MAHATMA GANDHI UNIVERSITY KOTTAYAM

BOARD OF STUDIES IN PHYSICS

CURRICULUM FOR B.Sc. PHYSICS PROGRAMME

UNDER COURSE - CREDIT - SEMESTER SYSTEM

Acknowledgement:

The Board of Studies in Physics (U G) acknowledges the contributions from participants of the workshop held on 14, 15, 20, 21 and 22 of May 2009 for proposals on restructuring Under Graduate Education in Physics. The abundant support and recommendations from the sub-groups for designing different courses has shaped this curriculum to this present nature.

We thank all the esteemed participants of the workshop for their benevolent support and cooperation to make this venture a success.

For the Board of Studies in Physics,

Kottayam 5-6-2009 **Prof. S Radhakrishnan Nair**
(Chairman)

MAHATMA GANDHI UNIVERSITY KOTTAYAM

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MAHATMA GANDHI UNIVERSITY KOTTAYAM

B.Sc. PROGRAMME IN PHYSICS

UNDER

COURSE - CREDIT - SEMESTER SYSTEM

(2009 admissions)

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 of students.

The programme also aims to develop the following abilities:

1. Read, understand and interpret physical information – verbal, mathematical and graphical.

2. Equip students in methodology related to Physics.

3. Impart skills required to gather information from resources and use them.

4. To give need based education in physics of the highest quality at the

undergraduate level.

5. Offer courses to the choice of the students with interdisciplinary approach.
6. Perform experiments and interpret the results of observation, including making an assessment of experimental uncertainties.
7. Provide an intellectually stimulating environment to develop skills and enthusiasms of students to the best of their potential.
8. Use Information Communication Technology to gather knowledge at will.
9. Attract outstanding students from all backgrounds.

Course structure:

The U.G.programme in Physics must include (a) Common courses, (b) Core courses, (c) Complementary Courses, (d) Open Courses and (e) Project. No course shall carry more than 4 credits. The student shall select any Choice based course offered by the department which offers the core courses, depending on the availability of teachers and infrastructure facilities, in the institution. Open course shall be offered in any subject and the student shall have the option to do courses offered by other departments/ or by the same department.

Courses:

The number of Courses for the restructured programme should contain 12 compulsory core courses and 1 choice based course from the frontier area of the core courses and a project; 8 complementary courses, or 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.

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 a more complete and logical framework in almost all areas of basic Physics.

By the end of the first year (2nd semester), the students should have attained a common level in basic mechanics, properties of matter, a secure foundation in mathematics and other relevant subjects to complement the core for their future courses and developed their experimental and data analysis skills through a wide range of experiments through practical at laboratories.

By the end of the fourth semester, the students should have been introduced to powerful tools for tackling a wide range of topics in Thermodynamics, Statistical Mechanics Electricity,Electrodynamics and Electronics. They should have been familiar with additional relevant mathematical techniques and other relevant subjects to complement the core and developed their experimental skills through a series of experiments which also illustrate major themes of the lecture courses.

By the end of the sixth semester, the students should have covered a range of topics in almost all areas of physics including quantum physics, solid state physics, computational physics, electronics etc. and had experience of independent work such as projects; seminars etc. They should have been developed their understanding of core Physics.

BSc Programme in Physics

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 & complementary courses with 78 credits and open courses with 4 credits. The programme (Vocational -Model II) consists of common courses with 24 credits, core & complementary courses with 92 credits and open courses with 4 credits. The programme (Model III) consists of common courses with 8 credits, core & complementary courses with 108 credits and open courses with 4 credits.

The compulsory core courses for all the models shall be the same in terms of number of courses, its credits and contact hours. The number of complementary courses may be different for different models.

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	Core Courses	12
Project	1	Project	1	Project	1
Choice based Course	1	Choice based Course	1	Choice based Course	1
		Vocational courses	8	Second core Courses	8
				OJT	1
Complementary Courses	8	Complementary Courses	4	Complementary Courses	8
Open Courses	1	Open Courses	1	Open Courses	1
Total	**33**	**Total**	**33**	**Total**	**34**

Courses with Credits:

Courses with Credits of different courses, its distribution of contact hours and scheme of examinations of the programme is the following

Course Code:

Every course in the programme should be coded according to the following criteria. The first two letters of the code indicates the name of programme ie. PH for Physics. One digit to indicate the semester. ie., PH1 (Physics, 1st semester). One letter from the type of courses such as, A for common course, B for core course, C for Complementary course and D for Open course. ie.., PH1B (Physics,

1st semester Core course). Two digits to indicate the course number of the semester. ie., PH1B01 (Physics, 1st semester, Core course, courses number is 01). The first digit in the course number indicates 0 for core courses, 1, 2, 3, etc. for various types of vocational, 5, 6, 7 etc. for UGC sponsored courses. The letter U to indicate Under Graduate Programme. For example PH1B01U (Physics, 1st semester, Core course, courses number 01, U for UG Programme)

Courses with Credits:

	Model I		**Model II**		**Model III**	
Courses	**Credits**	**Total**	**Credits**	**Total**	**Credits**	**Total**
Core Courses	46		46		46	
Choice based Core	3		3		3	
Project	1		1		1	
Vocational courses	Nil		28		Nil	
2nd Core courses	Nil		Nil		30	
Total		**50**		**78**		**80**
Complementary Courses I	14		14		14	
Complementary Courses II	14		Nil		14	
Total		**28**		**14**		**28**
Open Course	4		4		**4**	
Total		**4**		**4**		**4**
Common Courses	38		24		8	
Total		**38**		**24**		**8**
Grand Total		**120**		**120**		**120**

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	8	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

SCHEME: CORE COURSES (Common for the Programme)

Semester	Title of the Course	Number of hours per week	Number of credits	Total Credits	Total hours/ semester
1	PH1B01U– **Methodology in Physics** Practical	2 2	2 1	3	72
2	PH2B01U - **Mechanics and Properties of Matter** Practical	2 2	2 1	3	72
3	PH3B01U – **Electricity and Electrodynamics** Practical	3 2	3 1	4	90
4	PH4B01U – **Electronics** Practical	3 2	3 1	4	90
5	PH5B01U – **Classical and Quantum Mechanics** Practical	3 2	3 1	4	90
	PH5B02U – **Physical Optics and Photonics** Practical	3 2	3 1	4	90
	PH5B03U – **Thermal and Statistical Physics** Practical	3 2	3 1	4	90
	PH5B04U– **Digital Electronics** Practical	3 2	3 1	4	90
	PH5B05U **Project**	1	1	1	18
	PH5D01U – **Open course**	4	4	4	72
6	PH6B01U- **Computational Physics** Practical	3 2	3 1	4	90
	PH6B02U – **Nuclear and Particle Physics** Practical	3 2	3 1	4	90
	PH6B03U - **Condensed Matter Physics** Practical	3 2	3 1	4	90
	PH6B04U - **Relativity and Spectroscopy.** Practical	3 2	3 1	4	90
	PH6B05U**–Choice Based Course**	5	3	3	90

Scheme: <u>Complementary Courses (Model1)</u>

1. **<u>Physics for Mathematics & Statistics:</u>**

semester	Title of the paper	Number of hours per week	Number of credits	Total Credits	Total hours/ semester
1	MT1C01U – **Properties of Matter, Mechanics and Fourier analysis** Practical	2 2	2 1	3	72
2	MT2C01U - **Electric and Magnetic phenomena, Thermodynamics and Special theory of Relativity** Practical	2 2	2 1	3	72
3	MT3C01U – **Quantum Mechanics, Spectroscopy, Nuclear Physics, Basic Electronics and Digital Electronics** Practical	3 2	3 1	4	90
4	MT4C01U – **Physical Optics, Laser Physics and Astrophysics** Practical	3 2	3 1	4	90

Scheme: **COMPLEMENTARY COURSES** (MODEL-I)

2. Physics for Chemistry & Geology:

Semester	Title of the paper	Number of hours per week	Number of credits	Total Credits	Total hours/ semester
1	CH1C01U – **Properties of Matter, Mechanics and Particle Physics**	2	2	3	72
	Practical	2	1		
2	CH2C01U - **Electric and Magnetic Phenomena, Thermodynamics and Elementary Solid State Physics**	2	2	3	72
	Practical	2	1		
3	CH3C01U –**Quantum Mechanics, Spectroscopy, Nuclear Physics and Electronics**	3	3	4	90
	Practical	2	1		
4	CH4C01U – **Physical Optics, Laser Physics and Superconductivity**	3	3	4	90
	Practical	2	1		

Scheme: **VOCATIONAL COURSES : (1) APPLIED ELECTRONICS**

(in addition to core courses)

Semester	Title of the Course	Number of hours per week	Number of credits	Total Credits	Total hours/ semester
1	PH1B11U **Principles of Electronic Components.**	2	2	2	36
	PH1B12U **Electronic Applications.** **Practical**	2 2	2 1	3	72
2	PH2B11U **Basics of Power Electronics.**	2	2	2	36
	PH2B12U **Power Electronics.** **Practical**	2 2	2 1	3	72
3	PH3B11U **Linear Integrated Circuits.** **Practical**	3 2	3 1	4	90
	PH3B12U **Communication Electronics.** **Practical**	3 2	3 1	4	90
4	PH4B11U **Micro Processor and Interfacing Devices** **Practical**	3 2	3 1	4	90
	PH4B12U **Application of Microprocessors.** **Practical**	3 2	3 1	4	90

Scheme: **VOCATIONAL COURSES : (2) COMPUTER APPLICATIONS**

(in addition to core courses)

Semester	Title of the Course	Number of hours per week	Number of credits	Total Credits	Total hours/ semester
1	PH1B21U **Computer Fundamentals**.	2	2	2	36
	PH1B22U **Operating System & Computer Networks** **Practical**	2 2	2 1	3	72
2	PH2B21U **Word and Data Processing Packages**	2	2	2	36
	PH2B22U **Programming Language - 1 – ANSI C** **Practical**	2 2	2 1	3	72
3	PH3B21U **Concepts Of Object Oriented Programming** **Practical**	3 2	3	4	90
	PH3B22U **C++ Programming** **Practical**	3 2	3 1	4	90
4	PH4B21U **Visual Basic Programming** **Practical**	3 2	3 1	4	90
	PH4B22U **Computer Web Applications and Graphics** **Practical**	3 2	3 1	4	90

Scheme: **(Second core Courses):-**

ELECTRONIC EQUIPMENT MAINTENANCE

(In addition to first core courses)

Semester	Title of the Course	Number of hours per week	Number of credits	Total Credits	Total hours/ semester
1	PH1B51U **Principles of Electronics** Electronic Equipment Maintenance Practical	3 2	3 1	4	90
	PH1B52U **Power Electronics and Communication Engineering**	3	3	3	54
2	PH2B51U **Fundamentals of Microprocessors** Electronic Equipment Maintenance Practical	3 2	2 1	3	90
	PH2B52U **Communication Engineering**	3	2	2	54
3	PH3B51U **Microprocessors** Electronic Equipment Maintenance Practical	3 2	3 1	4	90
	PH3B52U **Trouble shooting and Maintenance of Audio Equipments** Electronic Equipment Maintenance Practical	3 2	3 1	4	90
4	PH4B51U **Application of Microprocessors** Electronic Equipment Maintenance Practical	3 2	3 1	4	90
	PH4B52U **Computer Hardware and Networking** Electronic Equipment Maintenance Practical	3 2	3 1	4	90

5	PH5D51U **Trouble shooting and Maintenance of Video Equipments (Open Course)** Electronic Equipment Maintenance Practical	3 2	3 1	4	90
6	PH6B51U **Computer Hardware and Software Installations (Choice Based Course)** Electronic Equipment Maintenance Practical	2 2	2 1	3	72
	PH6B06U- **Project**	1	1	1	18

Scheme: **(Second core Courses) for ELECTRONIC EQUIPMENT MAINTENANCE: -**

COMPLEMENTARY COURSES

Semester	Title of the Course	Number of hours per week	Number of credits	Total Credits	Total hours/ semester
1	PH1C51U **Computer Fundamentals** Computer Applications - Practical	2 2	2 1	3	72
2	PH2C51U **Object oriented programming with C++** Computer Applications - Practical	2 2	2 1	3	72
3	PH3C51U **Java Programming Language** Computer Applications - Practical	3 2	3 1	4	90
4	PH4C51U **The Java Library** Computer Applications - Practical	3 2	3 1	4	90

BSc Physics Programme- (2 Core courses)

INSTRUMENTATION

Semester	Title of the Course	Number of hours per week	Number of credits	Total Credits	Total hours/ Semester
1	PH1B61U - **Instrument Mechanism**	3	3	3	54
	PH1B62U - **Mechanical Measurements**	3	3	4	90
	Instrumentation Practical (Instrument Mechanism and Mechanical Measurement)	2	1		
2	PH2B61U - **Electrical Networks and Measuring Instruments**	3	2	2	54
	PH2B62U - **Metrology**	2	2	3	90
	Instrumentation Practical (Metrology)	2	1		
3	PH3B61U - **Vacuum Instrumentation**	3	3	4	90
	Instrumentation Practical	2	1		
	PH3B62U - **Transducers and Signal Conditioners**	5	4	4	90
	On Job Training – 1	0	2	2	
4	PH4B61U - **Process control Instrumentation**	3	3	4	90
	Instrumentation Practical	2	1		
	PH4B61U - **Optical and Biomedical Instrumentation**	5	4	4	90

5	PH5B61U **Microprocessors** Instrumentation Practical (Microprocessor)	3 2	3 1	4	90
	PH5D01U (Open Course) 1.Amateur Astronomy 2.Energy and Environmental Studies	4	4	4	90
	On Job Training - II	0	2	2	
	Project	1	1	1	18
6	PH6B61U – **Analytical and Environmental Instrumentation** Instrumentation Practical (Computers)	3 2	3 1	4	90
	PH6B61U Choice based course -	5	3	3	90

Choice Based Courses:

1. Astronomy and Astrophysics
2. Information Technology.
3. Renewable Energy Technology
4. Nanoscience and Nanotechnology
5. Optoelectronics

Open Course:

1. Amateur Astronomy
2. Energy and Environmental Studies

Projects:

All students shall do a project. The project can be done individually or as a group of maximum 3 students. However, the viva on this project will be conducted individually. The projects are to be identified during the IInd 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 and are to be produced before the external examiners appointed by the University for Valuation.

Zero Credit Courses:

Zero Credit courses shall be included in the programme to encourage advanced learners and shall be indicated in the score sheet. Permission for obtaining Zero credit courses shall be in accordance with the rules and regulations of the university. The Zero Credit courses shall be done only under the supervision of a university approved permanent faculty member of the department which offers the core courses.

Examinations:

The evaluation of each course shall contain two parts such as Internal or In-Semester Assessment (IA) and External or End-Semester Assessment (EA). The ratio between internal and external examinations shall be 1:3. The Internal and External examinations shall be evaluated using Direct Grading system based on 5-point scale.

Internal or In-Semester Assessment (IA):

Internal evaluation is to be done by continuous assessments on the following components. The Components of the internal evaluation for theory and practical and their weights are as below.

Theory

Component	Weights
Attendance*	1
Assignment	1
Seminar /Viva-voce	1
Best two test papers	2

***Attendance**

%age of Attendance	Grade
$\geq$ 90%	A
$\geqslant$ 85 and < 90	B
$\geqslant$ 80 and < 85	C
$\geqslant$ 75 and < 80	D
< 75	E

The student has to take a minimum of 1 assignment, 1 seminar / Viva-voce per course. A minimum of 2 class tests are to be attended. The grades of best 2 tests are to be taken.

Different components are given below:

Assignment

Components	Weights
Punctuality	1
Review	1
Content	2
Conclusion	1
Reference	1

Seminar

Components	Weights
Innovation of Topic	1
Review/ Reference	1
Content	2
Conclusion	1
Presentation	2

Practical: Internal

Component	Weights
Attendance *	1
Laboratory Involvement **	2
Test	2
Record	2
Viva-Voce/Quiz	1

Attendance & Laboratory Involvement *

Attendance *	Laboratory Involvement **
Same as shown in theory internal	Punctuality + Handling Equipments + Skill in Laboratory work + Group Interaction = A

The evaluation of all components is to be published and is to be acknowledged by the candidate. All documents of internal assessments are to be kept in the institution for 2 years and shall be made available for verification by the university. The responsibility of evaluating the internal assessment is vested on the teacher(s) who teach the course.

External or End-Semester Assessment (EA):

The external examination of all semesters shall be conducted by the university on the close of each semester. There will be no supplementary exams. For reappearance/ improvement as per university rules, students can appear along with the next batch.

