=45 marks

Total 100 marks

PRACTICALS

Maximum Ext. Marks: 60
Duration: 3 hours

The external examiner will prepare a question paper on the spot with the help of the Question Bank supplied by the controller's office.

ANNEXURE – III

Pattern of Internal Evaluation for B.Sc Physics Degree Course based on CBCS Pattern

THEORY

Maximum Int. Marks: 40

Best Two tests out of 3	15 marks
Attendance	5 marks
Assignment/Seminar	5 marks
Class Activity	

PRACTICAL

Maximum Int. Marks: 40

Attendance	5 marks
Practical Tests best 2 out of 3	30 marks
Record	5 marks

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DEPARTMENT OF PHYSICS

B.Sc DEGREE COURSE IN PHYSICS

Syllabus

Semester – V

Core Paper- 5

ELECTRICITY AND ELECTROMAGNETISM

(Effective from 2015-2016 batch)

No. of crédits: 5
No. of hours allotted: 5/ Week

Unit 1: Chemical Effects of Electric Current

Faraday's laws of electrolysis - ionic velocities and mobilities - Calculation - experimental determination of ionic mobilities - transport number. Thermoelectricity- Peltier effect - Experimental determination of Peltier coefficient - Thomson coefficient - experimental determination of Thomson coefficient - application of thermodynamics to a thermocouple and connected relations - thermoelectric diagram and uses.

Unit 2: DC and AC Circuits

DC Circuits

Growth and decay of current in a circuit containing resistance and inductance - growth and decay of charge in a circuit containing resistance and capacitor - growth and decay of charge in an LCR circuit - condition for the discharge to be oscillatory - frequency of oscillation - network analysis - Thevenin and Norton's Theorems.

AC Circuits

AC voltage and current - Power factor and current values in AC circuit containing LCR - series and parallel resonant circuits - AC motors - single phase, three phase - star and delta connections - electric fuses - circuit brakers.

Unit 3: Magnetic effect of electric current

Biot and Savart's law - magnetic field intensity due to a solenoid carrying current - effect of iron core in a solenoid – magnetic field at a point due to circular current carrying coil - Helmholtz galvanometer - moving coil ballistic galvanometer - theory - damping correction – experimental determination of the absolute capacity of a condenser using B.G – experiment to compare the capacitance, emf of cells using B.G.

Unit 4: Electromagnetic induction and its applications

Faraday's laws of electromagnetic induction - inductance - determination of self inductance of a coil using Anderson method - mutual inductance - experimental determination of absolute mutual inductance - coefficient of coupling - earth inductor - Uses of earth inductor - measurement of horizontal component of the earth's magnetic field - measurement of vertical component of earth's magnetic field – angle of dip - calibration of B.G. - Induction coil and its uses.

Unit 5: Maxwell's equations and electromagnetic theory

Basic equations - types of currents - vacuum displacement current - Maxwell's equations - Maxwell's equations in free space - electromagnetic waves in free space - propagation of electromagnetic wave in a non conducting medium - Hertz Experiment - energy density of e.m. wave - Poynting's theorem - energy per unit volume.

Books for Study

1. Electricity & Magnetism by M.Narayanamurthy & N.Nagarathnam, NPC pub., Revised edition (1996).
2. Electricity and Magnetism by Brijlal and Subrahmanyam; S.Chand & Co., New Delhi, (2000).
3. Electricity & Magnetism by D.Chattopadhyay and P.C. Rakshit, Books and Allied (P) Ltd.(2001).
4. Fundamentals of Electricity and Magnetism by B.D. Dugal and C.L. Chhabra, Shobanlal Nagin, S. Chand & Co., 5th edition, New Delhi(2005).
5. Electricity and Magnetism by R. Murugeshan, S.Chand & Co., New Delhi, (2008).

Books for Reference

1. Electricity & Magnetism by K.K.Tewari, S.Chand & Co., New Delhi, .(2002).
2. Introduction to Electrodynamics by D.J.Griffiths, Printice Hall of India Pvt. Ltd., 3rd Edition, New Delhi(2003).

