MAHATMA GANDHI UNIVERSITY, KOTTAYAM

CURRICULUM FOR UNDER GRADUATE PROGRAMMES IN

PHYSICS

UNDER CHOICE BASED CREDIT SYSTEM (UG CBCS) 2017

2017 ADMISSIONS ONWARDS

CONTENTS

1. ACKNOWLEDGEMENT

There are many profound personalities whose relentless support and guidance made this syllabus restructuring 2017 a success. We take this opportunity to express our sincere appreciation to all those who were part of this endeavour for restructuring the syllabus of U G course in Physics under Mahatma Gandhi University, Kottayam.

We express profound gratitude to the Honourable Vice-Chancellor, Pro-Vice Chancellor, Registrar, Members of the Syndicate and Academic Council for their sincere co-operation and guidance for completion of this work. We place on record my wholehearted gratitude to the members of Faculty of Science and Board of Studies for their untiring efforts. We also appreciate the efforts of members of University Academic Section and other staff.

Special thanks are due to the representatives of the colleges affiliated to M. G. University, who have actively participated and contributed in the workshops. The enthusiasm and sincerity shown by the teachers from various colleges in the context of syllabus restructuring is highly appreciated.

Prepared by BOS and Faculty of Science,

Kottayam
02-05-2017

2. TITLE

B. Sc. PHYSICS PROGRAMME – Under Graduate Programmes under Choice Based Credit System, 2017 (**UG CBCS 2017**).

3. AIMS AND OBJECTIVES OF THE PROGRAMME

Aims:

The Board of Studies in Physics (UG) recognizes that curriculum, course content and assessment of scholastic achievement play complementary roles in shaping education. The committee is of the view that assessment should support and encourage the broad instructional goals such as basic knowledge of the discipline of Physics including phenomenology, theories and techniques, concepts and general principles. This should also support the ability to ask physical questions and to obtain solutions to physical questions by use of qualitative and quantitative reasoning and by experimental investigation. The important student attributes including appreciation of the physical world and the discipline of Physics, curiosity, creativity and reasoned skepticism and understanding links of Physics to other disciplines and to societal issues should gave encouragement. With this in mind, we aim to provide a firm foundation in every aspect of Physics and to explain a broad spectrum of modern trends in physics and to develop experimental, computational and mathematics skills ofstudents.

The programme also aims to develop the following abilities:

1. Read, understand and interpret physical information – verbal, mathematical and graphical.
2. Impart skills required to gather information from resources and use them.
3. To give need based education in physics of the highest quality at the undergraduate level.
4. Offer courses to the choice of the students.
5. Perform experiments and interpret the results of observation, including making an

assessment of experimental uncertainties.

6. Provide an intellectually stimulating environment to develop skills and enthusiasms of students to the best of their potential.
7. Use Information Communication Technology to gather knowledge at will.
8. Attract outstanding students from all backgrounds.

Objectives:

The syllabi are framed in such a way that it bridges the gap between the plus two and post graduate levels of Physics by providing amore complete and logical framework in almost all areas of basic Physics.

By the end of the first year (2^{nd} semester), the students should have attained a common level in basic mechanics, a secure foundation in mathematics, Chemistry(otherwise specified), Languages and other relevant subjects to complement the core for their future courses and developed their experimental and data analysis skills through experiments at laboratories.

By the end of the second year(4^{th}semester), the students should have been introduced to powerful tools for tackling a wide range of topics in Optics, Laser, Fiber optics, Semiconductor devices and circuits. Along with Languages, they should have been familiar with additional relevant techniques in mathematics, Chemistry or Electronics/Computer application and developed their experimental and data analysis skills through a wide range of experiments through practical at laboratories.

By the end of the third year (6^{th} semester)r, the students should have developed their understanding of core Physics by covering a range of topics in almost all areas of physics including Classical and Quantum Mechanics, Electricity and Electrodynamics, Relativity and spectroscopy, Thermal and Statistical Physics, Nuclear and Particle physics, Solid State Physics, Digital Electronics etc. along with one choice based courses, Open course and had experience of independent work such as projects; seminars etc. and thereby developing their experimental skills through a series of experiments which also illustrate major themes of the lecture courses.

4. COURSE DESIGN - B. Sc. PROGRAMMES IN PHYSICS

The U.G. programme in Physics must include (a) Common courses, (b) Core courses, (c) Complementary courses, (d) Choice based courses, (e) Open courses and (f) Project. No course shall carry more than 4 credits. The student shall select any one Open course in Semester 5 offered by the various Departments which offers the core courses or physical education department, depending on the availability of infrastructure facilities, in the institution. The number of Courses for the restructured programme should contain 12 compulsory core courses, 1 open course, 1 choice based course from the frontier area of the core courses, 6 core practicals, 1 project in the area of core, 8 complementary courses, 2 complementary practicals otherwise specified, from the relevant subjects for complementing the core of study. There should be 10 common courses, or otherwise specified, which includes the first and second language of study.

5. PROGRAMME STRUCTURE

5.1. Programme structure

Model- I B. Sc

A	Programme Duration	6 Semesters
B	Total Credits required for successful completion of the Programme	120
C	Credits required from Common Course I	22
D	Credits required from Common Course II	16
E	Credits required from Core course (including Project) and Complementarycourses	79
F	Open course	3
G	Minimum attendance required	75%

Model- II B. Sc

A	Programme Duration	6 Semesters
B	Total Credits required for successful completion of the Programme	120
C	Credits required from Common Course I	16
D	Credits required from Common Course II	8
E	Credits required from Core (including Project) + Complementary + Vocational Courses	93
F	Open course	3
G	Minimum attendance required	75%

Model- III B. Sc

A	Programme Duration	6 Semesters
B	Total Credits required for successful completion of the Programme	120
C	Credits required from Common Course I	8
D	Credits required from Core I + Core II + Complementary + Project	109
E	Open course	3
F	Minimum attendance required	75%

5.2. Courses:

There shall be three different types (models) of courses in Physics programme. The programme (Model I) consists of common courses with 38 credits, core, Choice based course, Open course & complementary courses with 82 credits. The programme (Vocational -Model II) consists of common courses with 24 credits, core, Choice based courses, Open course & complementary courses with 96 credits. The programme (Model III) consists of common courses with 8 credits, core, Choice based course, Open course & complementary courses with 112 credits.

The Physics core subject will be the same in all respect in Model-I, Model-II and Model-III. Therefore B.Sc. Physics programme in all these three models will be treated equally for considering higher education in Physics and for Physical Science B.Ed.

5.3. Scheme of Courses:

The different types of courses and its number are as the following:

Model- I		Model- II		Model- III	
Courses	**No.**	**Courses**	**No.**	**Courses**	**No.**
Common Courses	10	Common Courses	6	Common Courses	2
Core Courses	12	Core Courses	12	First Core Courses	12
Project	1	Project	1	Project	1
Core Practicals	6	Core Practicals	6	First Core Practicals	6
Open Course	1	Open Course	1	Open Course	1
Choice based Course	1	Choice based Course	1	Choice based Course	1
-		Vocational courses	8	Second Core Courses	8
		Vocational Practicals	3	Second Core Practicals	3
		-	-	OJT	2
Complementary Courses	8	Complementary Courses	4	Complementary Courses	8
Complementary Practicals	2	-		Complementary Practicals	2
Total	**41**	**Total**	**42**	**Total**	**46**

5.4. Course Code:

Every course is coded using an eight digit alpha numeric code that gives a brief description on the following details.

A. Subject Code (2 characters)

Composed of two characters, which gives a meaningful abbreviation of the subject to which the paper belongs to.

The abbreviations used here are PH – Physics, AE – Applied Electronics, CA – Computer Application, EM – Electronic Equipment Maintenance, and EL - Electronics

B. Semester to which course belongs to (1 digit)

Composed of single digit number which indicates the semester to which the paper belongs to (1 to 6). In case of Practicals the number indicates the semester in which the exam in conducted.

C. Course type as per syllabus (2 characters)

Composed of two characters which give meaningful abbreviation of type of the course. The abbreviations used here are CM – Complementary Course, CB – Choice Based Core, CR – Core Course, OJ – On Job Training, PR – Project, OP – Open Course and VO – Vocational Course

D. Whether 'Theory' or 'Practical' or 'Other' (1 character)

Letter 'T' is used to denote Theory papers, the letter 'P' for Practical papers and the letter 'O' to denote other papers like Project, On Job Training, etc.

E. Serial number of the course in continuous series (2 digits)

Composed of two digits to indicate the paper's relative position in the programme.

Eg. 01 indicates 1st paper, 05 indicates 5th paper, etc.

Sample Course Code

The Course code "PH1CRT01" indicates that the paper is

"Physics – 1st Semester – Core Course – Theory – 1st paper"

5.5. Courses with Credits:

Courses with Credits of different courses and scheme of examinations of the programme is the following

Courses	Model I		Model II		Model III	
	Credits	**Total**	**Credits**	**Total**	**Credits**	**Total**
Core Courses	47		47		47	
Open Course	3		3		3	
Choice Based Core	3		3		3	
Project	1		1		1	
Vocational Courses	Nil		28		Nil	
2nd Core Courses	Nil		Nil		30	
Total		**54**		**82**		**84**
Complementary Courses I	14		14		14	
Complementary Courses II	14		Nil		14	
Total		**28**		**14**		**28**
Common Courses	38		24		8	
Total		**38**		**24**		**8**
Grand Total		**120**		**120**		**120**

5.6. Scheme of Distribution of Instructional hours for Core courses:

Semester	Model I		Model II		Model III	
	Theory	Practical	Theory	Practical	Theory	Practical
First semester	2	2	6	4	8	4
Second semester	2	2	6	4	6	4
Third semester	3	2	9	6	9	6
Fourth semester	3	2	9	6	9	6
Fifth semester	17	8	17	8	17	8
Sixth Semester	17	8	17	8	17	8

6. MARKS DISTRIBUTION FOR PROJECT AND INDUSTRIAL VISIT

All students are to do a **project in the area of core course.** This project can be done individually or in groups (not more than three students). The projects are to be identified and its work must be started during the V semester of the programme with the help of the supervising teacher. The report of the project in duplicate is to be submitted to the department at the sixth semester and are to be produced before the examiners appointed by the University. External Project evaluation and Viva / Presentation are compulsory for all subjects and will be conducted at the end of theprogramme.

An industrial visit is also included in the program. The entire student must visit an industry during 5^{th} or 6^{th} semester and submit a report in duplicate along with the project report. This industrial visit and the report will be evaluated internally and externally along with the project evaluation.

a) Marks of External Examination : 80

Components of Evaluation (External)	**Marks**
Dissertation - Project (External)	45
Viva-Voce– Project(External)	27
Industrial Visit Report	5
Viva-Voce – Industrial Visit	3
Total	**80**

b) Marks of internal evaluation: 20 (All the five components of the internal assessment are mandatory)

Components of Internal Evaluation	**Marks**
Punctuality	4
Experimentation/Data Collection	5
Knowledge	5
Report	4
Industrial Visit	2
Total	**20**

c) OJT Evaluation (Internal evaluation: 100 marks)

Components of Internal Evaluation	**Marks**
Punctuality	20
Knowledge	20
Experimentation	20
Report	25
Presentation & Viva Voce	15
Total	**100**

7. CONSOLIDATED SCHEME FOR I TO VI SEMESTERS

7.1. B. Sc. Physics Programme – (Model I)

Semester	Title of the Course	Hours/week	Credits	Total hrs	University Exam duration	Marks	
						IA	EA
1	English I	5	4	90	3	20	80
	English II/ Common Course I	4	3	72	3	20	80
	Second Language I	4	4	72	3	20	80
	PH1CRT01 - Methodology and Perspectives of Physics	2	2	36	3	15	60
	Complementary I: Mathematics I	4	3	72	3	20	80
	Complementary II: Chemistry I	2	2	36	3	15	60
	Core Practical I: PH2CRP01 Mechanicsand Properties of Matter	2	-	36	-	-	-
	Complementary II Practical I	2	-	36	-	-	-
2	English II	5	4	90	3	20	80
	English III/ Common Course II	4	3	72	3	20	80
	Second Language II	4	4	72	3	20	80
	PH2CRT02 – Mechanics and Properties of Matter	2	2	36	3	15	60
	Complementary I: Mathematics II	4	3	72	3	20	80
	Complementary II: Chemistry II	2	2	36	3	15	60
	Core Practical I: PH2CRP01 Mechanics and Properties of Matter	2	2	36	3	10	40
	Complementary II Practical I	2	2	36	3	10	40
3	English III	5	4	90	3	20	80
	II Lang/Common Course I	5	4	90	3	20	80
	PH3CRT03 – Optics, Laser and Fiber Optics	3	3	54	3	15	60
	Complementary I: Mathematics III	5	4	90	3	20	80
	Complementary II: Chemistry III	3	3	54	3	15	60
	Core Practical II: PH4CRP02 Optics and Semiconductor Physics	2	-	36	-	-	-
	Complementary II Practical II	2	-	36	-	-	-

4	English IV	5	4	90	3	20	80
	II Lang/ Common Course II	5	4	90	3	20	80
	PH4CRT04- Semiconductor Physics	3	3	54	3	15	60
	Complementary I: Mathematics IV	5	4	90	3	20	80
	Complementary II: Chemistry IV	3	3	54	3	15	60
	Core Practical II: PH4CRP02 Optics and Semiconductor Physics	2	2	36	3	10	40
	Complementary II Practical II	2	2	36	3	10	40
5	PH5CRT05 – Electricity and Electrodynamics	3	3	54	3	15	60
	PH5CRT06 – Classical and Quantum Mechanics	3	3	54	3	15	60
	PH5CRT07 –Digital Electronics and Programming	3	3	54	3	15	60
	PH5CRT08 – Environmental Physics and Human Rights	4	4	72	3	15	60
	PH5OPT0X* -Open Course	4	3	72	3	20	80
	Core Practical III: PH6CRP03 Electricity, Magnetism and Laser	2	-	36	-	-	-
	Core Practical IV: PH6CRP04 Digital Electronics	2	-	36	-	-	-
	Core Practical V: PH6CRP05 Thermal Physics, Spectroscopy and C++ programming	2	-	36	-	-	-
	Core Practical VI: PH6CRP06 Acoustics, Photonics and Advanced Semiconductor Physics	2	-	36	-	-	-
6	PH6CRT09- Thermal and Statistical Physics	3	3	54	3	15	60
	PH6CRT10 --Relativity and Spectroscopy	4	3	72	3	15	60
	PH6CRT11 – Nuclear, Particle and Astrophysics	3	3	54	3	15	60
	PH6CRT12- Solid State Physics	4	3	72	3	15	60
	PH6CBT0X *-Choice BasedCourse	3	3	54	3	20	80
	Core Practical III: PH6CRP03 Electricity, Magnetism and Laser	2	2	36	3	10	40
	Core Practical IV: PH6CRP04 Digital Electronics	2	2	36	3	10	40
	Core Practical V: PH6CRP05 Thermal Physics, Spectroscopy and C++ programming	2	2	36	3	10	40
	Core Practical VI: PH6CRP06 Acoustics, Photonics and Advanced	2	2	36	3	10	40

	Semiconductor Physics						
	PH6PRO01 – Project and Industrial Visit	**-**	**1**	**-**	**-**	**20**	**80**

***- X Stands for 1, 2, 3, … depending upon Open course and Choice based course**

Choice Based Course

Sl. No.	Paper Code	Semester	Paper Title
1	PH6CBT01	VI	IT
2	PH6CBT02	VI	Material Science
3	PH6CBT03	VI	Computational Physics
4	PH6CBT04	VI	Instrumentation
5	PH6CBT05	VI	Astronomy & Astrophysics

Open Course

Sl. No.	Paper Code	Semester	Paper Title
1	PH5OPT01	V	Our Universe
2	PH5OPT02	V	Physics in Daily Life
3	PH5OPT03	V	Computer Hardware and Networking

7.2. B.Sc Physics Programme – (Model -II)

Vocational Subject 1: APPLIED ELECTRONICS

Semester	Title of the Course	Hrs\week	Credits	Totalhrs/sem	Unty. Exam duration	Marks	
						IA	EA
1	English I	5	4	90	3	20	80
	Second Language I	5	4	90	3	20	80
	PH1CRT01 - Methodology and Perspectives of Physics	2	2	36	3	15	60
	Complementary I – Mathematics I	5	3	90	3	20	80
	AE1VOT01 Principle of Electronic Components	2	2	36	3	20	80
	AE1VOT02 - Electronics Application	2	2	36	3	15	60
	Core Practical 1: PH2CRP01 Mechanicsand Properties of Matter	2	-	36	-	-	-
	Vocational Practical 1: AE2VOP01- Basic and Power Electronics	2	-	36	-	-	-
2	English II	5	4	90	3	20	80
	Second language II	5	4	90	3	20	80
	PH2CRT02 – Mechanics and Properties of Matter	2	2	36	3	15	60
	Complementary I – Mathematics II	5	3	90	3	20	80
	AE2VOT03 - Basics of power Electronics	2	2	36	3	20	80
	AE2VOT04 - Power Electronics	2	2	36	3	15	60
	Core Practical 1: PH2CRP01 Mechanicsand Properties of Matter	2	2	36	3	10	40
	Vocational Practical 1: AE2VOP01- Basic and Power Electronics	2	2	36	3	10	40
3	English III	5	4	90	3	20	80
	PH3CRT03 – Optics, Laser and Fiber Optics	3	3	54	3	15	60
	Complementary I – Mathematics III	5	4	90	3	20	80
	AE3VOT05 - Microprocessor and Interfacing Devices	3	4	54	3	15	60
	AE3VOT06 - Communication Electronics	3	3	54	3	15	60

	Core Practical II: PH4CRP02 Optics and Semiconductor Physics	**2**	**-**	**36**	**-**	**-**	**-**
	Vocational Practical II: AE4VOP02- Microprocessor and Linear Integrated Circuits	**2**	**-**	**36**	**-**	**-**	**-**
	Vocational Practical III: AE4VOP03- Microprocessor and Communication Electronics	**2**	**-**	**36**	**-**	**-**	**-**

4	**English IV**	**5**	**4**	**90**	**3**	**20**	**80**
	PH4CRT04 - Semiconductor Physics	**3**	**3**	**54**	**3**	**15**	**60**
	Complementary I – Mathematics IV	**5**	**4**	**90**	**3**	**20**	**80**
	AE4VOT07-Linear Integrated Circuits	**3**	**4**	**54**	**3**	**15**	**60**
	AE4VOT08 - Applications of Microprocessors	**3**	**3**	**54**	**3**	**15**	**60**
	Core Practical II: PH4CRP02 Optics and Semiconductor Physics	**2**	**2**	**36**	**3**	**10**	**40**
	Vocational Practical II: AE4VOP02- Microprocessor and Linear Integrated Circuits	**2**	**2**	**36**	**3**	**10**	**40**
	Vocational Practical III: AE4VOP03- Microprocessor and Communication Electronics	**2**	**2**	**36**	**3**	**10**	**40**
5	**PH5CRT05 – Electricity and Electrodynamics**	**3**	**3**	**54**	**3**	**15**	**60**
	PH5CRT06 – Classical and Quantum Mechanics	**3**	**3**	**54**	**3**	**15**	**60**
	PH5CRT07 –Digital Electronics and Programming	**3**	**3**	**54**	**3**	**15**	**60**
	PH5CRT08 – Environmental Physics and Human Rights	**4**	**4**	**72**	**3**	**15**	**60**
	PH5OPT0X* - Open Course	**4**	**3**	**72**	**3**	**20**	**80**
	Core Practical III: PH6CRP03 Electricity, Magnetism and Laser	**2**	**-**	**36**	**-**	**-**	**-**
	Core Practical IV: PH6CRP04 Digital Electronics	**2**	**-**	**36**	**-**	**-**	**-**
	Core Practical V: PH6CRP05 Thermal Physics, Spectroscopy and C++	**2**	**-**	**36**	**-**	**-**	**-**
	Core Practical VI: PH6CRP06 Acoustics, Photonics and Advanced Semiconductor	**2**	**-**	**36**	**-**	**-**	**-**

6	**PH6CRT09- Thermal and Statistical Physics**	**3**	**3**	**54**	**3**	**15**	**60**
	PH6CRT10 - --Relativity and Spectroscopy	**4**	**3**	**72**	**3**	**15**	**60**
	PH6CRT11 – – Nuclear, Particle and Astrophysics	**3**	**3**	**54**	**3**	**15**	**60**
	PH6CRT12- Solid State Physics	**4**	**3**	**72**	**3**	**15**	**60**
	PH6CBT0X*- Choice Based Course	**3**	**3**	**54**	**3**	**20**	**80**
	Core Practical III: PH6CRP03 Electricity, Magnetism and Laser	**2**	**2**	**36**	**3**	**10**	**40**
	Core Practical IV: PH6CRP04 Digital Electronics	**2**	**2**	**36**	**3**	**10**	**40**
	Core Practical V: PH6CRP05 Thermal Physics, Spectroscopy and C++	**2**	**2**	**36**	**3**	**10**	**40**
	Core Practical VI: PH6CRP06 Acoustics, Photonics and Advanced Semiconductor	**2**	**2**	**36**	**3**	**10**	**40**
	PH6PRO01 – Project and Industrial Visit	**-**	**1**	**-**	**-**	**20**	**80**

***- X Stands for 1, 2, 3, … depending upon Open course and Choice based course**

Choice Based Course

Sl. No.	Paper Code	Semester	Paper Title
1	PH6CBT01	VI	IT
2	PH6CBT02	VI	Material Science
3	PH6CBT03	VI	Computational Physics
4	PH6CBT04	VI	Instrumentation
5	PH6CBT05	VI	Astronomy & Astrophysics

Open Course

Sl. No.	Paper Code	Semester	Paper Title
1	PH5OPT01	V	Our Universe
2	PH5OPT02	V	Physics in Daily Life
3	PH5OPT03	V	Computer Hardware and Networking

Vocational Subject 2: COMPUTER APPLICATION

Semester	Title of the Course	Hours\week	Credits	hrs/semester	Unty.Exam duration	marks	
						IA	EA
1	English I	5	4	90	3	20	80
	Second Language I	5	4	90	3	20	80
	PH1CRT01 – Methodology and Perspectives of Physics	2	2	36	3	15	60
	Complementary I – Mathematics I	5	3	90	3	20	80
	CA1VOT01 - Computer Fundamentals	2	2	36	3	20	80
	CA1VOT02 Computer Networks& Internet Technologies	2	2	36	3	15	60
	Core Practical I: PH2CRP01 Mechanics and Properties of Matter	2	-	36	-	-	-
	Vocational Practical I: CA2VOP01 Introduction to Computers & ANSI C Programming	2	-	36	-	-	-
2	English II	5	4	90	3	20	80
	Second Language II	5	4	90	3	20	80
	PH2CRT02 – Mechanics and Properties of Matter	2	2	36	3	15	60
	Complementary I – Mathematics II	5	3	90	3	20	80
	CA2VOT03 Word and Data processingPackages	2	2	36	3	20	80
	CA2VOT04 - Programming in ANSI C	2	2	36	3	15	60
	Core Practical I: PH2CRP01 Mechanicsand Properties of Matter	2	2	36	3	10	40
	VocationalPractical2: CA2VOP01 Introduction to Computers & ANSI C Programming	2	2	36	3	10	40
	English III	5	4	90	3	20	80
	PH3CRT03 – Optics, Laser and Fiber Optics	3	3	54	3	15	60
	Complementary I – Mathematics III	5	4	90	3	20	80

3	**CA3VOT05 Concepts of Object Oriented**	**3**	**4**	**54**	**3**	**15**	**60**
	CA3VOT06 –OperatingSystem	**3**	**3**	**54**	**3**	**15**	**60**
	Core Practical II: PH4CRP02 Optics and Semiconductor Physics	**2**	**-**	**36**	**-**	**-**	**-**
	Vocational Practical II: CA4VOP02 Data Processing Packages, Operating System and Visual Basic Programming	**2**	**-**	**36**	**-**	**-**	**-**
	Vocational Practical III: CA4VOP03 C++ Programming and Web Development	**2**	**-**	**36**	**-**	**-**	**-**

4	**English IV**	**5**	**4**	**90**	**3**	**20**	**80**
	PH4CRT04 - Semiconductor Physics	**3**	**3**	**54**	**3**	**15**	**60**
	Complementary I – Mathematics IV	**5**	**4**	**90**	**3**	**20**	**80**
	CA4VOT07 - Visual Basic Programming	**3**	**4**	**54**	**3**	**15**	**60**
	CA4VOT08 Web Development and PHP Programming	**3**	**3**	**54**	**3**	**15**	**60**
	Core Practical II: PH4CRP02 Optics and Semiconductor Physics	**2**	**2**	**36**	**3**	**10**	**40**
	Vocational Practical II: CA4VOP02 Data Processing Packages, Operating System and Visual Basic Programming	**2**	**2**	**36**	**3**	**10**	**40**
	Vocational Practical III: CA4VOP03 C++ Programming and Web Development	**2**	**2**	**36**	**3**	**10**	**40**
5	**PH5CRT05 – Electricity and Electrodynamics**	**3**	**3**	**54**	**3**	**15**	**60**
	PH5CRT06 – Classical and Quantum Mechanics	**3**	**3**	**54**	**3**	**15**	**60**
	PH5CRT07 –Digital Electronics and Programming	**3**	**3**	**54**	**3**	**15**	**60**
	PH5CRT08 – Environmental Physics and Human Rights	**4**	**4**	**72**	**3**	**15**	**60**
	PH5OPT0X* -Open Course	**4**	**3**	**72**	**3**	**20**	**80**
	Core Practical III: PH6CRP03 Electricity, Magnetism and Laser	**2**	**-**	**36**	**-**	**-**	**-**
	Core Practical IV: PH6CRP04 Digital Electronics	**2**	**-**	**36**	**-**	**-**	**-**
	Core Practical V: PH6CRP05 Thermal Physics, Spectroscopy and C++	**2**	**-**	**36**	**-**	**-**	**-**