Examinations (Practical):

The practical examinations for the core courses at the end of semester 1, semester 2, semester 3 and semester 4 should be conducted by the university with a common time-table and questions set by the university. One examiner shall be selected from a panel of examiners published by the university and the other shall be selected internally. The graded score sheet should be sent to the university before the commencement of the end semester university examinations on theory courses. The practical examinations for the core courses at the end of semester 5 and

semester 6 should be conducted externally by arranging two practical examinations in a session.

The practical examinations for the complementary courses at the end of semester 1, semester 2 and semester 3 should be conducted by the university with a common time-table and questions set by the university. One examiner shall be selected from a panel of examiners published by the university and the other shall be selected internally. The graded score sheet should be sent to the university before the commencement of the end semester university examinations on theory courses. The practical examinations for the complementary courses at the end of semester 4 should be conducted externally.

A minimum of 8 experiments should be done in a practical course in all semesters and a candidate submitting a certified record with a minimum of 4 experiments alone is eligible for appearing the University Practical Examination.

Project evaluation:

The internal to external component of the project is on the ratio1:3.The weightages for assessment of different components is shown below.

Internal:

Component	Weights
Punctuality	1
Experimentation/ Data collection	2
Compilation	1
Group involvement	1

External:

Component	Weights
Innovation of topic	1
Objective	1
Review	1
Materials & Methods	1
Result	1
Discussion	1
Conclusion/ application	1
Presentation	2

Pattern of Questions & Weights:

Questions shall be set to assess knowledge acquired, standard application of knowledge, application of knowledge in new situations, critical evaluation of knowledge and the ability to synthesize knowledge. The question setter shall ensure

that questions covering all skills are set. He/She shall also submit a detailed scheme of evaluation along with the question paper.

A question paper shall be a judicious mix of objective type, short answer type, short essay type /problem solving type and long essay type questions. Different types of questions shall be given different weights to quantify their range.

1. The examination has duration of 3 hours

2. Each question paper has four parts A, B, C & D.

3. Part A contains 16 objective type questions of which the candidate has to answer all. Each bunch of 4 questions carries a weightage of 1

4. Part B contains 8 short answer type questions spanning the entire syllabus and the candidate has to answer 5 questions. Each question carries a weightage of 1.

5. Part C contains 6 problem type questions spanning the entire syllabus and the candidate has to answer 4 questions. But, for open courses, Part C contains short essay type questions only. Each question carries a weightage of 2.

6. Part D contains 3 essay type questions spanning the entire syllabus and the candidate has to answer 2 questions. Each question carries a weightage of 4.

Evaluation of problems:

Numerical problems in Physics shall be graded in the following way.

1. Correct formula with correct substitution and answer : **A**

2. Correct formula with correct substitution and answer but wrong or no unit. : **B**

3. Correct formula with correct substitution and wrong answer : **C**

4. Formula alone is correct : **D**

5. Even formula is incorrect : **E**

Evaluation of practical examinations:

The Board of Examiners constituted by the University shall have the freedom for formulating the scheme of evaluation of the concerned practical examination.

Student Strength for practical:

There shall be at least one teacher to supervise a batch of not more than 15 students in each laboratory session.

Final Grade Card:

The final Grade Card issued at the end of the final semester shall contain the CGPA of the Core Courses and Complementary Courses of the entire Programme. The **CGPA** shall contain the awarded **GRADE LETTER** and the corresponding **GRADE POINT** in two decimal places

COURSE STRUCTURE

BSc Physics Programme– (Model I):

Semester	Title of the Course	Number of hours per week	Number of credits	Total Credits	Total hours/ semester	University Exam Duration	Weightage ratio	
							IA	EA
1	English I	5	4	4	90	3	1	3
	English /Common course I	4	3	3	72	3	1	3
	Second Language I	4	4	4	72	3	1	3
	PH1B01U – **Methodology in Physics** Practical	2 2	2 1	3	72	3	1	3
	PH1C01U Complementary I Practical (If no practical 4 hrs with 3 credits)	2 2	2 1	3	72	3	1	3
	PH1C02U Complementary II Practical	2 2	2 1	3	72	3	1	3
2	English II	5	4	4	90	3	1	3
	English /Common course II	4	3	3	72	3	1	3
	Second Language II	4	4	4	72	3	1	3
	PH2B01U - **Mechanics and Properties of Matter** Practical	2 2	2 1	3	72	3	1	3
	PH2C01U Complementary I Practical (If no practical 4 hrs with 3 credits)	2 2	2 1	3	72	3	1	3
	PH2C02U Complementary II Practical	2 2	2 1	3	72	3	1	3
3	English III	5	4	4	90	3	1	3

	Sec. Lang. /Common course I	5	4	4	90	3	1	3
	PH3B01U – **Electricity and Electrodynamics** Practical	3 2	3 1	4	90	3	1	3
	PH3C01U Complementary I Practical (If no practical 5 hrs with 4 credits)	3 2	3 1	4	90	3	1	3
	PH3C02U Complementary II Practical	3 2	3 1	4	90	3	1	3
4	English - IV	5	4	4	90	3	1	3
	Sec. Lang. /Common course II	5	4	4	90	3	1	3
	PH4B01U – **Electronics** Practical	3 2	3 1	4	90	3	1	3
	PH4C01U Complementary I Practical (If no practical 5 hrs with 4 credits)	3 2	3 1	4	90	3	1	3
	PH4C01U Complementary II Practical	3 2	3 1	4	90	3	1	3
5	PH5B01U – **Classical and Quantum Mechanics** Practical	3 2	3 1	4	90	3	1	3
	PH5B02U – **Physical Optics and Photonics** Practical	3 2	3 1	4	90	3	1	3
	PH5B03U – **Thermal and Statistical Physics** Practical	3 2	3 1	4	90	3	1	3
	PH5B04U –- **Digital Electronics** Practical	3 2	3 1	4	90	3	1	3

	PH5B05U **Project**	1	1	1	18	3	1	3
	PH5D01U – **Open course**	4	4	4	72	3	1	3
6	PH6B01U - **Computational Physics** Practical	3 2	3 1	4	90	3	1	3
	PH6B02U – **Nuclear and Particle Physics** Practical	3 2	3 1	4	90	3	1	3
	PH6B03U - **Condensed Matter Physics** Practical	3 2	3 1	4	90	3	1	3
	PH6B04U - **Relativity and Spectroscopy.** Practical	3 2	3 1	4	90	3	1	3
	PH6B05U – **Choice Based Course**	5	3	3	90	3	1	3

Course Structure:

BSc Physics Programme- (Model II) **Vocational: (1) APPLIED ELECTRONICS**

	Title of the Course	Number of hours	Number	Total Credits	Total hours/	University Exam	Weightage ratio

Semester		per week	of credits		semester	Duration Hrs.	IA	EA
1	English I	5	4	4	90	3	1	3
	Second Language I	5	4	4	90	3	1	3
	PH1B01U – **Methodology in Physics.** **Practical**	2 2	2 1	3	72	3	1	3
	PH1C11U **Mathematics.**	5	4	4	90	3	1	3
	PH1B11U **Principles of Electronic Components.**	2	2	2	36	3	1	3
	PH1B12U **Electronics Applications.** **Practical**	2 2	2 1	3	72	3	1	3
2	English II	5	4	4	90	3	1	3
	Second Language II	5	4	4	90	3	1	3
	PH2B01U - **Mechanics and Properties of Matter** Practical	2 2	2 1	3	72	3	1	3
	PH2C11U **Mathematics**.	5	4	4	72	3	1	3
	PH2B11U **Basics of Power electronics.**	2	2	2	36	3	1	3
	PH2B12U **Power Electronics.** **Practical**	2 2	2 1	3	72	3	1	3
3	English III	5	4	4	90	3	1	3
	PH3B01U – **Electricity and Electrodynamics.** **Practical**	3 2	3 1	4	90	3	1	3
	PH3C11U **Mathematics.**	5	4	4	90	3	1	3
	PH3B11U **Linear Integrated Circuits.** **Practical**	3 2	3 1	4	90	3	1	3

	PH3B12U **Communication Electronics.** **Practical**	3 2	3 1	4	90	3	1	3
4	English - IV	5	4	4	90	3	1	3
	PH4B01U – **Electronics.** **Practical**	3 2	3 1	4	90	3	1	3
	PH4C11U **Mathematics.**	5	4	4	90	3	1	3
	PH4B11U **Micro Processor and Interfacing Devices** **Practical**	3 2	3 1	4	90	3	1	3
	PH4B12U **Application of Microprocessors.** **Practical**	3 2	3 1	4	90	3	1	3
5	PH5B01U – **Classical and Quantum Mechanics.** **Practical**	3 2	3 1	4	90	3	1	3
	PH5B02U – **Physical Optics and Photonics.** **Practical**	3 2	3 1	4	90	3	1	3
	PH5B03U – **Thermal and Statistical Physics.** **Practical**	3 2	3 1	4	90	3	1	3
	PH5B04U – **Digital Electronics.** **Practical**	3 2	3 1	4	90	3	1	3
	PH5B05U **Project**	1	1	1	18	3	1	3
	PH5D01U – **Open course.**	4	4	4	72	3	1	3
6	PH6B01U - **Computational Physics.** **Practical**	3 2	3 1	4	90	3	1	3
	PH6B02U – **Nuclear and Particle Physics.** **Practical**	3 2	3 1	4	90	3	1	3

	PH6B03U – **Condensed Matter Physics** **Practical**	3 2	3 1	4	90	3	1	3
	PH6B04U - **Relativity and Spectroscopy.** **Practical**	3 2	3 1	4	90	3	1	3
	PH6B05U – **Choice Based Course.**	5	3	3	90	3	1	3

Course Structure:

BSc Physics Programme- vocational **(2): COMPUTER APPLICATION**

Semester	Title of the Course	Number of hours per week	Number of credits	Total Credits	Total hours/ semester	University Exam Duration	Weightage ratio	
							IA	EA
	English I	5	4	4	90	3	1	3
	Second Language I	5	4	4	90	3	1	3

1	PH1B01U – **Methodology in Physics.** **Practical**	2 2	2 1	3	72	3	1	3
	PH1C11U **Mathematics.**	5	4	4	90	3	1	3
	PH1B21U **Computer Fundamentals**.	2	2	2	36	3	1	3
	PH1B22U **Operating System and Computer Networks** **Practical**	2 2	2 1	3	72	3	1	3
2	English II	5	4	4	90	3	1	3
	Second Language II	5	4	4	90	3	1	3
	PH2B01U - **Mechanics and Properties of Matter.** **Practical**	2 2	2 1	3	72	3	1	3
	PH2C11U **Mathematics**.	5	4	4	72	3	1	3
	PH2B21U **Word and Data Processing Packages**	2	2	2	36	3	1	3
	PH2B22U **Programming Language - 1 – ANSI C** **Practical**	2 2	2 1	3	72	3	1	3
3	English III	5	4	4	90	3	1	3
	PH3B01U – **Electricity and Electrodynamics.** **Practical**	3 2	3 1	4	90	3	1	3
	PH3C11U **Mathematics.**	5	4	4	90	3	1	3
	Ph3b21u **Concepts Of Object Oriented Programming** **Practical**	3 2	3 1	4	90	3	1	3
	PH3B22U **C++ Programming** **Practical**	3 2	3 1	4	90	3	1	3

4	English - IV	5	4	4	90	3	1	3
	PH4B01U – **Electronics.** **Practical**	3 2	3 1	4	90	3	1	3
	PH4C11U **Mathematics.**	5	4	4	90	3	1	3
	PH4B21U **Visual Basic Programming** **Practical**	3 2	3 1	4	90	3	1	3
	PH 4B22U Computer Web Applications and Graphics Practical	3 2	3 1	4	90	3	1	3
5	PH5B01U – **Classical and Quantum Mechanics.** **Practical**	3 2	3 1	4	90	3	1	3
	PH5B02U – **Physical Optics and Photonics.** **Practical**	3 2	3 1	4	90	3	1	3
	PH5B03U – **Thermal and Statistical physics.** **Practical**	3 2	3 1	4	90	3	1	3
	PH5B04U –**Digital Electronics** **Practical**	3 2	3 1	4	90	3	1	3
	PH5B05U **Project**	1	1	1	18	3	1	3
	PH5D01U – **Open course.**	4	4	4	72	3	1	3
6	PH6B01U - **Computational Physics.** **Practical**	3 2	3 1	4	90	3	1	3
	PH6B02U – **Nuclear and Particle Physics.** **PRACTICAL**	3 2	3 1	4	90	3	1	3

	PH6B03U - **Condensed Matter Physics.** **Practical**	3 2	3 1	4	90	3	1	3
	PH6B04U - **Relativity and Spectroscopy.** **Practical**	3 2	3 1	4	90	3	1	3
	PH6B05U – **Choice Based Course.**	5	3	3	90	3	1	3

Course Structure:

BSc Physics Programme- (2 Core courses)

5. ELECTRONIC EQUIPMENT MAINTENANCE

(Common courses with 8 Credits)

Semester	Title of the Course	Number of hours per week	Number of credits	Total Credits	Total hours/ semester	University Exam Duration	Weightage ratio	
							IA	EA
1	PH1A01U **English - I**	5	4	4	90	3	1	3
	PH1B51U **Principles of Electronics** Electronic Equipment Maintenance Practical	3 2	3 1	4	90	3	1	3
	PH1B52U **Power Electronics and Communication Engineering**	3	3	3	54	3	1	3
	PH1B01U – **Methodology in Physics** Physics Practical	2 2	2 1	3	72	3	1	3
	PH1C01U -**Mathematics-I**	4	3	3	72	3	1	3
	PH1C51U **Computer Fundamentals** Computer Applications - Practical	2 2	2 1	3	72	3	1	3
	PH2A01U **English II**	5	4	4	90	3	1	3
	PH2B51U **Fundamentals of Microprocessors**	3	2	2	54	3	1	3
	PH2B51U **Communication Engineering** Electronic Equipment Maintenance Practical	3 2	2 1	3	90	3	1	3

2	**On Job Training – 1**	0	2	2				
	PH2B01U - **Mechanics and Properties of Matter** Physics Practical	2 2	2 1	3	72	3	1	3
	PH2C01U Complementary I **Mathematics - II**	4	3	3	72	3	1	3
	PH2C51U **Object Oriented Programming with C++** Computer Applications - Practical	2 2	2 1	3	72	3	1	3
3	PH3B51U **Microprocessors** Electronic Equipment Maintenance Practical	3 2	3 1	4	90	3	1	3
	PH3B52U **Trouble shooting and Maintenance of Audio Equipments** Electronic Equipment Maintenance Practical	3 2	3 1	4	90	3	1	3
	PH3B01U – **Electricity and Electrodynamics** Physics Practical	3 2	3 1	4	90	3	1	3
	PH3C01U Complementary I **Mathematics - III**	5	4	4	90	3	1	3
	PH3C51U **Java Programming Language** Computer Applications - Practical	3 2	3 1	4	90	3	1	3

4	PH4B51U **Application of Microprocessors** Electronic Equipment Maintenance Practical	3 2	3 1	4	90	3	1	3
	PH4B01U – **Electronics** Physics Practical	3 2	3 1	4	90	3	1	3
	PH4B51U **Computer Hardware and Networking** Electronic Equipment Maintenance Practical	3 2	3 1	4	90	3	1	3
	PH4C01U Complementary I **Mathematics - IV**	5	3	3	90	3	1	3
	PH4C51U **The Java Library** Computer Applications - Practical	3 2	2 1	3	90	3	1	3
	On Job Training - II	0	2	2				
	PH5B01U – **Classical and Quantum Mechanics** Physics Practical	3 2	3 1	4	90	3	1	3
	PH5B02U – **Physical Optics and Photonics** Physics Practical	3 2	3 1	4	90	3	1	3
	PH5B03U – **Thermal and Statistical physics** Physics Practical	3 2	3 1	4	90	3	1	3

5	PH5B04U — **Digital Electronics** Physics Practical	3 2	3 1	4	90	3	1	3
	PH5D51U **Trouble shooting and Maintenance of Video Equipments (Open Course)** Electronic Equipment Maintenance Practical	3 2	3 1	4	90	3	1	3
6	PH6B01U - **Computational Physics** Physics Practical	3 2	3 1	4	90	3	1	3
	PH6B02U – **Nuclear and Particle Physics** Physics Practical	3 2	3 1	4	90	3	1	3
	PH6B03U - **Condensed Matter Physics** Physics Practical	3 2	3 1	4	90	3	1	3
	PH6B04U – **Relativity and Spectroscopy** Physics Practical	3 2	3 1	4	90	3	1	3
	PH6B51U **Computer Hardware and Software Installations (Choice Based Course)** Electronic Equipment Maintenance Practical	2 2	2 1	3	72	3	1	3
	PH6B52U Project	1	1	1	18	3	1	3