Core Paper– 6

MATHEMATICAL METHODS IN PHYSICS
(Effective from 2015-2016 batch)

No. of credits: 5
No. of hours allotted: 5/ week

Unit 1: Vector Analysis

Scalar and vector fields: Gradient, divergence and curl - physical interpretation, Lamellar and solenoidal field – (only definition), line, surface and volume integrals – Gauss Divergence theorem – Stoke's theorem – Green's theorem - Application of vectors to hydrodynamics: Equation of continuity, Bernoulli's theorem,

Unit 2: Matrices

Characteristic equation of a matrix – eigen values and eigen vectors – Cayley Hamilton theorem – Theorems on eigens values and eigen vectors – Hermitian and unitary matrices – Diagonalisation of matrices – matrices in Physics: rotation matrix, Pauli spin matrices (elementary ideas only).

Unit 3: Special functions

Gamma and Beta functions – definition – Evaluation – other forms of the functions – symmetry property of Beta function- relation between Beta and Gamma functions - Series solutions of Bessel's differential equation and Legendre differential equation.

Unit 4: Lagrangian formulation

Mechanics of a system of particles – Degrees of freedom – constraints – Generalised coordinates – Configuration space – principle of virtual work – D'Alembert's principle – Lagrange's equation of motion from D'Alembert's principle for a conservative system - Applications of Lagrange's equation: Atwood's machine, a bead sliding on uniformly rotating wire – simple pendulum.

Unit 5: Hamiltonian formulation

Phase space – Hamiltonian function H – physical significance – Hamilton's equations - Applications of Hamiltonian equations: Simple pendulum – motion of a particle in a central force field.

Books for study

1. Mathematical Physics by Satya Prakash, S.Chand & Sons, New Delhi (1996)
2. Classical Mechanics by J.C. Upadhyaya, Himalaya Publishing House, Mumbai (2003).
3. Mechanics and Mathematical methods by R.Murugesan, S.chand & Company, New Delhi (1996)

Books for Reference

1. Mathematical Physics by B.D. Gupta, Vikas Publishing House Pvt. Ltd, New Delhi (1996)
2. Classical Mechanics by H. Goldstein, Special Indian Student Edition, Narosa Publishing House, New Delhi (1985)

Core Paper- 7

SOLID STATE PHYSICS

(Effective from 2015-2016 batch)

No. of credits: 5
No. of hours allotted: 4/ Week

Unit I: Crystal structure

Crystal Lattice – Primitive cell - Unit cell - Seven classes of crystals - Bravais Lattice – crystal planes and Miller Indices – inter planar spacing in crystal lattice - structure of crystals - Simple cubic, Face centered Cubic, Body Centered Cubic crystal structure, Hexagonal close packed structure, Sodium Chloride, Diamond, Zinc Blende and Caesium Chloride structure.

Unit II: X- rays in crystal study

Diffraction of X-rays by crystals - Bragg's Law in one dimension - Experimental method in X-ray Diffraction - Laue method, rotating crystal method - Powder photograph method - Von Laue's equations – crystal imperfections - point defects, line defects - surface defects - volume defects - effects of crystal imperfections.

Unit III: Bonding and Super Conductivity

Types of bonds in crystals – Ionic, covalent, metallic, van-der-waal's and hydrogen bonding – characteristic of various bonding – cohesive energy of cubic ionic crystals – Madelung constant for sodium chloride crystal – Phonons – monoatomic one dimensional lattice – specific heat of solids – Einstein's theory – Debye theory.

Super conductivity – general properties of super conductors - Meissner effect – Type I and Type II super conductors – applications of super conductors.

Unit IV: Dielectrics

Fundamental definitions in dielectrics - different types of Electric polarization - frequency and temperature effects on polarization - dielectric loss - local Field on Internal Field Clausius-Mosotti Relation - Determination of dielectric constant - dielectric Breakdown - properties of different types of insulating materials.

Unit V: Magnetic materials

Different type of magnetic materials - Langevin's theory of diamagnetism - Langevin's theory of paramagnetism - Weiss theory of paramagnetism - qualitative explanation of Heisenberg's internal field quantum theory of ferromagnetism.

Books for Study

1. Introduction to Solid State Physics by Charles Kittel, John Wiely and sons, 7th edition (2004).
2. Material Science by Arumugam.M, Anuradha Technical Book publishers (1997).
3. Solid State Physics, P.K. Palanisamy, Scitech publications (India) Pvt.Ltd.(2005).
4. Modern physics, R.Murugesan and Kiruthiga Sivaprasath,S.Chand and Company, New Delhi (2005)

Books for Reference

1. Marerial Science and Engineering First Course 5th edition, V.Raghavan, Prentice Hall (India)Pvt. Ltd. (2004)
2. Text Book of Solid State Physics, S.L.Kakani and L.Hemrajani, Sultan Chand and sons, New Delhi (1997)
3. Solid State Physics, A.J. Dekker, Macmillan India Ltd (2005).
4. Concepts of Modern Physics, Arthur Bieser, Tata Mc.Graw Hill, 6th edition (2005).
5. Solid state physics, S.O. Pillai, New Age International Pvt.Ltd,6th edition (2005).