	Core Practical VI: PH6CRP06 Acoustics, Photonics and Advanced Semiconductor	**2**	**-**	**36**	**-**	**-**	**-**
6	**PH6CRT09 Thermal and Statistical Physics**	**3**	**3**	**54**	**3**	**15**	**60**
	PH6CRT10 - Relativity and Spectroscopy	**4**	**3**	**72**	**3**	**15**	**60**
	PH6CRT11 – Nuclear, Particle and Astrophysics	**3**	**3**	**54**	**3**	**15**	**60**
	PH6CRT12- Solid State Physics	**4**	**3**	**72**	**3**	**15**	**60**
	PH6CBT0X *-Choice BasedCourse	**3**	**3**	**54**	**3**	**20**	**80**
	Core Practical III: PH6CRP03 Electricity, Magnetism and Laser	**2**	**2**	**36**	**3**	**10**	**40**
	Core Practical IV: PH6CRP04 Digital Electronics	**2**	**2**	**36**	**3**	**10**	**40**
	Core Practical V: PH6CRP05 Thermal Physics, Spectroscopy and C++	**2**	**2**	**36**	**3**	**10**	**40**
	Core Practical VI: PH6CRP06 Acoustics, Photonics and Advanced Semiconductor	**2**	**2**	**36**	**3**	**10**	**40**
	PH6PRO01 – Project and Industrial Visit	**-**	**1**	**-**	**-**	**20**	**80**

***- X Stands for 1, 2, 3, … depending upon Open course and Choice based course**

Choice Based Course

Sl. No.	Paper Code	Semester	Paper Title
1	PH6CBT01	VI	IT
2	PH6CBT02	VI	Material Science
3	PH6CBT03	VI	Computational Physics
4	PH6CBT04	VI	Instrumentation
5	PH6CBT05	VI	Astronomy & Astrophysics

Open Course

Sl. No.	Paper Code	Semester	Paper Title
1	PH5OPT01	V	Our Universe
2	PH5OPT02	V	Physics in Daily Life
3	PH5OPT03	V	Computer Hardware and Networking

7.3. B. Sc. Physics (Model -III) Programme (2 CoreCourses)

(1) ELECTRONIC EQUIPMENT MAINTENANCE

Semester	Title of the Course	Hours per week	No. of Credits	Total hrs/semester	University Examduration	Marks	
						IA	EA
1	English I	5	4	90	3	20	80
	PH1CRT01 – Methodology and Perspectives of Physics	2	2	36	3	15	60
	EM1CRT01 - Principles of Electronics	3	2	54	3	20	80
	EM1CRT02 - Communication Engineering	3	2	54	3	15	60
	Complementary I: Mathematics I	4	3	72	3	20	80
	Complementary II : CA1CMT01 Computer Fundamentals	2	2	36	3	15	60
	Core 1 Practical I: PH2CRP01 Mechanics and Properties of Matter	2	-	36	-	-	-
	Core 2 Practical I: EM2CRP01	2	-	36	-	-	-
	Complementary II Practical I: CA2CMP01	2	-	36	-	-	-
2	EnglishII	5	4	90	3	20	80
	PH2CRT02 – Mechanics and Properties of Matter	2	2	36	3	15	60
	EM2CRT03 - Power Electronics	3	2	54	3	20	80
	EM2CRT04 – Analogue Integrated Circuits	3	2	54	3	15	60
	Complementary I – Mathematics II	4	3	72	3	20	80
	Complementary II: CA2CMT02 Programming in C Language	2	3	36	3	15	60
	Core 1 Practical I: PH2CRP01 Mechanics and Properties of Matter	2	2	36	3	10	40
	Core 2 Practical I: EM2CRP01	2	2	36	3	10	40
	Complementary II Practical I: CA2CMP01	2	2	36	3	10	40
	EM2OJO01- On Job Training I	0	2	0	-	100	-

3	**PH3CRT03 – Optics, Laser and Fiber Optics**	**3**	**3**	**54**	**3**	**15**	**60**
	EM3CRT05 Microprocessor and its applications	**3**	**3**	**54**	**3**	**15**	**60**
	EM3CRT06 Trouble Shooting of Audio Equipments	**3**	**3**	**54**	**3**	**15**	**60**
	Complementary I - Mathematics III	**5**	**4**	**90**	**3**	**20**	**80**
	Complementary II: CA3CMT03 Web Technology and Programming	**3**	**2**	**54**	**3**	**15**	**60**
	Core 1 Practical II: PH4CRP02 Optics and Semiconductor Physics	**2**	**-**	**36**	**-**	**-**	**-**
	Core 2 Practical II: EM4CRP02	**2**	**-**	**36**	**-**	**-**	**-**
	Core 2 Practical III: EM4CRP03	**2**	**-**	**36**	**-**	**-**	**-**
	Complementary II Practical II: CA4CMP02	**2**	**-**	**36**	**-**	**-**	**-**
4	**PH4CRT04 - Semiconductor Physics**	**3**	**3**	**54**	**3**	**15**	**60**
	EM4CRT07 - Network Theory	**3**	**3**	**54**	**3**	**15**	**60**
	EM4CRT08 Trouble Shooting of Video Equipments	**3**	**3**	**54**	**3**	**15**	**60**
	Complementary I: MathematicsIV	**5**	**4**	**90**	**3**	**20**	**80**
	Complementary II: CA4CMT04 Visual Programming Techniques	**3**	**3**	**54**	**3**	**15**	**60**
	Core 1 Practical II: PH4CRP02 Optics and Semiconductor Physics	**2**	**2**	**36**	**3**	**10**	**40**
	Core 2 Practical II: EM4CRP02	**2**	**2**	**36**	**3**	**10**	**40**
	Core 2 Practical III: EM4CRP03	**2**	**2**	**36**	**3**	**10**	**40**
	Complementary II Practical II: CA4CMP02	**2**	**2**	**36**	**3**	**10**	**40**
	EM4OJ02: On Job Training II	**0**	**2**	**0**	**-**	**100**	**-**
5	**PH5CRT05 – Electricity and Electrodynamics**	**3**	**3**	**54**	**3**	**15**	**60**
	PH5CRT06 –Classical and Quantum Mechanics	**3**	**3**	**54**	**3**	**15**	**60**
	PH5CRT07 –Digital Electronics and Programming	**3**	**3**	**54**	**3**	**15**	**60**
	PH5CRT08 – Environmental Physics and Human Rights	**4**	**4**	**72**	**3**	**15**	**60**
	PH5OPT0X* -Open Course	**4**	**3**	**72**	**3**	**20**	**80**

	Core 1 Practical III: PH6CRP03 Electricity, Magnetism and Laser	**2**	**-**	**36**	**-**	**-**	**-**
	Core 1 Practical IV: PH6CRP04 Digital Electronics	**2**	**-**	**36**	**-**	**-**	**-**
	Core 1 Practical V: PH6CRP05 Thermal Physics, Spectroscopy and C++	**2**	**-**	**36**	**-**	**-**	**-**
	Core 1 Practical VI: PH6CRP06 Acoustics, Photonics and Advanced Semiconductor	**2**	**-**	**36**	**-**	**-**	**-**

6	**PH6CRT09 Thermal and Statistical Physics**	**3**	**3**	**54**	**3**	**15**	**60**
	PH6CRT10 - Relativity and Spectroscopy	**4**	**3**	**72**	**3**	**15**	**60**
	PH6CRT11 – – Nuclear, Particle and Astrophysics	**3**	**3**	**54**	**3**	**15**	**60**
	PH6CCRT12- Solid State Physics	**4**	**3**	**72**	**3**	**15**	**60**
	PH6CBT0X *-Choice BasedCourse	**3**	**3**	**54**	**3**	**20**	**80**
	Core 1 Practical III: PH6CRP03 Electricity, Magnetism and Laser	**2**	**2**	**36**	**3**	**10**	**40**
	Core 1 Practical IV: PH6CRP04 Digital Electronics	**2**	**2**	**36**	**3**	**10**	**40**
	Core 1 Practical V: PH6CRP05 Thermal Physics, Spectroscopy and C++	**2**	**2**	**36**	**3**	**10**	**40**
	Core 1 Practical VI: PH6CRP06 Acoustics, Photonics and Advanced Semiconductor	**2**	**2**	**36**	**3**	**10**	**40**
	PH6PRO01 – Project and Industrial Visit	**-**	**1**	**-**	**3**	**20**	**80**

***- X Stands for 1, 2, 3, … depending upon Open course and Choice based course**

Choice Based Course

Sl. No.	Paper Code	Semester	Paper Title
1	PH6CBT01	VI	IT
2	PH6CBT02	VI	Material Science
3	PH6CBT03	VI	Computational Physics
4	PH6CBT04	VI	Instrumentation
5	PH6CBT05	VI	Astronomy & Astrophysics

Open Course

Sl. No.	Paper Code	Semester	Paper Title
1	PH5OPT01	V	Our Universe
2	PH5OPT02	V	Physics in Daily Life
3	PH5OPT03	V	Computer Hardware and Networking

8. SYLLABUS CORE PHYSICS

B.Sc. Physics Programme (Model – I, II &III)

Semester-I

Core Course: I **Credit – 2 (36 hours)**

PH1CRT01: METHODOLOGY AND PERSPECTIVES OF PHYSICS

Module I

Concepts and Development Physics: (8hours)

Development of physics in the last century and the birth of new scientific concepts with reference to s*cientific contributions of Galileo, Newton, Einstein, J J Thomson, Curies, Rayleigh, Max Plank, Heisenberg and Schrodinger* (qualitative understanding). Contributions of Indian physicists -*C V Raman, H J Babha, J C Bose, S N Bose, M Saha, S Chandrasekhar, Vikram Sarabhai,* (Topics in this part require qualitative study only)

References:

1. Feynman lectures of Physics
2. Concepts of Modern Physics: ArtherBeisser,
3. Modern Physics: Kenneth Krane
4. Modern Physics: R Murugeshan
5. https://www.nobelprize.org/nobel_prizes/physics/laureates/

Module II **(18 hours)**

Number systems- Decimal, hexadecimal and Binary. Conversions, Binary arithmetic addition, subtraction and multiplication. 1's and 2's complement subtraction –signed binary numbers. Signed binary arithmetic, BCD code, ASCII code, Significance of binary number system in digital electronics, microprocessors and in computers,

Introductory Vector Analysis - Applications of vectors in Physics. Differential and integral vector calculus: – The operator ∇- physical significance of Gradient, Divergence and Curl, Line integral, surface integral and volume integral of vectors

Co-ordinate systems:Cartesian Co-ordinate system, plane polar and spherical polar coordinates, cylindricalcoordinates (Basic ideas with examples in physics),

References:

6. Introduction to Electrodynamics, David J. Griffiths, Prentice Hall India Pvt. Ltd., Chapter 1
7. Mathematical Physics: Charlie Harper
8. University Physics, Roger A Freedman, Hugh D Young 14th edition
9. Digital electronics: Albert Paul Malvino
10. Digital logic and computer design – M. Morris Mano, PHI.

Module III

Experimental methods and error analysis (10 hrs)

Experimental methods, least count of instruments, Instruments for measuring mass, length, time, angle , current, voltage. Fundamental units. Precision and accuracy of measurements, source of error in measurements, necessity of estimating errors , types of errors, reading error of instrument, calibration error, random error, systematic error, significant digits, order of magnitude and rounding of numbers, rounding error, absolute and relative errors, Errors of computation- addition, subtraction, multiplication, division, error in power and roots, Propagation of errors, analysis of data, standard deviation, calculation of mean value.

References:

1. Text book: Advanced course in Practical Physics by D Chattopadhyay- Chapter-1
2. Practical Physics, G L Squires, Third edn. Cambridge University Press.
3. The theory of Errors in Physical Measurements- J C Pal- New Central Book Agency- 2010

Semester-II

Core Course: II **Credit – 2 (36 hours)**

PH2CRT02: MECHANICS AND PROPERTIES OF MATTER

Module I

Wave motion **(4 hours)**

General equation of wave motion, plane progressive harmonic wave, energy density, intensity of a wave, superposition of waves, beats, transverse waves in stretched strings, modes.

Text Book: Mechanics by D.S. Mathur – Chapter 9.

Oscillations **(8 hours)**

Periodic motion, simple harmonic motion and harmonic oscillator, energy of a harmonic oscillator, examples of harmonic oscillator – simple and compound pendulum. Theory of Damped harmonic oscillator. Theory of forced oscillator, resonance, applications.

Text Book: Mechanics by D.S. Mathur – Chapter 7, 8.

Module -II

Rotational mechanics (7 Hours)

Angular velocity- angular acceleration- angular momentum- conservation- torque-moment of inertia- Parallel and perpendicular axes theorems - calculation of moment of inertia- (rod, ring, disc, cylinder, and sphere). Theory of flywheel.

Text Book: Mechanics by D.S. Mathur – Chapter 10.

Module III

Elasticity **(10 hours)**

Basic ideas on elasticity – Young's modulus, bulk modulus, rigidity modulus, Poisson's ratio, relations connecting various elastic constants. Work done per unit volume in a

strain. Bending of beams, bending moment, flexural rigidity. Young's modulus – uniform and non-uniform bending, cantilever. I –section girders. Determination of rigidity modulus using Static and Dynamic methods.

Text Book: Mechanics by D.S. Mathur – Chapter 12, 13.

Hydrodynamics (7 hours)

Streamline and turbulent flows, coefficient of Viscosity – Determination of viscosity by Poiseuille's method. Equation of continuity, energy possessed by a liquid, Bernoulli's theorem.

Surface tension, surface energy, excess pressure in a liquid drop and bubble, factors affecting surface tension, applications.

Text Book: Mechanics by D.S. Mathur – Chapter 14.

Text books:

1. Mechanics by J.C. Upadhayaya, Ramprasad Pub.
2. Mechanics -D.S.Mathur, S.Chand.
3. Advanced course in Practical Physics by D Chattopadhyay, Central Book
4. Properties of Matter and Acoustics by Murugeshan and K. Sivaprasath, S. Chand

References:

1. Mechanics- Hans and Puri, TMH
2. Classical Mechanics by J.C. Upadhyaya, Himalaya Pub.
3. Classical Mechanics-Takwale and Puranik, TMH.
4. Classical mechanics- K.SankaraRao, PHI.
5. Properties of Matter by Mathur, S. Chand,
6. Mechanics by Somnath Datta, Pearson
7. Mechanics by H.D Young and R.A Freedman, Pearson.

Semester-III

Core Course: III **Credit – 3 (54 hours)**

PH3CRT03: OPTICS, LASER AND FIBER OPTICS

Module I

Interference **(13 hours)**

Review of basic ideas of interference, Coherent waves-Optical path and phase change-superposition of waves-theory of interference-intensity distribution. Young's double slit experiment, Coherence-Conditions for interference.

Thin films-plane parallel film- interference due to reflected light-conditions for brightness and darkness-interference due to transmitted light-Haidinger fringes-interference in wedge shaped film-colours in thin films-Newton's rings-applications. Michelson interferometer-construction, working and just mention the applications.

Text book: Optics by N.Subramanayam, Brijlal, M.N.Avadhanulu-Chapter 14 and 15.

Module II

Diffraction **(10 hours)**

Fresnel Diffraction – Huygens- Fresnel theory –zone plate –Difference between zone plate and convex lens. Comparison between interference and diffraction –diffraction pattern due to a straight edge, single silt. Fraunhoffer diffraction at a single slit, double slit,N slits, theory of plane transmission grating. Dispersive power and resolving power of grating.

Text book: Optics by N.Subramanayam, Brijlal, M.N.Avadhanulu-Chapter 17, 18 and 19.

Polarization **(12hours)**

Concept of polarization – plane of polarization- Types of polarized light-production of plane polarized light by reflection-refraction. Malu's law-Polarization by double refraction-calcite crystal. Anisotropic crystals-optic axis-Double refraction-Huygens explanation of double refraction. Retarders - Quarter wave plate and Half wave plate. Production and Detection of plane, elliptically and circularly polarized light-Optical Activity- specific rotation.

Text book: Optics by N.Subramanayam, Brijlal, M.N.Avadhanulu-Chapter 20.

Module III

Laser (10 hours)

Absorption and emission of light-Absorption-spontaneous emission and stimulatedemission, Einstein relations, Population inversion- Active medium-Pumping, different pumping methods, Resonators – plane mirror and confocal resonators – Metastable state, Three level and Four level Laser systems. Ruby Laser, He-Ne laser, Semiconductor Laser, Laser beam Characteristics, coherence. Applications of Laser, Holography (qualitative study only).

Text book: Optics by N.Subramanayam, Brijlal, M.N.Avadhanulu-Chapter 22 and 23.

Fiber Optics (9 hours)

Propagation of light in a fiber -acceptance angle, numerical aperture, V-number, single mode and multimode step index fiber –graded index fiber- attenuation- application of fiber-optical fiber communication – advantages.

Text book: Semiconductor physics and optoelectronics- V.Rajendran, J.Hemaletha and M.S.M.Gibson, Unit IV*-Chapter 1.*

References

1. Optics, E Hecht and AR Ganesan, Pearson
2. Optics, 3rd edition, AjoyGhatak, TMH
3. Optical Electronics, AjoyGhatak and K Thyagarajan, Cambridge
4. Optics and Atomic Physics, D P Khandelwal, Himalaya Pub. House
5. Optics, S K Srivastava, CBS Pub. N Delhi
6. A Text book of Optics, S L Kakani, K L Bhandari, S Chand.
7. Optics N.Subramanayam, Brijlal, M.N Avadhanulu S Chand.
8. Semiconductor optoelectronic devices: Pallab Bhattacharya, PHI 2009.
9. Lasers and Non linear Optics, BB Laud, New Age Int Pub. 2013
10. Laser Fundamentals, William T Silfvast, Cambridge Univ Press. 2012.
11. Optoelectronics an Introduction, J Wilson & JFB Hawkes, PHI 1999.
12. Fiber Optics and Optoelectronics, R P Khare, Oxford 2012..
13. Introduction to Optics, Frank L Pedrotti, Leno M Pedrotti& Leno S Pefrotti, Pearson 2014.
14. Optical fiber and fiber optic communication system (4th edition) Subir Kumar Sarkar, S Chand.

Semester-IV

Core Course: IV **Credit – 3 (54 hours)**

PH4CRT04: SEMICONDUCTOR PHYSICS

Module I

Semiconducting diodes and applications (14 hours)

PN Junction, Depletion layer, Barrier potential, Biasing- forward and reverse, Reverse breakdown, Junction capacitance and diffusion capacitance- PN Junction diode – V-I characteristics–Diode parameters, Diode current Equation, Diode testing, Ideal diode. Zener diode and its reverse characteristics. Thermistors.

Rectification - Half wave, Full wave, Centre tapped, Bridge rectifier circuits - Nature of rectified output, Efficiency & Ripple factor-Filter circuits – Inductor Filter, Capacitor Filter, LC Filter, π Filter-Regulated Power supplies - Zener diode voltage regulator- Voltage multipliers – Doubler & Tripler- Wave shaping circuits - Clipper-Positive, negative and biased – Clampers- Positive, negative and biased.

Text Book: Basic Electronics- B.L.Theraja Chapters 13,14,15,17

A Text Book of Applied Electronics- R.S.Sedha Chapters-11, 12, 19, 20, 33

Module II

Transistors Configurations and Feed back (12 hours)

Bipolar junction transistors, Transistor biasing, CB, CC, CE configurations and their characteristics- Active, saturation and cut-off regions. Current gain α, β, γ and their relationships. Leakage currents- Thermal runaway. DC operating point and AC and DC Load line, Q-Point.

Basic principles of feedback, positive & negative feedback, Advantages of negative feedback, negative feedback circuits – voltage series & shunt, current series & shunt.

Amplifiers and Oscillators (12 hours)

Need for biasing-Stabilization- Voltage divider bias. Single stage transistor Amplifiers-CE amplifier - amplification factors. Decibel system, Variations in Amplifier gain with frequency.

Oscillatory Circuits, LC oscillators – Hartley Oscillator, Colpit's Oscillator, RC oscillators - Phase shift Oscillator. Astable and monostable multivibrator (basic idea only)

Text Book: Basic Electronics-B.L.Theraja-Chapters 18, 19, 20, 22, 24, 25, 28, 29.

A Text Book of Applied Electronics-R.S.Sedha Chapters 14, 15, 22,24, 29, 31, 32

Module III

FET, Operational Amplifier & Modulation (16 hours)

FET -characteristics, FET- Parameters. Comparison between FET and BJT. MOSFET (basic idea only)

OP-amp- Symbol and terminals. Characteristics of ideal OP-amp, CMRR, Applications - inverting, Non-inverting, Unity follower and Summing amplifiers.

Types of modulation – AM, FM, Pulse modulation and Phase modulation (qualitative study only). Amplitude modulation- modulation index - Analysis of AM wave – Sidebands –bandwidth- AM Demodulation.

Text Book: Basic Electronics-B. L. Theraja - Chapters 26, 30, 31

A Text Book of Applied Electronics-R.S.Sedha-Chapter-16, 35

References:

1. Principles of electronics, VK Mehta, S Chand
2. Basic Electronics(7^{th}Edition), Malvino and Bates, TMH
3. Electronics Fundamentals and Applications- D. Chattopadhyay and P.G.Rakshit, New Age International Publishers.
4. Electronics: Fundamentals of Analog circuits, Thomas L. Floyd, David Buchla, Prentice Hall
5. Electronic Devices and Circuit Theory, Robert Boylestad, Louis Nashelsky, Prentice Hall
6. Basic Electronics, Debashis De , Pearson 2010
7. Basic Electronics, Santiram Kal, PHI 2010

Semester-V

Core Course: V **Credit – 3 (54 hours)**

PH5CRT05: ELECTRICITY AND ELECTRODYNAMICS

Module I

Alternating Current and Network Theorems (15 hours)

EMF induced in a coil rotating in a magnetic field - AC applied to resistive, inductive and capacitance circuits - AC applied to LR and RC circuits - Analysis of LCR series circuits - LCR parallel resonant circuit – comparison - Power in ac circuits - Wattless current - choke coil - transformer on no load- skin effect.

Ideal voltage source and current source - Superposition theorem - Reciprocity theorem - Thevenin's theorem - Norton's theorem - Maximum power transfer theorem.

Text Book:Electricity and Magnetism, R. Murugeshan- Chapters 13, 30 and 18

Module II

Transient Current and Thermo electricity (8 hours)

Growth and decay of current in an LR circuit- Charging and discharging of a capacitor through a resistor - Growth and decay of charge in an LCR circuit.

Seebeck effect - Laws of thermo emf - Peltier effect- Thomson effect- Thermoelectric diagrams -Thermocouple (qualitative study) - Explanation of thermoelectric effects based on electron theory.

Text Book: Electricity and Magnetism, R. Murugeshan- Chapters 12, 8 and 32.

Module III

Electrostatics and Magnetostatics (20 hours)

Fundamental theorems of divergence and curl (physical concepts) - Electric field - Continuous charge distribution- Divergence and curl of electrostatic field- Gauss's law and applications: solid sphere, infinite wire, infinite plane sheet - Electric potential - Poisson's and Laplace's equations - Potential of a localized charge distribution – Electrostatic boundary conditions- work and energy in electrostatics – The work done to

move a charge – Energy of a point charge distribution and continuous charge distribution- Basic properties a conductor .

Lorentz Force law- Biot- Savart law- Divergence and curl of B- Applications of Amperes' law: long straight wire, infinite plane, solenoid – Comparison of electrostatics and magnetostatics- Magnetic vector potential – Magnetostatics boundary conditions

Electromagnetic induction- Faraday's law

Text Book:Introduction to Electrodynamics, David J Griffiths, Chapters 1, 2, 5 and 7

Module IV

Maxwell's Equations and Electromagnetic wave propagation (11 hours)

Maxwell's equations - Boundary conditions for free space - Continuity equations- Poynting's theorem

Wave equations (general idea on reflection at boundary and polarization) - Electromagnetic wave in vacuum - Wave equation for E and B - Monochromatic plane waves- Energy of electromagnetic waves

Text Book: Introduction to Electrodynamics, David J Griffiths-Chapters 7,8 and 9

References:

1. *Fundamentals of Magnetism and Electricity, D.N Vasudeva - S Chand*
2. *Principles of Electromagnetics, Mathew N.O Sadiku- 4th Ed. , Oxford*
3. *Electricity and Magnetism, KK Tewari- S Chand*
4. *Electricity and Electronics, Saxena, Arora and Prakash- Pragati Prakashan*
5. *Classical Electromagnetism, Jerrold Franklin- Pearson*
6. *Electromagnetic Fields and Waves, KD Prasad- Satya Prakashan*
7. *Field and wave Electromagnetics, David K Cheng- Pearson.*

Semester-V

Core Course: VI **Credit – 3 (54 hours)**

PH5CRT06: CLASSICAL AND QUANTUM MECHANICS

Module I

Lagrangian and Hamiltonian Formulations of Classical Mechanics (15 hours)

Constraints, degrees of freedom, generalized co-ordinates, principle of virtual work, D'Alembert's principle, Lagrange's equations(no derivation required), Application of Lagrangian (Linear Harmonic oscillator, Planetary motion and Simple Pendulum only), Hamilton's Canonical equations of motion, Advantages of Hamilton's method, Applications of Hamilton's method (Linear Harmonic oscillator and Simple pendulum only).Hamilton's Principle of Least Action. Derivation of Lagrange's equation from Hamilton's Principle.