Course Structure:

BSc Physics Programme- (2 Core courses)

6. INSTRUMENTATION

(In addition to first core courses)

Semester	Title of the Course	Number of hours per week	Number of credits	Total Credits	Total hours/ Semester	University Exam Duration	Weightage ratio	
							Internal	External
1	PH1A01U **English - I**	5	4	4	90	3	1	3
	PH1B61U **Instrument Mechanism**	3	3	3	54	3	1	3
	PH1B62U **Mechanical Measurements** Instrumentation Practical (Instrument Mechanism and Mechanical Measurement)	3 2	3 1	4	90	3	1	3
	PH1B01U **Methodology in Physics** Physics Practical	2 2	2 1	3	36 36	3	1	3
	PH1C01U Complementary-**Mathematics-I**	4	3	3	72	3	1	3
	PH1C61U Complementary-**Electronics – I** Complementary-Electronics Lab	2 2	2 1	3	36 36	3	1	3
	PH2A01U **English II**	5	4	4	90	3	1	3

2	PH2B61U **Electrical Networks and Measuring Instruments**	3	2	2	54	3	1	3
	PH2B61U **Metrology** Instrumentation Practical (Metrology)	2 2	2 1	3	90	3	1	3
	PH2B01U - **Mechanics and Properties of Matter** Physics Practical	2 2	2 1	3	72	3	1	3
	PH2C01U Complementary I **Mathematics - II**	4	3	3	72	3	1	3
	PH2C61U Complementary- **Electronics II** Complementary- Electronics lab	2 2	2 1	3	72	3	1	3
3	PH3B61U **Vacuum Instrumentation** Instrumentation Practical	3	3	4	90	3	1	3
	PH3B62U **Transducers and Signal Conditioners**	5	4	4	90	3	1	3
	PH3B01U – **Electricity and Electrodynamics** Physics Practical	3 2	3 1	4	90	3	1	3
	PH3C01U Complementary I **Mathematics - III**	5	4	4	90	3	1	3
	PH3C61U Complementary- **Electronics III** Complementary- Electronics lab	3 2	3 1	4	90	3	1	3

	On Job Training- I	0	2	2				
4	PH4B61U **Process control Instrumentation** Instrumentation Practical	3 2	3 1	4	90	3	1	3
	PH4B61U **Optical and Biomedical Instrumentation**	5	4	4	90	3	1	3
	PH4B01U – **Electronics** Physics Practical	3 2	3 1	4	90	3	1	3
	PH4C01U Complementary I **Mathematics - IV**	5	3	3	90	3	1	3
	PH4C61U Complementary- Electronics-IV Practical	3 2	2 1	3	90	3	1	3
5	PH5B01U – **Classical and Quantum Mechanics** Physics Practical	3 2	3 1	4	90	3	1	3
	PH5B02U – **Physical Optics and Photonics** Physics Practical	3 2	3 1	4	90	3	1	3
	PH5B03U – **Thermal and Statistical physics** Physics Practical	3 2	3 1	4	90	3	1	3
	PH5B61U**Microprocessors** Instrumentation Practical (Microprocessor)	3 2	3 1	4	90	3	1	3
	PH5D61U (Open Course)	4	4	4	90	3	1	3
	On Job Training - II	0	2	2				
	Project	1	1	1	18			

6	PH6B02U – **Nuclear and Particle Physics** Physics Practical	3 2	3 1	4	90	3	1	3
	PH6B03U - **Condensed Matter Physics** Physics Practical	3 2	3 1	4	90	3	1	3
	PH6B04U – **Relativity and Spectroscopy** Physics Practical	3 2	3 1	4	90	3	1	3
	PH6B61U– **Analytical and Environmental Instrumentation** Instrumentation Practical (Computers)	3 2	3 1	4	90	3	1	3
	PH6B62U Choice based course	5	3	3	90	3	1	3

Choice based courses:

1. PH6B62U Computer Hardware and Networks

SYLLABI OF COURSES

CORE COURSES

(Common for the Programme)

Semester I

PH1B01U – **Methodology in Physics**

Credits – 3 (Theory 2+ Practical 1)

No. of contact hours – 36

Scope : This course will be an introduction to the pursuit of Physics, its history and methodology. The course also aims at emphasizing the importance of measurement which is central to physics.

Prerequisites: This is an introductory course. Any student who opts to take Physics as the core subject for B. Sc. should attend this course.

Module I

Historical perspective on Physics and its method (12 hrs)

Ancient perspectives on the universe - Geocentric model of Ptolemy - Copernican revolution. Galileo, and his emphasis on experiments and observations. Kepler's laws. Newton and the deterministic universe - Maxwell and the unification of electricity, magnetism and optics.

Planck's hypothesis of quantum. Quantum mechanics. Einstein and his theories of relativity. Contributions by S. N. Bose, M. N. Saha, C. V. Raman and S. Chandrasekhar. Emergence of modern physics and technology - Semiconductor revolution - nanotechnology. Contemporary worldview - the expanding universe – fundamental particles and the unification of all forces of nature. *(All from a historical perspective – details and derivations not required)*

Physics, and its relation to other branches of Science. Hypotheses; theories and laws in science- verification (proving), corroboration and falsification (disproving), Revision of scientific theories and laws. Significance of Peer Review. Publications and patents.

www.britannica.com. This online Encyclopedia is a good resource for module I (See articles on Ptolemaic System, Copernican System, Galileo, Johannes Kepler, James Clerk Maxwell, Electromagnetism, Max Planck, Quantum Mechanics and Relativity.)

Vignettes in Physics – G. Venkataraman, Universities Press - this series of books gives authentic accounts of contributions of Indian physicists (See 'Bose and his Statistics', 'Saha and his formula', 'Raman and his effect' and 'Chandrasekhar and his limit')

Module II

Measuring instruments (12 Hours)

Measurement of time – water clocks – sun dials – pendulum clocks – digital clocks – atomic clocks.

Length measurement – rulers – standard metre – micrometers – screw gauges- travelling microscope – laser range finder- sonar – GPS.

Angle measurement – spectrometer verniers - scale and telescope - measurement of stellar parallaxes .

Electrical measurement - Working principle of galvanometer, voltmeter, ammeter and digital multimeters.

Instrumentation Devices & Systems - C. S. Rangan, G. R. Sarma, V. S. V. Mani McGraw-Hill

http://www.howstuffworks.com/ This site provides good information on measuring instruments

Module III

Error Analysis (12 Hours)

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 – error bars and graphical representation.

Propagation of errors – sum and differences – products and quotients – multiplying by constants – powers

Calibration – need for calibration – methods of calibration.

An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements, John R. Taylor - Univ. Science Books

http://www.upscale.utoronto.ca/PVB/Harrison/ErrorAnalysis/

http://phys.columbia.edu/~tutorial/index.html

Reference

1. Gieryn, T.F. **Cultural Boundaries of Science**., Univ. Chicago Press, 1999.
2. Collins H. and T. Pinch. **The Golem: What Everyone Should Know About Science**.,Cambridge Univ Press, 1993.
3. Hewitt, Paul G, Suzanne Lyons, John A. Suchocki & Jennifer Yeh, **Conceptual Integrated Science**, Addison-Wesley, 2007
4. Newton RG. The Truth of Science : New Delhi, 2nd edition
5. Bass, Joel, E and et.al. **Methods for Teaching Science as Inquiry**, Allyn & Bacon,2009
6. http://www.howstuffworks.com/
7. John R. Taylor. **An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements,** Univ. Science Books
8. http://www.upscale.utoronto.ca/PVB/Harrison/ErrorAnalysis/
9. http://phys.columbia.edu/~tutorial/index.html
10. Scientific Endeavour J A lee Longman

SEMESTER II

PH2B01U - **Mechanics and Properties of Matter**

Credits – 3 (Theory 2+ Practical 1)

No. of contact hours – 36

Scope: This course would empower the student to acquire engineering skills and practical knowledge, which help the student in their everyday life. This syllabus will cater the basic requirements for their higher studies. This course will provide a theoretical basis for doing experiments in related areas.

Prerequisites: Basic mechanics, reasoning power, initiative skills and calculus

Module I

Motion under gravity : 5 hrs

Velocity- acceleration- force – acceleration due to gravity- weightlessness- compound pendulum (symmetric and unsymmetric) radius of gyration- kater's pendulum- centripetal acceleration and force- centrifugal force

Rotational mechanics : 6 hrs

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

Fundamentals of Physics – Halliday and Resnik (John Wiley & sons); Principles of Mechanics – John . L. Synge and Byron .A. Griffith (Mc-graw Hills); Mechanics – D.S.Mathur (S.Chand). Advanced Physics–Materials and Mechanics – Tom Duncan (John Murray London); Classical Mechanics – Goldstein ; Classical mechanics – K.SankaraRao (PHI); Refresher course in Physics. Vol. 1 – C.L.Arora

Module II

Oscillation and waves: 9 hrs

SHM, equation of motion to SHM- theory of damped oscillation (over, under, critical)- theory of forced oscillation- resonance- solution and equation to

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

Books of study: Vibration, waves and Acoustics – D. Chattopadhyay (Books and Allied Pvt Ltd, Culcutta); Text book of sound – Brijlal and Subrahmanniam (S.Chand); Classical mechanics – K.SankaraRao (Prentice Hall of India); Refresher course in Physics. Vol. 1 – C.L.Arora

Module III

Elasticity: 8 hrs

Stress- strain- Hooke's law- elastic module- Poisson's ratio- bending of beams- bending moment- Young's modulus (cantilever-mirror and telescope)- Young's modulus (uniform and non uniform bending-microscope) torsional oscillations- rigidity modulus- static torsion(mirror and telescope)- I section girder.

Surface tension: 4 hrs

Molecular theory of surface tension- surface energy- excess pressure in a liquid drop- transverse waves on the surface of a liquid- effect of gravity- effect of surface tension- factors affecting surface tension- applications.

Viscosity: 4 hrs

Streamline and turbulent flow- critical velocity- derivation of Poiseuille's formula- derivation of - Stoke's formula-Lubricants.

Properties of Matter- Brijlal and N. Subrahmaniam (S. Chand.); Refresher course in Physics. Vol. 1 – C.L.Arora

Reference

1. Fundamentals of Physics - Halliday and Resnik (John Wiley)

2. Principles of Mechanics - John. L. Synge and Byron A Griffith (Mc- Graw Hill)

3. Advanced Physics - Materials and Mechanics - Tom Duncan (John Murray London)

4. Mechanics - D.S.Mathur (S.Chand)

5. Classical Mechanics - Goldstein

6. Classical Mechanics - K. SankaraRao (Prentice. Hall of India- N.Delhi)

7. Text Book of Sound - Brijlal and Subramaniam (S.Chand)

8. Refresher Course in Physics - Vol1- C.L.Arora

9. Vibration, Waves and Acoustics - D.Chattopadhyay (Books and Allied Pvt Ltd)

10. Properties of Matter - Brijlal and Subramaniam (S.Chand)

11. Properties of Matter - -D.S.Mathur (S.Chand)

12. Mechanics- H.S.Hans and S.P.Puri. (Tata McGraw-Hill)

13. Properties of Matter- Brijlal and N. Subrahmanyam (S. Chand and Co.)

14. Mechanics- J.C. Upadhyaya (Ram Prasad and Sons)

SEMESTER III

PH3B01U – **Electricity and Electrodynamics**

Credits – 4 (Theory 3+ Practical 1)

No. of contact hours – 54

Scope: Electricity and Electrodynamics have the key role in the development of modern technological world. Without electric power and communication facilities, life on earth stands still. A course in electricity and electrodynamics is thus an essential component of physics programme at graduate level. This course is expected to provide a sound foundation in electricity and electrodynamics.

Prerequisites: Knowledge of Vector analysis, Vector calculus and fundamentals of electricity and magnetism.

Module I

Varying Currents: (9 hrs)

Growth and decay of current in an inductive circuit-charge and discharge of a capacitor through a resistance - measurement of high resistance by capacitor leak method- DC applied to LCR series circuit(charge case)-discharging of capacitor through LR circuit(discharge case)- Theory of BG-measurement of K of BG using standard capacitance.

Electricity and Magnetism- J.H.Fewkes & John Yarwood Chapters 3 & 5

Alternating currents & Circuit theory (10 hrs)

RMS and peak values-AC through series LCR(acceptor circuit) and parallel LCR circuit(rejecter circuit)-Q factor-power in AC-power factor-measurement of power in AC circuit-AC watt meter- Distribution of three phase current: star connection – delta connection -Ideal voltage and current sources-Thevenin's and Norton's theorems-Maximum power transfer theorem- Superposition Theorem

Electricity and Magnetism- J.H.Fewkes & John Yarwood chapter 6

Fundaments of Magnetism and Electricity D N Vasudeva Chapter 21 and 22.

Module II

Electrostatics- (13 hrs)

Electric field- Continuous charge distribution-Divergence and curl of electrostatic fields, Gauss' Law-Applications Fields due to: Spherically symmetric charge distribution, Uniformly charged spherical conductor, Line charge, Infinite plane sheet of charge, Electric field at a point between two oppositely charged parallel plates. Electric potential-Poisson's equation and Laplace's equation, The potential of a localized charge distribution, Work and Energy in electrostatics-The work done to move a charge - Energy of a point charge distribution and continuous charge distribution, Conductors - Basic properties-induced charges, Surface charge and force on a conductor-Capacitors.

Introduction to Electrodynamics- David J Griffiths- PHI Chapter 2

Magnetostatics and Maxwell's equations (12 hrs)

Magnetic field of Steady currents - Comparison of magnetostatics and electrostatics – Maxwell's equations and magnetic charge - Maxwell's equations inside matter – Boundary conditions – Scalar and vector potentials –Poynting theorem.

Introduction to Electrodynamics- David J Griffiths- PHI Chapter 5,7 &8

Module III

Electromagnetic waves (10 hrs)

Production and Detection of EM Waves- Hertz Experiment- The wave equation in one dimension – Plane waves - Polarisation – Boundary conditions- Reflection and transmission - Monochromatic plane waves in vacuum - Energy and momentum of electromagnetic waves – Propagation through linear media –- Modified wave equation in conductors - Monochromatic plane waves in conducting media.

Introduction to Electrodynamics- David J Griffiths- PHI Chapter 9

References

1. Electricity and Magnetism – J.H.Fewkes & John Yarwood -University tutorial Press

2. Fundaments of Magnetism and Electricity D N Vasudeva - S chand
3. Electricity and Magnetism A S Mahajan and AA Rangwala -TMH
4. Introduction to electrodynamics- David J Griffiths- PHI
5. Electromagnetics Matthew N Sadiku- Oxford 4th Edn
6. Electromagnetics with applications Kraus/Fleish 5th Edn – TMH
7. Electromagnetics J A Edminister 2nd Edn - TMH
8. Electromagnetic Fields TVS Arunmurthi – S. Chand

SEMESTER IV

PH4B01U – Electronics

Credits – 4 (Theory 3+ Practical 1)

No. of contact hours – 54

Scope : We are living in a wonder world of Electronics. To know the physical principles and applications of Electronics is most necessary for a Physics student. This course is intended to provide this know-how.

Prerequisites: A basic knowledge of semiconductors, circuit fundamentals, current laws, network theorems, passive elements etc is a must for the deeper understanding of the topics.

Module-I

Basic concepts of semiconductors(15 Hours)

P-N junction Diode-Diode Characteristics-Expression for Diode current (Expression-without derivation)-Static and Dynamic resistances-Junction capacitance-Equivalent circuit-Avalanche and Zener breakdown-PIV.

Rectifiers-Half wave-Centre tapped full wave and Bridge rectifiers-Derivation of efficiency and ripple factor of half wave and full wave rectifiers

Filter circuits- Shunt capacitor filter-Series inductor filter-LC filter- π section filter-Voltage regulation-Line regulation and load regulation- Zener diode shunt regulator-Design of circuit-Optimum value of current limiting resistor.

Wave shaping circuits-Clipper-Positive, negative and biased clipping circuits-Clampers-Biased clampers-Voltage multipliers- Doubler-Tripler & Quadrupler.