Core paper - 8

BASIC ELECTRONICS

(Effective from 2015-2016 batch)

No. of credits: 5
No. of hours allotted: 4/ Week

Unit 1: Semiconductors:-

Energy bands in a solid – intrinsic semiconductors – extrinsic semiconductors – Fermi level - pn junction – volt – ampere characteristic curve – biasing the pn junction - diode as rectifier – half wave rectifier – full wave rectifier – centre tapped, bridge rectifier – efficiency and ripple factor - circuits using diode – clipper, clamper – zener diode – zener diode as voltage regulator.

Unit II: Transistors:-

Basic transistor amplifier – Transistor input and collector characteristics – common base and common emitter amplifier – relation between α and ß – transistor biasing techniques – emitter bias – voltage divider bias. Transistor hybrid model – the h parameter – analysis of transistor amplifier (CE only) circuit using h parameters.

Unit III: Transistor amplifiers:-

Emitter follower, RC coupled amplifier – analysis using h parameters – frequency response – power amplifiers – classification – class A, push – pull, class B, power amplifier – collector efficiency – differential amplifier – A_d, A_{CM} and CMRR.

Unit IV: Oscillator and switching circuits:

Feedback in amplifier – negative feedback - Essential of transistor oscillator – basic LC oscillator circuit – Hartley oscillator – phase shift oscillator – Wein's bridge oscillator – expression for frequency. Types of multivibrators – Astable – monostable and bi-stable multivibrators.

Unit V: Special semiconductor devices:

Junction field transistor (JFET) – characteristics – Common source FET amplifier – UJT – characteristics – UJT as relaxation oscillator – SCR – characteristic – SCR as a rectifier.

Books for Study

1. Principles of electronics, V.K. Metha, S.Chand and company, 6th edition (2004).
2. Elements of electronics – M.K. Bagde, S.R. singh, Kamal Singh, S.Chand and company (2002).
3. A Textbook of Applied Electronics, R.S.Sedha, S.Chand and Company,New Delhi (1998)
4. Handbook of Electronics, Gupta and Kumar, Pragati Prakashan , Meerut (1991)

Books for Reference

1. Electronic devices and circuits, Allen Mottershead, Prentice Hall of India (1989).
2. Integrated electronics, Millman and Halkias, Tata McGrawHill Publication, New Delhi (2005).
3. Grob's Basic Electronics, Mitchell E Schultz, Tata McGraw Hill., New Delhi 10th Edn.(2006)

Semester – V

Elective - 1
APPLIED ELECTRONICS
(Effective from 2015-2016 batch)

No. of credits: 5
No. of hours allotted: 4/ Week
Unit I: Operational Amplifier fundamentals

Characteristics– op-amp parameters – inverting amplifier- non- inverting amplifier – unity follower – summing amplifier – difference amplifier. Differentiator,integrator, comparator using op-amp.

Unit II: Analog computation and waveform generation

Analog computation and waveform generation using op amp - solving simultaneous equation – second order differential equation – square wave generation (astable operation) – sine wave generation – Wien's Bridge oscillator.

Unit III: 555 Timer

555 Timer – internal block diagram – and working – applications – Schmitt Trigger – astable, monostable multivibrator.

Unit IV: D/A and A/D converters

Introduction – Binary weighted resistor D/A converter – R -2R ladder method – resolution A/D converter – counter type – successive approximation type – resolution.

Unit V: Semiconductor Memories

Semiconductor memories- classification based on Principle of operation – ROM – organization – 256 x 4 ROM – 1K x 4 ROM – PROM – EPROM – EEPROM – Random Access Memory(RAM) – static RAM – Dynamic RAM –memory parameters.

Books for study

1. Op- AMPs and Linear Integrated Circuits by Ramakant A.Gayakwad, Prentice Hall of India (1994)
2. Introduction to Integrated Electronics by V.Vijayendran, S.Viswanathan(printers and publishers) Pvt. Ltd, Chennai (2005)
3. Integrated electronics, Millman and Halkias, Tata McGrawHill Publication, New Delhi (2005).