Text book: Classical Mechanics by J.C. Upadhyaya-Chapter 2 & 3.

Classical Mechanics by G. Aruldhas

Module II

Historical development and origin of quantum theory (9 hours)

Failure of classical physics- Black Body radiation-Planck's radiation law, Photoelectric effect-Einstein's explanation, Compton effect, Bohr's correspondence principle-Wave particle Dualism, Dual nature of matter- De Broglie hypothesis, Davisson-Germer Experiment, De Broglie waves, Wave packet, Group and phase velocities

Text Book: A Textbook of Quantum Mechanics- G Aruldhas-Chapter 1

General Formalism of Quantum Mechanics (15 hours)

Linear vector space- Hilbert space- Orthogonality- Linear operator-Eigen functions and eigen values- Hermitian operator- Postulates of Quantum Mechanics- wave function, Operators, Expectation value, Eigen value, Time development- Simultaneous measurability- General uncertainty relation.

Text Book: A Textbook of Quantum Mechanics- G Aruldhas-Chapter 3 and 8

Module III

Schrödinger equation and its applications (15 hours)

Time dependent Schrödinger equation- interpretation of wave function, Probability density, Probability current density, Ehrenfest theorem- Extension to three dimensions- Time independent Schrödinger equation- Stationary states- Admissibility conditions of wave function-general properties of one dimensional Schrödinger equation, particle in a box, one dimensional barrier problem- square potential barrier.

Text Book: A Textbook of Quantum Mechanics- G Aruldhas.

Text Book:

1. *Classical Mechanics by J.C. Upadhyaya. Himalaya Pub.*
2. *Concepts of Modern Physics- Arthur Beiser, TMH*

References:

1. *Concepts of Modern Physics- Arthur Beiser, TMH*
2. *A Textbook of Quantum Mechanics- G Aruldhas- (2nd Edition)- PHI*
3. *Classical Mechanics-Takwale and Puranik, TMH.*
4. *Classical mechanics- K.SankaraRao, PHI.*
5. *Introductory Quantum Mechanics- RI Liboff, Pearson*
6. *Quantum Physics- Gasiorowicz,John Wiely*
7. *Quantum Mechanics- Griffith, Pearson*

Semester-V

Core Course: VII **Credit-3 (54 hours)**

PH5CRT07: DIGITAL ELECTRONICS AND PROGRAMMING

Module I

Boolean algebra and logic gates **(9 hours)**

Basic gates NOT, OR, AND. Universal Logic Gates- NOR, NAND. XOR and XNOR Gates. Rules and Laws of Boolean algebra. Duality theorem -De Morgan's Theorems. analysis and simplification of logic circuits. Boolean equation and truth table - SOP and POS. Minterms and Maxterms. Standard SOP and Standard POS- Conversion between Standard SOP & Standard POS. Karnaugh Map (up to four variables). K map SOP minimization.

Module II

Combinational logic **(6 hours)**

Half Adder and Full Adder, Half and Full subtractor, 4-bit parallel Adder/Subtractor. Multiplexer, De-multiplexer, Encoder & Decoder.

Sequential logic **(13 hours)**

Flip-flops, RS, Clocked RS, Master Slave JK FF, DFF, T Flip-flop, Buffer registers- Shift register-SISO and SIPO, Counters- Binary ripple counter. D/A converters (Ladder type), A/D Converter (Counter type).

Module III

Programming in C++ **(26 hours)**

Basic C++ program structure –comments-data types-variable types-constants-operators(arithmetic, relational, logical and assignment operators)- if, if-else and else if, do while - case – loops(while, do-while, and for)-nested loops- arrays(Defining Arrays, Accessing Array Elements, Initializing Arrays)- basic ideas of functions(qualitative idea), object and classes. Programs using loops.

Text book: Object oriented programming in Turbo C++ - Robert Lafore (Galgotia Pub.) Chapter 2, 3 and 7.

Text books:

1. *Digital fundamentals, Thomas L. Floyed (10th edition), Pearson*
2. *Digital principles and applications, Malvino, Leach and Saha (6th Edition) TMH*
3. *Digital electronics, S Salivahanan & S Arivazhagan VPH (2010)*
4. *Digital design, M Morris Mano, PHI*

References:

1. *Digital logic and computer design - M Morris Mano, PHI*
2. *Digital Electronics- William H Gothmann, PHI*
3. *Digital circuits and design- S Salivahanan and S Arivazhakan, PHI*
4. *Digital Electronics- Sedha, S Chand*
5. *Digital computer electronics- Malvino, Brown, TMH*
6. *Object oriented programming in Turbo C++ - Robert Lafore (Galgotia Pub.)*

Semester-V

Core Course: VIII **Credit-4 (72 hours)**

PH5CRT08: ENVIRONMENTAL PHYSICS AND HUMAN RIGHTS

Vision

The importance of environmental science and environmental studies cannot be disputed. The need for sustainable development is a key to the future of mankind. Continuing problems of pollution, solid waste disposal, degradation of environment, issues like economic productivity and national security, Global warming, the depletion of ozone layer and loss of biodiversity have made everyone aware of environmental issues. The United Nations Conference on Environment and Development held in Rio de Janerio in 1992 and World Summit on Sustainable Development at Johannesburg in 2002 have drawn the attention of people around the globe to the deteriorating condition of our environment. It is clear that no citizen of the earth can afford to be ignorant of environment issues.

India is rich in biodiversity which provides various resources for people. Only about 1.7 million living organisms have been described and named globally. Still many more remain to be identified and described. Attempts are made to conserve them in ex-situ and in-situ situations. Intellectual property rights (IPRs) have become important in a biodiversity-rich country like India to protect microbes, plants and animals that have useful genetic properties. Destruction of habitats, over-use of energy resource and environmental pollution has been found to be responsible for the loss of a large number of life-forms. It is feared that a large proportion of life on earth may get wiped out in the near future.

In spite of the deteriorating status of the environment, study of environment has so far not received adequate attention in our academic programme. Recognizing this, the Hon'ble Supreme Court directed the UGC to introduce a basic course on environment at every level in college education. Accordingly, the matter was considered by UGC and it was decided that a six months compulsory core module course in environmental studies may be prepared and compulsorily implemented in all the University/Colleges of India.

The syllabus of environmental studies includes five modules including human rights. The first two modules are purely environmental studies according to the UGC directions. The second two modules are strictly related with the core subject and fifth module is for human rights.

Objectives

- Environmental Education encourages students to research, investigate how and why things happen, and make their own decisions about complex environmental

issues by developing and enhancing critical and creative thinking skills. It helps to foster a new generation of informed consumers, workers, as well as policy or decision makers.

- Environmental Education helps students to understand how their decisions and actions affect the environment, builds knowledge and skills necessary to address complex environmental issues, as well as ways we can take action to keep our environment healthy and sustainable for the future. It encourages character building, and develops positive attitudes and values.
- To develop the sense of awareness among the students about the environment and its various problems and to help the students in realizing the inter-relationship between man and environment and helps to protect the nature and natural resources.
- To help the students in acquiring the basic knowledge about environment and the social norms that provides unity with environmental characteristics and create positive attitude about the environment.

Module I

Unit 1: Multidisciplinary nature of environmental studies(2 hours)

Definition, scope and importance

Need for public awareness.

Unit 2: Natural Resources:**(10 hours)**

Renewable and non-renewable resources: Natural resources and associated problems.

a) **Forest resources**: Use and over-exploitation, deforestation, case studies.

Timber extraction, mining, dams and their effects on forest and tribal people.

b) **Water resources**: Use and over-utilization of surface and ground water,

floods, drought, conflicts over water, dams-benefits and problems.

c) **Mineral resources**: Use and exploitation, environmental effects of extracting

and using mineral resources, case studies.

d) **Food resources**: World food problems, changes caused by agriculture and

overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) **Energy resources**: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, Case studies.

f) **Land resources**: Land as a resource, land degradation, man induced landslides, soil erosionand desertification

- Role of individual in conservation of natural resources.
- Equitable use of resources for sustainable life styles.

Unit 3: Ecosystems (6 hours)

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the given ecosystem:- Forest ecosystem

Module II

Unit 1: Biodiversity and its conservation (8 hours)

- Introduction
- Biogeograhical classification of India
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
- India as a mega-diversity nation
- Hot-sports of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts
- Endangered and endemic species of India

Unit 2: Environmental Pollution (8 hours)

Definition, Causes, effects and control measures of: -

a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides.

Unit 3: Social Issues and the Environment (10 hours)

- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people: its problems and concerns, Case studies
- Environmental ethics: Issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion , nuclear accidents and holocaust, Case studies
- Consumerism and waste products
- Environment Protection Act
- Air (Prevention and Control of Pollution) Act
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation
- Public awareness

Module III

Non-renewable and Renewable Energy Sources (10 hours)

Non-renewable energy sources:-Coal, Oil, Natural gas; Nuclear fission energy; Merits and demerits of non-renewable energy.

Renewable energy sources: Biomass energy- Biogas plant - Fixed dome type and moving dome type; Wind energy; Wave energy; Tidal energy; Hydroelectricity; Geothermal energy conversion; Ocean thermal energy conversion; Fusion energy; Hydrogen energy- Production (electrolysis) and storage; Merits and demerits of each renewable energy sources; Storage of intermittently generated renewable energy (qualitative); Fuel cell.

Module IV

Solar energy **(10 hours)**

Sun as a source of energy- Solar radiation, Solar Constant, Spectral distribution; Solar pond - Convective and salt gradient types; Flat plate collector; Solar water heater - Direct and indirect systems- Passive and active systems; Optical concentrator - Parabolic trough reflector - Mirror strip reflector - Fresnel lens collector; Solar desalination; Solar dryer - Direct and indirect type; Solar cooker; Solar heating of buildings; Solar green houses; Need and characteristics of photovoltaic (PV) systems; Solar cells - Principle, Equivalent circuits, V-I characteristics, fill factor, conversion efficiency; PV Sun tracking systems; Merits and demerits of solar energy.

Module – V **(8 hours)**

Unit 1- Human Rights– An Introduction to Human Rights, Meaning, concept and development, Three Generations of Human Rights (Civil and Political Rights; Economic, Social and Cultural Rights).

Unit-2 Human Rights and United Nations – contributions, main human rights related organs - UNESCO, UNICEF, WHO, ILO, Declarations for women and children, Universal Declaration of Human Rights.

Human Rights in India – Fundamental rights and Indian Constitution, Rights for children and women, Scheduled Castes, Scheduled Tribes, Other Backward Castes and Minorities

Unit-3 Environment andHuman Rights - Right to Clean Environment and Public Safety: Issues of Industrial Pollution, Prevention, Rehabilitation and Safety Aspect of New Technologies such as Chemical and Nuclear Technologies, Issues of Waste Disposal, Protection of Environment

Conservation of natural resources and human rights: Reports, Case studies and policy formulation. Conservation issues of western ghats- mention Gadgil committee report, Kasthurirengan report. Over exploitation of ground water resources, marine fisheries, sand mining etc.

Internal: **Field study**

- Visit to a local area to document environmental grassland/ hill /mountain

- Visit a local polluted site – Urban/Rural/Industrial/Agricultural Study of common plants, insects, birds etc
- Study of simple ecosystem-pond, river, hill slopes, etc

(Field work Equal to 5 lecture hours)

REFERENCES

1. Bharucha Erach, Text Book of Environmental Studies for undergraduate Courses. University Press, IInd Edition 2013 (TB)
2. Clark.R.S., Marine Pollution, Clanderson Press Oxford (Ref)
3. Cunningham, W.P.Cooper, T.H.Gorhani, E & Hepworth, M.T.2001 Environmental Encyclopedia, Jaico Publ. House. Mumbai. 1196p .(Ref)
4. Dc A.K.Enviornmental Chemistry, Wiley Eastern Ltd.(Ref)
5. Down to Earth, Centre for Science and Environment (Ref)
6. Heywood, V.H & Watson, R.T. 1995. Global Biodiversity Assessment, Cambridge University Press 1140pb (Ref)
7. Jadhav.H & Bhosale.V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284p (Ref)
8. Mekinney, M.L & Schock.R.M. 1996 Environmental Science Systems & Solutions. Web enhanced edition 639p (Ref)
9. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co. (TB)
10. Odum.E.P 1971. Fundamentals of Ecology. W.B. Saunders Co. USA 574p (Ref)
11. Rao.M.N & Datta.A.K. 1987 Waste Water treatment Oxford & IBII Publication Co.Pvt.Ltd.345p (Ref)
12. Rajagopalan. R, Environmental Studies from crisis and cure, Oxford University Press, Published: 2016 (TB)
13. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut (Ref)
14. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (Ref)

15. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Stadards, Vol I and II, Enviro Media (Ref)
16. Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (Ref)
17. Wanger K.D., 1998 Environmental Management. W.B. Saunders Co. Philadelphia, USA 499p (Ref)

(M) Magazine (R) Reference (TB) Textbook

18. Renewable Energy Sources and Emerging Technologies: Edition 2, D.P. Kothari K. C. Singal Rakesh Ranjan - PHI Learning Pvt. Ltd, 2011.
19. Solar energy - M P Agarwal - S Chand and Co. Ltd.
20. Solar energy - Suhas P Sukhative Tata McGraw - Hill Publishing Company Ltd.

Human Rights

1. Amartya Sen, The Idea Justice, New Delhi: Penguin Books, 2009.
2. Chatrath, K. J.S., (ed.), Education for Human Rights and Democracy (Shimla: Indian Institute of Advanced Studies, 1998)
3. Law Relating to Human Rights, Asia Law House, 2001.
4. Shireesh Pal Singh, Human Rights Education in 21st Century, Discovery Publishing House Pvt.Ltd, New Delhi,
5. S.K.Khanna, Children andthe Human Rights, Common Wealth Publishers, 1998. 2011.
6. Sudhir Kapoor, Human Rights in 21st Century, Mangal Deep Publications, Jaipur, 2001.
7. United Nations Development Programme, Human Development Report 2004: Cultural Liberty in Today's Diverse World, New Delhi: Oxford University Press, 2004.

Semester-V

OPEN COURSE: Credit-3 (72hours)

PH5OPT01: Our Universe

Scope: *To help the students to comprehend the cosmos and its origin and to developscientific attitude and aptitude*.

Prerequisites: *This course in intended for the students of other disciplines. So asecondary level knowledge of mathematics and physics is enough to study this course. But an inquisitive mind and curiosity are essential from the part of a student.*

Module I

Our universe (10 hours)

Early models of universe- Geo centric model- Ptolemy-Aristotle. Copernican model - Sun at the centre. Galileo and his observations. Planetary paths-Kepler's laws (**No need of derivation**).

Galaxies-Hubble's classification – Spiral, elliptical & irregular galaxies. Milky way galaxy (**qualitative**).

Module II

Cosmology (14 hours)

Origin of the universe - Big bang theory – expansion of the universe – Hubble's law, age of the universe. Doppler effect and red shift(**qualitative**).

Stellar evolution – birth - red giant- death of a star. White dwarf- Chandrasekhar limit. Super novae- neutron star- black hole.

Text Books

1. Architecture of the universe. (cha 3,4,8 and 9) Necia H.Apfel and Allen Hynek-Benjamin Cummins Publishing Company.
2. Astronomy A Beginners guide to the universe sixth edition(Ch.12)-Chaisson Mc Millan
3. Cosmic vistas-A popular history of astronomy(chap 4,5,6,7,8) Biman Basu-national book trust,India
4. Astronomy; A Self Teaching Guide (cha 5&6)-Dinah L Moche
5. The Great Universe (cha 4,5,6,7) G.K Sasidharan-S.Chand

Module III

Observational Astronomy (24 hours)

Celestial sphere- cardinal points, celestial equator, ecliptic, equinoxes. Celestial co-ordinate systems-equatorial co-ordinate system-Right ascension & declination, Ecliptic and galactic co-ordinate systems. Diurnal motion of sun - Summer solstice and winter solstice. Time - apparent and mean solar time, International date line. Constellations-zodiacal constellations. Astronomical distance scales – AU, Parsec and light year. Stellar Parallax and distance to stars from parallax.

Optical Telescopes - Light gathering power, visual angle, angular magnification, Types of telescopes-refracting and reflecting – Newtonian and Cassegrain telescopes **(No need ofderivation of magnification**). HST, Radio telescopes, GMRT (India).

Text Books:

1. Astronomy A beginner's guide to the universe sixth edition(ch-1)-Chaisson Mc Millan
2. Astrophysics stars and galaxies (chap 2,4,20)K D Abhayankar
3. Joy of Star watching (**ch-** 3, 8 &10)- Biman Basu- National Book Trust, India
4. A textbook of Optics(ch-10) N.Subrahmanyan, Brijlal and M.N Avadhanulu
5. Astronomy; A Self Teaching Guide (cha 2&3)-Dinah L Moche
6. www.gmrt.ncra.tifr.in

Module IV

Solar system (24 hours)

The sun- solar atmosphere - Photosphere, chromospheres and corona. Sun spots. Definition of a planet- terrestrial planets & Jovian planets, Comparison of planets. Minor members of solar system- Asteroids, comets, meteors.

Universal law of gravitation. Earth's orbital motion-day to day changes-seasonal changes.

Text Books:

1. Architecture of the Universe (**ch-** 2, 14, 15, 17, 18, 19, 20)- Necia H. Apfel & Allen Hynek- The Benjamin Cummings publishing company, Inc.
2. Astronomy A beginner's guide to the universe sixth edition(ch-1)-Chaisson Mc Millan
3. Astronomy; A Self Teaching Guide (cha 4,9,10,11)-Dinah L Moche
4. The great Universe – G.K Sasidharan-S.Chand

Semester-V

Open Course: **Credits-3 (72 Hrs)**

PH5OPT02: Physics in Daily Life

Module I

Unit 1 **(8 hours)**

Fundamental and derived quantities. Units and dimensions,dimensional analysis, order of magnitude, significant figures, errors.

Unit 2 Light **(12 Hours)**

Reflection, refraction, diffraction,interference, scattering(elementary ideas only) – examples from daily life – apparent depth, blue color of sky, twinkling of stars.

Total internal reflection, mirage, sparkling of diamond, primary and secondary rainbow – optical fibers. Concave and convex mirrors, lenses – focal length, power of a lens, refractive index, prism, dispersion. Human eye, defects of the eye – myopia, hypermetropia, presbyopia and astigmatism and their correction by lens.

Module II

Unit 3 Motion **(12 Hours)**

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

Rotational motion, Moment of inertia, torque, centripetal and centrifugal acceleration- examples- banking of curves, centrifugal pump, roller coasters.

Unit 4 Electricity **10 Hours)**

Voltage and current, ohms law. Electric energy, electric power, calculation of energy requirement of electric appliances – transformer, generator, hydroelectric power generation – wind power – solar power – nuclear power

Module III

Unit 5 Matter and energy (18 Hours)

Different phases of matter, fluids - surface tension, viscosity- capillary rise, Bernoulli's theorem and applications.

Heat energy, temperature, different temperature scales – degree Celsius, Fahrenheit and Kelvin.

Waves – transverse and longitudinal waves, sound waves, Doppler Effect.

Lasers, fluorescence, phosphorescence, electromagnetic waves – applications – microwave oven, radar, super conductivity.

Unit 6 Universe (12 hours)

Planets, – solar system, moon- faces of moon, lunar and solar eclipses, constellations, Different types of stars, Galaxies, black hole. Satellites, Artificial satellites, Global positioning system. Geo stationary satellite.

Reference Texts

1. Fundamentals of Physics with Applications by Arthur Beiser
2. Conceptual Physics by Paul G Hewitt

Semester-V

OPEN COURSE: Credit-3 (72hours)

PH5OPT03: COMPUTER HARDWARE AND NETWORKING

Module I (24 hours)

Microprocessors – Basic concepts of Intel 80186, 80286, 80386, 80486 and Pentium processors. Motherboard, Expansion buses, Memory, upgrading / adding memory, BIOS Motherboard – removing, installing / configuring motherboards, BIOS set up, troubleshooting memory.

Module II (24 hours)

Data storage devices, IDE and SCSI controllers, hard disk, installing / upgrading CD ROM drives, DVD, Optical storage, Tape back – ups. Printers, Keyboards, pointing and positioning devices, digital camera, Scanners, Monitors, Hard disks- installing / upgrading, troubleshooting, formatting, Error codes, BIOS disk routines

MODULE III (24 hours)

Multimedia, Graphical accelerators, audio, modems, I/E add on, Networks, Power supplies, UPS

Printer installation, Software installation – DOS, Windows 95, 98, Linux, WindowsNT – installation,

Administration, Installing PASCAL, C, ORACLE, VISUAL BASIC, Software diagnostics –

PC tools, Norton utilities, XT/AT diagnostics, Viruses and anti-viruses.

References:

1. *IBM PC and CLONES- Hardware, troubleshooting and maintenance – B Govindarajalu*
2. *PC Hardware, a beginners guide – Ron Gilster*
3. *All about Motherboard: - Manahar Lotia, Pradeep Nair*

Semester-VI

Core Course: IX **Credit-3 (54 hours)**

PH6CRT09: THERMAL AND STATISTICAL PHYSICS

Module I

Equation of state for gases **(5 hours)**

Equation of an ideal gas, behavior of real gases, Andrew's experiment on carbon dioxide**,** critical state, two phase region, intermolecular forces, van der Waals equation of state, van der Waals isotherms, critical constants, limitation of van der Waals equation.

Zeroth law of thermodynamics **(4 hours)**

Thermodynamic system, surroundings, variables, thermal equilibrium: zeroth law, thermodynamic equilibrium, thermodynamic processes, reversible and irreversible processes, equation of state, expansivity and compressibility.

First laws of thermodynamics **(7 hours)**

Internal energy, heat, work, cyclic processes, first law, heat capacity, energy equation and difference of specific heat capacities, indicator diagram work done in reversible isothermal expansion of ideal gas, work done in reversible adiabatic expansion of ideal gas.

Heat engines and second law of thermodynamics **(5 hours)**

Second law statements, heat engine, efficiency, Carnot's ideal heat engine, **work done by the engine per cycle**, reversibility, Carnot refrigerator, heat pump, Carnot theorem, absolute scale of temperature, Clausius- Clapeyron latent heat equation.

Text Book: Thermal and Statistical Physics, R.B. Singh, part-1 chapter 3, 4, 5 and6

Module II

Entropy **(5 hours)**

Definition of entropy, principle of increase of entropy, entropy and unavailable energy, change in entropy in heat conduction, change in entropy in reversible and irreversible process, efficiency of Carnot cycle from TS diagram, entropy of an ideal gas, entropy and disorder.

Thermodynamic relations (8hours)

Maxwell's thermodynamic relations, TdS equations, energy equation, heat capacity equations, thermodynamic functions, third law of thermodynamics.

Conduction and radiation (4 hours)

Conduction, thermal conductivity, thermal conductivity of bad conductor Lee's disc experiment -thermal resistance, thermal radiation and its properties, fundamental definitions of energy flux, intensity and radiant emittance, Stefan's law, Stefan-Boltzmann law.

Text Book: Thermal and Statistical Physics, R.B. Singh, part-1 chapter7,8,10 and 11.

Module III

Statistical mechanics (8 hours)

Microstates and macrostates, Phase space, density of states, mu space and Gamma space, principle of equal a priori probability, ergodic hypothesis, statistical equilibrium, ensemble,ensemble formulation of statistical mechanics, microcanonical, canonical and grand canonical ensemble, partition function, average energy of particle, equipartition theorem.

Statistical distributions (8 hours)

Maxwell Boltzmann, Fermi-Dirac and Bose-Einstein statistics, distribution laws, Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein distribution.

Text Book: Thermal and Statistical Physics, R.B. Singh, part-2, Chapters 2, 3,4 and 5.

Text Book:

1. *Thermal and Statistical Physics, R.B. Singh, New Age Pub. (2010)*

References:

1. *An introduction to thermodynamics by Y.V.C. Rao (New Age Pub.)*
2. *An introduction to Thermal Physics by D.V. Schroeder (Pearson Pub.)*
3. *Heat and thermodynamics by Mark W Zemansky, Richard H Dittman & Amit K Chattopadhyay. MCH New Delhi.*
4. *Thermodynamics and Statistical physics Brij Lal, N.Subrahmanyam and P S Hemne (S. Chand &Co, Multi colour edition 2007).*
5. *Berkeley Physics Course Volume 5; Statistical Physics; Frederick Reif. McGraw Hill.*
6. *Statistical Mechanics, R.K. Pathria, Pergamon press, Oxford*

Semester-VI

Core Course: X **Credit-3 (72 hours)**

PH6CRT10: RELATIVITY AND SPECTROSCOPY

Module I

Special Theory of Relativity **(18 hours)**

Inertial and non inertial frames of reference- Galilean transformation, Significance of Michelson-Morley experiment, Postulates of Special Theory of Relativity, Lorentz transformation, Spatial contraction, Time dilation, composition of velocities, mass of moving particle, Equivalence of mass and energy. Introductory concept of general theory of relativity.