A Text Book of Applied Electronics-R.S.Sedha: S.Chand Co. Multi Colour Edn. Chapters-12,19,20 &33

Basic Electronics-B.L.Theraja: S.Chand Co. Chapters13&14

Module-II

Transistors (18 Hours)

Transistors-Bipolar junction transistors-Mechanism of amplification in a transistor-Common base, common emitter and common collector configurations and their characteristics-Active, saturation and Cut-off regions-Current gain α , β , γ and their relationships-Experiment to draw the characteristics of transistor in the CB and CE modes-Leakage currents-Expressions for output currents in the three modes-Thermal runaway-

Load line, Q-Point- Classification of amplifiers-Class A,B,AB and C amplifiers Need for biasing-Stabilization-Transistor biasing-Fixed bias-Collector to base bias-Self bias(emitter bias)-Voltage divider bias-Transistor as a switch.

AC equivalent circuit using h-parameters-Analysis of a transistor amplifier using h-parameters-Performance of CE,CC and CC amplifiers

Basic ideas of FET & MOSFET

A Text Book of Applied Electronics-R.S.Sedha: Multi colour Edn. S.Chand Co.Chapters-14, 15,16 &25

Basic Electronics-B.L.Theraja: S.Chand Co. Chapters 8,19, 20, 22&26.

Module-III

Amplifiers (21 Hours)

Feedback amplifiers-Principle of feedback amplifiers-Positive and negative feedback and its effects - Different types of feedback (Block diagrams only)-Emitter follower.

Sinusoidal oscillators-Principle of oscillators-Barkhausen criterion-Tuned collector oscillator-Hartley and Colpitt's Oscillators – RC Phase shift oscillators - Crystal oscillator.

Operational amplifiers - Ideal Op-amp - Virtual ground and summing point-Applications-Inverting amplifier - Non inverting amplifier-Unity follower - Summing amplifier (adder).

Modulation and Demodulation -Types of modulation - Amplitude modulation-Percentage modulation-modulation index - Analysis of AM wave – Sidebands – bandwidth - Power in an AM wave-Modulating amplifier circuit.

Frequency modulation-Carrier swing-Modulation index-Deviation ratio-Percentage modulation (Basics only)

Demodulation or detection-Diode detector circuit for AM signals

A Text Book of Applied Electronics-R.S.Sedha: Multi colour Edn S.Chand Co.Chapter-29

Basic Electronics-B.L.Theraja: S.Chand Co. Chapters25,30&31

References:

1. Electronic Principles-Sahdev (Dhanpat Rai Co.)
2. Electronic Devices and Circuit Theory-Robert L Boylestad&Louis Nashelsky, PHI
3. Electronic Principles and Applications-Schuler(McGrawHill)
4. Foundations of Electronics-D Chattopadhyay,P.C.Rakshit,B Saha,N.N.Purkait(New Age International Publishers)
5. Principles of Electronics-V.K.Mehta(S.Chand Co.)
6. Electronic Principles-A.P.Malvino 5th Edition(Tata McGrawHill)
7. Electronic Devices and Circuits-Sajeev Gupta(Dhanpat Rai Publications)
8. Basic Electronics and Linear Circuits-N.N.Bhargava,D.C.Kulshreshtha&S.C.Gupta (Tata McGrawHill)
9. Introduction to Semiconductor Devices, Kevin, Brennan Cambridge Univ. Press
10. Art of Electronics, Thomas C Hayes, Paul Horowitz, Cambridge Univ. Press

SEMESTER V

PH5B01U – **Classical and Quantum Mechanics**

Credits – 4 (Theory 3+ Practical 1)

No. of contact hours – 54

Scope: This course is a prelude to advanced theoretical studies in Condensed Matter Physics, Spectroscopy, Astrophysics, Electrodynamics and Nuclear Physics.

Prerequisites: Student should have essential knowledge of Algebra, Calculus and Newtonian Mechanics.

Module – I

Lagrange and Hamilton Equations (18 hours)

Constraints and degrees of freedom - Generalized coordinates – Classification of a dynamical system – Principle of virtual work – D'Alemberts Principle - Lagrange's equations for general systems - Applications – one dimensional harmonic oscillator – planetary motion – Hamilton's equations of motion – Application - One dimensional harmonic oscillator - Hamilton's Principle for a conservative system – Principle of least action – Calculus of variations - Lagrange's equation from Hamilton's Principle

Classical Mechanics – K. Sankara Rao, Prentice Hall of India. Chapter – 6

Module – II

Quantum Mechanics

I. Emergence of quantum concepts (9 hours)

Black body radiation - Planck's law - Particle nature of radiation – Photoelectric effect - Compton effect - wave nature of matter – deBroglie hypothesis – Davisson and Germer experiment - Uncertainty principle – probabilistic interpretation of wave function.

Introduction to Quantum Mechanics, Ajoy Ghatak, Macmillan India Ltd. Chapter– 3

II. Time dependent Schrodinger Equation (8 hours)

The Schrodinger equation – Operators - The commutator - Physical Interpretation of wave function – Normalisation probability current density -

expectation value – General eigen value equation – eigen value for momentum operator.

Introduction to Quantum Mechanics, Ajoy Ghatak, Macmillan India Ltd. Chapter– 4

Module – III

I. Propagation of wave packet (4 hours)

General solution of one dimensional Schrodinger equation for a free particle – group velocity and phase velocity.

Introduction to Quantum Mechanics – Ajoy Ghatak, Macmillan India Ltd. Chapter – 5

II. Time independent Schrodinger Equation (15 hours)

Stationary state - Time independent Schrodinger equation – boundary and continuity condition for wave functions – degeneracy – orthogonality of wave function – particle in a box (one dimensional) – One dimensional harmonic oscillator – energy eigen value and zero point energy – Orbital angular momentum – commutation relations – Eigen values of L^2, L_z - Energy eigen values of rigid rotator

Introduction to Quantum Mechanics, Ajoy Ghatak, Macmillan India Ltd. Chapter– 9

Reference:

1. Classical Mechanics - 3rd Edition: Herbert Goldstein, Charles Poole & John Safk, Pub. Pearson Education (Indian Edn.)
2. Mechanics, Hans & Puri, TMH
3. Classical Mechanics – Rana & Joag, TMH
4. Classical Mechanics – Greiner, Springer International Edn.
5. Classical Mechanics- Vimal Kumar Jain Ane Books Pvt. Ltd.
6. Quantum Physics – Stephen Gasirowicz Pub. Pearson Education (Indian Edn.)
7. Quantum Mechanics - Greiner, 4th Edition, Springer International Edn.
8. Quantum Mechanics G. Aruldhas, Premtice Hall of India.
9. Concepts of Modern Physics - Arthur Beiser, Tata Mc Graw Hill.
10. Applied Quantum Mechanics, A F J Levi, Cambridge Univ. Press.

SEMESTER V

PH5B02U – **Physical Optics and Photonics**

Credits – 4 (Theory 3+ Practical 1)

No. of contact hours – 54

Scope: This course aims to provide necessary foundation in optics and photonics which prepare the students for an intensive study of advanced topics at a later stage.

Prerequisites: Concepts of waves, basics in Mathematics.

Module I

Interference (11 hrs)

Review of basic ideas of interference, (Coherent waves-Optical path and phase change-superposition of waves, condition for bright and dark fringes).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. Michelson interferometer-construction-working and applications.

Optics by Subramanayam, Brijlal, MN Avadhanalu, S.Chand Chapter 14 and15

Diffraction (11 hrs)

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 diffraction grating.

Optics by Subramanayam, Brijlal, MN Avadhanalu, S.Chand Chapter 17 and 18

Module II

Polarization (10hrs)

Concept of polarization – (plane of polarization)-polarization by reflection-Brewster's law-polarization by refraction-pile of plates. Polarization by double refraction-(calcite crystal). Anisotropic crystals –optic axis –Double refraction-Huygens explanation of

double refraction. Positive and Negative crystals-Electromagnetic theory of double refraction. Types of polarized light-Retarders or wave plate- Quarter wave plate – Half wave plate- Production and Detection of elliptically and circularly polarized light-Optical Activity-Fresnels Explanation of Optical Rotation-(Analytical treatment not needed) – Specific Rotation-Laurents half shade polarimeter

Optics by Subramanayam, Brijlal, MN Avadhanalu, S.Chand. Chapter – 20

Module-III

Lasers (12hrs)

Absorption and emission of light-Absorption-spontaneous emission and stimulated emission-light amplification by stimulated emission. Einstein's relations-condition for light amplification –population inversion-pumping –pumping methods –optical pumping – electrical pumping -direct conversion. Active medium-metastable states-pumping schemes (two level, three level and four level) Optical resonator (theory not required) Threshold condition. Types of lasers-ruby laser, He-Ne laser, semi-conductor laser. Applications of lasers-Holography (principle, recording and reconstruction)

An introduction to lasers theory and applications.MN Avadhanulu.S.Chand

Chapter-1

Fibre Optics and Optical Communication (10hrs)

Optical fibre- Critical angle of propagation-modes of propagation- Acceptance angle-Fractional refractive index change- Numerical Aperture- Types of Optical fibers-Normalized Frequency- pulse dispersion Attenuation- Applications- Fibre optic communication system- Advantages of Optical fibers.

Optics by Subramanayam, Brijlal, MN Avadhanalu, S.Chand Chapter 24.

References

1. Optics 3rd edition- Ajoy Ghatak, TMH
2. Optical Electronics – Ajoy Ghatak and K Thyagarajan, Cambridge
3. Optics and Atomic Physics D P Khandelwal, Himalaya Pub. House
4. Optics S K Srivastava, CBS Pub. N Delhi
5. A Text book of Optics S L Kakani, K L Bhandari, S Chand.

SEMESTER V

PH5B03U – **Thermal and Statistical Physics**

Credits – 4 (Theory 3+ Practical 1)

No. of contact hours – 54

Scope: This course is to develop a working knowledge of statistical mechanic and to use this knowledge to explore various applications related to topics in material science and the physics of condensed matter.

Prerequisites: Basics of calculus and quantum mechanics.

Module I

Thermal Physics (18 hrs)

Laws of Thermodynamics: Zeroth law. First law- internal energy, Applications of first law, Indicator diagram, Work done during isothermal and adiabatic process, slopes, relation between them , cooling due to Adiabatic reversible processes . Reversible and irreversible processes, Second law, Heat Engines, Carnot cycle and theorem, Work done by the engine per cycle, efficiency, Otto Engine, Petrol engine, Diesel Engine, Third law of thermodynamics -Unattainability of absolute zero

Thermodynamics and Statistical physics Brij Lal, N.Subrahmanyam and P S Hemne (S. Chand &Co, Multi colour edition 2007) Chapters 4,5

Module II

Thermodynamic relations and Heat Transmission (18 hrs)

Entropy, entropy changes in reversible and irreversible processes, Entropy – temperature diagrams and equations**.** Physical significance of entropy. Clausius Clepeyron Equation. Thermodynamic potentials: Enthalpy, Gibbs and Helmholtz functions, Maxwell's relations and applications, Concepts of adiabatic and isothermal elasticity

Modes of heat transfer, Searle's & Lee's experiment, black body radiation, Stefan-Boltzmann Law, Wein's displacement law, Rayleigh -Jean's Law, Planck's law (no derivation).

Thermodynamics and Statistical physics Brij Lal, N.Subrahmanyam and P S Hemne (S. Chand &Co, Multi colour edition 2007) Chapters 5,6,8,15

Module III

Statistical Mechanics (18hrs)

Micro and Macro states, thermodynamic probability, energy states, energy levels, degenerate energy levels, degenerate gas, phase space, concept of entropy and thermodynamic probability.

Classical Statistics: Maxwell-Boltzmann Distribution law, thermodynamics of an ideal monoatomic gas, Classical entropy expression, Gibbs' paradox.

Quantum Statistics:

Need of quantum statistics- Indistinguishability of particles- Spin and Statistics- Ideas of Bose Einstein distribution law and its application to black body radiation, Fermi Dirac Statistics and its application to electron gas

Thermodynamics and Statistical physics Brij Lal, N.Subrahmanyam and P S Hemne (S. Chand &Co, Multi colour edition 2007) Chapters 9,10,11,12

Reference:

1. Heat and Thermodynamics, Mark W Zemaskay and Richard H Dittman, Tata McGraw-Hill Publishing Co. (Special Indian Edition)
2. Thermodynamics and Statistical Mechanics, Greiner, Springer
3. Berkeley Physics Course Volume 5; Statistical Physics; Frederick Reif. McGraw Hill.
4. A Treatise on Heat; Saha and Srivastava, The Indian Press, Allahabad.
5. Statistical Mechanics, R.K. Pathria, Pergamon press, Oxford

SEMESTER V

PH5B04U - **Digital Electronics**

Credits – 4 (Theory 3+ Practical 1)

No. of contact hours – 54

Scope: This course is expected to provide necessary back ground for applications of electronics in mathematical computation.

Prerequisites: Basic knowledge of electronics and Mathematics

Module I

Number systems (8 hrs)

Digital and analog systems- Comparison, Different number systems- decimal, binary, octal and hexadecimal-conversion between different systems- Binary arithmetic- addition, subtraction and multiplication. Subtraction with 2's complement and 1's complement- BCD code, ASCII code

Digital design- M Morris Mano PHI Chapter 1

Module II

Boolean algebra (20 hrs)

Binary logic- AND,OR and NOT operators- Logic symbol and truth table-Laws of Boolean algebra- Demorgan's theorem- Duality theorem- Boolean functions- Complement of a function- Reducing Boolean expressions- Canonical and standard form- Conversion between truth table, Boolean expressions and Logic diagrams- Simplification of Boolean functions using Karnauh map(Two, three and four variables) NAND, NOR, XOR, XNOR gates- IC digital logic families (Familiarization only)

Digital design- M Morris Mano PHI Chapter 2 and 3

Module III

Combinational Logic (9 hrs)

Adders- Half and Full adders- Subtractor- Four bit adder- Subtractor. Encoders, Decoders, Multiplexers and Demultiplexers

Sequential logic (17 hrs)

Flip-flops, RS, Clocked RS, MSJK FF, DFF JK, T Flip-flop, Buffer registers- Shift register- Counters- Binary ripple counter- BCD ripple counter- synchronous binary counter- Decade counter.

D/A converters (Ladder type), A/D Converter (Counter type).

Digital design- M Morris Mano PHI Ch. 4,5,6 and 7

Digital principles and applications 6th Edn. Malvino, Leach and Saha TMH Ch. 13

Reference:

1. Digital design- M Morris Mano PHI
2. Digital logic and computer design - M Morris Mano PHI
3. Digital Electronics- William H Gothmann PHI
4. Digital principles and applications 6th Edn. Malvino, Leach and Saha TMH
5. Digital circuits and design- S Salivahanan and S Arivazhakan PHI
6. Digital Electronics- Sedha S Chand
7. Pulse, Digital and switching wave forms –Millam and Taub.
8. Digital computer electronics- Malvino, Brown TMH
9. Digital electronics- Tokheim(TMH)

SEMESTER V

PH5D01.1U – **Open course**

Amateur Astronomy

Credits – 4

No. of contact hours – 72

Scope: To help students comprehend the cosmos and to develop scientific temper.

Prerequisites: This being a course open to students from different streams does not require a solid background in Physics. However a healthy curiosity for the subject is expected.

Module I

Observing the night sky. (24 hours)

Celestial sphere. The cardinal points and circles on the celestial sphere. Equatorial. ecliptic and galactic system of co-ordinates. Aspects of sky from different places on the earth. Twilight, Seasons, Sidereal, Apparent and Mean solar time and their relations. Equation of time. Ephemeris and Atomic Times. Calendar. Julian date and heliocentric correction.

Understanding star maps. Identification of bright stars, constellations, lunar asterisms. . Nebula – galaxies – Messier objects. Stellar magnitudes and nomenclature. Sky catalogues. . Classification of stars and galaxies.

Different types of telescopes – reflectors and refractors. Different types of eye pieces. Focal ratio, magnification etc. telescope mounts – equatorial and altazimuth mounts. Design of a simple reflectors and refractors. Magnification of telescopes.

Colin A Ronan: **The Sky-watcher's handbook,** Corgi Books.

Antonin Ruki, **A Guide to the stars, Constellations and Planets**, Caxton editions

Module II

Solar system and beyond (24 hours)

Structure and origin of the solar system The sun, a model star; The planets, asteroids and comets: Mercury-the elusive planet, Venus-the clouded planet, Mars-the red planet, The asteroid belt-rubble of the solar system, Jupiter-a strange veiled giant, Saturn-the ringed planet, Planets beyond the reach of the eye, A cloud made of comets; The Earth-the most familiar planet; Lunar and solar eclipses. Other moons in solar system.