Books for reference

1. Linear integrated circuits by D. Roy Choudhury and Shail Jian, New Age International (P) Ltd (2003).
2. Integrated Electronics by J. Millman and C. Halkias, Tata McGraw Hill, New Delhi (2001).

Semester VI

Core Paper - 9

RELATIVITY AND QUANTUM MECHANICS

(Effective from 2015-2016 batch)

No. of credits: 5
No. of hours allotted: 6/ week

Unit I: Relativity

Frame of reference – Gallilean transformation – Michelson – Morley experiment – Postulates of special theory of relativity – Lorentz transformation – length contraction – time dilation – relativity of simultaneity – addition of velocities – variation of mass with velocity – mass energy equation – elementary ideas of general theory of relativity – Principle of equivalence – Bending of rays of light due to gravitational field- shift of spectral lines - Minkowski's four dimensional space.

Unit II: Wave nature of matter

Matter wave – phase and group velocity – wave packet – expression for de Broglie wavelength – experimental confirmation of particle waves – Davisson and Germer's experiment – G.P. Thomson's experiment – applications of electron diffraction – electron microscope – principle of complementarity – Heisenberg's uncertainity principle – experimental illustration of uncertainity principle – applications of uncertainity principle.

Unit III: Schroedinger's Equation

Inadequacy of classical mechanics – basic postulates of wave mechanics – properties of wave function – probability interpretation of a wave function – operator formalism – linear operators – self – adjoint operators – expectation value – eigenvalues and eigenfunctions – commutativity and compatibility – Schroedinger's equation - steady state and time dependent form.

Unit IV: Angular Momentum

Orbital angular momentum operators and their commutation relations – elementary ideas of spin angular momentum of an electron – Pauli matrices – spin matrices - properties.

Unit V: Solution of Schroedinger's Equations

Free particle solution – particle in a box – Qualitative treatment of the Barrier penetration problem (one dimension only), linear harmonic oscillator, rigid rotator and Hydrogen atom.

Books for Study

1. Mechanics and Relativity by Brijlal Subramanyam, S.Chand & Co., New Delhi,. (1990)
2. Quantum mechanics by G. Aruldas ,Prentice Hall India (2002).
3. Modern Physics by R. Murugeshan and Kiruthiga Sivaprasath, S. Chand & Co.,(2008)
4. Quantum Mechanics, Satyaprakash, Pragati Prakashan, Meerut (2009)

Books for Reference

1. A text book of Quantum mechanics by P.M.Mathews and S.Venkatesan, Tata McGraw – Hill, New Delhi (2005).
2. Concepts of modern physics by Arthur Beiser. Tata McGraw - Hill, 5th edition, New Delhi (1997).
3. Quantum mechanics by A.Ghatak and Loganathan, McMillan India Pvt. Ltd.
4. Quantum Mechanics by V.K. Thankappan, New Age International (P) Ltd. Publishers, New Delhi (2003).

Core Paper-10

NUCLEAR AND PARTICLE PHYSICS

(Effective from 2015-2016 batch)

No. of credits: 5
No. of hours allotted: 6/week

Unit I: General Properties of Nuclei

Nuclear size, charge, mass-determination of nuclear radius-mirror nucleus - 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 – nuclear forces-meson theory of nuclear force(qualitative)

Unit II: Radioactivity

Natural radioactivity – properties of alpha, beta and gamma rays - alpha rays – characteristics -determination of e/m of alpha particle – determination of range of alpha particle– Geiger Nuttal experiment and law – α-ray spectra – Gamow's theory of α-decay (qualitative study) – beta rays – characteristics - beta ray spectra – neutrino hypothesis – violation of parity conservation – gamma rays – determination of wavelength - internal conversion – nuclear isomerism - law of disintegration – half life and mean life period – units of radioactivity – transient and secular equilibrium – radiocarbon dating – age of earth.

Unit III: Radiation Detectors and Particle Accelerators

Ionization chamber – G.M. Counter and resolving time – scintillation counter – photo multiplier tube – Linear accelerators – cyclotron – synchrocyclotron - betatron.