Text Book: Modern Physics, Kenneth S Krane.

Concepts of modern Physics, Arthur Beiser

Module II

Atomic Spectroscopy **(21 hours)**

Historical introduction. Electrostatic spectrum. Types of spectra. Absorption and emission of light by atoms, quantum theory, early atom models – Bohr model, electron spin and magnetic moment, Exclusion principle, Stern-Gerlach experiment, Vector atom model, quantum numbers associated with vector atom models, Total angular momentum and LS coupling, fine structure of Sodium D lines, Zeeman effect, quantum mechanical explanation for anomalous Zeeman effect, Paschen-Back effect.

Text Book: Molecular structure and Spectroscopy, G Aruldas.

Concepts of modern Physics, Arthur Beiser

Module III

Molecular Spectroscopy **(21 hours)**

Molecular energy levels. Electronic, rotational and vibrational energies, rotational spectra, explanation in terms of rigid rotator model, vibrational energy levels, explanation in terms of harmonic oscillator.

Electronic energy levels of atoms, Fluorescence and phosphorescence, Raman effect – experimental arrangement and result, classical theory and its failure, quantum theory of Raman effect.

IR and Microwave spectroscopes.

Text Book: Fundamentals olf Molecular Spectroscopy, C.Banwell and E. Mccash.

Molecular structure and Spectroscopy, G Aruldas.

NMR and ESR Spectroscopy (12 hours)

NMR Spectroscopy- Basic principles and instrumentation- Medical applications of NMR.

Text Book: Molecular structure and Spectroscopy, G Aruldas – Chapter 10 (Sections 10.1, 10.2,10.3 and 10.19).

ESR Spectroscopy- Basic principles and instrumentation.

Text Book: Molecular structure and Spectroscopy, G Aruldas – Chapter 11 (Sections 11.1, 11.2 and 11.3).

Text Books:

1. *Molecular structure and spectroscopy, Aruldas 2nd ed. EEE.*
2. *Modern Physics, Kenneth S Krane (2nd Edition) -Wiley.*
3. *Concepts of modern Physics, Arthur Beiser (6th Edition) - SIE.*

References:

1. *Spectroscopy: Straughan and Walker –(Vol.1) John Wiley*
2. *Fundamentals of Molecular Spectroscopy: CN Banwell –(4th edition) TMH .*
3. *Introduction to Atomic Spectra, HE White, TMH*
4. *Elements of spectroscopy, Guptha, Kumar and Sharma (Pragathi Prakash)*
5. *Special Relativity- Resnick, (Wiley)*
6. *Mechanics – D.S.Mathur (S.Chand).*
7. *Mechanics by J.C. Upadhayaya (Ramprasad)*
8. *Semiconductor physics and optoelectronics- V Rajendran, J Hemaletha and M S M Gibson.*

Semester-VI

Core Course: XI **Credit - 3 (54 hours)**

PH6CRT11: NUCLEAR, PARTICLE PHYSICS AND ASTROPHYSICS

Module I

Nuclear structure **(10 hours)**

Nuclear composition – Discovery of neutron – Nuclear electrons - Nuclear properties: Nuclear radii – Spin and magnetic moment - Stable nuclei - Binding energy- Binding energy curve, Liquid drop model - Semi empirical binding energy formula with correction factors - Shell model - Nuclear forces- Meson theory of nuclear forces – Discovery of pion – Virtual Photons

Nuclear Radiation Detectors, Counters and Particle Accelerators (8 Hours)

Interactions between energetic particles and matter (basic concepts only) - Ionization chamber - Solid state detectors - Proportional counter - Geiger-Muller counter - The Wilson cloud chamber - Bubble chamber - Scintillation counters - Van de Graaff generator - Linear accelerator - Cyclotron - Betatron

Module II

Nuclear Transformations **(15 hours)**

Radioactive decay – Radiation hazards – Half life – Radiometric dating – Radioactive series - Alpha decay, tunnel theory of alpha decay, derivation for alpha decay constant - Beta decay, positron emission, electron capture, inverse beta decay – Gamma decay - The concept of interaction cross section, reaction rate – Nuclear reactions, Resonance, Center of mass coordinate system, Q value of nuclear reaction – Nuclear fission – Nuclear reactors – Breeder reactors - Nuclear fusion in stars – Formation of heavier elements – Fusion reactors – Confinement methods

Cosmic rays **(4 hours)**

Latitude effect – Azimuth effect – Altitude effect - Primary cosmic rays – Secondary cosmic rays – Cosmic ray showers – Discovery of Positron – Mesons Van Allen belts – Origin of cosmic rays

Module III

Particle Physics (10 hours)

Interactions and Particles – Leptons – Neutrinos and Antineutrinos, other leptons – Hadrons – Resonance particles – Elementary particle quantum numbers – Basic concepts of symmetries and conservation principles – Basic concepts of Quarks – color, flavor, Quark confinement –Higgs boson

Astrophysics (7 hours)

Classification of stars – Hertzsprung - Russel diagram – Luminosity of a star – Stellar evolution - White Dwarfs - Chandrasekhar limit - Neutron stars - Black holes - Supernova explosion – Photon diffusion time.

***Text Book**:*

1. *Concepts of Modern Physics, Arthur Beiser, 6th Edition, Tata McGraw-Hill publishing company*
2. *Modern Physics, R Murugeshan and K. Sivaprasath, 15th Edition (Revised) (2010), S.Chand*

References:

1. *Atomic and Nuclear Physics, S N Ghoshal, S.Chand.*
2. *Nuclear and Particle Physics S L Kakani and Subhra Kakani -Viva Books 2008*
3. *Elements of Nuclear Physics, M L Pandya and R P S Yadav, Kedar Nath Ram Nath*
4. *Modern Physics, Kennth Krane, 2nd Edition, Wiley India (Pvt) Ltd.*
5. *Modern Physics , G. Aruldhas and P. Rajagopal, Prentice-Hall India*
6. *An Introduction to Astrophysics, Baidyanath Basu, 2nd Edition, Prentice-Hall India*

Semester-VI

Core Course: XII **Credit-3 (72 hours)**

PH6CRT12: SOLID STATE PHYSICS

Module I

Crystal structure **(18 hours)**

Solid state, crystalline, polycrystalline and amorphous materials, crystal lattice, periodicity, translation vectors, unit cell, basis, symmetry operations, bravais lattice in two and three dimensions, miller indices, interplanar spacing, simple crystal structures-hcp, fcc, bcc and simple cubic, Structures of NaCl, Diamond and ZnS, X-ray diffraction from crystals- Bragg's law, powder method, reciprocal lattice-properties, reciprocal lattice to sc, bcc and fcc, Bragg's law in reciprocal lattice.

Text book: Solid State Physics by Puri and Babbar- Chapter 1 & 2

Module II

Bonding in solids **(7 hours)**

Inter-atomic forces, ionic bonding, bond dissociation and cohesive energy, madelung energy, covalent bonding, metallic bonding, hydrogen bonding, van derwaals bonding (basic ideas only).

Text book: Solid State Physics by Puri and Babbar

Free electron theory and elementary band theory **(12 hours)**

Free electron gas in one dimension, three dimension, electronic specific heat, band theory, Bloch theorem, Kronig-Penney model (derivation not expected), energy-wave vector relations, different zone schemes, velocity and effective mass of electron, distinction between metals, insulators and semiconductors.

Semiconducting properties of materials **(12 hours)**

Intrinsic and extrinsic semiconductors, drift velocity, mobility and conductivity of intrinsic semiconductors, carrier concentration and Fermi level for intrinsic semiconductor, carrier concentration, conductivity and Fermi level for extrinsic semiconductor. Hall Effect, Direct and Indirect band gap, Principles of LED and Photodiodes.

Text book: Solid State Physics by Puri and Babbar Chapter 5, 6 and 7

Module III

Dielectric properties of materials (5 hours)

Polarization and susceptibility, local filed, dielectric constant and polarizability, sources of polarizability, Clausius-Mossoti relation, piezoelectricity.

Magnetic properties of materials (7 hours)

Response of materials to magnetic field, classification of magnetic materials, Langevin's classical theory of diamagnetism and paramagnetism, ferromagnetism, Weiss theory, domain theory, antiferromagnetism and ferrimagnetism.

Superconductivity (10 hours)

Origin of superconductivity, response of magnetic field, Meissner effect, super current and penetration depth, critical field and critical temperature, type-I and type –II superconductors, thermodynamic and optical properties, isotope effect, Josephson effect and tunneling- SQUID BCS theory-Cooper pairs-Existence of bandgap.

Text book: Solid State Physics by Puri and Babbar Chapter 5, 6 and 7

Text book:

1. *Solid State Physics by Puri and Babbar (S.Chand)*

References:

1. *Solid State Physics, M.A. Wahab, (2nd Edition), Narosa*
2. *Introduction to Solid State Physics, Charles Kittel, (7th Edition), Wiley*
3. *Crystallography applied to solid state Physics, AR Verma, ON Srivastava, New age*
4. *Solid State Physics, AJ Dekker- Macmillian.*
5. *Solid State Physics, NW Ashcroft, ND Mermin – Cengage Learning.*
6. *Elementary Solid State Physics, M. Ali Omer, Pearson.*
7. *Solid state physics, R L Singal, KNRN &Co.*
8. *Solid state physics, S O Pillai, New age*

Semester-VI

Choice Based Course – XIV-1 **Credit – 3 (54 hours)**

PH6CBT01: INFORMATION TECHNOLOGY

Scope: To learn about the fascinating world of information technology and to use the tools available in Internet and the World Wide Web for a deep study of the subjects related to physics in better way by the students themselves.

Prerequisites: Awareness of basic computer operations.

Module I **(20 hours)**

Information and its Use : Information Technology – Quality of information – Message transmission – Electronic Office – E mail – Document storage – Computers in Industry – Different types – Graphical user interface

Text book: "Information Technology – The Breaking Wave", D.Curtin, K.Sen and K.Morin, Tata McGraw Hill, 1999. Chapter – 1, 2

Computer Networks: Importance of Networks. Components of Networks. Classification of Networks: Broad cast networks-Switched networks. Switching Techniques. Types of Networks – LAN – MAN – WAN. Networking Models – OSI reference model – TCP/IP reference model-Comparison between the OSI and TCP/IP models. Network Topology – Bus- Star-Ring-Tree-Mesh-Cellular.

Text book: Computer Networks, A.S. Tanenbaum - Prentice Hall of India, Chapter - 1

Computer Fundamentals, P.K. Sinha 3rd Edn. BPB Publications, Chapter – 17

THE INTERNET: Internet Protocols – Internet Protocol (IP)-Transmission Control Protocol (TCP) -Internet Address – Structure of Internet Servers Address-Address Space- Services on Internet – Domain Name System-SMTP and Electronic mail – Http and World Wide Web-Usenet and News groups-FTP-Telnet-Network Security

-Digital Signature-E-mail Privacy-Internet Tools – Search Engines-Web browsers-Internet explorer, Netscape Navigator, Mozilla Firefox(Working Knowledge)

Text book: Computer Networks, A.S.Tanenbaum - Prentice Hall of India, Chapter –5, 6, 7

Computer Fundamentals, P.K. Sinha 3rd Edn. BPB Publications, Chapter – 18

Module – II **(20 hours)**

THE HTML: What is HTML? Basic Tags of HTML – HTML-TITLE-BODY - Starting an HTML document – The <!DOCTYPE>declaration-setting boundaries with <HTML>-the HEAD element-the BODY element-the STYLE element and the SCRIPT element. - Formatting of text– Headers-Formatting Tags-PRE tag-FONT tag-Special Characters. Working with Images- META tag -Links – Anchor Tag -Lists – Unordered Lists-Ordered Lists-Definition Lists -Tables –TABLE, TR and TD Tags-Cell Spacing and Cell Padding-Colspan and Rowspan -Frames –Frameset-FRAME Tag-NOFRAMES Tag - Forms – FORM and INPUT Tag-Text Box-Radio Button-Checkbox-SELECT Tag and Pull Down Lists-Hidden-Submit and Reset

Text book: HTML4 – 2nd Edn. Rick Darnell, Techmedia, Chapter – 1, 2,3,4,5

Module – III **(14 hours)**

Basic Idea of DBMS: Need for Data Base – Database Systems versus File systems - View of Data - Data Abstraction-Instances and Schemas - Data Models – ER Model-Relational Model- Network Model-Hierarchical Model (general ideas) -Basic ideas about Structured Query Language.

Text book: Fundaments of Database System – Elmasri, Ramez and Navathe Shamkant B. 4th Edn.Person Education, India, 2004. Chapter – 1

MS – OFFICE/OPEN OFFICE (Working Knowledge): Word processors – PowerPoint - Spreadsheets – Databases

(No specific text book is preferred. MS office (97, 98, 2000, /Open Office which is installed in the lab can be used. Working practice must be given)

References

1. “Information Technology – The Breaking Wave”, D.Curtin, K.Sen and K.Morin,Tata McGraw Hill, 1999.
2. Computer Networks – A.S. Tanenbaum - Prentice Hall of India
3. Computer Fundamentals – P.K. Sinha 3rd Edn. BPB Publications
4. Internet and World Wide Web – Deitel
5. HTML4 – 2nd Edn. Rick Darnell, Techmedia
6. Database System Concepts – Silberschatz-Korth-Sudarshan 4th Edn – TataMac Graw Hill
7. “Information Technology and systems”, Green, B.C., Longman Scientific

&Technical Publishers, England, 1994.

8. Networks – Tirothy S. Ramteke – 2nd Edn. Pearson Edn – New Delhi, 2004
9. Data and Computer Communucation, William Stalling, PHI, New Delhi.
10. Mastering HTML4 – Ray D.S. and Ray E.J. – BPB
11. HTML – The Complete Reference – Tata Mc Graw Hill
12. Fundaments of Database System – Elmasri, Ramez and Navathe Shamkant B. 4thEdn.v Pearson Education, India, 2004.

Semester-VI

Choice Based Course – XIV-2 **Credit-3 (54 hours)**

PH6CBT02: MATERIAL SCIENCE

Module I **(18 hours)**

Structure and Properties of Materials

Classification of materials- Advance materials- Level of structures, Microstructure and Macrostructure, Structure-Property relationships, Physical properties of materials- Imperfections in solids- Point defects, imperfections, dislocations- interfacial and bulk defects. Diffusion Mechanisms- Fick's first and second laws. Mechanical Properties- Stress strain relationship, Basic ideas of anelasticity, plastic deformation, tensile properties, ductility, malleability, brittleness, toughness, resilience, hardness, stiffness, endurance, creep and impact strength- Basic Thermal properties, Thermal cracking- Electrical and Magnetic properties- Dielectric strength and dielectric constant- Basic ideas of Chemical properties

Text Book: Callister's Material Science and Engineering-Adapted by R Balasubramaniam, Wiley

Module II **(18 hours)**

Optical Properties of Materials

Absorption processes- Fundamental absorption-Exciton absorption- Free –carrier absorption- Photoconductivity- Photoelectric effect- Photovoltaic effect- Photoluminescence-colour centres-Generation of colour centres

Text Book: Solid State Physics, M.A. Wahab, Chapter-15

Modern Engineering Materials

Display devices- active and passive-Liquid crystals- Types of Liquid crystals- Nematic liquid crystals-Cholesteric liquid crystals- Smectic liquid crystals-General features of liquid crystals- Numeric display using LCD

Metallic glasses; Shape memory alloy; lead free solders

Text Book: Semiconductor Physics and Optoelectronics, V.Rajendran et al. Unit-II

Module III **(18 hours)**

Nanoscience

Metal nanoclusters-magic numbers, theoretical modelling, geometric and electronic structure, magnetic clusters; Semiconducting nano particles- Rare gas and molecular clusters- carbon nanostructures- Carbon clusters, CNT preparation, properties and applications; Quantum wells, wires and dots – preparation, Size and dimensionality effects, applications .

Text Book: Modern Physics by Murugeshan

Material Characterization Techniques

Qualitative study of Powder XRD, SEM, SPM, TEM, STM, AFM, PES and Raman spectroscopy.

Text Book: Nanotechnology-The science of small- MA Shah and KA Shah, Chapter 5

Text Books:

1. *Text Book: Callister's Material Science and Engineering-Adapted by R Balasubramaniam, Wiley*
2. *Solid State Physics (2nd ed.), M.A. Wahab, Narosa pub.*
3. *Nanotechnology-The science of small, MA Shah and KA Shah, Wiley.*
4. Text Book: Modern Physics by Murugeshan
5. *Semiconductor Physics and Optoelectronics, V.Rajendran et al., Vikas PublishingHouse.*

References:

1. *Crystallography applied to solid state Physics, A.R Verma, O.N Srivastava, New age*
2. *Nanotechnology, L.E Foster, Pearson.*
3. *Nanotechnology: Principles and Practices, 2nd edition, Sulabha K Kulkarni, Springer.*
4. *Introduction to Nanotechnology, C.P Poole, F.J Owens –Wiley*
5. *Textbook of Nanoscience and Nanotechnology, BS Murthy, P Shankar, Baldev Raj,BB Rath and J Murday- Universities Press-IIM*

Semester-VI

Choice Based Course – XIV-3 **Credit-3 (54 hours)**

PH6CBT03: COMPUTATIONAL PHYSICS

Algorithms of all methods required

Module I **(18 hours)**

Solutions of Nonlinear Equations

Bisection Method - Newton Raphson method (two equation solution) – Regula-Falsi Method, Secant method - Fixed point iteration method - Rate of convergence and comparisons of these Methods

Solution of system of linear algebraic equations

Gauss elimination method with pivoting strategies-Gauss-Jordan method-LU Factorization, Iterative methods (Jacobi method, Gauss-Seidel method)

Module II **(18 hours)**

Curve fitting: Regression and interpolation

Least squares Regression- fitting a straight line, parabola, polynomial and exponential curve

Finite difference operators-forward differences, divided difference; shift, average and differential operators- Newton's forward difference interpolation formulae- Lagrange interpolation polynomial- Newton's divided difference interpolation polynomial

Module III **(18 hours)**

Numerical Differentiation and Integration

Numerical Differentiation formulae - Maxima and minima of a tabulated function- Newton-Cote general quadrature formula - Trapezoidal, Simpson's 1/3, 3/8 rule –

Solution of ordinary differential equations

Taylor Series Method, Picard's method-Euler's and modified Euler's method –Heun's method- Runge Kutta methods for 1st and 2nd order

***Text Books**:*

1. *Numerical Methods, Balagurusamy, TMH*
2. *Numerical Methods for Scientists and Engineers- K Sankara Rao- PHI*
3. *Introductory Numerical Methods, S S Sastry, PHI.*

Semester-VI

Choice Based Course – XIV-IV **Credit – 3 (54 hours)**

PH6CBT04: INSTRUMENTATION

Module I **(10 hours)**

Measurements and Measurement Systems

Measurements-Method of measurement-Instruments and measurement systems-Mechanical, Electrical and Electronic instruments-Classification of Instruments-Applications of Measurement Systems - Elements of generalized measurement systems

Text book: A Course in Electrical and Electronics Measurements and Instrumentation, Sawhney. A.K- Chapter 1

Module II **(18 hours)**

Primary Sensing Elements and Transducers

Mechanical Devices as Primary Detectors – Mechanical Spring Devices – Pressure Sensitive Primary Devices – Flow Rate Sensing Elements - Transducers-Classification– Characteristics (Static and Dynamic) and Choice of Transducers – Characterization

Text book: Sensors and Transducers, Patranabis D., Chapter 1

A Course in Electrical and Electronics Measurements and Instrumentation, Sawhney. A.K- Chapter 25

Module III **(18 hours)**

Resistive, Inductive and Capacitive Transducers

Potentiometers –Strain gauges (Theory, types) - Rosettes – Resistance thermometer – Thermistors (materials, Constructions, Characteristics) – Thermocouples-Self inductive transducer – Mutual inductive transducers – Linear Variable Differential Transformer – LVDT Accelerometer – RVDT – Synchros – Capacitive transducer – Variable Area Type – Variable Air Gap type – Variable Permittivity type – Capacitor microphone.

Miscellaneous Transducers **(8 hours)**

Light transducers (photo-conductive, photo emissive, photo-voltaic, semiconductor, LDR)–Piezoelectric transducer – Hall Effect transducers – Digital Encoding transducers

Text book: A Course in Electrical and Electronics Measurements and Instrumentation, Sawhney. A.K- Chapter 1 and 25

Text books:

1. *A Course in Electrical and Electronics Measurements and Instrumentation, Sawhney A.K, 18th Edition, Dhanpat Rai & Company Private Limited, 2007.*
2. *Sensors and Transducers, Patranabis D., 2nd edition, PHI, 2015.*

References:

1. *Measurement Systems-Applications and Design, Doebelin. E.A, Tata McGraw Hill*
2. *Sensors and Transducers, Patranabis. D, Prentice Hall of India*
3. *Principles of Measurement Systems John. P, Bentley,, III Edition, Pearson*
4. *Transducers and Instrumentation, Murthy.D.V.S,, Prentice Hall of India*
5. *Instrumentation- Devices and Systems, Rangan, Sarma, and Mani, Tata-McGrawHill*
6. *Electronic Instrumentation by H.S Kalsi, McGrawHill*
7. *Instrumentation measurements and analysis, Nakra & Choudhary, Tata-McGrawHill*
8. *Mechanical and industrial measurement by R.K. Jain, Khanna Publishers, New Delhi*

Semester-VI

Choice Based Course – XIV-V **Credit – 3 (54 hours)**

PH6CBT05: Astronomy and Astrophysics

Module I

Observational astronomy **(12 Hours)**

Astronomical distance scales – AU, Parsec and light year. Stellar Parallax and distance to stars from parallax. Magnitude scale - Apparent and absolute magnitudes. Variable stars as distance indicators. Cepheid variables. Astronomy in different bands of electromagnetic radiation- Optical, radio and X-ray astronomies, Radiation Laws.

Optical Telescopes. Types of telescopes-refracting and reflecting – Newtonian and Cassegrain telescopes. Magnification and f number. Resolving Power, Telescope mounts – alt-azimuth and equatorial mounts.

Text Book **:** K D Abhyankar Section 3.1 & 4.3, Ian Morison Chapter 5, Dinah L. Moché, Chapter 2 &3.

Module II

Celestial sphere **(8 Hours)**

Concept of celestial sphere - cardinal points, celestial equator, ecliptic, equinoxes. Diurnal motion of sun - summer solstice and winter solstice. Celestial co-ordinate systems: – Horizon system – Azimuth & Altitude, Equatorial system-Right ascension & declination, Ecliptic coordinate system.

Time - apparent and mean solar time, sidereal time. Twilight, Seasons- causes of seasons (qualitative ideas). International Date Line.

*Text Book***:**K D Abhyankar, Chapter 2 & Dinah L. Moché, Chapter 1

Sun (**5 Hours)**

Sun - solar atmosphere and internal structure – Photosphere, chromosphere and corona. Radiation zone & Convection Zone. Sun spots, Activity Cycles, flares, prominences, coronal holes, Solar wind.

*Text Book***:** Dinah L. Moché, Chapter 4, Ian Morison Chapter 2

Galaxies **(3 hours)**

Galaxies - our galaxy, galaxy types & turning fork diagram. Structure on the largest scale-clusters, super clusters and voids.

*Text Book***:** Dinah L. Moché, Chapter 6

Module III

Astrophysics (14 hours)

Gravitational contraction - Virial theorem, Jeans mass. Energy production inside stars. Thermonuclear fusion. Hydrogen burning. p-p chain. CNO cycle. Evolution of stars – birth – protostar, hydrostatic equilibrium, red giant, late stages of evolution - white dwarfs & Chandrasekhar limit, Neutron stars, Supernovae, Pulsars, Black holes. Stellar Classification, H-R diagram - Main sequence stars

*Text Book***:** K D Abhyankar, Chapter 10, Dinah L. Moché Chapter 5

Cosmology (12 hours)

Large scale structure of the universe – isotropy and homogeneity. Cosmological principle.

Standard big bang model - GUT, Planck Epoch, Inflation, Nucleosynthesis, Recombination & CMBR. Expanding universe - red shift. Hubble's law and Hubble parameter. Age of universe and its determination. Dark energy and Dark Matter (qualitative idea).

*Text Book***:** Dinah L. Moché Chapter 7 & Ian Morison Chapter 9

References:

1. A short history of the Universe – Joseph Silk
2. Introduction to Astronomy and Cosmology, Ian Morison, John Wiley & Sons, Inc.
3. ASTRONOMY, A Self-Teaching Guide, Dinah L. Moché, John Wiley & Sons, Inc.
4. Introduction to cosmology- J V Narlikar
5. http://www.astro.cornell.edu/academics/courses/astro201/topics.html
6. http://www.ualberta.ca/~pogosyan/teaching/ASTRO_122/lectures/lectures.html
7. http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
8. Astrophysics: Stars and Galaxies- K D Abhyankar

B. Sc. PHYSICS PRACTICAL

Minimum of experiments to be done in each paper is 14.