Beyond the solar system; Distances to stars from parallaxes. Stellar motions. Magnitude scale and magnitude systems. Atmospheric extinction. Absolute magnitudes and distance modulus. color index. Black-body approximation to the continuous radiation and temperatures of stars. Variable stars as distance indicators.

http://solarsystem.nasa.gov/planets/

http://www.nineplanets.org/

Baidyanath Basu: Introduction to Astrophysics. Prentice-Hall of India Pvt. Ltd

K. D. Abhyankar, Astrophysics of the Solar System, Universities Press

Module III

Our Universe (24 hrs)

Historical perspective -Early models of the universe, Geocentric models – annual and diurnal motions of Sun - Ptolemy's model – epicycles. Copernican model – Galileo and his telescopic observations. . Our place in the universe – Sun in the Milky Way – local cluster of Galaxies - super cluster - voids

Stellar evolution – interstellar cloud – protostar – main sequence – energy production – red giants, white dwarfs, super nova, neutron star, pulsar, black holes. The expanding universe. Galactic red shift – distance to galaxies – Hubble's law –Big bang and Steady State models of the universe - Microwave background.

Observational evidence for the Big Bang model. Inflationary universe. Dark matter and dark energy

References

James B. Seaborn. **Understanding the Universe**, Springer

Jayant V. Narlikar, **Elements of Cosmology**, Universities Press

Baidyanath Basu: Introduction to Astrophysics.

SEMESTER V

PH5D01.2U – Open course

Energy and Environmental Studies

Credits – 4

No. of contact hours – 72

Scope: The course creates concern among the students on energy conservation and environmental protection.

Prerequisites: Basic knowledge in science.

Module I

Energy sources (10 hrs)

World's reserve of energy sources- various forms of energy- non- renewable energy sources- coal, oil, natural gas- availability- statistical details- merits and demerits renewable energy sources- solar energy- wind energy- fusion energy- geothermal energy- hydro energy – biogas energy - tidal energy - comparison- merits and demerits- storage, transportation and distribution of energy.

Solar energy utilization (20 hrs)

Sun as a source of energy- solar radiation- spectral distribution- sunshine hours- flat plate collector- solar water heating- solar pond- optical concentrator- solar desalination- solar dryer- solar cooker- solar air conditioning- active and passive heating of buildings- cooling and refrigeration- solar green houses- solar furnaces- solar thermo-mechanical power- solar powered thermo water pump- solar photovoltaics- economic analysis.

Energy audit and planning (5hrs)

Energy audit concepts –energy management- elements- measurements- mass and energy balance- evaluation of energy conserving opportunities- demand reduction options.

Sustainable energy: choosing among options- J.W. Tester, E.M. Drake, M.J. Driscoll, M.W. Golay and W.M. Peters (PHI Pvt. Ltd)

Renewable Energy sources and their Environmental Impact- S.A. Abbasi and N. Abbasi (PHI Pvt. Ltd)

Solar energy- fundamentals and applications- H.P. Garg and J. Prakash (Tata Mc Graw Hill)

Solar energy-fundamentals, design, modeling and applications- G.N. Tiwari (Narosa Pub. House)

Module II

Environmental pollution (15hrs)

Basic concepts of ecology and environment- environmental pollution- primary and secondary pollutants- classification- environmental degradation- assessment of impacts on air environment- green house gases- global warming - climatic effects of environmental pollution- assessment of impacts on water, soil and groundwater environment- marine pollution - noise pollution- environmental disasters

Environment impact assessment and ethics (10hrs)

Environment impact assessment- environment ethics- Environmental legislation and strategies to control pollution- methodology of environmental impact studies- role of national and international agencies in dealing with environmental aspects- standards developed by ministry of environment and forest- sampling and analysis techniques- data interpretations and relationships for the design of treatment facilities- regulations for pollution controls of water- air industrial- automobile- noise and hazardous waste environmental audit- public liability insurance- regulations on vehicles in metropolitans- participation of public in environmental decision making.

Environmental Science: Principles and Practice- R.C. Das and D.K. Behera (PHI Pvt. Ltd)

Biotechnology for waste and wastewater treatment- N.P. Cheremisinoff (PHI Pvt. Ltd)

Environmental management- B. Krishnamoorthy (PHI Pvt. Ltd)

Environmental chemistry- S. K. Banerji (PHI Pvt. Ltd)

Introduction to Environmental engineering and science- G.M. Masters and W.P. Ela (PHI Pvt. Ltd)

Environmental engineering- D. Srinivasn (PHI Pvt. Ltd)

Module III

Waste management and bioconversion (12hrs)

Waste minimization and resource conservation- environmental management system- remediation of municipal and industrial waste problems- hazardous waste management options- remediation of hazardous waste contaminated soils- engineering issues in waste remediation case studies

Overview of waste management program- chemical waste treatment processes- physical waste treatment processes- biological waste treatment processes- thermal waste treatment processes - classification of hazardous wastes- biological treatment of waste/waste water and hazardous wastes- production of biomass- photosynthesis- bioconversion mechanism- wastes undergoing bio treatment- bio gas- energy from organic wastes- waste elimination option.

Environmental Science: Principles and Practice- R.C. Das and D.K. Behera (PHI Pvt. Ltd)

Biotechnology for waste and wastewater treatment- N.P. Cheremisinoff (PHI Pvt. Ltd)

Environmental management- B. Krishnamoorthy (PHI Pvt. Ltd)

Environmental chemistry- S. K. Banerji (PHI Pvt. Ltd)

Introduction to Environmental engineering and science- G.M. Masters and W.P. Ela (PHI Pvt. Ltd)

Environmental Engineering- D. Srinivasn (PHI Pvt. Ltd)

References

1. Sustainable energy: choosing among options- J.W. Tester, E.M. Drake, M.J. Driscoll, M.W. Golay and W.M. Peters (PHI Pvt. Ltd)

2. Renewable Energy sources and their Environmental Impact- S.A. Abbasi and N. Abbasi (PHI Pvt. Ltd)

3. Solar energy- fundamentals and applications- H.P. Garg and J. Prakash (Tata Mc Graw Hill)
4. Solar energy-fundamentals, design, modeling and applications- G.N. Tiwari (Narosa Pub. House)
5. Environmental Science: Principles and Practice- R.C. Das and D.K. Behera (PHI Pvt. Ltd)
6. Biotechnology for waste and wastewater treatment- N.P. Cheremisinoff (PHI Pvt. Ltd)
7. Environmental management- B. Krishnamoorthy (PHI Pvt. Ltd)
8. Environmental chemistry- S. K. Banerji (PHI Pvt. Ltd)
9. Introduction to Environmental engineering and science- G.M. Masters and W.P. Ela (PHI Pvt. Ltd)
10. Environmental engineering- D. Srinivasan (PHI Pvt. Ltd)

SEMESTER VI

PH6B01U - **Computational Physics**

Credits – 4 (Theory 3+ Practical 1)

No. of contact hours – 54.

Scope: This course is intended to give an insight to computer hardware and computer applications.

Prerequisites: Basic mathematics and electronics

Module 1

Microprocessors (20 hrs)

Introduction to microprocessors- microprocessor operations (with relevance to 8085 microprocessor): 8085 bus organization-address bus- data bus- control bus, internal data operations- 8085 registers- accumulator- flags- program counter- stack pointer, externally initiated operations

The 8085 microprocessor architecture- pinout and signals- internal architecture of 8085 microprocessor

Machine language- assembly language- high level language.

Instruction cycle, machine cycle and T state- instruction format- addressing modes.

The 8085 instruction set- simple programmes for data transfer, addition and subtraction.

Microprocessor architecture, programming and applications- Ramesh S. Gaonkar (Penram Int. Pub.) Chapter.1,2,3,5,6,7

Module II

Computer hardware (5 hrs)

Characteristics of a computer- I/O devices- memory and storage devices- RAM, ROM, Primary and secondary memory

Fundamentals of Microprocessors and microcomputers- B. Ram (Dhanpat Rai Pub.) Chapter 1

Programming in C^{++} (17 hrs)

Introduction- C^{++} programming basics- loops and decisions- basic ideas of structures, arrays, functions, objects and classes

Object oriented programming in Turbo C^{++}- Robert Lafore (Galgotia Pub.)

Chapter 1,2,3,4

Module III

Numerical methods (12 hrs)

Iteration principle- solution of algebraic equations- bisection, false position and Newton-Raphson methods- algorithms - numerical integration- trapezoidal rule and Simpson's 1/3 rule - algorithm- Numerical solution of differential equation- Euler's method and second order Runge-Kutta method- algorithm. Computer oriented numerical methods.

Computer oriented numerical methods. V Rajaraman 3rd Edn PHI, Ch. 3,8and 9

References

1. Microprocessor architecture, programming and applications- Ramesh S. Gaonkar (Penram Int. Pub.)
2. Fundamentals of Microprocessors and microcomputers- B. Ram (Dhanpat Rai Pub.)
3. Microcomputers and Microprocessors- John Uffenbeck (PHI Pub.)
4. Object oriented programming in Turbo C^{++} - Robert Lafore (Galgotia Pub.)
5. Programming with C^{++} - John R. Hubbard (Mc Graw Hill Pub.)
6. Numerical method- V. Rajaram (PHI Pub.)
7. Introductory methods of Numerical methods -S.S .Sastry (PHI Pub.)
8. Numerical method with computer programming in C^{++} - Ghosh (PHI Pub.)

SEMESTER VI

PH6B02U – **Nuclear and Particle Physics**

Credits – 4 (Theory 3+ Practical 1)

No. of contact hours – 54

Scope: This course intended to explore the interior of nucleus and interaction between nucleons

Prerequisites: Basic mathematics and quantum mechanics.

Module I

Nuclear structure & General properties of nuclei (15 hr)

Classification of nuclei – Isotopes, Isobars, Isomers, Mirror nuclei. General properties of nucleus – size, nuclear mass, density, charge, angular momentum, nuclear magnetic dipole moments, electric quadrupole moment, Mass defect, B.E, B.E. curve, packing fraction, nuclear stability. Theories of nuclear composition – proton-electron hypothesis – proton-neutron hypothesis. Properties of Nuclear forces – Meson theory of nuclear forces. Nuclear shell model. Determination of nuclear mass by Bainbridge's mass spectrograph. Detectors of nuclear radiations – ionisation chamber - G.M Counter.

Modern Physics	**(Ch. 8)**	**R. MurugeshanS.Chand**
Modern Physics	**(Ch.3)**	**R. MurugeshanS.Chand**
Atomic and Nuclear Physics	**(Ch.2)**	**S.N Ghoshal)S.Chand**
Modern Physics	**(Ch. 9)**	**R. MurugeshanS.Chand**

Module II

Radioactivity (18 hr)

Natural radioactivity – Radioactive disintegration law – half life – Mean life Radioactive series. Radioactive dating – Uranium dating & Carbon dating Range of $\propto$ particles – range – energy relationship. Geiger – Nuttal law Alpha particle disintegration energy Theory of $\propto$ - delay – Gamow's theory β- decay - β ray energy

spectrum Neutrino hypothesis Positron emission, orbital electron capture (Basic ideas only) γ decay – Internal conversion Electron positron pair production by γ rays. Electron positron annihilation. Artificial radioactivity & Transuranic elements. (Basic ideas only)

Atomic and Nuclear Physics (Ch.3) S.N Ghoshal S.chand

Modern Physics (Ch. 11) R MurugesanS.Chand

Module III

Nuclear fission & Fusion (11 hr)

Discovery of nuclear fission – Fission products. Neutron emission in fission. Energy release in fission. Nuclear fission on the basis of liquid drop model chain reaction – Nuclear reactor – Breeder reactor Nuclear fusion Energy production in stars – Proton-Proton cycle and Carbon - Nitrogen cycle Peaceful utilization fusion power Controlled thermo nuclear reactions Toroidal confinement – Tokamak Nuclear waste disposal and radiation hazards from nuclear explosion – radiation dosage.

Modern Physics (Ch. 13) R. Murugeshan

Atomic and Nuclear Physics (Ch. 14) S.N Goshal

Elementary particles (10 hr)

Particles and antiparticles – Fundamental interactions in nature. Classification of elementary particles according to nuclear interactions. Resonance particles Elementary particle quantum numbers and conservation laws. The quark model – compositions of hadron according to quark model. Cosmic rays – Primary and secondary- lattitude effect- altitude effect- eastwest effect

Modern Physics (Ch. 18) S.N Ghoshal S.Chand

Atomic and Nuclear Physics (Ch. 15) R. Murugeshan

S.Chand

References:

1. Nuclear Physics Principles and Applications. Lilley, Pub. John. Wiley
2. Nuclear and Particle Physics S L Kakani and Subhra Kakani -Viva Books 2008

SEMESTER VI

PH6B03U –- **Condensed Matter Physics**

Credits – 4 (Theory 3+ Practical 1)

No. of contact hours – 54

Scope: This course is intended to provide an introduction to the physics of Condensed Matter. This study attempts to explain various types of phenomena like electro-magnetic properties, super-conductivity and super fluidity.

Prerequisites: Basics of Mathematics, quantum mechanics

Module I

Crystal structure and Bonding (12 hrs)

Crystal Structure - Crystalline Matter - Bravias Lattice - Crystal Systems - Crystal Planes - and Miller Indices - Lattice Constants - Reciprocal Lattice - Crystal Structures - sc, bcc, fcc and hcp - Bragg's Law - Experimental Methods of X-Ray diffraction - Powder method.

Bonding in Solids - Ionic, Covalent, Van der Waal and Metallic Bonding (qualitative) - Binding Energy in Crystals - Madelung Constant.

Free Electron Theory and Band Theory of Solids (15 hrs)

Free Electron theory in one dimension- Formation of Energy Bands-Bloch Theorem (Statement) - Kronig Penney Model –Brillouin Zones (qualitative) –Effective Mass-Carriers in Solids- Metals, Insulators and Semiconductors-Band Structure-Intrinsic and Extrinsic Semiconductors- Electric Conductivity-Temperature Dependence-Hall effect.

M. Elementary Solid State Physics: (Pearson) Chapter1,2,5&6, Ali Omar

Solid State Physics, P.K. Palanisamy, Scitech publications Chapter 1,2&6

Solid State Physics, S.Chand R.K Puri & V.K.Babber, Chapter 3&6.

Module II

Dielectric and Magnetic Properties of Solids (10Hrs)

Review of Basic Equations - Dielectric Constant - Dipole Moment-Polarizability-Clausius-Mosotti Relation- Ferrroelectricity - Classification of Magnetic Materials-Langevin's theory - Paramagmetism - Curie-Weiss Law- Curie temperature - Antiferromagnetism and Ferrimagnetism – Magnetisation - Magnetic Domain Structure – Spintronics - Spin Waves.

M. Elementary Solid State Physics: Ali Omar (Pearson) Chapter 8& 9

Solid State Physics, P.K. Palanisamy, Scitech publications , Chapter 7&8

Solid State Physics, R.K Puri & V.K.Babber, S.Chand Chapter8

Mircea.S.Rogalski & B.Palmer, Solid State Physics. Chapter 8&9

Module III

Superconductivity (10 hrs)

Zero resistance - Superconducting Phenomenon - Critical Temperature - Meissner Effect-Type I& II Superconductors - BCS theory (qualitative) - London Equation - Josephson Effect – SQUID - High Tc superconductors and applications.

Elementary Solid State Physics: Ali Omar (Pearson) Chapter 10

Solid State Physics, P.K. Palanisamy, Scitech publications , Chapter 10

Materials Science and Technology (7hrs)

Amorphous Semiconductors - Liquid Crystals – Polymers - Thin films - Properties-Crystalline Materials and Applications - Nanostructures and Nanometerials-Applications.

Elementary Solid State Physics: Ali Omar (Pearson) Chapter 12

Thin film fundamentals, A.Goswami.New Age International,2008. Chapter1

Nanostructures And Nanomaterials Synthesis, Properties, And Applications,

Guozhong Cao, Imperial College Press, 2004 Chapter 3 And 5.

References

1. Kittel, C. Introduction to Solid State Physics, 8th edition (Wiley)

2. Ashcroft, N.W. & Mermin, N.D. Solid State Physics, TMH

3. Blakemore, J.S. Solid State Physics, 2nd edition (Cambridge)

4 C.L. Arora, Solid State Physics. S Chand.

5. S.O.Pillai, Solid State Physics. New Age International Pub.

6. Superconductivity, Superfluids and Condensate James F Annett Oxford

SEMESTER VI

PH6B04U - **Relativity and Spectroscopy**

Credits – 4 (Theory 3+ Practical 1)

No. of contact hours – 54

Scope: This course is intended to introduce principles of spectroscopy and special theory of relativity.