Unit IV: Nuclear Reactions

Conservation laws – nuclear reaction Kinematics-Q-value-threshold energy – artificial radioactivity – radioisotopes and its uses – classification of neutrons – nuclear fission – chain reaction – critical mass and size – nuclear reactor-breeder reactor – transuranic elements – nuclear fusion – thermonuclear reactions – sources of stellar energy.

Unit V: Elementary Particles

Classification of elementary particles – particles and anti particles – anti matter - fundamental interaction – elementary particle quantum numbers – isospin and strangeness – conservation laws.

Books for study

1. Atomic and nuclear Physics by N. Subrahmanyam and Brijlal, S. Chand & Co., New Delhi (1996).
2. Nuclear Physics by Tayal D.C., Himalaya publishing House, Mumbai(2006)

3. Nuclear Physics by R.C. Sharma, K. Nath & Co., Meerut (2000)

4. Modern physics, R.Murugesan and Kiruthiga Sivaprasath, S.Chand and Company, New Delhi (2005)

Books for reference

1. Nuclear Physics by R.R. Roy and B.P. Nigam, New Age International (P) Ltd., New Delhi(1997)
2. Nuclear Physics by Irving Kaplan, Narosa Publishing house, New Delhi(2002).

Semester VI
Elective -2
DIGITAL ELECTRONICS
(Effective from 2015-2016 batch)

No. of credits: 5
No. of hours allotted: 4/ Week

Unit I: Number System and Binary Code

Introduction, binary, octal and hexadecimal number system. Binary operations-addition; Subtraction, multiplication and division. Subtraction using 1's and 2's complement; BCD system.

Unit II: Combinational Logic Design

Boolean algebra-De Morgan's theorem- basic logic gates- NAND and NOR as universal gates-SOP, POS- Karnaugh map representation and simplification, pair, quad, octet (limited to four variables). Arithmetic circuits - half and full adders, half and full subtractors), BCD adder. Demultiplexers /Decoders, Multiplexers, Encoders, Code converters (BCD-to Binary, Binary to BCD converters).

Unit III: Flip flops

Sequential logic circuits – 1-bit memory, Latch, R-S Flip flop, J-K Flip flop – Race-around comdition – master – Slave Flip flop – T and D flip flops.

Unit IV: Registers and counters

Registers, Modes of operation, shift right, shift left registers. Counters (4 bit). Ripple (or) asynchronous Counters – synchronous counters –Up - down counters – decade counter – BCD counter.

Unit V: Introduction to IC technology

Basic fabrication steps: epitaxial growth, oxidation, photolithography, etching, diffusion, ion implantation, film deposition and metallisation. Process integration for integrated Circuits, Diodes and transistor for monolithic circuits, integrated resistors, capacitors.

Books for Study

1. Introduction to Integrated Electronics by V.Vijayendran, S. Viswanathan (Printers and Publishers) Pvt. Ltd., Chennai(2005).
2. Digital Electronics by Practice Using Integrated Circuits - R.P.Jain - Tata McGraw Hill(1996).
3. Integrated Electronics by J.Millman and C.Halkias, Tata McGraw Hill, New Delhi (2001)
4. Digital Principles and Application by Malvino Leach, Tata McGraw Hill, 4th Edition (1992).

Books for Reference

1. Linear Integrated Circuits by D. Roy Choudhury and Shail Jain - New Age Internation(P) Ltd.(2003)
2. Electronics - Analog and Digital by I.J. Nagrath - Prentice Hall of India, New Delhi(1999).

Semester VI

ELECTIVE - 3

MICROPROCESSOR FUNDAMENTALS

(Effective from 2015-2016 batch)

No. of credits: 5
No. of hours allotted: 4/ Week

Unit 1: Architecture

Architecture of 8085 – registers, flags, ALU, address and data bus, demultiplexing address/data bus – control and status signals – control bus, Programmer's model of 8085 – Pin out diagram – Functions of different pins.

Unit 2: Programming Techniques

Instruction set of 8085 – data transfer, arithmetic, logic, branching and machine control group of instructions – addressing modes – register indirect, direct, immediate and implied addressing modes.

Assembly language & machine language – programming techniques: addition, subtraction, multiplication, division, ascending, descending order, largest and smallest (single byte)

UNIT 3: Interfacing memory to 8085

Memory interfacing – Interfacing 2kx8 ROM and RAM, Timing diagram of 8085 (MOV R_d, R_s – MVI R_d, data(8) .

Unit 4: Interfacing I/O Ports to 8085

Interfacing input port and output port to 8085 – Programmable peripheral interface 8255 – control word-three modes of operation-flashing LEDs.