Minimum number of experiments for appearing practical examination is 8.

Maximum possible number of repetitions must be done to reduce error in a measuring quantity.

Do calculation of percentage error for all experiments.

The S.I. units must be specified along with the results.

Division of internal marks for record (maximum 4 marks)

No. of Experiments	Marks
14 and above	4
12 & 13	3
10 & 11	2
8, 9 & 10	1
Less than 8	0

SEMESTER	PAPER	PAPER CODE	TITLE
1 & 2	01	PH2CRP01	Mechanics and Properties of Matter
3 & 4	02	PH4CRP02	Optics and Semiconductor Physics
5 & 6	03	PH6CRP03	Electricity, Magnetism and LASER
5 & 6	04	PH6CRP04	Digital Electronics
5 & 6	05	PH6CRP05	Thermal Physics, Spectroscopy and C++ Programming
5 & 6	06	PH6CRP06	Acoustics, Photonics and Advanced Semiconductor Physics

SEMESTER 1&2 (First Year)

Core Practical 1: PH2CRP01 – Mechanics and Properties of Matter

1. Symmetric Compound Pendulum – Determination of acceleration due to gravity (g), radius of gyration(K) and moment of inertia (I)
2. Asymmetric Compound Pendulum – Determination of acceleration due to gravity (g), radius of gyration(K) and moment of inertia (I)
3. Kater's pendulum – Determination of acceleration due to gravity (g)
4. Torsion Pendulum – Determination of rigidity modulus (n) and moment of inertia (I)
5. Torsion Pendulum (Method of equal masses) – Determination of rigidity modulus (n) and moment of inertia (I)
6. Measurement of density of a solid – Sensibility method to find mass using beam balance and screw gauge / venier calipers for dimension measurements
7. Uniform bending – Pin and Microscope – Determination of Young's modulus
8. Non Uniform bending – Pin and Microscope – Determination of Young's modulus
9. Uniform bending – Optic Lever – Determination of Young's modulus
10. Non Uniform bending – Optic Lever – Determination of Young's modulus
11. Cantilever – Scale and telescope – Determination of Young's modulus
12. Cantilever – Pin and Microscope – Determination of Young's modulus
13. Vertical oscillations of a spring – Determination of Young's modulus
14. One dimensional elastic collision – Hanging sphere method – Law of conservation of energy and momentum
15. Static Torsion – Determination of rigidity modulus
16. Flywheel – Determination of moment of inertia
17. Constant pressure head – Determination of viscosity of a liquid
18. Variable pressure head – Determination of viscosity of a liquid
19. Stokes's method – Determination of viscosity of a liquid
20. Capillary rise method – Determination of surface tension
21. Quincke's method – Determination of surface tension

SEMESTER 3&4 (Second Year)

Core Practical 02: PH4CRP02 –Optics and Semiconductor Physics

1. Liquid Lens – Determination of optical constants of a convex lens – water and mercury given
2. Liquid Lens – Determination of refractive index of a liquid – water and unknown liquid
3. Spectrometer – Prism – Determination of refractive index of material of the prism
4. Spectrometer – Hollow Prism – Determination of refractive index of liquid
5. Spectrometer – Small angled prism – Normal incidence – Determination of refractive index of material of the prism
6. Spectrometer – i – d curve – Determination of refractive index of material of the prism
7. Newton's rings – Determination of wavelength of sodium light
8. The air wedge – Determination of diameter of thin wire
9. Zener characteristics – forward and reverse – Study of dynamic and static properties
10. Transistor characteristics – Common Emitter Configuration
11. Half wave rectifier – Study of ripple factor and load regulation with and without filter circuit
12. Full wave rectifier – (center tap) – Study of ripple factor and load regulation with and without filter circuit
13. Full wave rectifier – (bridge) – Study of ripple factor and load regulation with and without filter circuit
14. FET – characteristics – Determination of parameters
15. Voltage regulator using zener diode – Study of line and load regulations
16. Clippers – positive, negative and biased – Study of output waveforms
17. Clampers – positive, negative and biased – Study of output waveforms
18. OPAMP characteristics – Study of CMRR and open loop gain
19. OPAMP – inverter, non inverter and buffer – Study of gain
20. LC Oscillator – Colpit's /Hartley – using transistor
21. Phase shift oscillator – using transistor

SEMESTER 5&6 (Third Year)

Core Practical 03: PH6CRP03 – Electricity, Magnetism and LASER

1. Potentiometer – Measurement of resistance of wire
2. Potentiometer – Calibration of low range voltmeter
3. Potentiometer – Calibration of high range voltmeter
4. Potentiometer – Calibration of ammeter
5. Tangent galvanometer – Calibration of ammeter
6. Moving coil galvanometer – figure of merit
7. Conversion of galvanometer into voltmeter
8. Conversion of galvanometer into ammeter
9. Field along the axis of a circular coil – magnetic flux variation
10. Field along the axis of a circular coil – m and B_h
11. Searle's vibration magnetometer – magnetic moment
12. Deflection and vibration magnetometer – m and B_h
13. Carey Foster's bridge – Measurement of resistivity of wire
14. LCR seriesand parallel resonant circuit analysis
15. Verification of Thevenin's and Norton's theorems
16. Verification of Superposition and Maximum power transfer theorems.
17. Laser – Grating – Determination of wavelength
18. Laser – Determination of spot size and divergence
19. Optical fiber – Determination of numerical aperture
20. Single slit diffraction using laser – Determination of slit width
21. e/m – Thomson's apparatus – Bar magnet/magnetic focusing
22. Determination of Dielectric constant of a thin sheet/ a liquid

SEMESTER 5&6 (Third Year)

Core Practical 04: PH6CRP04 – Digital Electronics

1. Realization of logic gates – AND, OR and NOT – Using diodes, transistors etc.
2. Realization of logic gates – AND, OR and NOT – Using universal gates
3. Verification of truth table of NAND, NOR, XOR and XNOR gates
4. Verification of De Morgan's theorems – Using IC 7400
5. BCD to 7 segment decoder
6. Realization of Half adder/ Full adder using gates – Verification of truth table
7. Astable Multivibrator using Transistor
8. Astable Multivibrator using IC 555
9. Monostable Multivibrator using Transistor
10. Monostable Multivibrator using IC 555
11. D/A converter using IC 741 – Using binary weighed resistor / R – 2R ladder type
12. A/D converter using IC 741
13. SR Flip Flops using IC 7400 – Verification of truth table
14. JK Flip Flops using IC 7400 & 7410 – Verification of truth table
15. Digital counter using IC 7490 / 7495 / 74194 / 74151 – Verification of truth table
16. Schmitt trigger using IC 741
17. Bistable multivibrator using IC 555
18. Multiplexer using gates
19. Demultiplexer using gates
20. Shift register – SISO
21. Shift register – SIPO
22. 4-Bit Binary to Gray conversion
23. 4-Bit Gray to Binary conversion

SEMESTER 5&6 (Third Year)

Core Practical 05: PH6CRP05 – Thermal Physics, Spectroscopy and C++ Programming

1. Thermistor – Resistance - Temperature characteristics and temperature co-efficient of resistance
2. Newton's law of cooling – Specific heat capacity of a liquid
3. Thermal conductivity of bad conductor – Lee's disc
4. Carey Foster's bridge – Temperature co-efficient of resistance
5. Study of Seeback effect/Peltier effect
6. Electrochemical equivalent of Copper
7. To determine e/k using transistor
8. Spectrometer – Cauchy's constants
9. Spectrometer – Resolving power of a prism.
10. Spectrometer – Resolving power of grating.
11. Spectrometer – Dispersive power of grating
12. Spectrometer – Dispersive power of prism
13. Computer programming in C++ – Conversion of temperature scale
14. Computer programming in C++ – Solving a quadratic equation
15. Computer programming in C++ – Generation of Fibonacci series
16. Computer programming in C++ – Conversion of a decimal number into binary number
17. Computer programming in C++ – Simple Pendulum – Calculation of 'g' from experimental data
18. Computer programming in C++ – Resistance colour code to numerical value conversion
19. Computer programming in C++ – For different initial velocity and angle of projection, find out time of flight, horizontal range, Maximum height of a Projectile
20. Computer programming in C++ – sorting the numbers in ascending and descending order
21. Computer programming in C++ – multiplication of two matrices

SEMESTER 5&6 (Third Year)

Core Practical 06: PH6CRP06 – Acoustics, Photonics and Advanced Semiconductor Physics

1. Melde's string – Determination of frequency of given tuning fork
2. Sonometer – Determination of frequency of AC
3. Sonometer – Determination of frequency of given tuning fork, unknown mass and verification of laws of strings
4. Kundt's tube – Determination of velocity of sound
5. Spectrometer – Quartz prism – Refractive indices of quartz for the ordinary and extra –ordinary rays
6. Characteristics of LED – V- I characteristic for different colors
7. Characteristics of solar cell / photodiode – V- I characteristics
8. Characteristics of Light Depend Resistors
9. Planck's constant using LED's of at least 3 different colours
10. Weinbridge Oscillator using IC 741
11. Realization of XOR and Ex NOR using transistor
12. Sweep wave generator using transistor
13. Regulated power supply using zener diode and IC 741 – Study of line and load regulations
14. Regulated power supply using IC 78XX/79XX etc – Study of line and load regulations
15. Voltage regulator using zener diode and transistor – Study of line and load regulations
16. RC coupled common emitter amplifier – Study of frequency response and bandwidth
17. Voltage multipliers – doubler & tripler
18. Wave shaping R C circuits – Integrator and differentiator
19. OPAMP – adder and subtractor
20. Amplitude modulation using transistor
21. Pulse Width Modulation using IC 555

References:

1. *Advanced course in Practical Physics by D Chattopadhyay*
2. *Practical Physics – Joseph Ittiavirah, Premnath and Abraham(2005)*
3. *Practical Physics, CL Arora, S.Chand*
4. *Practical Physics, Harnam Singh , S Chand*
5. *Electronics lab manual Vol 1 & 2, K A Navas.*
6. *A course of Experiments with He –Ne Laser – R.S Sirohi (2nd Edition) Wiley Eastern Ltd.*
7. *Electronics lab manual Vol 1 & 2, Kuryachan T D and Shyam Mohan S, Ayodhya pub.*

9. COMPLEMENTARY PHYSICS FOR MATHEMATICS AND STATISTICS

Semester I **2 credits (36 hours)**

PH1CMT01: PROPERTIES OF MATTER & ERROR ANALYSIS

Module I

Elasticity **(13 hours)**

Stress- strain- Hooke's law- Elastic moduli- Poisson's ratio- twisting couple- determination of rigidity modulus- static and dynamic methods- static torsion- torsion pendulum, bending of beams- cantilever, uniform and non-uniform bending, I section girder.

Module II

Surface tension **(3 hours)**

Molecular theory of surface tension - surface energy - excess pressure in a liquid drop, factors affecting surface tension - applications

Hydrodynamics **(7 hours)**

Streamline and turbulent flow - critical velocity - Coefficient of viscosity - Derivation of Poiseuille's equation, Stokes equation-Determination of viscosity by Poiseuille's method - Brownian motion – Viscosity of gases – Bernoulli's theorem.

Module III **(13 hours)**

Error Analysis

Basic ideas – uncertainties of measurement – importance of estimating errors – dominant errors – random errors – systematic errors - rejection of spurious measurements. Estimating and reporting errors – errors with reading scales, errors of digital instruments – number of significant digits –absolute and relative errors – standard deviation. Propagation of errors – sum and differences – products and quotients – multiplying by constants – powers

References:

1. *Elements of properties of matter, D S Mathur*
2. *Advanced course in Practical Physics by D Chattopadhyay*
3. *Properties of Matter- Brijlal and N. Subrahmanyam (S. Chand and Co.)*
4. *Concepts of Modern Physics- A. Beiser (Tata McGraw-Hill, 5th Edn.)*
5. *Modern Physics- G. Aruldas and P. Rajagopal (PHI Pub)*
6. *Physics- Resnick and Halliday*
7. *An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements, John R. Taylor - Univ. Science Books*

Semester II **2 credits (36 hours)**

PH2CMT01: MECHANICS AND ASTROPHYSICS

Module I

Motion under Gravity **(5 hours)**

Velocity- acceleration- force – acceleration due to gravity - compound pendulum (symmetric and asymmetric) radius of gyration – Kater's Pendulum- centripetal acceleration and force - centrifugal force

Rotational Dynamics **(10 hours)**

Angular velocity- angular momentum- torque- conservation of angular momentum- angular acceleration- moment of inertia- parallel and perpendicular axes theorems- moment of inertia of rod, ring, disc, cylinder and sphere- flywheel

Module II

Oscillations **(9 hours)**

Periodic and oscillatory motion- simple harmonic motion- differential equation, expression for displacement, velocity and acceleration- graphical representation- energy of a particle executing simple harmonic motion - damped oscillation- forced oscillation and resonance.

Waves **(4 hours)**

Waves-classifications- progressive wave- energy of progressive wave- superposition of waves-theory of beats- Doppler Effect.

Module III

Astrophysics **(8 hours)**

Temperature and color of a star- elements present in a stellar atmosphere- mass of star- life time of a star- main sequence stars-HR diagram- evolution of stars- white dwarf- supernova explosion- neutron star- black hole- (all topics to be treated qualitatively)

References

1. Elements of properties of matter, D S Mathur Mechanics- H.S.Hans and S.P.Puri. (TMH)
2. Mechanics, D S Mathur
3. Modern Physics- R. Murugeshan, Er. Kirthiga Sivaprasad

4. A text book on oscillations waves and acoustics, M.Ghosh , D Bhattacharya
5. Introduction to Astrophysics-Baidyanath Basu.
6. Mechanics by D.S. Mathur and P.S. Hemne, S. Chand.
7. Waves, Mechanics & Oscillations- S B Puri

Semester III **3 credits (54 hours)**

PH3CMT01: MODERN PHYSICS AND ELECTRONICS

Module I

Modern Physics **(18 hours)**

Basic features of Bohr atom model-formula for energy- vector atom model- various quantum numbers-coupling schemes – LS & JJ-Pauli's exclusion principle- magnetic moments of orbital electrons

Atomic nucleus-classification-basic properties of nucleus-charge, mass, spin, magnetic moment binding energy and packing fraction-nuclear forces-salient features

Radioactivity- properties of alpha, beta and gamma-Soddy Fajan's displacement law, law of radioactive disintegration-decay constant-half life and mean life-radioactive equilibrium - measurement of radioactivity-radio carbon dating

Module II

Quantum Mechanics **(12 hours)**

Inadequacies of classical physics-experimental evidences-evidences for quantum theory-Planck's hypothesis-foundation of quantum mechanics-wave function & probability density- Schrödinger equation-time dependent and time independent particle in a potential box.

Spectroscopy **(6 hours)**

Optical spectra- spectral terms, selection rules, hyperfine structure; molecular spectra-rotational, vibrational and electronic spectra; Raman effect- experimental study, quantum theory; fluorescence and phosphorescence; comparison of Raman, fluorescence and IR spectra; NMR

Module III

Electronics (8 hours)

Current-voltage characteristics of a diode-forward and reverse bias-breakdown mechanism of p-n junction diode-Zener diode and its characteristics-half wave and full wave rectifiers- bridge rectifier-ripple factor, efficiency. Bipolar junction transistor-Construction and operation.

Module IV

Digital Electronics (10 hours)

Different number systems – decimal, binary, octal, hexa decimal number systems-conversion between different number systems- binary mathematics – addition, subtraction (1's compliment and 2's compliment methods) - basic theorems of Boolean algebra- de Morgan's theorems – Simplification of Boolean equations - AND, OR, NOT, NAND, NOR, XOR gates- truth tables- half adder- full adder

References

1. *Modern Physics- R. Murugeshan, Er. Kirthiga Sivaprasad*
2. *Principles of electronics, V K Mehta*
3. *Digital principles and applications- A. P. Malvino and P. Leach*
4. *Concepts of Modern Physics: Arthur Beiser (TMH).*
5. *Basic Electronics , B L Thereja (S. Chand)*

Semester IV 3 credits (54 hours)

PH4CMT01: OPTICS & ELECTRICITY

Module I

Interference, Diffraction and Polarization (22 hours)

Light waves- phase difference and coherence, optical path and phase change, principle of superposition, Analytical treatment of interference-young's double slit experiment, conditions for interference, bandwidth - Interference in thin films-reflected system-colour of thin films-fringes of equal inclination and equal thickness. Newton's rings-reflected system-measurement of wavelength

Fresnel and Fraunhofer diffractions. Fresnel's theory of approximate rectilinear propagation of light-. Fraunhofer diffraction. Theory of Plane transmission grating-determination of wavelength-dispersive power of grating. Prism and grating spectra, resolving power, Rayleigh criterion, resolving power of grating,

Polarization, types of polarization, Brewster's law, dichroism, birefringence – e ray and o-ray, polarizer and analyser, Malu's law, optical activity

Module II

Laser and Fiber Optics (10 hours)

Principle of operation of laser-population inversion, metastable states, optical resonator-components of laser- active medium, pump, optical resonant cavity- principal pumping schemes- three level and four level- laser beam characteristics applications of lasers. Light propagation in optical fibers, acceptance angle, numerical aperture-step index fiber - graded index fiber.

Module III

Dielectrics (10 hours)

Dielectrics- polar and non-polar dielectrics- polarization- sources of polarization-Gauss's law in dielectrics- permittivity- dielectric displacement vector- dielectric constant-susceptibility- ferro-electricity.

Module IV

Varying Currents (12 hours)

Transient currents – Growth and decay of current in an inductive circuit – charging and discharging of a capacitor through a resistance - Peak, mean, rms and effective values of a.c, Ac circuits-AC through RC, LC, LR and LCR series circuits resonance-sharpness of resonance-power factor.

References:

1. *Optics - Brijlal and N. Subrahmanyam, S Chand-2015*
2. *Electricity and Magnetism , D C Tayal*
3. *Electricity and Magnetism- J. H. Fewkes & John Yarwood*
4. *Electricity and Magnetism – R. Murugeshan*

5. *Nuclear physics –Irvin Kaplan*
6. *Lasers – theory & applications- Thyagarajan & Ghatak*
7. *Concepts of Modern Physics- A. Beiser*
8. *Laser Physics and Applications, V K Jain (Narosa Publication)*
9. *Optical Fiber Communications, John M Senior*

10. COMPLEMENTARY PHYSICS FOR CHEMISTRY AND GEOLOGY

Semester 1

PH1CMT02: PROPERTIES OF MATTER AND THERMODYNAMICS

Module I

Elasticity (13 hours)

Stress- strain- Hooke's law- Elastic moduli- Poisson's ratio- twisting couple- determination of rigidity modulus- static and dynamic methods- static torsion- torsion pendulum, bending of beams- cantilever, uniform and non-uniform bending, I section girder.

Module II

Surface tension (3 hours)

Molecular theory of surface tension - surface energy - excess pressure in a liquid drop, factors affecting surface tension - applications

Hydrodynamics (7 hours)

Streamline and turbulent flow - critical velocity - Coefficient of viscosity - Derivation of Poiseuille's equation, Stokes equation-Determination of viscosity by Poiseuille's method - Brownian motion – Viscosity of gases- Bernoulli's theorem.

Text Book: Elements of properties of matter, D S Mathur, Chapter- 14

Module III

Thermodynamics (13 hours)

Thermodynamic systems- thermodynamic equilibrium- thermodynamic processes- isothermal process- adiabatic process- zeroth law of thermodynamics, first law of thermodynamics- heat engine- the Carnot engine- refrigerator, concept of entropy- second law of thermodynamics- third law of thermodynamics- Maxwell's thermodynamic relations

Text Books:

1. Elements of properties of matter, D S Mathur- S Chand
2. Heat and Thermodynamics-Brijlal & Subrahmanyam (S.Chand)

References

1. Mechanics - H.S.Hans and S.P.Puri. (Tata McGraw-Hill)
2. Properties of Matter - Brijlal and N. Subrahmanyam (S. Chand and Co.)
3. Mechanics - J.C. Upadhyaya (Ram Prasad and sons)
4. Heat and Thermodynamics – Mark W Zemanski (Tata McGraw-Hill)

Semester 2

PH2CMT02: MECHANICS AND SUPERCONDUCTIVITY

Module I

Motion under gravity **(5 hours)**

Velocity- acceleration- force – acceleration due to gravity - compound pendulum (symmetric and asymmetric) radius of gyration –centripetal acceleration and force - centrifugal force

Rotational dynamics **(10 hours)**

Angular velocity- angular momentum- torque- conservation of angular momentum- angular acceleration- moment of inertia- parallel and perpendicular axes theorems- moment of inertia of rod, ring, disc, cylinder and sphere- flywheel

Module II

Oscillations **(9 hours)**

Periodic and oscillatory motion- simple harmonic motion- differential equation, expression for displacement, velocity and acceleration- graphical representation- energy of a particle executing simple harmonic motion damped oscillation- forced oscillation and resonance.

Waves **(4 hours)**

Waves-classifications- progressive wave- energy of progressive wave- superposition of waves-theory of beats- Doppler effect.

Module III

Superconductivity (8 hours)

Super conducting phenomenon- Occurrence- BCS theory (qualitative) Meissner Effect- Type I and Type II superconductors- Josephson effects (qualitative) - High temperature superconductors- Applications of Superconductivity

Text Books:

1. *Elements of properties of matter, D S Mathur- S Chand*
2. *Mechanics- D S Mathur- S Chand*
3. *Solid State Physics- P K Palanisamy- Scitech*

References

1. *Properties of Matter- Brijlal and N. Subrahmanyam (S. Chand and Co.)*
2. *A text book on oscillations waves and acoustics, M.Ghosh , D Bhattacharya*
3. *Solid State Physics- R. K. Puri and V.K. Babbar (S. Chand and Co.)*
4. *Elementary Solid State Physics,Ali Omar*
5. *Modern Physics- Murugeshan- S Chand*

Semester III

PH3CMT02: MODERN PHYSICS AND MAGNETISM

Module I

Modern Physics (18 hours)

Basic features of Bohr atom model-formula for energy-vector atom model- various quantum numbers- Coupling schemes-LS and JJ coupling-Pauli's exclusion principle-magnetic moment of orbital electrons,

Atomic nucleus classification-basic properties of nucleus-charge, mass, spin, magnetic moment binding energy and packing fraction-nuclear forces-salient features

Radioactivity- properties of alpha, beta and gamma- Soddy Fajan's displacement law, law of radioactive disintegration -decay constant-half life and mean life-radioactive equilibrium - measurement of radioactivity-.Radio carbon dating

Module II

Quantum Mechanics (12 hours)

Inadequacies of classical physics-experimental evidences-evidences for quantum theory-Planck's hypothesis-foundation of quantum mechanics-wave function & probability density- Schrödinger equation-time dependent and time independent particle in a potential box.

Spectroscopy (6 hours)

Optical spectra- spectral terms, selection rules, hyperfine structure; molecular spectra-rotational, vibrational and electronic spectra; Raman effect- experimental study, quantum theory; fluorescence and phosphorescence; comparison of Raman, fluorescence and IR spectra; NMR

Module III

Electronics (8 hours)

Current-voltage characteristics of a diode-forward and reverse bias-breakdown mechanism of p-n junction diode-Zener diode and its characteristics-half wave and full wave rectifiers- bridge rectifier-ripple factor, efficiency. Construction and operation of a bipolar junction transistor

Module IV

Magnetism (10 hours)

Properties of magnetic materials, Paramagnetism, Diamagnetism, Ferromagnetism, Hysteresis, Ferrites, Magnetostriction, Earth's magnetism-elements of earth's magnetism-dip, declination, horizontal and vertical components-magnetic maps-magnetographs-cause of earth's magnetism

Text Books:

1. *Modern Physics- R. Murugeshan, Er. Kirthiga Sivaprasad . S Chand*
2. *Principles of electronics, V K Mehta, S Chand*
3. *Electricity and magnetism, D C Tayal,*

References

1. *Functional Electronics, Ramanan (Tata McGraw-Hill)*
2. *Electricity and magnetism - Brijlal and N. Subrahmanyam (S. Chand and Co.)*

Semester IV

PH4CMT02: OPTICS AND SOLID STATE PHYSICS

Module I

Interference, Diffraction and Polarization (22 hours)

Light waves- phase difference and coherence, optical path and phase change, principle of superposition, Analytical treatment of interference-- young's double slit experiment, conditions for interference, bandwidth Interference in thin films-reflected system-colour of thin films-fringes of equal inclination and equal thickness. Newton's rings-reflected system-measurement of wavelength

Fresnel and Fraunhofer diffractions. Fresnel's theory of approximate rectilinear propagation of light. Fraunhofer diffraction. Theory of Plane transmission grating-determination of wavelength- dispersive power of grating. Prism and grating spectra, resolving power, Rayleigh criterion, resolving power of grating,

Polarization, types of polarization, Brewster's law, dichroism, birefringence – e ray and o-ray, polarizer and analyzer, Malu's law, optical activity

Module II

Laser and Fiber Optics (10 hours)

Principle of operation of laser-population inversion, metastable states, optical resonator-components of laser- active medium, pump, optical resonant cavity- principal pumping schemes- three level and four level- laser beam characteristics, applications of lasers. Light propagation in optical fibers, acceptance angle, numerical aperture-step index fiber - graded index fiber.