Prerequisites: Basics courses in Mathematics and Quantum mechanics

Module I

Special Theory of Relativity.(18 hours)

Inertial and non inertial frames of reference – Galilean transformation – Significance of Michelson – Morley experiment – postulates of STR- Lorentz transformation – spatial contraction - time dilation – composition of velocities – Mass of a moving particle – Equivalence of mass and energy – Introductory concepts of general theory of relativity

Concepts of modern Physics, Arthur Beiser

Classical Mechanics – K. Sankara Rao, Prentice Hall of India

Module II

Atomic spectroscopy (18 hours)

Historical introduction. Electromagnetic 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. NMR and ESR spectroscopy (qualitative ideas only)

Concepts of Modern Physics, Arthur Beiser; Tata McGraw-Hill

Fundamentals of Molecular Spectroscopy, C. Banwell and E. Mccash; TMH

Module III

Molecular Spectroscopy (18 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 results - classical theory and its failure – quantum theory of Raman effect.

IR and Microwave spectroscopes.

Fundamentals of Molecular Spectroscopy, C. Banwell and E. Mccash; Tata McGraw-Hill

Molecular structure and Spectroscopy, G. Aruldhas, Prentice Hall of India

References:

1. Arthur Beiser; Concepts of modern Physics.
2. C. Banwell and E. Mccash; Fundamentals of Molecular Spectroscopy.
3. G. Aruldhas; Molecular structure and Spectroscopy.
4. Classical Mechanics – K. Sankara Rao, Prentice Hall of India

SEMESTER VI

Choice Based course

PH6B05.1U **– Astronomy and Astrophysics**

Credits –3

No. of contact hours – 90

Scope: A good introduction to the basics of astronomy and astrophysics will be given in the course. It is expected that some of the students will opt for this specialization for their post graduation.

Prerequisites: This is a specialized course. Students are supposed to have attended basic courses on thermal physics, statistical mechanics and quantum mechanics prior to this course.

Module I

Introduction to observational astronomy (30 hours)

Celestial sphere. Constellations and nomenclature of stars. The cardinal points and circles on the celestial sphere. Equatorial. ecliptic and galactic system of co-ordinates. Aspects of sky from different places on the earth. Sidereal, Apparent and Mean solar time and their relations. Equation of time. Ephemeris and Atomic Times. Calendar. Julian date and heliocentric correction. Introduction to telescopes. Amateur Refracting telescopes and their design. Newtonian reflectors, Cassegrain telescopes. Telescope mounts - equatorial and alt-azimuth, telescope drives.

Distances of stars from parallaxes. Stellar motions. Magnitude scale and magnitude systems. Black-body approximation to the continuous radiation and temperatures of stars. Variable stars as distance indicators

World Book Encyclopedia of Science, Volume. 1

Textbook of Astronomy and Astrophysics with Elements of Cosmology, V. B. Bhatia, Narosa Publishing House.

Exploring the Night Sky with Binoculars, Patrick Moore, Cambridge University Press.

Module II

Stars (30 hours)

Sun –internal structure and atmosphere- photosphere- sunspots - chromospheres – corona –solar flares –prominences. Stellar structure - hydrostatic equilibrium- structure equations - energy sources - energy transport. Types of stars – classification and HR diagram.

Formation - Interstellar dust and gas – Jeans' mass - formation of protostars – evolution of planetary systems with special reference to Sun -Pre-main sequence evolution; nuclear fusion. P-P chain and CNO cycle. Energy production in massive stars. Evolution on the main sequence - Late stages of evolution. Fate of massive stars, supernovae - White dwarfs - Chandrasekhar limit - Neutron stars – Pulsars – Black holes

Astrophysics: Stars and galaxies, K. D. Abhyankar, Tata McGraw Hill

The Physics of Stars, A.C. Philips, Wiley

Module III

Galaxies and the expanding Universe (30 hours)

Galaxies-their morphology and classification. Cepheid variables and distance measurements. Origin and evolution of Galaxies. Large scale structure of the universe – isotropy and homogeneity. Expanding universe – Doppler effect – red shift – distance scale –Hubble law. Standard Big bang theory , cosmic microwave background and its discovery ; early universe – nucleosynthesis in early universe – inflationary model of the universe – age of the universe and its determination.

Introduction to Cosmology, J. V. Narlikar, Cambridge University Press.

Particle Astrophysics, Donald Perkins, Oxford

Astrophysics: Stars and galaxies, K. D. Abhyankar, Tata McGraw Hill

References:

1. Baidyanath basu, An Introduction to Astrophysics. PHI
2. James B. Seaborn, Understanding the Universe, Springer

3. The Physical Universe – An Introduction to Astronomy – Frank H. Shu- University Science Books.

4. The First Three Minutes. Steven Weinberg

SEMESTER VI

Choice Based Course

PH6B05.2U – Information Technology

Credits – 3

No. of contact hours – 90

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 (32 hrs)

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

"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. Network Architecture – Client/Server, Peer-to-Peer

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-Internet Infrastructure -Services on Internet – Domain Name System-SMTP and Electronic mail – Http and World Wide Web-Usenet and News groups-FTP-Telnet-Network Security – Ideas of secret key Algorithms and Public key Algorithms-

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

Computer Networks – A.S. Tanenbaum – PHI, Chapter – 5,6,7

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

Module – II (32 hrs)

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 -Some Special Tags–COLGROUP-THREAD,TBODY-TFOOT-_blank-_self,_parent-_top-IRFRAME-LABEL-Attribute for <SELECT>-TEXTAREA

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

Module – III (26 hrs)

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

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)

Reference

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 – Tata Mac 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. 4th Edn.v Pearson Education, India, 2004.

Choice Based Course

SEMESTER VI

PH6B05.3U **– Renewable Energy Technology**

Credits – 3

No. of contact hours – 90

Scope: This course is designed to make the students aware of challenging energy crisis and alternative energy solutions.

Prerequisites: Concepts of work- power- energy, heat energy- Modes of energy transfer- Heat engines, Concepts of Physical optics, Fundamental of Electricity.

Module I

Introduction to Energy Sources (6 hours)

Energy consumption as a measure of Prosperity – World energy futures – Energy sources and their availability – New energy technologies – Renewable energy sources

Non-conventional Sources of Energy - G D Rai Chapter 1

Solar Energy (20 hours)

Solar radiation geometry – Solar radiation measurements – Principles of the conversion of solar radiation in to heat – Flat plate collectors – Energy balance equation and collector efficiency – Concentrating collector: Focusing type – Performance analysis of a parabolic collector – Selective absorber coatings – Solar energy storage systems – Solar pond – Principle of operation and extraction of thermal energy – Solar heating and solar cooling of buildings – Solar electric power generation: Solar photo-voltaic cells

Non-conventional Sources of Energy - G D Rai Chapters 2,3,4&5

Module II

Wind Energy (14 hours)

Basic principles of wind energy conversion – site selection considerations – Classification of wind energy conversion systems – types of wind machines – Performance analysis of wind machines – Schemes for electric generation – Applications of wind energy – Environmental aspects.

Non-conventional Sources of Energy - G D Rai Chapter 6

Geothermal Energy (14 hours)

Nature of geothermal fields - Geothermal resources – Hot dry rock resources – Magma resources – Geothermal exploration – Advantages and disadvantages of geothermal energy – Applications of geothermal energy – Operational and environmental problems.

Non-conventional Sources of Energy - G D Rai Chapter 8

Energy from Biomass (11 hours)

Biomass conversion technologies – Biomass as a source of energy – Energy plantation – Methods for obtaining energy from biomass – Biogas generation – Biodegradation – Biogas plants – Biogas from waste – Community biogas plants – Thermal gasification of biomass.

Non-conventional Sources of Energy - G D Rai Chapter 7

Module III

Energy from the Oceans (15 hours)

Ocean thermal electric conversion (OTEC) – Introduction – Open cycle OTEC system – Closed cycle OTEC system – Hybrid cycle – Prospects of OTEC in India.

Energy from Tides – Basic principle of tidal power – Operation methods of utilization of tidal energy – Single cycle and double cycle systems – Advantages and limitations of tidal power generation - Prospects of tidal energy in India.

Ocean waves – Energy and power from the waves – Wave energy conversion devices - Advantages and limitations of wave energy.

Non-conventional Sources of Energy - G D Rai Chapter 9

Energy storage (10 hours)

Fuel cells – Design and principle of operation of a fuel cell – Classification of fuel cells – Conversion efficiency of fuel cells – Applications of fuel cells.

Non-conventional Sources of Energy - G D Rai Chapter 10

Hydrogen energy – Hydrogen production (Electrolysis, thermochemical methods) – Hydrogen storage – hydrogen as an alternative fuel for motor vehicles.

Non-conventional Sources of Energy - G D Rai Chapter 11

References:

1. Non – Conventional Energy Sources: G D Rai (Khanna Publishers)
2. Renewable Energy Technologies : Solanki C S (Prentice-hall Of India Pvt Ltd)
3. Renewable Energy Sources & Their Environmetal Impact : Abbasi (Prentice-hall of India Pvt Ltd)
4. Renewable Energy Sources for Sustainable Development N.S.Rathore N.L.Panwar (New India Publishing Agency)
5. Renewable Energy : Ulrich Laumanns And Dieter Uh Dirk Abmann (James & James Science Publishers)
6. Understanding Renewable Energy Systems : Volker Quaschning (James & James Science Publishers)
7. Renewable Energy: Global Perspectives : Azmal Hussain (Icfai University Press)
8. New And Renewable Energy Technologies For Sustainable Development : Naim Hamdia Afgan, Da Graca Carvalho Maria, Maria Da Graca Carvalho (Taylor & Francis Group)
9. Renewable Energy from the Ocean : Avery, William H.; Wu, Chih; Craven, John P. (Oxford University Press)
10. Fundamentals of Renewable Energy Systems : Mukherjee D (New Age International (p) Limited)
11. Renewable Energy Sources & Emerging Tech., : Kothari D P (Prentice-hall Of India Pvt Ltd)
12. Energy From Biomass : Willeke Palz, D. Pirrwitz (Springer)
13. Understanding Renewable Energy Systems : Volker Quaschning (James & James

Science Publishers)

14. Ocean, Tidal, And Wave Energy: Power From The Sea : Lynn Peppas (Crabtree Publishing Company)
15. Fuel Cells, Geothermal Energy And Tidal Power: Emerging Scenario In Alternate Energy : Sameer A Zodgekar (Icfai University Press)

SEMESTER VI

Choice Based Course

PH6B05.4U – Nanoscience and Nanotechnology

Credits – 3

No. of contact hours – 90

Scope: Today's science and engineering disciplines are at a crossroad where they can couple strongly with each other to give rise to new and emerging disciplines such as, the field of Nanoscience and Nanotechnology. This field is truly interdisciplinary in nature, and concerns with the fabrication and manipulations of few atoms and molecules to form mesocpic structures with dimensions ranging between 1-100 nm. In order to get a nano object to functions is necessary to assemble the constituent atoms or molecules, perhaps into a large single molecule such as a protein. These objects are of the size of a nanometer (10^{-9} m). The science of nanometer scale objects is Nanoscience. The resulting technology is called Nanotechnology. This introductory course is provided to get knowledge in Nanoscience and nanotechnology.

Prerequisites: Basics of Mathematics, quantum mechanics, semiconductor physics.

Module I

Basic Physical Properties of Nanostructures (11hrs)

Structure - Size Dependence of Properties -Crystal Structures -Face-Centered Cubic Nanoparticles -Tetrahedrally Bonded Semiconductor Structures -Lattice Vibrations - Size Dependence of Properties -Energy Bands -Reciprocal Space-Effective Masses - Fermi Surfaces -Insulators, Semiconductors, and Conductors -Energy Bands and Gaps of Semiconductors -Localized Particles - Mobility –Excitons-Donors, Acceptors, and Deep Traps.

Methods of Characterization (11hrs)

Structure- Atomic Structures - Crystallography- Particle Size Determination- Surface Structure-Microscopy-Transmission Electron Microscopy- Field Ion Microscopy-Scanning Microscopy.

Properties of Individual Nanoparticles (11hrs)

Metal Nanoclusters -Magic Numbers -Geometric Structure -Electronic Structure -Reactivity -Fluctuations -Magnetic Clusters -Bulk to Nanotransition- Semiconducting Nanoparticles -Optical Properties -Photofragmentation -Coulombic Explosion -Rare Gas and Molecular Clusters -Inert-Gas Clusters -Superfluid Clusters -Molecular Clusters -Theoretical Modeling of Nanoparticles -Methods of Synthesis -RF Plasma -Chemical Methods -Thermolysis -Pulsed Laser Methods.

Introduction to Nanotechnology, Charles P. Poole, Jr. and Frank J. Owens, Wiley, 2003 Chapter 2,3 and 4

Module II

Carbon Nanostructures (11hrs)

Carbon Molecules -Nature of the Carbon Bond -New Carbon Structures-Carbon Clusters -Small Carbon Clusters -Carbon Nanotubes -Fabrication -Structure -Electrical Properties-Vibrational Properties-Mechanical Properties -Applications of Carbon Nanotubes -Computers -Fuel Cells -Chemical Sensors-Catalysis -Mechanical Reinforcement -Field Emission and Shielding.

Bulk Nanostructured Materials (11hrs)

Solid Disordered Nanostructures -Methods of Synthesis -Failure Mechanisms of Conventional Grain-Sized Materials -Mechanical Properties -Nanostructured Multilayers -Electrical Properties-Porous Silicon -Metal Nanocluster Composite Glasses -Nanostructured Crystals -Natural Nanocrystals -Crystals of Metal Nanoparticles -Nanoparticle Lattices in Colloidal Suspensions -Photonic Crystals.

Nanostructured Ferromagnetism (11hrs)

Basics of Ferromagnetism -Dynamics of Nanomagnets -Nanopore Containment of Magnetic Particles -Nanocarbon Ferromagnets -Ferrofluids -Effect of Bulk Nanostructuring of Magnetic Properties -Giant and Colossal Magnetoresistance.

Introduction to Nanotechnology, Charles P. Poole, Jr. and Frank J. Owens, Wiley, 2003 Chapter 5,6 and 7

Module III

Quantum Wells, Wires, and Dots (12hrs)

Preparation of Quantum Nanostructures -Size and Dimensionality Effects -Size Effects -Potential Wells-Partial Confinement -Conduction Electrons and Dimensionality -Fermi Gas and Density of States-properties Dependent on Density of States -Excitons -Single-Electron Tunneling -Applications -Infrared Detectors -Quantum Dot Lasers-Superconductivity.

Nanomachines and Nanodevices (12hrs)

Microelectromechanical Systems (MEMSs) -Nanoelectromechanical Systems (NEMSs) -Fabrication Nanodevices and Nanomachines -Molecular and Supramolecular Switches.

Introduction to Nanotechnology, Charles P. Poole, Jr. and Frank J. Owens, Wiley, 2003 Chapter 9 and 13

References:

1. MEMS/NEMS ; micro electro mechanical systems/nano electro mechanical systems Volume 1,Design Methods,, Cornelius T. Leondes, Springer, 2006.
2. Nano: the essentials, T. PRADEEP,TMH ,2007.
3. Nanoscale Materials ,Luis M. Liz-Marzán and Prashant V. Kamat, Kluwer Academic Publishers, 2003
4. Nanoscience,Nanotechnologies and Nanophysics, C. Dupas, P. Houdy and M. Lahmani,Springer-Verlag , 2007.
5. Nanotechnology 101, John Mongillo, Greenwood Press, 2007.

6. Semiconductor Nanostructures for Optoelectronic Applications, Todd Steiner, ARTECH HOUSE, 2004.
7. What is What in the Nanoworld,A Handbook on Nanoscience and Nanotechnology, Victor E. Borisenko and Stefano Ossicini , WILEY-VCH Verlag, 2008.
8. Nanotechnology and Nano-Interface Controlled Electronic Devices, M. Iwamoto,K. Kaneto,S. Mashiko Elsevier Science, Elsevier Science, 2003.
9. S emiconductors for Micro and Nanotechnology—An Introduction for Engineers Jan G. Korvink and Andreas Greiner, WILEY-VCH Verlag ,2002.

SEMESTER VI

Choice Based Course

PH6B05.5U **– Optoelectronics**

Credits – 3

No. of contact hours – 90

Scope: This century is going to be the century of Optoelectronics or Photonics – the light wave technology. Today we have optical technologies replacing electronic memories, amplifiers etc. These enable high speed computing. Hence no Physics student can avoid this latest field of science and technology.