Unit 5: Interrupts

Interrupts in 8085 - hardware and software interrupts – RIM, SIM instructions – priorities – simple polled and interrupt controlled data transfer.

Books for Study

1. Microprocessor Architecture programming and application with 8085 / 8080A. by R.S.Gaonkar, Wiley Eastern Ltd.(1992).
2. Fundamental of microprocessor 8085 by V. Vijayendran, S.Viswanathan Publishers, Chennai(2003).

3. Fundamentals of Microprocessors and microcomputers by B.Ram - Dhanpat Rai publication.

Books for Reference

1. Introduction to microprocessor by Aditya Mathur - Tata Mc.Graw Hill Publishing Company Ltd.(1987).
2. Microprocessor and digital system by Dougles V. Hall - 2nd Edition - McGraw Hill Company (1983).

CORE PRACTICAL – III

(Practical Examination at the end of the Sixth semester)

No. of credits: 4

External: 60 marks. Record: 10 marks Practical Exam: 50 marks

General (Any 15 experiments)

1. Young's modulus – Koenig's method – Non uniform bending.
2. Young's modulus – Non uniform bending – optic lever – scale and telescope.
3. Newton's Rings - R_1 R_2 and μ of a long focus convex lens.
4. Spectrometer i – i' curve fixing i.
5. Spectrometer – Cauchy's constants.
6. Field along the axis of a circular coil – Deflection Magnetometer – B_H and M.
7. Field along the axis of a Circular coil – vibration magnetic needle.
8. EMF of Thermocouple – Potentiometer (199P method).
9. EMF of Thermocouple – Potentiometer (108P method).
10. Calibration of high range Voltmeter – Potentiometer.
11. Figure of merit – B.G.
12. Internal resistance of a cell – B.G.
13. Comparison of Capacitances – B.G.
14. Comparison of EMFs – B.G
15. Absolute capacitance of a capacitor -B.G.
16. Series resonance Circuit – LCR – finding L, Resonant frequency, Bandwidth, Q.
17. Spectrometer – narrow angled Prism.

CORE PRACTICAL – IV

(Practical Examination at the end of the Sixth semester)

No. of credits: 4

External: 60 marks. Record: 10 marks Practical Exam: 50 marks

Basic Electronics (Any 15 experiments)

1. Full wave Rectifier.
2. Bridge rectifier.
3. Zener regulated power supply – 9V - regulation characteristics.
4. Transistor characteristics – CB mode.
5. Transistor characteristics – CE mode.
6. Single Stage RC coupled amplifier – gain – frequency response.
7. Emitter follower.
8. Hartley oscillator.
9. Colpitt's oscillator.
10. Transistor – astable multivibrator.
11. Basic logic gates – AND, OR, NOT gates using diodes & transistors.
12. NAND/NOR universal building blocks.
13. De Morgan's theorem – Verification.
14. Half adder – full adder using IC - XOR, AND and OR gates.

15. Half subtractor, full subtractor using IC - XOR, AND and OR gates.
16. 4 bit ripple counter using IC 7473.
17. Decade counter - IC 7490.

PRACTICAL – V

(Practical Examination at the end of the Sixth semester)

No. of credits: 4

External: 60 marks. Record: 10 marks Practical Exam: 50 marks

Applied Electronics (Any 15 experiments)

1. OP Amp – IC 741 – Inverting amplifier, non –inverting amplifier, unity follower.
2. OP Amp – Summing and difference amplifier.
3. Op Amp – Differential amplifier – CMRR.
4. OP Amp – AC frequency response.
5. OP Amp – Square wave generator.
6. OP Amp – Wien's bridge oscillator.
7. OP Amp – Phase Shift oscillator.
8. 555 Timer – astable multivibrator.
9. 555 Timer – Schmitt Trigger.
10. D/A convertor – 4 bit binary weighted resistor method.
11. µp- 8085 8 bit addition, multiplication.
12. µp- 8085 8 bit subtraction, division.
13. µp - Sorting in ascending order – 8 bit data.
14. µp -Sorting in descending order – 8 bit data.
15. µp - Finding the largest number in an array.
16. µp - Finding the smallest number in an array.

The following procedure is to be followed for internal marks (40 marks)

Attendance: 5 marks
Practical test – best 2 out of 3: 30 marks
Record: 5 marks.