Module III

Dielectrics (10 hours)

Dielectrics- polar and non-polar dielectrics- polarization- sources of polarization-Gauss's law in dielectrics- permittivity- dielectric displacement vector- dielectric constant-susceptibility- ferro-electricity. Peak, mean, rms and effective values of A.C

Module IV

Crystallography (12 hours)

Crystal structure-crystal lattice and translation vectors-unit cell-types of lattices- Miller indices- lattice directions and planes interplanar spacing-simple crystal structures- sc, fcc, bcc, hcp close packed structures- -sodium chloride structure. X-ray crystallography-diffraction of x-rays-Bragg's law

Text Books:

1. *Optics - Brijlal and N. Subrahmanyam - S Chand-2015*
2. *Electricity and Magnetism , D C Tayal*
3. *Solid State Physics, S O Pillai*

References:

1. *A text book of Applied Physics – A .K Jha*
2. *Electricity and Magnetism – R. Murugeshan (S Chand & Co.)*
3. *Solid state physics, P. K Palanisami*
4. *Lasers – theory & applications- Thyagarajan &Ghatak*

COMPLEMENTARY PHYSICS PRACTICALS

Semester I & II

Complementary Physics Practical 1: PH2CMP01

1. Vernier Calipers -- Volume of cylinder (solid and hollow), sphere and beaker
2. Screw gauge – Radius of wire, volume of sphere and glass piece
3. Beam balance - Mass of a solid (sensibility method)
4. Spectrometer - Refractive Index of material of prism.
5. Diode characteristics- ac and dc resistance
6. Coefficient of viscosity of the liquid – Constant **OR** Variable pressure head method
7. Surface Tension – Capillary rise method
8. Determination of Young's Modulus- Cantilever (Scale and Telescope)
   OR - Uniform bending (Optic lever method)
   OR- Non-uniform bending (Pin and Microscope method)
9. Acceleration due to gravity (g)- Symmetric Compound Pendulum

   OR Kater's pendulum
10. Symmetric Compound Pendulum - Determination of Radius of gyration and moment of inertia
11. Fly wheel – Moment of Inertia
12. Torsion pendulum -Rigidity modulus
13. Determination of moment of inertia of rotationally symmetric body (solid sphere **OR** cylinder **OR** disc) from their period of oscillation on a torsion axle
14. Spring constant - Hooke's law - oscillation
15. Resistivity of the material of the wire- Ohm's law and verification by multimeter
16. Construction of half wave rectifier with and without filter – Ripple factor
17. Laser- Transmission **OR** Reflection Grating- Determination of wavelength
18. Liquid lens - Refractive Index of glass using a liquid of known refractive index
19. Poisson's ratio of rubber
20. Temperature dependence of capacitance- polymer and ceramic capacitors
21. Resistance of a galvanometer and its figure of merit.

Semester III & IV: Complementary Physics Practical 2: PH4CMP02

1. Determination of Young's Modulus- Cantilever (Pin & Microscope)
   OR Uniform bending (pin and microscope)**OR** Non-uniform bending (optic lever)
2. Asymmetric Compound Pendulum- Determination of moment of inertia and Acceleration due to gravity (g)
3. Torsion pendulum (Equal mass method) - Rigidity modulus and Moment of Inertia
4. Spectrometer – Dispersive power of prism
5. Spectrometer – Dispersive power of a Grating
6. Newton's rings -Wave length
7. Characteristics of Zener diode- ac and dc resistance
8. Conversion of Galvanometer into voltmeter
9. Carey Foster's Bridge -Measurement of resistivity
10. Tangent Galvanometer – Ammeter calibration
11. Potentiometer-Calibration of low range ammeter **OR** voltmeter
12. Construction of full wave rectifier (center-tap **OR** bridge) with and without filter – Ripple factor
13. Construction of regulated power supply using Zener diode- line and load regulation
14. Laser diffraction- width of single slit **OR** thickness of wire
15. Refractive index of liquid- Liquid Lens **OR** Spectrometer and Hollow Prism
16. Air wedge-thickness of wire
17. Static Torsion - Rigidity modulus
18. Deflection and Vibration Magnetometer-m & Bh
19. Field along the axis of circular coil- determination of Bh
20. Searle's Vibration Magnetometer - magnetic moment
21. Gates – AND, OR, NOT- verification of truth tables

References

1. *Practical Physics – C L Arora- S Chand*
2. *Properties of Matter -D.S. Mathur*
3. *Optics -Subrahmanyam& Brijlal*
4. *Electricity &Magnetism -Sreevastava*
5. *Electronics Lab Manual (Vol.1) -K. A. Navas*
6. *Laboratory manual for electronic devices and circuits-David A Bell*
7. *Practical Physics- Joseph Ittiavirah, Premnath and Abraham*

11. COMPLEMENTARY PHYSICS FOR B. Sc. ELECTRONICS (MODEL III) PROGRAMME

SEMESTER I

PH1CMT03: SOLID STATE PHYSICS

Objectives:

1. To provide the students of B.Sc. Electronics programme the bare minimum knowledge in Solid State Physics which is the basis of electronic devices.
2. It aims at developing a taste for solid state physics where the real advances in electronic device technology happens.
3. To enable students to catch up with the new areas related to electronics which include quantum computing, nanotechnology etc.
4. Miniaturization has made the physics of devices more demanding. One requires the application of the methods of quantum mechanics to tackle them.

Hours/Week 4

Contact Hours 72

Credit s 3

Course Outline

Module I- Crystal structure and atomic bonding (15hours)

Basic definitions - Crystal lattice, Unit cell- primitive and non primitive cells, Basis. Types of lattices-Bravais lattices and derived structures, Lattice directions and planes-Miller indices (simple calculations expected). X-ray diffraction-Bragg's law- Powder crystal method (qualitative study).Inter-atomic bonding- ionic, covalent, metallic.

Textbook

Chapter One, Two and Three. Solid State Physics-R.K Puri&V.KBabbar.

Module II – Basic quantum mechanics (15 hours)

Dual nature of matter and wave - de Broglie waves, Particle diffraction - Davison-Germer experiment, Uncertainty principle(derivation based on Fourier integral not needed),Classical mechanics as an approximation of quantum mechanics, Wave function, Wave equation, Schrodinger equation- Time dependent & Steady State forms(Eigen functions and eigen values not needed).

Textbook

Chapter Three &Five.Concepts of Modern Physics-Arthur Beiser.

Module III –Free electron theory of metals and Band theory of solids (10 hours)

Free electron theory in one dimension (qualitative study only)-fermi energy and fermilevel, Band theory -Bloch theorem (proof not required), Metals, insulators and semiconductors according to energy band picture.

Textbook

Chapter Five, Six. Solid State Physics-R.K Puri & V.K.Babbar.

Module IV-Semiconductors (12 hours)

Semiconductors –intrinsic and extrinsic types-doping. Drift velocity, mobility and conductivity of intrinsic semiconductors, Law of mass action and intrinsic carrier concentration (only essential formula required), Hall effect-hall coefficient.

Textbooks

Chapter Seven. Solid State Physics-R.K Puri & V.K.Babbar.

Chapter Six. Elementary Solid State Physics-Principles and Applications-Ali Omar, Pearson Education.

Module V – Magnetism in solids and Super conductivity (20 hours)

Magnetic terminology–Types of magnetism (derivations not needed)-dia, para and ferromagnetism –Weiss Theory of ferromagnetism-Concept Domain and Hysterisis, antiferromagnetism, ferrimagnetism.

Superconductivity, Electrical resistivity- zero resistance, Meissner effect, Critical field and critical temperature, Type I and Type II Superconductors, Applications of superconductivity (basic information only).

Textbook

Chapter Eight and Ten. Solid State Physics-R.K Puri&V.K.Babbar.

Books for study

1. Concepts of Modern Physics -Arthur Beiser, 6th edn., Tata McGraw Hill Publishing Company Ltd.
2. Solid State Physics-R.K Puri & V.KBabbar,S.Chand & Company Ltd.
3. Elementary Solid State Physics-Principles and Applications-Ali Omar, Pearson Education.

Books suggested for further reading

1. Quantum Mechanics-G Aruldhas, PHI Learning.
2. Solid State Physics-S.O Pillai, 6th revised edition. New Age International Pvt. Ltd.
3. Introduction to Solid State Physics - Charles Kittel, 8th edition, Wiley.

4. Introduction to Quantum Mechanics - Griffiths, 2nd edition. Pearson Education.
5. Solid State Physics-Structures and Properties of materials, M.A Wahab, 3rdedition, Narosa Publishing House.
6. Solid State Physics- C.L. Arora, S Chand & Company Ltd.
7. Solid State Physics-P.K. Palanisamy, Scitech Publications.
8. Solid State Physics- Blakemore, J.S. 2nd edition. Cambridge.
9. Solid State Physics - Gupta & Kumar, K.Nath& Co., Educational Publishers,
10. Fundamentals of Solid State Physics –Saxena, Gupta & Saxena, Pragati Prakashan

12. VOCATIONAL COURSES - MODEL II- APPLIED ELECTRONICS

Semester-I

Vocational Course I **Credit-2 (36 hours)**

AE1VOT01: PRINCIPLES OF ELECTRONIC COMPONENTS

Scope: This course is expected to give a familiarization of various electronic components.

Prerequisites: Basic Physics and Mathematics

Module I (12 hours)

Resistors: (6Hours)

Basic Ideas – Resistor Types – Wire wound Resistors – Carbon composition Resistors – Carbon Film Resistors – Metal Film Resistors – Power Rating – Value- tolerance – Variable Resistors – Potentiometers and Rheostat – Fusible resistor – Resistor Colour code –Resistors under 10 Ohm – Resistor troubles – Checking Resistors with an Ohmmeter –Measurement of resistance-Wheststone bridge.

Inductors: (6Hours)

Basic Ideas – Comparison of different cores – Inductance of an Inductor – Mutual Inductance Coefficient of Coupling – Variable Inductors – Series and Parallel combination of inductors – Energy stored – troubles in coils – Reactance – Impedance – Q factor – Power factor and wattless current - Measurement of Inductance-Hay's and Maxwell's bridge.

Basic Electronics – Solid State, B.L. Theraja-S Chand (2005)

Electronic Components, D.V.Prasad- Radiant Publishing House, Hyderabad.

Module II (12 hours)

Capacitance (8Hours)

Basic ideas – Capacitor connected to the battery – Capacitance – Factors controlling capacitance – Types of Capacitors – Fixed Capacitors:- Paper, Mica, Ceramic, Electrolytic – Variable Capacitors:- Gang, Trimmer, Padder - Voltage ratings of Capacitors – Stray circuit capacitance – Leakage Resistance – Series and Parallel combination Capacitors – Energy stored – Troubles in Capacitors – Checking Capacitors with Ohmmeter – Charging of aCapacitor – Capacitor connected across and AC source – Capacitive Reactance – Q factor –Power factor – Measurement of Capacitance-Schering bridge.

Transformers (4Hours)

Principle, Symbols – Mains and isolation transformers – Auto, Audio, IF, RF and Power transformers – Impedance matching – Losses in transformers – Equivalent circuit – Frequency response – Common fault in transformers.

Electronic Instruments and Systems, R.G. Gupta – TMH (2001) Basic Electronics – Solid State, B.L. Theraja-S Chand (2005)

Electronic Components, D. V. Prasad- Radiant Publishing House, Hyderabad.

Module III (12 hours)

Switches and Relays:(9Hours)

Basic ideas: switching actions, momentary contact actions, maintained contact actions – Types of switches: SPST, SPDT, DPST, DPDT, Toggle, rotary-Fuses: General idea, fuse rating – Circuit breaker-Relays: General information, Symbol-Types of relays: electromagnetic, reed relay – Specifications – Application areas.

A text Book of Applied Electronics, R.S. Sedha – S. Chand (2005)

Electronic Components and materials, Madhuri A. Joshi – Wheeler Publishing (1996)

Display Devices: (3 Hours)

LED, LCD, Segmental Displays using LEDs, LCDs.

Electronic Instrumentation (2 Ed.) H.S. Kalsi, TMH (2 Edn)

Semester-I

Vocational Course:II **Credit-2 (36 hours)**

AE1VOT02: ELECTRONIC APPLICATIONS

Scope: This course is expected to provide knowledge of various electronic circuits and its application.

Pre-requisites: Basic Electronics, Physics and Mathematics

Module I

Measuring Instruments (6 Hours.)

PMMC Multimeter – Digital Multimeter– Cathode Ray Oscilloscope (CRO):- Principle – Cathode Ray Tube – Deflection of the Beam – Blanking or Flyback or Retrace-Deflection Sensitivity- Single Trace Oscilloscope – Recurrent Sweep.

Electronic Instruments and Systems, R.G. Gupta – TMH (2001)

Tuning Circuits and Filters: (6Hours)

Resonance in series and parallel LCR circuits – Operating characteristic of a tuning circuit – Q value – Bandwidth – Tuning circuit in radio receivers – Double tuned transformers – direct and indirect coupled circuits – coefficient of coupling – filters: low pass filter-high pass filter

– band pass filter-band stop filter.

Basic Electronics – Solid State, B.L. Theraja-S Chand (2005)

Module II

Time base Circuits: (6Hours)

General features of a time base signal – Types of time base circuits – Methods of Generating a time base Waveform – Exponential Sweep circuit – Sweep Circuit Using Transistor Switch– A Transistor Constant Current Sweep – Miller Sweep Circuit – Bootstrap Sweep Circuit –Current Time Base Generator.

A text Book of Applied Electronics, R.S. Sedha – S. Chand (2005)

Transducers: (6Hours)

General information-LDR-Thermistor –Thermocouple –Photodiode –Phototransistor – LVDT-Piezoelectric transducer, Microphone-moving coil.

Basic Electronics – Solid State, B.L. Theraja-S Chand (2005) Electronic Instrumentation (2 Ed.) H.S. Kalsi, TMH (2006).

Module III

Optical Recording: (4Hours).

Compact Disc – Optical recording of disc -CD playback process – Advantages and disadvantages of compact discs.

Audio and Video Systems, R.G. Gupta – TMH (2002)

Printed Circuit Board and Soldering: (8Hours)

General Information-Types of PCBs-Steps involved in development of PCB using FeCl3 solution- Preparation of layout of simple circuits, transferring the lay out to the board and etching, Advantages of PCB. Soldering and Desoldering Techniques- Solder joint, Dry solder joint, Cold solder joint, Good and bad solder joints, Soldering material, Soldering tools, Soldering iron, Ultrasonic soldering, Advantages of ultrasonic soldering, Tools for desoldering, Desoldering techniques, Soldering techniques.

A text of Applied Electronics, R.S. Sedha – S.Chand (2005)

Electronic Instrumentation and Systems, R.G.Gupta, Tata McGraw-Hill (2004), Chapter-4.

Electronic Components and materials, Madhuri A. Joshi – Wheeler publishing (1996)

Semester-II

Vocational Course:III **Credit-2 (36 hours)**

AE2VOT03: BASICS OF POWER ELECTRONICS

Scope: This course is expected to provide knowledge of various Power Electronic components and its application.

Prerequisites: Basic Electronics, Physics and Mathematics

Module I

Field-Effect Transistors: 12 hours.

Introduction– Types of Field-Effect Transistor. Junction Field-Effect Transistor – Formation of Depletion Region in JFET – Operation of JFET – Characteristics of JFET – Drain Characteristics – Effect of Gate-to-Source Voltage on Drain Characteristics – Transfer Characteristics – Specifications Sheet of JFET – JFET Parameters – Mathematical Expression for Transconductance – Comparison between Junction Field Effect Transistors and Bipolar Junction Transistor

A Text book of Applied Electronics, R.S. Sedha – S. Chand (2005).

Basic Electronics – Solid State, B.L. Thereja-S Chand (2005)

Electronic Devices and Circuits, J.B.Gupta-S.K.Kataria & Sons Module II

MOSFET: 12Hours.

Types of MOSFET – Depletion-Type MOSFET – Working of a Depletion-Type MOSFET – Drain Characteristics of Depletion-Type MOSFET – Transfer Symbol for Depletion

Type MOSFET – Circuit Symbol for Depletion-Type MOSFET – Enhancement-Type MOSFET – Drain characteristics for enhancement type MOSFET - Transfer Characteristics of Enhancement-Type MOSFET – Circuit Symbol for Enhancement type MOSFET – The MOSFET as a Resistor – Advantages of N-Channel MOSFET's Over P-Channel – Complementary MOSFETs (CMOS), Handling Precautions for MOSFET's.

A Text Book of Applied Electronics, R.S. Sedha – S. Chand (2005).

Basic Electronics – Solid State, B.L. Theraja-S Chand (2005)

Electronic Devices and Circuits, J.B.Gupta-S.K.Kataria & Sons

Module III

FET Amplifiers: 12Hours.

Introduction-Biasing the FET- Biasing the JFET-Gate Bias-Self Bias-Setting a Q-Point - Setting a Q-Point Using Load Line – Biasing Against Device Parameter Variation – Voltage Divider Bias – Source Bias – Current Source Bias – Biasing the Enhancement Type MOSFET 's – Biasing the Depletion Type MOSFET 's -The Field –Effect Transistor amplifier-Common source Amplifier-Analysis of Common Source Amplifier-Effect of AC load on amplifier parameters-Effect of external source resistance on Voltage gain, Common Drain Amplifier- Analysis of Common Drain Amplifier-Common Gate Amplifier- Analysis of Common Gate Amplifier

A Text book of Applied Electronics, R.S. Sedha – S. Chand (2005)

Electronic Devices and Circuits, J.B.Gupta-S.K.Kataria & Sons

Semester-II

Vocational Course:IV **Credit-2 (36 hours)**

AE2VOT04: POWER ELECTRONICS

Scope: This course is expected to provide a knowledge of various Power electronic circuits and its application.

Prerequisites: Basic Electronics, Physics and Mathematics

Module I

Thyristors, SCR, Diac, Triac: (14 hours.)

Basic ideas and Types of Thyristors Basic construction of Silicon Controlled Rectifier – SCR biasing – SCR operation – SCR equivalent Circuit- Two transistor model of SCR –

Trigger Current and Trigger voltage- Turning ON & Turning OFF an SCR– V-I characteristics – Forward characteristic – Reverse characteristic – Thyristor Specifications and ratings – Applications. Basic construction of Diac:- V-I characteristic- Applications. Basic construction of Triac:- Operation – V-I characteristic – Applications – Difference between SCR and Triac.

Module II

Uni Junction Transistors, Silicon Controlled Switch: (10 hours.)

Unijunction Transistors (UJT) : Basic construction-Equivalent circuit, Symbol, Intrinsic Standoff ratio- UJT operation. V-I characteristic –UJT Relaxation Oscillator- Applications of UJT. Silicon Controlled Switch(SCS)-SCS operation, V-I characteristics, SCS application. Silicon Unilateral Switch (SUS)- Symbol, Operation, V-I characteristics, Application. Silicon Bilateral Switch (SBS) – Symbol, Operation, V-I characteristics, Application. Silicon Asymmetrical Switch (SAS)- Symbol, Operation, V-I characteristics, Application.

Module III

Controlled Rectifiers: 12 Hours.

Introduction-SCR – Power control using SCR – SCR half wave rectifier – Average values of load voltage and current - 90°Variable Half Wave Rectifier - 180º Variable Half Wave Rectifier – SCR Full Wave Rectifier – UJT Triggered SCR phase control – Triac power control – Diac-Triac Phase Control Circuit – General ideas of Inverters -Single phase inverter– Push-pull inverter.

A Text book of Applied Electronics, R.S. Sedha – S. Chand (2005)

Power Electronics, B.R.Gupta and V.Singhal- S.K. Kataria & Sons

Power Electronics, Dr.P.S.Bimbhra, Khanna Publishers

Semester-III
Vocational Course:V **Credit-4 (54 hours)**

AV3VOT05: MICRO PROCESSOR AND INTERFACING DEVICES

Curriculum and syllabus 2017 admissions onwards

Scope: This course is expected to provide knowledge of Micro Processor and Interfacing Devices

Prerequisites: Basic Electronics, Physics and Mathematics

Module I (34 hours)

Intel 8085(34hours)

Microprocessor Architecture – Intel 8085 – Instruction cycle - Timing diagram – Instruction set of Intel 8085 – Addressing Modes – Status Flags – Intel 8085 Instructions – Simple program for data transfer and arithmetic operations, program branching, looping, using sub routines, Program for finding smallest and largest number, Program for arranging data in ascending and descending order, Delay sub routine.

References: Fundamentals of Microprocessors and Microcomputers – B Ram Pub: Dhanpat Rai Publications (P) Ltd.(6 th Edn.)

Micro Processor Architectures Programming and Applications – R.S. Gaonkar, Pub: Penram International

ModuleII (20hours)

Peripheral Devics

Address space partitioning – Data transfer schemes – Interrupts of Intel 8085 – Programmable Peripheral Interface (PPI) Intel 8255 - Programmable DMA Controller Intel 8257 – Programmable Interrupt Controller Intel 8259

Fundamentals of Microprocessors and Microcomputers – B Ram Pub: Dhanpat Rai Publications (P) Ltd.(6th Edn.)

Micro Processor Architectures Programming and Applications – R.S. Gaonkar, Pub: PenramInternational

Semester-III

Vocational Course:VI **Credit-3 (54 hours)**

AE3VOT06: COMMUNICATION ELECTRONICS

Scope: This course is expected to provide knowledge of various communication systems and its working

Prerequisites: Basic Electronics, Physics and Mathematics

Module I (18 hours)

Communication Systems (6Hours)

Communication Systems- Information, Transmitter, Channel, Noise, Receiver - Modulation- need for modulation.

Electronic Communication Systems- Kennedy & Davis, TMH, 4th Edition. Electronic Devices: Floyd, Pearson , 6th Edition.

Radio waves (12Hours)

Propagation of radio waves: Ground waves, Sky waves, Space waves, Frequency and band allocation- ionospheric influence on radio waves. Terms relating sky wave communication, skip distance, maximum usable frequency, Single and multihop transmission, Fading.

Electronics: Fundamentals and Applications- D. Chattopadhyaya , P.C.Rakshit, Newage- Revised 6th edition.

Module II (18 hours)

Modulation and Demodulation (7Hours)

Modulation and Demodulation: Amplitude modulation- Modulation index, Frequency spectrum, Sidebands, Power in AM wave, Amplitude modulation generation. Frequency modulation- Modulation index, Generation of FM wave, Reactance modulator, Voltage controlled oscillator.

Wave detectors (11Hours)

Detection of AM wave- Diode detector (qualitative) - Detection of FM waves- Slope detector, phase discriminator, Pre emphasis, De emphasis - Comparison between AM & FM Pulse modulation-Analog & digital Pulse modulation, Basic idea of Pulse amplitude

modulation (PAM), Pulse width modulation (PWM) & Pulse position modulation (PPM) - Radio Receivers- Super heterodyne AM receiver & Super heterodyne FM receiver (Explanation with block diagram).

Electronics: Fundamentals and applications- D. Chattopadhyaya , P.C.Rakshit, Newage- Revised 6th edition.

Electronic Communication Systems- Kennedy & Davis, TMH, 4th Edition. Electronic Devices: Floyd, Pearson , 6th Edition.

Module III (18 hours)

Antenna Television and Radar (12Hours)

Antenna – Half-wave dipole – Antenna parameters – Dipole antenna with reflector and director – Yagi-Uda Antenna – T.V. Scanning, Colour TV –Luminance, hue and saturation- Colour signal Transmission, Modulation of colour difference signals, Weighting factors, Formation of Chrominance Signal, PAL Colour T.V. System, PAL-D Colour system, PAL-D Colour Receiver, Merits and Demerits of the PAL system. Principles of radar, Radar range equation, Basic pulsed radar set, Applications of radar.

Forms of communication systems (6Hours)

Other communication systems: Satellite communication- Microwave communication- Mobile communication- Cellular mobile communication (Basic ideas only).

Electronics: Fundamentals and applications- D. Chattopadhyaya, P. C. Rakshit, Newage- Revised 6th edition.

Monochrome and Colour Television, R.R. Gulati- New Age International (P) LTD, Publishers.

Semester-IV

Vocational Course: VII **Credit-4 (54 hours)**

AE4VOT07: LINEAR INTEGRATED CIRCUITS

Scope: This course is expected to provide knowledge of various Linear Integrated Electronic circuits and its application.

Prerequisites: Basic Electronics, Physics and Mathematics

Module I (18 hours)

Operational Amplifiers: 18 Hours.

Introduction – Operational Overview – Op-Amp supply voltages – IC Identification – Packages – Parameters. Op-amp as an Voltage Amplifier-Inverting Amplifier – Non inverting amplifier –inverting–Voltage follower(buffer) – Summing Amplifier – Differential Amplifier- Op. Amp frequency response – Frequency versus gain Characteristics

A Text book of Applied Electronics, R.S. Sedha – S. Chand (2005). Electronic Devices and Circuits, J.B.Gupta-S.K.Kataria & Sons

Linear Integrated Circuits, M.P.A.Jaleel-Maliyakkal Publishers, Calicut.

Module II (18 hours)

Op-amp Applications: 18Hours.