Prerequisites: Basic concepts of Optics, Quantum Mechanics, Electronics and Solid State Physics.

Module I

Optoelectronic Fundamentals

Introduction to Photonics (12 hrs)

(i) Optical radiation and light- Luminescence and Radiation-Radiation source parameters– Receiver parameters (1.1.1, 1.1.2,1.1.4 &1.1.5 of Ref.1)-Photometric and Radiometric terms and units- Inverse square law – verification by photometer-comparison of efficiency of light sources available in the market and recommended values of illumination for various activities (General awareness) (Ch.6 of Ref.2).

(ii) Introduction to Photonics – electrons Vs photons – Electronics Vs Optics Photonics (1.1 to 1.3 of Ref.3)- Photonics and light technology and applications-introduction (1.2 to 1.5 of Ref.4)

(iii) Properties of Photons (2.1 of Ref.4)-

(iv) Gausian beams – beam characteristics and parameters (2.4 of Ref.4)

(v) Light Characteristics – Power, energy, peak power, beam radius, intensity, divergence, beam quality, brightness, brilliance, radiation pressure, optical levitation (2.7 of Ref.4)

Optical process in semiconductors (16 hrs)

Electron hole pair formation and recombination. Radiative and non radiative recombination. Absorption in semiconductors – indirect transitions, exciton absorption, donor- acceptor band impurity band absorption. Long wavelength absorption. Franz Keldysh and Stark effect. Radiation in semiconductors. Stokes shift in optical transitions. Deep level transitions, Auger recombination. (Ch.3 of Ref.5)

Module II

Optical Devices

Radiation sources (12hrs)

(i) LED –Principle –characteristics (V-I & light – current)–materials- efficiencies- LED structures- hetero junction and edge emitting LED-. Applications &advantages.

(ii) Semiconductor lasers – Homo junction and hetero junction and Quantum well lasers – Principle -Optical and carrier confinement

Photodetectors (12hrs)

Introduction- Classification of detectors- Qualitative idea of each type- Photo detector parameters – Noise mechanisms (Ch.4 of Ref.1, Ch.5.3 of Ref.3)– Principle and operation of Photodiode, APD, Phototransistor, PIN photodiode- opto isolators

Solar cells (6 hrs)

Principle-. V-I characteristics- Fill factor – conversion efficiency (Qualitative study)- Hetero junction solar cells. (Ch.10 of Ref.5, Ch.6 of Ref.1)

Module III

Optical Communication

(i) Introduction (5hrs)

Introduction to Optical communication- Historical perspective- Advantages and disadvantages of optical communication links in comparison with radio and microwave system and with guided systems- measurement of information and the capacity of telecommunication channel- Communication system architecture- basic

optical communication system – Definition of attenuation, pulse duration and band width. Ch. 1 of Ref.9)

(ii) Optical Modulation. (15hrs)

Direct modulation of LED and diode laser. Digital and analog modulation of LED and diode laser. External modulation. Birefringence, Pockel effect , phase modulation. Wave guide modulators . Electro-optic , Magneto- optic and acousto- optic modulators. Bipolar controller modulator. (Ref.1,7,10)

(iii) Fibre optic communication (12hrs)

Introduction to Optical fibres and fibre optic communication (Ch.1 of Ref.11 and Ch.1.1 to1.3 of Ref.13)- Types of optical fibres- Numerical aperture- Fibre bundles, cables- strength-fibre optical properties- Fibre materials – Classification of fibres – Step index and graded index- mono mode and multi mode fibres –plastic fibres- latest developed fibres (Ch.2,3 of Ref.11)- Fibre loses.

Fibre optic communication componets- switches, transmitters, receivers, repeaters- - Integrated optics.(Ch.5 of Ref.13)

Optical amplifiers- Fibre amplifiers- Erbium doped fibre amplifiers (Ref.12,13)

References:

1. Optoelectronic Engineering S.N. Biswass, Dhanpat Rai Publications
2. A Text book of Optics- Brijlal, Subramoniam, S Chand & Co
3. Photonics Elements and Devices, V. V. Rampal , Wheeler Publishing Co
4. Photonics, Ralf Menzel, Springer
5. Semiconductor optoelectronic devices – Pallab Bhattacharya PHI
6. Optoelectronics Wilson and Hawkes
7. Optoelectronics Jasprit Singh
8. Semiconductor Physics and Devices – Donald A Neamen, Tata McGraw-Hill
9. Optical communication system- John Gowar , Prentice Hall of India
10. Optical Electronics – Ajoy Ghatak and K Thyagarajan Cambridge
11. Optical fibres and fibre optic communication systems, Subir Kumar Sarkar, S.Chand & Co

12. Semiconductor Physics and Optoelectronis, V. Rajendran et al, Vikas Publishing House
13. Fibre Optic Communication, D.C.Agarwal, Wheeler Publishing
14. Physics of Semiconductor devices, Dilip K Roy, University Press.
15. Physics of Semiconductor devices, S M Sze, Wiley Eastern Limited

SYLLABUS FOR PRACTICAL – CORE COURSES

A minimum of 8 experiments should be done in each practical course component

SEMESTER I

Course PH1B01U

1. Vernier Calipers - Volume of a cylinder, sphere and a hollow cylinder
2. Screw gauge - Volume of a sphere and a glass plate
3. Spherometer - Thickness of a glass plate, radius of curvature of a convex surface and a concave surface
4. Beam balance - Mass of a solid (sensibility method), radius measurement of capillary tube using mercury
5. Travelling microscope - Radius of a capillary tube
6. Multimeter -Measurement of resistance, potential difference, current
7. Multimeter -Checking of capacitor ,diode ,inductance and transistor
8. Identification of electronic components- Coil, capacitor, resistor, transistor, triac, diac, I C's 741,555 etc.
9. Viscosity of a liquid -Variable pressure head
10. Spectrometer - Angle of prism

SEMESTER II

Course PH2B01U

1. Cantilever- pin & microscope –Determination of Young's modulus
2. Carey Foster's Bridge-Measurement of resistivity
3. Symmetric Compound Pendulum-Determination of radius of gyration(K) and Acceleration due to gravity (g)
4. Surface tension - Capillary rise method
5. Half wave rectifier with and without filter-ripple factor, line and load regulation
6. Conversion of Galvanometer into voltmeter
7. Viscosity-constant pressure head- coefficient of viscosity (η) of the liquid
8. Spectrometer- Refractive Index of material of Prism
9. Field along the axis of a coil-Variation of magnetic field along the axis of a circular coil
10. Electro chemical equivalent of copper

SEMESTER III

Course PH3B01U

1. Cantilever – Scale and Telescope-Determination of Young's modulus
2. Carey Foster's Bridge-Temperature coefficient
3. Asymmetric Compound Pendulum-Determination of K and g
4. Spectrometer-refractive index of a liquid –Hollow prism
5. Diode Characteristics.
6. Potentiometer-Measurement of resistivity
7. Full wave rectifier using diode – Ripple factor, line and and load regulation
8. Transistor characteristics- CE configuration
9. Study of UJT characteristics
10. Torsion pendulum - Rigidity modulus

SEMESTER IV

Course PH4B01U

1. Non-uniform bending- Pin and Microscope method
2. Thermal conductivity of bad conductor- Lee's Disc
3. Bridge rectifier with filter and without filter- Ripple factor, line and load regulation
4. Spectrometer-prism- i-d curve
5. Potentiometer-Calibration of low range voltmeter
6. Searle's Vibration Magnetometer-Magnetic moment
7. Transistor Characteristics - CB configuration
8. Diode clamper- Positive and negative
9. Gates- AND, OR, NOT –Verification of truth table.
10. Sweep generator using transistor

SEMESTER V

Course PH5B01U

1. Fly Wheel – Moment of Inertia
2. Uniform bending – Young's Modulus-Optic lever method
3. Static torsion- Rigidity modulus
4. Viscosity- Stoke's method
5. Viscosity- Searle's rotation viscometer method
6. Thermal conductivity of rubber
7. Melde's String – Measurement frequency
8. Sonometer – Verification of laws, Measurement of density of solid.
9. A.C Sonometer- Frequency of a.c.
10. Liquid Lens- Refractive index of Liquid

Course PH5B02U

1. Spectrometer – Grating- wave length
2. Spectrometer- prism-Dispersive power
3. Liquid lens-Optical constants of a convex lens
4. Air wedge-Diameter of wire
5. Potentiometer-Calibration of low range ammeter
6. Potentiometer-Calibration of high range voltmeter.
7. Conversion of Galvanometer into ammeter
8. LCR circuit analysis-Series, parallel and Q-factor
9. Mirror Galvanometer-Figure of merit
10. B.G - charge sensitivity – Standard capacitor method

Course PH5B03U

1. Characteristics of Zener diode
2. Voltage regulation using Zener diode
3. Voltage multiplier- Doubler and Tripler.
4. Characteristics of FET
5. Characteristics of diac
6. Wave shaping R C circuits - Integrator and differentiator
7. Diode clipper- Positive, Negative and Biased
8. Hartley Oscillator –frequency
9. Colpitt's oscillator –frequency
10. Phase shift oscillator- frequency

Course PH5B04U

1. Spectrometer – Grating- dispersive power
2. Spectrometer – Cauchy's constants
3. Newton's rings- Determination of wave length.
4. Laser- Determination of wave length
5. Ultrasonic- Determination of frequency
6. Single slit – Diffraction using Laser
7. Verification of Thevenin's and Norton's theorem
8. Deflection and Vibration Magnetometer- m & B_h
9. e/m – Thomson's apparatus- Bar magnet/magnetic focusing
10. B.G - Measurement of capacitance

SEMESTER VI

Course PH6B01U

1. Young's Modulus –Koenig's method
2. Torsion pendulum- n and I - using two identical masses

3. Surface Tension- Quincke's methods
4. Field along the axis of circular coil-Moment of magnet (null method)
5. Kater's pendulum-g
6. Kundt's tube- Velocity of sound
7. Sp.heat of liquid –Newton's law of cooling
8. Computer programming – Simple Pendulum –Calculation of 'g' from experimental data.
9. Computer programming – Solving differential equation-Rungekutta method – I and II order.
10. Computer programming – Multiplication of any two matrices- (m x n) and (n x q)

Course PH6B02U

1. Universal gates IC – NAND,NOR
2. Realize basic gates from universal gates.
3. BCD to 7 segment decoder (IC)
4. Astable multivibrator – using transistor
5. Monostable multivibrator- using transistor
6. Monostable multivibrator – IC 555
7. 8085 Microprocessor – sorting in ascending and descending order.
8. Computer programming –Conversion of temperature scale
9. Computer programming –sorting the numbers in ascending and descending order.
10. Computer programming – Solving a quadratic equation

Course PH6B03U

1. Thermistor – Temperature coefficient of resistance
2. Regulated power supply – Transistor and Zener diode
3. Regulated power supply – Using IC's- LM 7805,7905,7809,7909,7812,7912
4. Construction and measurement of a dual Regulated power supply with filter.
5. Op-Amp - Adder and Subtractor
6. R.C. Coupled amplifier - Gain
7. Amplitude modulation
8. Pulse width modulation
9. FET amplifier - Frequency response
10. Astable multivibrator – IC 555

Course PH6B04U

1. D/A Converter using IC
2. 4 bit Shift register
3. Flip-Flop – R.S
4. J.K Flip-Flop
5. Schmitt trigger using 7414
6. Op- Amp – Inverter, non inverter and buffer.
7. 8085 Microprocessor - BCD addition and subtraction

8. 8085 Microprocessor – multiplication of two eight bit numbers with result 16 bit.
9. Computer programming – Solving a linear equation- Bisection method.
10. Computer programming – Solving a equation by Newton – Raphson method

References:

1. Properties of Matter - D.S. Mathur
2. Optics - Subramanyan & Brijlal
3. Electricity &Magnetism - Sreevastava
4. Electronics Lab Manual (Vol.1) - K.A.Navas
5. Laboratory manual for electronic devices and circuits- David A Bell
6. Electronic Laboratory Primer- A design approach- S Poorna Chandra and B Sasikala.
7. A text book of practical Physics _ Indu Prakash and Ramakrishnan.

Complementary Physics for Mathematics and Statistics

SEMESTER I

MT1C01U – Properties of Matter, Mechanics and Fourier analysis

Credits – 3 (Theory 2+ Practical 1)

No. of contact hours – 36

Prerequisies: Basic knowledge of mechanics, electricity, magnetism, properties of matter and mathematical tools.

Scope: The syllabus will cater into the basic requirements for his/her higher studies.

Module I

Elasticity (12 hrs)

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

Mechanics- H.S.Hans and S.P.Puri. (Tata McGraw-Hill)

Properties of Matter- Brijlal and N. Subrahmanyam (S. Chand and Co.)

Mechanics- J.C. Upadhyaya (Ram Prasad and sons)

Module II

Rotational dynamics of rigid bodies (10 hrs)

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

Mechanics- H.S.Hans and S.P.Puri. (Tata McGraw-Hill)

Properties of Matter- Brijlal and N. Subrahmanyam (S. Chand and Co.)

Mechanics- J.C. Upadhyaya (Ram Prasad and sons)

Module III

Oscillations (9 hrs)

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

Fourier analysis (5 hrs)

Fourier's theorem- evaluation of Fourier coefficients- analysis of square wave, saw tooth wave and triangular wave

Mechanics- H.S.Hans and S.P.Puri. (Tata McGraw-Hill)

Properties of Matter- Brijlal and N. Subrahmanyam (S. Chand and Co.)

Mechanics- J.C. Upadhyaya (Ram Prasad and sons)

Mathematical methods for Physicists – G. B. Arfken and H.J. Weber (Academic press)

Reference:

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. Mathematical methods for Physicists – G. B. Arfken and H.J. Weber (Academic press)

Complementary Physics for Mathematics and Statistics

SEMESTER II

MT2C01U – Electric and Magnetic phenomena, Thermodynamics and Special theory of Relativity

Credits – 3 (Theory 2+ Practical 1)

No. of contact hours – 36

Scope: This syllabus will cater the basic requirements for their higher studies.

Prerequisites: Basic knowledge of electricity, magnetism, heat, thermodynamics, mathematical tools.

Module I

Dielectric materials (7 hrs)

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

Magnetic Materials (7 hrs)

Magnetization in materials- linear and non-linear materials- diamagnetism-paramagnetism-ferromagnetism- hysteresis- ferromagnetic domains-antiferromagnetism- ferrimagnetism

Introduction of Electrodynamics- D.J. Griffiths (PHI Pvt. Ltd)

Solid State Physics- R. K. Puri and V.K. Babbar (S. Chand and Co.)

Module II

Thermodynamics (12 hrs)

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

Thermodynamics- Zemansky and Dittmann (Tata McGraw-Hill)

Heat and Thermodynamics- Brijlal and Subrahmanyam (S. Chand &Co)

Module III

Special theory of relativity (10 hrs)

Introduction- Galilean transformation- Newtonian principle of relativity- special theory- postulates- Lorentz transformation- length contraction- time dilation- relativity of simultaneity- addition of velocities- relativistic mass transformation- mass energy relation

Introduction to Modern Physics- H.S. Mani and G.K. Mehta (Affiliated East West press Pvt. Ltd)

Concepts of Modern Physics- A. Beiser (Tata McGraw-Hill, 5th Edn.)

Modern Physics- R. Murugeshan (S. Chand and Co.)

Modern Physics- G.Aruldas and P.Rajagopal (PHI Pub)

Reference:

1. Introduction to Modern Physics- H.S. Mani and G.K. Mehta (Affiliated East West press Pvt. Ltd)

2. Concepts of Modern Physics- A. Beiser (Tata McGraw-Hill, 5th Edn.)

3. Modern Physics- R. Murugeshan (S. Chand and Co.)

4. Introduction of Electrodynamics- D.J. Griffiths (PHI Pvt. Ltd)

5. Modern Physics- G.Aruldas and P.Rajagopal (PHI Pub)

6. Thermodynamics- Zemansky and Dittmann (Tata McGraw-Hill)

7. Heat and Thermodynamics- Brijlal and Subrahmanyam (S. Chand &Co)

Complementary Physics for Mathematics and Statistics

SEMESTER III

MT3C01U – Quantum Mechanics, Spectroscopy, Nuclear Physics, Basic Electronics and Digital Electronics

Credits – 3 (Theory 2+ Practical 1)

No. of contact hours – 54

Module I

Elementary Quantum theory (12 hrs)

Introduction- black body radiation and Planck's quantum hypothesis- photoelectric effect- Einstein's explanation- de Broglie hypothesis- matter wave- Davisson-Germer experiment- uncertainty principle (derivation not expected) -wave function- conditions-normalization- Schroedinger equation- stationary states- non-normalizable wavefunctions- box normalization

Spectroscopy (12 hrs)

Atom models- Thomson's model-Rutherford's nuclear atom model-Bohr atom model- Somerfeld's relativistic atom model- vector atom model- Fine structure of Hydrogen atom -Rotational and vibrational spectra of rigid diatomic molecules- Raman effect-quantum theory

Introduction to Modern Physics- H.S. Mani and G.K. Mehta (Affiliated East West press Pvt. Ltd)

Concepts of Modern Physics- A. Beiser (Tata McGraw-Hill, 5th Edn.)