Comparators- Integrator – Differentiator – Audio amplifier – High Impedance, Voltmeter – Op-Amp based oscillator circuits: Wein Bridge Oscillator – Colpitts Oscillator, Crystal Oscillator, Triangular wave Oscillator, Voltage-Controlled Saw tooth Oscillator, Square Wave Relaxation Oscillator. Active Filters: Low-pass Filters, High Pass Filters, Band Pass Filters, Notch Filter

A Text book of Applied Electronics, R.S. Sedha – S. Chand (2005) Electronic Devices and Circuits, J.B.Gupta-S.K.Kataria & Sons

Op-Amps and Linear Integrated Circuits, Ramakant.A.Gayakwad-PHI(2004) Linear Integrated Circuits, M.P.A.Jaleel-Maliyakkal Publishers, Calicut.

Module III (18 hours)

IC Timer (555): 9Hours.

Monostable Multivibrator – Applications, Astable Multivibrator – Applications, Bistable Multivibrator – Applications, Schmitt trigger – Applications, VCO

Phase – Locked Loops (PLL): 9Hours.

Operating Principles – Phase Detector – Low –Pass Filter – VCO – monolithic PLL

References:

Op-Amps and Linear Integrated Circuits, Ramakant.A.Gayakwad-PHI (2004) Electronic Devices and Circuits, J.B.Gupta-S.K.Kataria & Sons

Linear Integrated Circuits, M.P.A.Jaleel-Maliyakkal Publishers, Calicut.

Semester-IV

Vocational Course: VIII **Credit-3 (54 hours)**

AE4VOT08 APPLICATIONS OF MICROPROCESSORS

Scope: This course is expected to provide knowledge of architecture and applications of Microprocessors

Prerequisites: Basic Electronics, Physics and Mathematics

Module I

Applications of Intel 8085 (12Hours)

7 segment LED display – Temperature measurement and control- Stepper Motor – Traffic control – Generation of square wave or pulse using I/O Port.

Fundamentals of Microprocessors and Microcomputers – B Ram Pub: Dhanpat Rai Publications (P) Ltd. (6th Edn.)

Module II

Micro Controller 8051 (10Hours)

Microprocessors and Microcontrollers – Comparison –The Z 80 and the 8051 – A Microcontroller survey – Four bit, Eight bit, Sixteen bit, Thirty Two bit microcontrollers – Development system for microcontrollers.

The 8051 Microcontroller, Architecture, Programming & Applications-Kenneth J Ayala –

Second Edition

Module III

The 8051 Architecture (32Hours)

Introduction – 8051 Microcontroller hardware – The 8051 Oscillator and Clock – Program Counter and Data Pointer – A and B CPU Registers – Flags and the Program Status Word (PSW) – Internal Memory – Internal RAM – The Stack and the Stack Pointer – Special Function Registers – Internal ROM – Input/output Pins, Ports, and Circuits – Port 0 – Port 1– Port 2 – Port 3 - External Memory – Connecting External Memory – Counter and Timers –Timer Counter Interrupts – Timing – Timer Modes of Operation – Counting – Serial DataInput/output – Serial Data Interrupts – Data Transmission – Data Reception – Serial Data Transmission Modes – Interrupts – Timer Flag Interrupt – Serial Port Interrupt – External Interrupts – Reset – Interrupt Control – Interrupt Priority – Interrupt Destinations – Software– Generated Interrupts

The 8051 Microcontroller, Architecture, Programming & Applications-Kenneth J Ayala –

Second Edition

VOCATIONAL COURSES (1): APPLIED ELECTRONICS-PRACTICAL

SEMESTER 1 & 2

Vocational Practical I: AE2VOP01 (Minimum 14 experiments)

1. Familiarization of passivecomponents
2. Familiarization of activecomponents
3. Familiarization ofCRO
4. PCB layout and fabrication (Hartley, Colpitt's oscillators, RC coupledamplifier)
5. Zener DiodeCharacteristics
6. RC Integrator (Design – Set up – Its response to pulses or squarewaves)
7. RC Differentiator (Design-Set up-its response to pulses or squarewaves)
8. RC low pass filter (Study the frequencyresponse)
9. RC high pass filter (Study the frequencyresponse)
10. Photo diode–Characteristics
11. Solderingpractice
12. Construction & study of regulated power supply using regulator IC's 78xx 79xx Line regulation(for a given full load) and loadregulation
13. JFET characteristics (Static drain characteristics – Calculation ofparameters)
14. UJTcharacteristics
15. SCR.Characteristics
16. DIACCharacteristics
17. TRIACCharacteristics
18. UJT relaxationOscillator
19. Common emitter amplifier design and construction. (a) Study the influence the biasingresistorsonD.Coperatingpoint.(b)Variationofgainwithcollectorresistor. (c) Measure the gain with and without the bypass capacitor
20. Common source JFETamplifier

References:

1. *Electronics Lab Manual, Vol 1 and 2, K.A. Navas – RajathPublishers*
2. *Digital Electronics Theory and Experiments, Virendra Kumar-New Age International Publishers.*
3. *Electronics Laboratory Primer, Poorna Chandra and B. Sasikala – S.Chand*

SEMESTER 3 and 4

Vocational Practical II: AE4VOP02 (Minimum 14 experiments)

1. Op-amp – Square Wave Generator
2. Op-amp – First Order Low Pass Filter (Design, Construction, Study)
3. Op-amp – First Order High Pass Filter (Design, Construction, Study)
4. Op-amp – Pulse Width Modulation
5. Op-amp – Digital/Analog Converter
6. Op-amp – A /D Converter
7. Op-amp –Summing Amplifier
8. OP-Amp – inverter, non inverter, buffer for A.C input voltages
9. Decade Counter (BCD Counter) (IC 7490)
10. Bistable multivibrator using IC 555
11. µP – Conversion of 8 bit binary to BCD/BCD to binary
12. µP – Square of a number
13. µP – Square root of a number
14. µP – Multi byte decimal addition
15. µP – Largest among the set of numbers
16. µP – Smallest among the set of numbers
17. µP – Hex number to ASCII Hex Code conversion
18. µP – ASCII Hex Code to Hex number conversion
19. µP – Binary to BCD conversion
20. µP – BCD to Binary conversion

References:

1. *Electronics Lab Manual, Vol 1 and 2, K.A. Navas – Rajath Publishers*
2. *Digital Electonics Theory and Experiments, Virendra Kumar-New Age International Publishers.*
3. *Electronics Laboratory Primer, Poorna Chandra and B. Sasikala – S. Chand*

Vocational Practical III: AE4VOP03 (Minimum 14 experiments)

1. Amplitude Modulator (Set up – Study using CRO)
2. Demodulator (Set up – Study using CRO)
3. IF Tuned amplifier (Frequency response)
4. Mixer Circuit for 455Hz (Design and set up)
5. Frequency modulation using IC 555
6. Pulse width modulation using IC 555
7. Construction of VCO using PLL (IC 565)
8. FM using PLL (IC 565)
9. LED- Characteristics
10. LDR- Characteristics
11. PhotoDiode-Characteristics
12. OptoCoupler- Characteristics
13. µP – Move a block of data from one section of memory to another
14. µP – Square from look up table
15. µP – 16 bit multiplication
16. µP – Sorting (ascending order)
17. µP – Sorting (descending order)
18. µP – Factorial of a number
19. µP – Counting the number of occurance
20. µP – Decimal counter to count 00to99
21. µP – Generation of pulse waveform
22. µP – Stepper motor interface

Reference:

Electronics Lab Manual, Vol 1 and 2, K.A. Navas – Rajath Publishers

Fundamentals of Microprocessors and Microcomputers – B Ram Pub: Dhanpat Rai Publications (P) Ltd.(6th Edn.)

13. VOCATIONAL COURSES - MODEL II - COMPUTER APPLICATIONS

Vocational Paper I: CA1VOT01 - COMPUTER FUNDAMENTALS

Credits – 2 **No. of contact Hours. –36**

Scope: This course provides the basic knowledge about computers.

Prerequisites: Basic Mathematics, Fundamentals of Electronics.

Module I – (10 Hours.)

Fundamentals of Computers:
Evolution of Computers: Abacus, Napier's Logs and Bones, Mechanical Calculators, Babbage's Engines, Hollerith's Machine, Generation of Computers, Purpose of using computers. Data & Information, Characteristics of a Computer, Capabilities & Limitations of Computers. Type of Computers: Analog-Digital-Hybrid. Classification based on memory size: Micro, Mini and Mainframes, Supercomputers.

Module II – (6 Hours.)

Basic Computer Organization and Number System
Basic Organization & Working of a Computer: Arithmetic Logic unit-Control unit-Central Processing unit.
Number system arithmetic – octal addition, octal Subtraction, hexadecimal addition, hexadecimal subtraction
Computer Codes (BCD, EBCDIC, ASCII), BCD Addition

Module III - (10 Hours.)

Components of a Computer
Input unit: Different types of Keyboards, Mouse and its working, Joystick, Trackball, Scanner: Flat bed, Sheet-fed and Hand-held scanners, Graphic Tablets, Light Pen
Output unit: Working of monochromatic and color CRT, LCD Panel, Plotters, Audio output devices, Printers – Working of Dot Matrix, Laser, Inkjet, Color Thermal printer
Motherboard, Expansion Buses, BIOS
Storage unit: Primary Memory-RAM, ROM, PROM, EPROM and EEPROM, Cache Memory Secondary Memory-Magnetic storage devices, Optical storage devices, Semiconductor memory.

Module IV – (10 Hours.)

Software Components and Computer Languages:

What is software, Relation between Hardware and Software?

Types of Software:

System software: Operating System, Language Translators- Assembler, Compiler & Interpreter

Application software: General Purpose Application Software, Customized Application software.

Utility Software: Antivirus, Disk Defragmenter, Backup Software, Compression Software

Classification of software based on license: Proprietary, Shareware, Freeware, Open source, Free Software

Computer Languages-Machine Language, Assembly Language, High-Level Language, Define program, purpose of program, flowcharts, flowchart symbols, flowcharting rules, advantages and limitations of flowcharts

Book of Study

1. *Computer Fundamentals sixth edition by P.K Sinha,BPB Publications*
2. *Fundamentals of Computers, V Rajaraman, Prentice-Hall of India, New Delhi.*

Reference Books

1. *Introduction to Computer Science 2nd Edition, Rohit Khorana, Pearson Publishers*
2. *An introduction to Digital Computer design by V. Rajaraman and T. Radhakrishnan*
3. *Computer fundamentals by B. Ram*
4. *A First Course in Computers 2003, Saxena, VIKAS*

Vocational Paper II: CA1VOT02 - COMPUTER NETWORKS & INTERNET TECHNOLOGIES

Credits – 2 **No. of contact Hours. –36**

Scope: This course is expected to provide knowledge of various networking technologies and its applications.

Prerequisites: Basic mathematics, Fundamentals of Computers.

Module I: (8 Hours.)

Computer Networks: Introduction to computer network, data communication, Components of data communication, data transmission mode, Network topologies, LAN, MAN, WAN, Client Server Model- Peer-to-Peer, Uses of networks

Module II: (10 Hours.)

Transmission Media: Introduction, Guided Media: Twisted pair, Coaxial cable,Optical fiber. Unguided media: Microwave, Radio frequency propagation. LAN Topologies: Ring, bus, star, mesh and tree topologies.Network Devices: NIC, repeaters, hub, bridge, switch, gateway and router, Multiplexing – FDM, TDM, WDM

Module III: (11 Hours.)

Network Models: The OSI Model- Layers -Physical Layer, Data Link Layer, Network Layer, Transport Layer, Session Layer, Presentation Layer, Application Layer. TCP/IP Protocol suite-Physical and Data Link Layer, Network Layer, Transport Layer, Application Layer.

Module IV: (7 Hours.)

INTERNET- Basics of internet, features of internet, E-mail, Email Architecture, SMTP, POP,IMAP, WWW Architecture, URL, File transfer, The TELNET, Gopher, Web server, Web Browser.

Book of study

1. *Andrew S. Tanenbaum, David J. Wetherall Computer Networks (5th Edition),PHI, 2010*
2. *Forouzan, Data Communication and Networking, TMH,2003.*

Reference Books:

1. *Computer Networking: A Top-Down Approach 5th Edition, by James F Kurose*
2. *Computer Networks- A system approach, by Peterson*

Semester II

Vocational Paper III: CA2VOT03 - WORD AND DATA PROCESSING PACKAGES

Credits – 2 **No. of contact Hours. –36**

Scope: This course provides the detailed knowledge of Word and data processing software's

Prerequisites: Basic Computer Knowledge.

Module I

MS Word: (12 Hours.)

Word Processing Package: MS-Word: Introduction; Features- Word User Interface Elements; Creating new Documents; Basic editing, Saving a Document; Printing a

Document; Print Preview, Page orientation – Viewing Documents; Setting tabs- Page Margins; Indents; Ruler, Formatting Techniques; Font Formatting, Paragraph Formatting; Page Setup; Headers & Footers; Bullets & Numbered List; Borders & shadings; Find & Replace; Page Break & Page Numbers; Mail Merging ; Spelling & Grammar Checking; Thesaurus; Automating Documents; Macros; Tables- Side by Side & Nested Tables; Formatting Tables; Word Art, E-mail editor

Module II

PageMaker (12 Hours.)

Desktop Publishing: PageMaker: Introduction to Desktop Publishing as a Process- Advantages of PageMaker- PageMaker User Interface Elements; Creating new Documents - PageMaker Tools & Palettes-Master Pages- Page Setup, Page Orientation, Inserting Pages, Removing Pages; Headers & Footers, Page Number - Working with objects- Type Styling Options- Working with text-Formatting Options: Leading, Margins & indents- Scaling Text- Changing Line Specifications, Changing Fill Specifications, Fill & Stroke-Paragraph Formatting Options- Working with Grids- Creating Frames-Adding Graphics to a Frame- Layers- Creating a new layer, moving an object to another layer, hiding layers, locking layers, deleting layers

Module III

MS Excel: (12 Hours.)

Spreadsheet package: MS-Excel Introduction, Excel User interface, working with cell and cell addresses, Selecting a range, Moving, Cutting, Copying & Paste, inserting &deleting cells, freezing cells, adding deleting & copying worksheet within a workbook, Renaming a worksheet. Cell formatting options-Formatting Fonts, Aligning, Wrapping and Rotating Text, Using Borders, Boxes and Colors, Centering a heading, Changing row/column and height/width, Formatting a work sheet automatically, Insert Comments, Clear contents in a cell, using Print preview, Preparing worksheet for the printer, Selecting Print area, Margin and Orientation, Centering a worksheet, Using header & Footer, inserting page breaks, creating list, sorting data, Logical &

Mathematical functions in excel, Linking data between work sheets, pie chart, converting a pie chart on a webpage, Use of Pivot Tables

References

1. *An Introduction to Business Data Processing, Sardino, Prentice Hall.Microsoft Office 97, Ned Snell, PustakMahal, New Delhi.*
2. *Windows and MS Office 2000 with Database Concepts, N Krishnan, Scitech Publications Pvt. Ltd, Chennai.*
3. *Adobe PageMaker 7.0 (Illustrated Series: Complete) by Kevin Proot.*
4. *Discovering Computers and Microsoft Office 2010: A Fundamental Combined Approach (Shelly Cashman Series) by Gary B Shelly and Misty Vermaat*
5. *PageMaker(r) 7: The Complete Reference(Paperback) Carolyn Connally*
6. *PageMaker for Macintosh and windows David D Busch BPB Publications*.

Vocational Paper IV: CA2VOT04 - PROGRAMMING IN ANSI C

Credits – 2 **No. of contact Hours. –36**

Scope: To gain the skills of Programming and to learn the programming concepts in C Language.

Prerequisites: Basic mathematics, basic computer knowledge.

Module-I: (8 Hours.)

Basic concepts of programming. Language classification. Steps in developing a program, Algorithm and flowchart. C language basics: C character set, tokens, Identifiers and keywords, Data types, constants, variables, declarations, qualifiers-long, short and unsigned declarations, expressions, symbolic constants, Input and output operators/functions , compound statements, arithmetic operators, unary operators, relational and logical operators, assignment operators, increment and decrement operators, conditional operators.

Module -II: (10 Hours.)

Decision making and Branching: If statement, if else statement, nested if...else statement, Else if ladder, switch statements, looping - for loop, while loop, do..while statements, nested loop structure, break, continue and go to statements, scope of variables.

Module -III: (8 Hours.)

Arrays one dimensional and two dimensional arrays, initializing, reading, writing, strings, string functions, Library functions: Math.h, Conio.h and Stdio.h.

Module -IV: (10 Hours.)

User defined functions - Elements of functions, different arguments, Return values and their types, Function declaration, Function calls, different types /category of functions. Recursive functions, Call by value and reference methods.

Book of study:

1. *Programming in ANSI C – E Balaguruswamy - Mc GrawHill Education*

References:

1. *Mastering C – K R Venugopal& S R Prasad – Mc GrawHill Education*
2. *Programming in C – Ashutosh Pandey – Cyber Tech Publications*
3. *Let Us C – YashavantKanetker – BPB Publications*

Semester III

Vocational Paper V: CA3VOT05 - CONCEPTS OF OBJECT ORIENTED PROGRAMMING

Credits – 4 **No. of contact Hours. – 54**

Scope: This course is expected to provide sound knowledge in object oriented programming.

Module I: (9 Hours.)

Basic concepts of Object Oriented Language

Basic concept of object oriented programming- benefits of OOPs- A simple C++ programme, structure of C++ program. Basic data types and declarations, symbolic constants- Reference by variables, operators in C++, Special Assignment Expressions, operator precedence and associatively, control structures- function in C++ - the main

function, function prototyping- call by reference- return by reference- inline function Default argument,- function overloading – friend and virtual function.

Module II: **(12 Hours.)**

Classes and Objects

Specifying a class- Defining member functions- nesting of member functions – private member functions – arrays within a class – Memory allocation for object- static data members – static member functions – arrays of objects – friendly functions.

Module III: (10 Hours.)

Constructors and Destructors

Constructors- parameterized constructors-multiple constructors- copy constructor-dynamic constructor, Destructors.

Module IV:

Inheritance and operator overloading (12 Hours.)

Operator overloading- Defining operator overloading-Overloading unary and binary operators-Inheritance- Defining derived classes- single, multiple, multilevel, hierarchical and hybrid inheritance - virtual base classes.

Pointers, Virtual Functions and Polymorphism (11 Hours.)

Pointers- Declaring and initializing pointers, Manipulation of pointers, Arrays of pointers, Dynamic memory allocation, Pointers and strings, Pointers to functions, Virtual functions, pure virtual function

Book of Study:

1. *E. Balagurusamy , Object Oriented Programming with C++, Fifth edition, McGraw Hill publications*
2. *Object-Oriented Programming in Turbo C++, Robert Lafore, Galgotia.*

Reference:

1. *Mahesh Bhave and Sunil Pateker Object Oriented Programming with C++, Second edition, Pearson*
2. *Ashok N Kamthane and Amit Ashok Kamthane, Programming in C++, Second Edition, Pearson*.

Vocational Paper VI: CA3VOT06 - OPERATING SYSTEM

Credits – 3 **No. of contact hours – 54**

Scope: This course provides a basic knowledge about the role of Operating System in the functioning of computers

Prerequisites: Basic knowledge of computer fundamentals and computer networks

Module I (10 Hours.)

Introduction to operating system:

Operating System: Objectives and functions; Different views of an operating system; Types of operating systems-batch OS, mainframe OS, time sharing OS, multiprocessor OS, personal computer OS, handheld computer OS, embedded OS, real-time OS, Operating system services

Module II (8 Hours.)

Processes management:

Process concept- The process, Process states, Process Control Block; Process Scheduling- Scheduling Queues, Schedulers;

Module III (18Hours.)

CPU Scheduling:

Scheduling concepts- Process behavior, When to schedule, Dispatcher; Scheduling Criteria; Scheduling algorithms-

CPU Scheduling Problems

First Come First Serve (FCFS)-Shortest Job First (SJF) - Priority Non Preemptive (P-NP)-Shortest Remaining Time First (SRTF)-Priority Preemptive - Round Robin (RR)

Module IV (18 Hours.)

Memory Management Basics:

Basic ideas-Memory Management requirements, Address binding, Dynamic address space binding, Fixed partition memory strategies, Variable partition memory strategies,

Dynamic Storage allocation problems: First Fit, Best Fit, Worst Fit, Next Fit, Fragmentation, Swapping, Virtual memory, Page Replacement problems- FIFO, LRU and Optimal replacement

Deadlock:

Introduction, deadlock characterization-deadlock conditions, resource allocation graph; deadlock prevention.

File systems: Files- Basic concept- file attributes, file operations, file types, file structures, file access

Book of Study:

1. *RohitKhurana, Operating System, 2nd edition,Vikas Publishing house pvt ltd.*
2. *EktaWalia, Operating Systems Concepts, Khanna Book Publishing.*

References:

1. *Silberschatz, galvin, gagne, Operating System Concepts, 6th edition.*
2. *Gary Nutt, NabenduChaki, SarmishthaNeogy, Operating Systems, 3rd edition, Pearson.*

Semester IV

Vocational Paper VII: CA4VOT07 - VISUAL BASIC PROGRAMMING

Credits – 4 **No. of contact hours – 54**

Scope: This course is designed to provide basic ideas of VB programming

Prerequisites: Basic knowledge of computer fundamentals and computer programming.

Module I

Introduction (12 hours)

VB Introduction-VB Developing Environment – VB Menu Bar –Toolbars –Project Explorer- Tool Box-Form Designer-Form Layout.

Visual Basic Program Elements: Variables, Data Types, Scope and Lifetime of Variables, Declaring and using Constants; Operators – Arithmetic Operators, Relational or Comparison Operators, Logical operators; User Defined Data Type, Arrays, Multi-dimensional Arrays, Dynamic Arrays, Comments in VB.

Control Flow Statements- if ....then, if...then...else, select case; Loop Statements- do loop, for next, for each next; Input Box and Message Box functions

Using intrinsic controls (10 hours)

Pointer – Label – Frame – Check box – Combo box – Scroll Bar – Timer – Dir list box – Shapes – Image – OLE – Picture box – Text box – Command button – Option button – List box – Drive List Box-Directory List Box-File List Box-Shape Control & Line Control-Horizontal Scroll bar – Vertical Scroll Bar-Adding check box controls – Adding combo box– Standard MDI form features – Building the MDI form.

Module II

Methods, Properties, and Events (14 hours)

Learn about properties and how to manage them – Discover how to call methods –Learn how Visual Basic enables program to respond to events, System Events and User Events.

Debugging Window- Immediate Window, Locals Window, Watch Window, Quick Watch Window, Call Stack Window, creating a toolbar in VB

Module III

Functions and File Handling (8 hours)

Control Arrays, Procedures, Event Procedure, General Procedures-Sub Procedures, Functions; Arguments to functions or sub procedures, Passing arguments by reference and value, Optional arguments , Using named Arguments, Exiting Procedures, Event-Driven Programming, String Functions

Module IV (10 Hours.)

File Handling

File Handling-File, Field, Records, Sequential Access Files, Opening and closing of Sequential Access Files, Editing (Reading & Writing) Files opened for Sequential Access, Random Access Files, Opening and closing of Random Access Files, Editing (Reading & Writing) Files opened for Random Access, Deleting records in Random Access- Binary

Access Files, Opening and closing of Binary Access Files, Editing (Reading & Writing) Files opened for Binary Access, Deleting records in Binary Access

Reference Books:

1. *Visual Basic 6 - Clayton Walnum, Prentice- Hall of India, New Delhi.*
2. *Microsoft Visual Basic 6.0 Professional: Step by Step by by Halvorson*
3. *Visual Basic 6.0, N Krishnan and N Saravanan, Scitech Publications, Pvt Ltd, Chennai.*
4. *Programming With Visual Basic 6.0 by M. Azam*

Vocational Paper VIII: CA4VOT08 - WEB DEVELOPMENT AND PHP PROGRAMMING

Credits – 3 **No. of contact hours – 54**

Scope: This course is designed to provide basic ideas of HTML, JavaScript and MYSQL

Prerequisites: Basic knowledge of computer fundamentals and computer programming.

Module I

HTML & CSS (18 hours)

Basics of HTML:- Html tags, HTML Editors, HTML Documents, Heading Tags, Paragraph Tags, Centering Contents, HTML Elements, frames element, marquee text,

HTML Attributes:- lang, href, size, align, valign, bgcolor, background, width, height, title

HTML styles, HTML symbols, HTML layout, HTML Text formatting elements, HTML comments, HTML Links, Anchor, HTML elements, HTML Tables, HTML List, HTML Block elements, HTML head, HTML forms, GET & POST Methods, Form Attributes, Organization of HTML Document, Creating a webpage using html, HTML editors (Microsoft Front page, dream weaver), Introduction to HTML Web server (IIS - Internet Information Server, PWS - Personal Web Server).

CSS:- Basics, Syntax, CSS Comments, CSS Selectors, External style sheet, Internal style sheet, Inline style, CSS Text

Module II

JavaScript (12 hours)

Basics, Static webpage, Dynamic webpage, Advantages & Limitations of JavaScript, JavaScript Development Tools, External JavaScript, JavaScript Output, JavaScript Data Types, Variables and its scope, JavaScript Reserved Words. JavaScript Operators, Conditional Statements-if statement, if...else statement, if...else if... statement, Switch statement, JavaScript Loops:- while loop, for loop, do-while loop, for-in loop, break & continue statements, various mouse and keyboard events

Module III

PHP& MYSQL (15 hours)

The Structure of PHP- Using Comments, Basic Syntax, Variables, Operators, Variable Assignment, Multiple-Line Commands, Constants, Predefined Constants, The Difference Between the echo and print Commands, Functions, Variable Scope. Conditional Statements-if statement, if...else statement, if...else if...else statement, Switch statement, PHP Loops:- while loop, for loop, do-while loop, for each loop, break statement, functions, arrays, super globals, PHP sessions and cookies, PHP file handling.

Module IV

Implementing MYSQL using PHP (9 Hours.)

Introduction, Database, opening a connection, closing a connection, Create Database, drop database, select database, MYSQL Data types, tables, Drop tables, insert, select tables, Where clause, update, delete records, Like clause, Order By, Joins, alter, dropping adding or repositioning a column,

References

1. *Learning Web Design 2nd Edition by Jennifer Niederst*
2. *DHTML and JavaScript by Gilorien*
3. *PHP and MySQL for Dynamic Web Sites: Visual QuickPro Guide by Larry Ullman*
4. *HTML & CSS: The Complete Reference, Fifth Edition by Thomas Powell*
5. *HTML and CSS: Design and Build Websites by Jon Duckett*
6. *PHP: The Complete Reference by Steven Holzner*
7. *Learning PHP, MySQL & JavaScript with j Query, CSS & HTML by Robin Nixon*

VOCATIONAL SUBJECT COMPUTER APPLICATIONS PRACTICAL SYLLABUS

SEMESTER I& II

Vocational Practical 1

CA2VOP01: INTRODUCTION TO COMPUTERS & ANSI C PROGRAMMING

1. Introduction to various hardware components of a computer.
2. Preparation and printing of a simple document using DOS TEXT Editor.
3. Development of a batch file to copy the contents of a text file into another text file.
4. Development of a batch file to create a directory named “Computer” and any two subdirectories inside “Computer
5. Development of a batch file to copy all files from a source drive to a target drive.
6. Development of a batch file to copy all the files, directories and all hidden files (if any) from one disk to another identical disk.
7. Development of a batch files to rename any existing directory by giving a new name with all possible error messages.
8. Composing and sending an E-Mail message.
9. Program to find the sum and average of n numbers.
10. Obtain roots of a quadratic equation in all possible cases.
11. Program that read a four digit number from keyboard and then prints it in reverse case.
12. Program to compute x to the power n using for loop.
13. Program to calculate the standard deviation of an array of values. The array elements are read from terminal. Use function to calculate standard deviation and mean.
14. Program to read the elements of the given two matrices of order n x n and to perform the matrix multiplication.
15. Program to print the first n Fibonacci numbers using function.
16. Program to find the sum of the following series using a function declaration. Sum = $x - x^3/3! + x^5/5! - x^7/7! + \ldots x^n/n!$. Where n and x are entered from the keyboard.
17. Program that uses a function to sort an array of integers.
18. Program to reverse a string without using string function

19. Program to find the length of the given string without using string function
20. Program to print prime numbers within a range.
21. Program to print the following pattern by using any loop. Range of star (*) must be entered from keyboard.

    *

    **

    ***

References

1. *Operating systems Gary Nutt 3rd Edn. Pearson.*
2. *Microsoft MS-DOS User's Guide & Reference.*
3. *Programming in ANSI C – E Balaguruswamy - Mc GrawHill Education*
4. *Visual Basic 6 - Clayton Walnum, Prentice- Hall of India, New Delhi.*

SEMESTER III & IV

Vocational Practical II

CA4VOT01 - DATA PROCESSING PACKAGES, OPERATING SYSTEM & VISUAL BASIC PROGRAMMING

(Minimum 14 experiments)

1. Implement the concept of First Come First Serve (FCFS) using C or C++
2. Implement the concept of Shortest Job First (SJF) using C or C++
3. Implement the concept of First Fit algorithm.
4. Create a worksheet which contain Employee no, Emp. name, Salary, department, Designation. Calculate the gross salary. Gross Salary = (Salary+HRA+DA) - PF. HRA = 50% of salary, DA = 30% of salary, PF = 10% of salary. Extract all employees who are managers. Extract all the employees whose salary is between 20000 and 40000. List the total salary and gross salary in each department.
5. Create the following work sheet. Marks of 4 subjects of 15 students and calculate the total mark, Average mark, Result and Grade. Sort the total marks in the descending order. All the numeric fields in the left alignment. Centralize the name of the Institute that you are studying.
6. Create a work sheet for preparing merit list for BSc admission in your college.
7. Create two documents using MS WORD exactly the way they are seen.

8. Create a document and type 30 lines in it. Spell-check the document and create five AutoCorrect entries on your own. Then create five Auto text entries. Print only the current page of the document.
9. Create a file, inviting your friends to a dinner. Use the Mail Merge facility so that you do not have to re-type the letter with their names and addresses.
10. Create two documents using PageMaker exactly the way they are seen.
11. Create two documents using PageMaker. Change its character width, indents, space around paragraphs; add special characters, figures, tables etc.
12. Design a text book cover page with title and pictures using page maker.
13. Create a VB project that will display pictures in a PictureBox and ImageBox controls, when the user click display button
14. Using a text box and a command button in the form, enter a number in the text box and on clicking on command button display whether the number a single, two or three-digit number in a message box.
15. Create a project to change the shape of a shape control at the interval of one second using Timer control.
16. Create an event procedure to convert a text from lowercase to uppercase.
17. Create a function procedure to calculate the sum of “n” Fibonacci numbers
18. Create a function procedure to find simple interest.
19. Create a program to accept a number and print it in the reverse order.
20. Create a program to accept a set of numbers and find the largest and smallest number.
21. Create a program to count the number of vowels in a string and replace with ‘*’ symbol.
22. Create a program to check whether a given string is palindrome or not.
23. Create a function procedure to find prime numbers within a range
24. Implement traffic system demonstration

References

1. *E. Balagurusamy , Object Oriented Programming with C++, Fifth edition, McGraw Hill publications.*
2. *Visual Basic 6 - Clayton Walnum, Prentice- Hall of India, New Delhi.*
3. *Operating systems Gary Nutt 3rd Edn. Pearson.*
4. *Discovering Computers and Microsoft Office 2010: A Fundamental Combined Approach (Shelly Cashman Series) by Gary B Shelly and Misty Vermaat*

Vocational Practical III

CA4VOP03: C++ PROGRAMMING & WEB DEVELOPMENT

(Minimum 14 experiments)

1. Write a function called reversit() that reverses a string (an array of char). Use a for loop that swaps the first and last characters, then the second and next –to-last characters, and so on .The string should be passed to reversit() as an argument. Write a program to exercise reversit().The program should get a string from the user, call reversit(), and print out the result.
2. A program to perform simple arithmetic operations of two complex numbers using operator overloading.
3. Create a class called employee that contains a name and an employee no: Create another class called scientist that inherits the properties of employee and it contains the function for entering the name of the award he gets and display it. Create objects for class scientist that contain their name, no and the award they get. Implement single inheritance.
4. Imagine a publishing company that markets both book and audio-cassette versions of its works. Create a class “publication” that stores a title (a string) and price (type float) of a publication. From this class derive two classes; “book”, which adds a page count (type int); and “tape”, which adds a playing time in minutes (type float). Each of these three classes should have a getdata() function to get its data from the user at the keyboard, and a putdata() function to display its data. Write a main() program to test the “book” and “tape” classes by creating instances of them, asking the user to fill in their data with getdata(), and then displaying the data with putdata().
5. Declare a class to represent bank account of 10 customers and the following data members: Name of the depositor, Account Number, Type of Account (S for saving and C for current Account), Balance Amount. The class also contains the following member functions. a). To initialize data members, b) To deposit money. c) For withdrawal of money after checking the minimum balance (minimum balance is Rs1000) d) To display the data members.
6. A program to concatenate using two strings into one string using a pointer method.

7. Write a program that read a group of numbers from the user and places them in an array of type float. Once the numbers are stored in the array, the program should average them and print the result. Use pointer notation wherever possible
8. Program to find Armstrong numbers within a range.
9. Write any program to implement the concept of friend function.
10. Write an HTML code for a webpage for your college with the following details and features
    - A heading followed by a paragraph of 5 sentences about your college using text formatting tags and attributes.
    - Provide yellow color to the background of the page.
    - Include an image of the college.
    - Include a marquee that "Admission for the new academic year commences on 1st June"
11. Write an HTML code to display an online application form for BSc admission. The application form must contains columns for name, address, parent's name, age, sex, caste, marks, photo etc.
12. Write an HTML code to create a list of 3 bikes of your choice in a frame. Link each one to display the description with a picture in another frame.
13. Create an HTML document with following formatting – Bold, Italics, Underline, Color, Headings, Title, Font and Font Width, Background, Paragraph, Line Brakes, Horizontal Line, Blinking Text as well as marquee Text.
14. Develop a website to display an email login page. The page must contain one text box for entering the username and one password box for entering the password. The username must contain at least 4 characters and the password must contain at least 6 characters. The first two characters in the password must be numbers. On clicking show login button, if the valid data are given in the boxes, a message "Correct Data" should be displayed. Otherwise "Wrong Data" message should be displayed.
15. Develop a webpage to implement a simple calculator. The page should have two textboxes to enter two numbers. It should also have 4 buttons to add, subtract,

multiply and divide the two numbers. The answer should be displayed in a third text box on clicking the button.

16. Design an HTML page that contains five text boxes, three textboxes for marks of three subjects, and remaining for total marks and average marks. Provide validations for this textbox in a separate JavaScript file and link it with the HTML file. The validations are (i) Textboxes should not be empty (ii) It should be a number (iii) It should be between 0 and 99.
17. A webpage contains a button. Write HTML code for the button which executes a function Message() on the occurrence of the following events. (a) When user clicks the mouse on the button. (b) When user moves the mouse over the button.
18. Write HTML codes to create two web pages to show some information about the science and the commerce department of your college. Create another webpage to divide the browser window horizontally into two. In the first frame, a brief introduction of the college and two links are to be provided- one for science and other for commerce. On clicking these links the respective webpage is to be opened in the second frame.
19. Create a form using HTML which has the following types of controls:
    I. Text Box
    II. Option/radio buttons
    III. Check boxes
    IV. Reset and Submit buttons

References

1. *E. Balagurusamy , Object Oriented Programming with C++, Fifth edition, McGraw Hill publications*
2. *Object-Oriented Programming in Turbo C++, Robert Lafore, Galgotia.*
3. *Learning Web Design 2nd Edition by Jennifer Niederst*
4. *HTML & CSS: The Complete Reference, Fifth Edition by Thomas Powell*

14. B. Sc. PHYSICS - MODEL III- ELECTRONIC EQUIPMENT MAINTENANCE

Semester-I

Core 2- Course:I **Credit-2 (36 hours)**

EM1CRT01 - PRINCIPLES OF ELECTRONICS

MODULE – I

Switches, Cables and Connectors (Qualitative study only)

SPDT, DPDT, Band switches, Touch switches, Thumb Wheel switches, Micro switches – specifications and application areas.

Batteries and Fuses

Dry cells, Lead acid accumulators, Nickel – Cadmium cells – Principles and specifications. Fast and Slow fuses

Semiconductors

Intrinsic and Extrinsic, P-type and N-type, PN junction Diode and its characteristics Zener diode, Photodiode, LED

LCR and Wave Shaping Circuits

Serial and Parallel response, Integrator and Differentiator using RC circuits, Clipper and Clamper circuits, Rectifiers – Half and Full wave Filter circuits – Capacitor input, L - section and π filter

MODULE – II

Transistors

PNP and NPN- Configurations, characteristics and constants, Phototransistors Transistor Amplifiers – Biasing and stabilization, frequency response, Voltage regulators – Series, Shunt and IC regulators

Oscillators

Feedback- Positive and Negative, LC and RC oscillators

MODULE – III

Power Amplifiers

Class A, Class B, Class AB, Class C transformer coupled

Push – pull amplifiers – Phase splitter circuit, complementary symmetry, thermal run away, heat sink, power ratings of transistors, thermal resistance.

References:

1. Electronic Devices and Circuits – Allen Mottershed
2. Principles of Electronics – V K Mehta
3. Applied Electronics - R S Sedha
4. Linear Integrated Circuits – Roy Choudhury
5. Principles of Electronics and Linear circuits – N.N. Bhargava, D. C. Kulshreshtha, S.C. Gupta, T.M.H. Publications.

Semester-I
Core 2-Course:II **Credit-2 (36 hours)**

EM1CRT02 - COMMUNICATION ENGINEERING (2 Credits)

MODULE – I

Modulation – Need of modulation, AM and FM modulation and demodulation principles, DSB, SSB, DSBSC and Vestigial sideband transmission systems

Super Heterodyne Radio Receiver

Principles, advantages, block diagram, RF tuner, IF amplifier, detector, audio amplifiers, loud speaker, power supply and voltage regulators, alignment of RF and IF sections, Waveforms and voltages at different check point.

MODULE – II

Sampling reconstruction Aliasing PAM, PDM, PPM, Time Division Multiplexing, Noise in Pulse Modulation, Base Band Digital Transmission, Digital Signals, Pulse Code Modulation, Generation and Reconstruction, Quantization noise, Companding Law, Band Pass Digital Transmission, Digital CW Modulation, ASK, FSK, PSK, DPSK.

MODULE – III

Monochrome Television System

Elements of television system – Picture and sound transmission and reception, Composite Video Signal, Scanning process adopted in TV system, Sync details, channel bandwidth, vestigial side band transmission.

Television Receiver

Receiving Antenna, RF tuner, VIF amplifiers, video amplifier, Video detector, SIF amplifier, FM detector, Sweep section, keyed AGC, Delayed AGC, AFC, sync separator, SMPS **References:**

1. *Modern Electronic Communicating Theory and System – AshokRaj*
2. *Video Demystified - Keith Jack, LLHT TechnologyPublishing*
3. *Electronic Communication - Dennis Roody andCoolen*
4. *Principles of Electronic Communication systems –Kennedy*
5. *Monochrome and colour television – R RGulati*

Semester-II

Core 2- Course:III **Credit-2 (36 hours)**

EM2CRT03 : POWER ELECTRONICS

MODULE I

Introduction – Concept of power electronics, Applications of power electronics, Advantages and disadvantages of power electronic converters, power electronic systems, power semiconductor devices, types of power electronic converters, power electronic modules.

MODULE II

Power transistors, Power MOSFETS, Insulated Gate Bipolar Transistor (IGBT), Power semiconductor Diodes – Characteristics of power diodes, types of power diodes,

MODULE III

Thyristors; Terminal characteristics of thyristors, thyristor turn on methods, thyristor Gate characteristics, Two – transistor model of a thyristor, thyristor ratings, other members of thyristor family, Gate turn off (G.T.O) Thyristor, MOS controlled Thyristor (MCT)

References:

1. *Modern Power Electronics – Dr. P.S. Bimbhara*
2. *Power Electronics Circuits Devices Application – M.H. Rashid*

Semester-II

Core 2- Course:IV **Credit-2 (36 hours)**

EM2CRT04 - ANALOGUE INTEGRATED CIRCUITS

MODULE I

Operational Amplifiers: Basic Differential Amplifier Analysis, Block Diagram Representation of Typical OP-Amp., OP-Amp. Parameters, Inverting and non-inverting

amplifier, Voltage follower. OP-Amp. Circuits, , Differential Amplifier, Instrumentational Amplifier, Integrator, Differentiator

MODULE II

Active Filters: Introduction:Simple circuits and Explanation of Lowpass, Highpass, Bandpass, band reject and Allpass filters.

Waveform Generators: Sine wave generators, triangular wave generators.

MODULE III

555 timer – Astable, Monostable, VCO, - Basic comparators, Characteristic, Typical comparator circuit using OP-Amp.

References:

1. *OP-Amp and Linear IC's – Gayakward*
2. *Integrated Circuits – Botkar*

Semester-III

Core 2- Course:V **Credit-3 (54 hours)**

EM3CRT05 – MICROPROCESSORS AND ITS APPLICATIONS

MODULE I

The 8085 Microprocessor

Block Diagram and functions, architecture of microprocessor, machine and assembly languages, Instruction cycle, timing diagram, Memory Organization, Mapping and Types, Types of Input Output (I/O), Addressing Memory Mapped I/O

MODULE II

Instruction set of 8085 µP

Arithmetic instructions, Logical instructions, data transfer instructions, branch instructions, call and return instructions, stack, I/O and machine control instructions, Addressing modes Straight line programmes, Mathematical programmes, branching programmes, looping programmes, programmes using subroutine and time delay.

MODULE III

Programming Concept of 8085 µP

Introduction to Programmable Peripheral Devices (8255A, 8251A, 8253A, 8279A) function of each chip.

Applications

Traffic control, Temperature control, Digital clock, stepper motor control, washing machine control

References:

1. *0000 to 8085 – Gosh and Sridhar*
2. *Fundamentals of microprocessors and microcomputers – B Ram*
3. *Microprocessor architecture, programming and applications with the 8085 – Gaonkar*
4. *Microprocessor and its applications – Nagurkani*

Semester-III
Core 2- Course:VI **Credit-3 (54 hours)**

EM3CRT06 - TROUBLE SHOOTING OF AUDIO EQUIPMENTS

MODULE – I

Characteristic of Sound

Nature of sound, pressure and intensity of sound waves, sensitivity of human ear for sound, frequency, overtone, harmonics, resonance of sound waves. Reflection and diffraction of sound waves.

Audio Devices and Their Applications

Microphones – Different types, Loud Speakers – Characteristics, Different types, Basic knowledge about speaker, enclosures, cross over network, multi way speaker system, woofer and tweeter, consequence of mismatch between amplifier output and loudspeaker impedance, Audio Amplifiers and Hifi systems, equalizers and tone controlled circuits.

MODULE – II

Digital Audio Fundamentals – Principle of ADC and DAC, optical recording of digital audio on disc conversion technologies, EFM, error correction method, playback process of digital audio from CD, comparison of CD and conventional (Gramophone) disc, audio as data, compression and expansion of digital audio, channel coding, disc based recording, digital audio broadcasting and networks, introduction Home Theatre systems such as 2.1, 4.1 and5.1.

MODULE – III

Introduction to audio cd players, block diagram, transport mechanism, MP3 player, block diagram assembling of MP3 player, different types of cables in audio industry, introduction to remote controllers, troubleshooting of audio, cd , DVD player, MP3 player power supply modules used in ACD/MP3/amplifiers. Troubleshooting of remote controllers, amplifiers and Home Theatresystems.

References

1. *Modern Television Parctice with 4th Edition – RRGulathi*
2. *Audio and Video systems 2nd edition – R.G.Gupta*
3. *Video de-mystified – KeithJack*
4. *Audio Engineering know it all series – NewnesPress*
5. *Essential guide to digital video – John Watkinson Snell and Wilcox IncPublications.*
6. *Guide to compression - Wilcox IncPublications.*
7. *Audio Video Systems Principles practices and Troubleshooting – Bali and Bali, Khanna publishingcompany*

Semester-IV
Core 2- Course:VII **Credit-3 (54 hours)**

EM4CRT07 - NETWORK THEORY

MODULE – I

Signals, Periodic Wave Forms, Types of Signals, Fourier representation of Signals, Laplace Transformation Properties, Inverse Transform. Voltage and Current – Sources – Dependent Sources, Kirchhoff's Law – Node and Mesh analysis, Superposition Theorem, Reciprocity theorem.

MODULE – II

Thevenin's, Norton, Power Transfer Theorems, Transient and Steady State Analysis **–** Transient analysis of RC and RL circuits, Time Constant, Sinusoidal Study State Analysis, Resistance, Impedance, Admittance, Millor Theorem, Analysis of RC and LC circuit.

MODULE – III

Two port networks, Short circuited admittance parameters, Open circuited impedance parameters, hybrid parameters, Transmission parameters, Relationship between parameter sets, Attenuator, Lattice type, Insertion loss, Network function – Poles and Zeros, Time domain behavior from Pole Zero Plot.

References:

1. Networks and Systems - *D. RoyChoudhury*
2. Basic Circuit Theory -*Desor*
3. Network Analysis – *VanValkenberg*
4. Network Lines and Fields –*Ryder*
5. Principles of Network Synthesis – *VanVakenberg*

Semester-IV
Core 2- Course:VIII **Credit-3 (54 hours)**

EM4CRT08 - TROUBLE SHOOTING OF VIDEO EQUIPMENTS

MODULE – I

Digital Video Compression Techniques and Standards, Digital Video, The RGB and YVB representation of video signals, need for compression, how compression works, compression format for video, MPEG – XH.26 format, DVD players and standards.

MODULE – II

DVD/ VCD player block diagram, transport mechanism, power supply and assembling of VCD/DVD player with kit. Troubleshooting of DVD players, Introduction to Digital TV transmission and Reception, Signal Quantizing encoding techniques

MODULE – III

Introduction to DTH, Video on demand, CCTV, LCD/LED TV, LCD technology, LCD matrix type operation, Introduction to plasma TV, Comparison between LCD and Plasma TV, Introduction to LED TV. Difference between LED backlit and backlit LCDdisplays.

References:

1. *Modern Television Parctice with 4th Edition – RRGulathi*
2. *Audio and Video systems 2nd edition – R.G.Gupta*
3. *Video de-mystified – KeithJack*
4. *Audio Engineering know it all series – NewnesPress*
5. *Essential guide to digital video – John Watkinson Snell and Wilcox Inc Publications.*
6. *Guide to compression - Wilcox IncPublications.*
7. *Audio Video Systems Principles practices and Troubleshooting – Bali and Bali, Khanna publishingcompany.*

ELECTRONIC EQUIPMENT MAINTENANCE – SYLLABUS FOR PRACTICALS

SEMESTER 1 & 2

Core 2 Practical1:EM2CRP01 (Credit 2)

(Minimum 14 Experiments)

1. Diode characteristics – PN junction diode & Zenerdiode.
2. Integrator and differentiator using RCcircuit.
3. Clipper and clampercircuits.
4. Single stage & two stage RC coupled amplifier – comparison of gain andbandwidth
5. Oscillators – RC phase shift, Wein bridge, Hartley &Colpitts
6. Multivibrators – Astable &Monostable
7. Rectifiers – half wave & full wave (ripple factors with and withoutfilters)
8. Transistor characteristics – CB &CE
9. Poweramplifier
10. JFETCharacteristics
11. UJTCharacteristics
12. MOSFETcharacteristics
13. SCRcharacteristics
14. Triaccharacteristics
15. AM generation anddetection
16. Frequency modulation and demodulation using 565PLL
17. AGC generation usingIC
18. IF tunedamplifier

SEMESTER 3&4
Core 2 Practical2:EM4CRP02 (Credit2)
(Minimum 14 Experiments)

Semester 3

1. Block transfer of data bytes
2. Largest among a set of numbers
3. Smallest among a set of numbers
4. Addition with carry
5. BCD addition and subtraction
6. Binary multiplication
7. Counting the number of occurrence
8. Sorting in ascending / descending order
9. Decimal counter to count 00 to99

Semester 4

1. Operational amplifier and its characteristics
2. OP-Amp Inverter, Non -Inverter
3. OP-Amp Buffer or Voltage Follower
4. OP-Amp Adder & Subtractor
5. Integrator &Differentiator
6. Astable Multi Vibrator –555
7. Monostable Multi Vibrator –555
8. Schmitt Trigger
9. Voltage Controlled Oscillator (VCO) using555
10. High pass Filter & Low pass Filter

SEMESTER 3 &4

Core 2 Practical 3: EM4CRP03 (Credit 2)

(Minimum 14 Experiments)

Semester 3

1. Study of Multimeter (Analog and Digital)
2. Study and familiarization of passive components
   - General purpose resistor
   - Precision resistor
   - Wire wound resistor
   - Ceramic encased resistors
   - Capacitors (non electrolyte, electrolyte, colour coded)
   - Inductors (general purpose, colou rcoded)
   - Surface Mount Devices(SMD)
3. Study of electrical components
   - Transformers (low power and power)
   - Basics of house wiring
   - Electrical relays
   - Mechanical switches
   - Familiarization of electrical home appliances
4. Study of semiconductor devices - Diodes, Transistors, FETs
5. Practicing different types of soldering works
6. Familiarization of tools in lab and workshops
7. How to draw schematic diagrams
8. Assembling practice on various media
   - On breadboard
   - On PC type breadboard
   - On Printed circuit board
9. Fabrication of PCB
10. Power supply – assembling and faultfinding
    - Unregulated
    - Regulated(Shunt)

- Series regulated(transistorized)
- Series regulator (IC version)

11. Assembling of regulated variable power pack
12. Assembling and fault finding of SMPS

Semester 4

1 Assembling and fault finding of tape recorders
2 Assembling and fault finding of power amplifiers
3 Assembling and fault finding of home theatre system
4 Fault finding of TV power supply(SMPS)
5 Assembling and fault finding of VCD
6 Assembling and fault finding of DVD
7 Assembling and fault finding of LCDTV
8 Assembling and fault finding of MP3player
9 Fault finding of IR remote controller in VCD, DVD or Home Theaters
10 Fault finding of SMPS in VCD, DVD, Home Theatres

15. COMPUTER APPLICATION – COMPLIMENTARY COURSES FOR Model III

COMPLIMENTARY COURSES FOR B. SC. PHYSICS EEM

(Complimentary Computer Application Offered by BOS of Computer Science)