Modern Physics- G.Aruldas and P.Rajagopal (PHI Pub)

Quantum Physics- S. Gasiorowicz (John Wiley & Sons)

Module II

Atomic nucleus and radioactivity (10 hrs)

Nuclear constituents- different nuclear types- properties of nuclei- size- mass- charge- density- binding energy- packing fraction -nuclear stability -spin - magnetic dipole moment -electric quadrupole moment -properties of nuclear forces -radioactivity- radiations -law of radioactive decay - half life- mean life- radioactivity units -radio active series-radio active dating- carbon dating- artificial radioactivity

Introduction to Modern Physics- H.S. Mani and G.K. Mehta (Affiliated East West press Pvt. Ltd)

Concepts of Modern Physics- A. Beiser (Tata McGraw-Hill, 5th Edn.)

Modern Physics- R. Murugeshan (S. Chand and Co.)

Modern Physics- G.Aruldas and P.Rajagopal (PHI Pub)

Module III

Basic electronics (13 hrs)

Semiconductors- doping- band structure- PN junction- biasing- Diode equation (derivation not expected) - diode characteristics- Zener diode- voltage regulation- diode circuits- rectification- half wave, full wave and bridge rectifiers- transistors- different configurations- characteristics- biasing- transistor amplifiers- feedback in amplifiers

Digital electronics (7 hrs)

Different number systems – decimal, binary, octal, hexa decimal number systems- conversion between different number systems- binary mathematics-

addition and subtraction- basic theorems of Boolean algebra- de Morgan's theorems AND, OR, NOT, NAND, NOR, XOR gates- truth tables- half adder- full adder

Basic electronics- B. L. Theraja (S. Chand and Co.)

Elements of electronics- M.K. Bagde, S.P. Sngh and K. Singh (S. Chand and Co.)

Digital principles and applications- A. P. Malvino and P.Leach

Reference:

1. Introduction to Modern Physics- H.S. Mani and G.K. Mehta (Affiliated East West press Pvt. Ltd)

2. Concepts of Modern Physics- A. Beiser (Tata McGraw-Hill, 5th Edn.)

3. Modern Physics- R. Murugeshan (S. Chand and Co.)

4. Quantum Physics- S. Gasiorowicz (John Wiley & Sons)

5. Basic electronics- B. L. Theraja (S. Chand and Co.)

6. Elements of electronics- M.K. Bagde, S.P. Sngh and K. Singh (S. Chand and Co.)

7. Modern Physics- G.Aruldas and P.Rajagopal(PHI Pub)

8. Digital principles and applications- A. P. Malvino and P.Leach

Complementary Physics for Mathematics and Statistics

SEMESTER IV

MT4C01U – Physical Optics, Laser Physics and Astrophysics

Credits – 3 (Theory 2+ Practical 1)

No. of contact hours – 54

Module I

Interference (12 hrs)

Interference of light- Principle of superposition- conditions for maximum and minimum intensities- coherent sources- Interference by division of wave front and division of amplitude- Young's double slit experiment (division of wave front) –Expression for fringe width- Newton's rings by reflected light (division of amplitude) - measurement of wavelength of sodium light by Newton's rings- interference in thin films

Diffraction (8 hrs)

Introduction – Difference between Interference and diffraction- Fresnel and Fraunhofer diffraction- Fresnel Diffraction at a straight edge- Theory of plane transmission grating- Determination of wavelength (normal incidence) – resolving power- dispersive power

A Text book of Optics- N. Subrahmanyam, Brijlal and M.N.Avadhanulu (S. Chand and Co.)

Optics- Satyaprakash (Ratan Prakash Mandir)

Optics- A. Ghatak (Tata McGraw-Hill)

Module II

Polarization (15 hrs)

Introduction- polarized and unpolarized light- plane of vibration –plane of polarization - polarization by reflection- Brewster's law- polarization by refraction through pile of plates – law of Malus- uni-axial and biaxial crystals – double refraction- principal plane- polarization by double refraction- polarization by selective absorption- polaroid- polarization by scattering- elliptically and circularly polarized light- half wave and quarter wave plates

A text book of Optics- N. Subrahmanyam, Brijlal and M.N.Avadhanulu (S. Chand and Co.)

Optics- Satyaprakash (Ratan prakash Mandir)

Optics- A. Ghatak (Tata McGraw-Hill)

Module III

Laser Physics (10 hrs)

Interaction of electromagnetic radiation with matter- stimulated absorption- spontaneous emission- stimulated emission- principle of laser-population inversion- Einstein's coefficients- Types of lasers- Ruby laser-Neodymiun YAG laser- He-Ne laser- Properties of laser beams- Application of laser beams

Astrophysics (9 hrs)

Temperature and color of a star- brightness- size 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)

Introduction to Modern Physics- H.S. Mani and G.K. Mehta (Affiliated East West press Pvt. Ltd)

Concepts of Modern Physics- A. Beiser (Tata McGraw-Hill, 5th Edn.)

Modern Physics- R. Murugeshan (S. Chand and Co.)

Modern Physics- G.Aruldas and P.Rajagopal (PHI Pub)

An introduction to Astrophysics- Baidyanath Basu

Reference:

1. Introduction to Modern Physics- H.S. Mani and G.K. Mehta (Affiliated East West press Pvt. Ltd)

2. Concepts of Modern Physics- A. Beiser (Tata McGraw-Hill, 5th Edn.)

3. Modern Physics- R. Murugeshan (S. Chand and Co.)

4. A text book of optics- N. Subrahmanyam, Brijlal and M.N.Avadhanulu (S. Chand and Co.)

5. Optics- Satyaprakash (Ratan prakash Mandir)

6. Modern Physics- G.Aruldas and P.Rajagopal(PHI Pub)

7. An introduction to Astrophysics- Baidyanath Basu

8. Optics- A. Ghatak (Tata McGraw-Hill)

SYLLABUS FOR PRACTICAL – COMPLEMENTARY COURSES

COMPLEMENTARY PHYSICS FOR MATHEMATICS AND STATISTICS

A minimum of 8 experiments should be done in each practical course

SEMESTER I

1. Vernier Calipers - Volume of a cylinder, sphere and a beaker

2. Screw gauge - Volume of a sphere and a glass plate

3. Beam balance - Mass of a solid (sensibility method)

4. Radius of a capillary tube- using (1) travelling microscope

5. U-Tube – Density of a liquid

6. Viscosity of a liquid - Variable pressure head

7. Surface Tension – Capillary rise method.

8. Cantilever - Pin & Microscope – Determination of Young's Modulus

9. Symmetric Compound Pendulum-Determination of radius of gyration(K) and Acceleration due to gravity (g)

10. Spectrometer – Angle of the Prism.

SEMESTER II

1. Cantilever – Scale and Telescope-Determination of Young's modulus

2. Asymmetric Compound Pendulum-Determination of K and g

3. Coefficient of Viscosity – Constant pressure head

4. Spectrometer - Refractive Index of material of prism.

5. Liquid lens - Refractive Index of glass using liquid of known refractive index

6. Potentiometer-Calibration of low range voltmeter

7. Characteristics of Zener diode

8. Construction of half wave rectifier with and without filter – Ripple factor and Load regulation

9. Mirror Galvanometer – Figure of merit

10. Torsion pendulum - Rigidity modulus

SEMESTER III

1. Non-uniform bending-Young's modulus - Pin and Microscope method
2. Spectrometer – Prism – Wavelength
3. Carey Foster's Bridge - Measurement of resistivity
4. Liquid lens - Refractive index of liquid
5. Searle's vibration Magnetometer-Magnetic moment
6. Tangent Galvanometer – Ammeter calibration
7. Spectrometer – Prism – Dispersive power
8. Potentiometer-Calibration of low range ammeter
9. Construction of full wave rectifier with and without filter – Ripple factor and Load regulation
10. Construction of regulated power supply using Zener diode

SEMESTER IV

1. Uniform bending –Young's modulus- Optic lever method
2. Torsion pendulum (Equal mass method) - Rigidity modulus and Moment of Inertia
3. Fly wheel - Moment of Inertia
4. Static Torsion - Rigidity modulus
5. Spectrometer - Grating Dispersive power
6. Newton's rings - Wave length
7. Deflection and Vibration Magnetometer- m & B_h
8. Conversion of Galvanometer into voltmeter
9. Transistor characteristics- CE configuration
10. Gates – AND , OR, NOT- verification of truth table
11. Construction of CE amplifier – gain

References

1. Properties of matter - D.S. Mathur
2. Optics - Subrahmanyan & Brijlal

3. Electricity &Magnetism - Sreevastava
4. Electronics Lab Manual (Vol.1) - K.A.Navas
5. Laboratory manual for electronic devices and circuits- David A Bell
6. Electronic Laboratory Primer- A design approach- S Poorna Chandra and B Sasikala.
7. A text book of Practical Physics _ Indu Prakash and Ramakrishnan.

COMPLEMENTARY PHYSICS FOR CHEMISTRY AND GEOLOGY

SEMESTER I

CH1C01U –Properties of Matter, Mechanics and Particle Physics

Credits – 3 (Theory 2+ Practical 1)

No. of contact hours – 36

Scope: This syllabus will cater the basic requirements for their higher studies. This course will provide a theoretical basis for doing experiments in related areas.

Prerequisites: Basic knowledge of mechanics, properties of matter, mathematical tools.

Module I

Elasticity (12 hrs)

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

Mechanics- H.S.Hans and S.P.Puri. (Tata McGraw-Hill)

Properties of Matter- Brijlal and N. Subrahmanyam (S. Chand and Co.)

Mechanics- J.C. Upadhyaya (Ram Prasad and sons)

Module II

Rotational dynamics of rigid bodies (10 hrs)

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

Mechanics- H.S.Hans and S.P.Puri. (Tata McGraw-Hill)

Properties of Matter- Brijlal and N. Subrahmanyam (S. Chand and Co.)

Mechanics- J.C. Upadhyaya (Ram Prasad and sons)

Module III

Oscillations (9 hrs)

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

Particle Physics (5 hrs)

Fundamental interactions in nature- gauge particles- classification of particles- antiparticles- elementary particle quantum numbers- conservation laws- quark model (qualitative)

Modern Physics- R. Murugeshan (S. Chand and Co.)

Mechanics- J.C. Upadhyaya (Ram Prasad and sons)

References

Mechanics- H.S.Hans and S.P.Puri. (Tata McGraw-Hill)

Properties of Matter- Brijlal and N. Subrahmanyam (S. Chand and Co.)

Concepts of Modern Physics- A. Beiser (Tata McGraw-Hill, 5th Edn.)

COMPLEMENTARY PHYSICS FOR CHEMISTRY AND GEOLOGY

SEMESTER II

CH2C01U – Electric and Magnetic Phenomena, Thermodynamics and Elementary Solid State Physics

Credits – 3 (Theory 2+ Practical 1)

No. of contact hours – 36

Scope: This syllabus will cater the basic requirements for their higher studies.

Prerequisites: Basic knowledge of electricity, magnetism, heat, thermodynamics, mathematical tools.

Module I

Dielectric materials (7 hrs)

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

Magnetic materials (7 hrs)

Magnetization in materials- linear and non-linear materials- diamagnetism- paramagnetism-ferromagnetism- hysteresis- ferromagnetic domains- antiferromagnetism- ferrimagnetism

Introduction of Electrodynamics- D.J. Griffiths (PHI Pvt. Ltd)

Solid State Physics- R. K. Puri and V.K. Babbar (S. Chand and Co.)

Module II

Crystalline solids (10 hrs)

Crystalline and amorphous solids- crystal lattice- basis- unit cell- lattice parameters- crystal systems- crystal planes and directions- miller indices- simple cubic- fcc -bcc hcp structures- packing fraction- NaCl structure- crystal diffraction- Bragg's law

Solid State Physics- R. K. Puri and V.K. Babbar (S. Chand and Co.)

Introduction to Solid State Physics- C. Kittel (John Wiley & Sons, 7th Edn.)

Module III

Thermodynamics (12 hrs)

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

Thermodynamics- Zemansky and Dittmann (Tata McGraw-Hill)

Heat and Thermodynamics- Brijlal and Subrahmanyam (S. Chand &Co)

References:

1. Thermodynamics- Zemansky and Dittmann (Tata McGraw-Hill)

2. Heat and Thermodynamics- Brijlal and Subrahmanyam (S. Chand &Co)

Complementary Physics for Chemistry and Geology

SEMESTER III

CH3C01U – Quantum mechanics, Spectroscopy, Nuclear Physics and Electronics

Credits – 3 (Theory 2+ Practical 1)

No. of contact hours –54

Scope: This syllabus will cater the basic requirements for their higher studies.

Prerequisites: Basic knowledge of electricity, modern physics, mathematical tools.

Module I

Elementary Quantum theory (12 hrs)

Introduction- black body radiation and Planck's quantum hypothesis- photoelectric effect- Einstein's explanation- de Broglie hypothesis- matter wave- Davisson-Germer experiment- uncertainty principle (derivation not expected) -wave function- conditions-normalization- Schroedinger equation- stationary states- non-normalizable wavefunctions- box normalization

Spectroscopy (12 hrs)

Atom models- Thomson's model-Rutherford's nuclear atom model-Bohr atom model- Somerfeld's relativistic atom model- vector atom model- Fine structure of Hydrogen atom -Rotational and vibrational spectra of rigid diatomic molecules- Raman effect-quantum theory

Introduction to Modern Physics- H.S. Mani and G.K. Mehta

Concepts of Modern Physics- A. Beiser (Tata McGraw-Hill, 5th Edn.)

Modern Physics- R. Murugeshan (S. Chand and Co.)

Modern Physics- G.Aruldas and P.Rajagopal (PHI Pub)

Module II

Atomic nucleus and radioactivity (10 hrs)

Nuclear constituents- different nuclear types- properties of nuclei- size- mass- charge- density- binding energy- packing fraction -nuclear stability -spin - magnetic dipole moment -electric quadrupole moment -properties of nuclear forces -radioactivity- radiations -law of radioactive decay - half life- mean life- radioactivity units -radio active series-radio active dating- carbon dating- artificial radioactivity

Nuclear fission and fusion (7 hrs)

Nuclear fission- energy release in fission reactions- liquid drop model of fission- chain reaction- nuclear reactor- power and breeder reactor- atom bomb- nuclear fusion- energy production in stars- thermo nuclear reactions in sun- p-p chain - C-N cycle

Introduction to Modern Physics- H.S. Mani and G.K. Mehta

Concepts of Modern Physics- A. Beiser (Tata McGraw-Hill, 5th Edn.)

Modern Physics- R. Murugeshan (S. Chand and Co.)

Modern Physics- G.Aruldas and P.Rajagopal (PHI Pub)

Module III

Basic electronics (13 hrs)

Semiconductors- doping- band structure- PN junction- biasing- Diode equation (derivation not expected) - diode characteristics- Zener diode- voltage regulation- diode circuits- rectification- half wave, full wave and bridge rectifiers- transistors- different configurations- characteristics- biasing- transistor amplifiers- feedback in amplifiers

Basic Electronics- B. L. Theraja (S. Chand and Co.)

Elements of Electronics- M.K. Bagde, S.P. Sngh and K. Singh (S. Chand and Co.)

References:

1. Introduction to Modern Physics- H.S. Mani and G.K. Mehta (Affiliated East West press Pvt. Ltd)

2. Concepts of Modern Physics- A. Beiser (Tata McGraw-Hill, 5th Edn.)

3. Modern Physics- R. Murugeshan (S. Chand and Co.)

4. Quantum Physics- S. Gasiorowicz (John Wiley & Sons)

5. Basic Electronics- B. L. Theraja (S. Chand and Co.)

6. Elements of electronics- M.K. Bagde, S.P. Sngh and K. Singh (S. Chand and Co.)

7. Modern Physics- G.Aruldas and P.Rajagopal (PHI Pub)

COMPLEMENTARY PHYSICS FOR CHEMISTRY AND GEOLOGY

SEMESTER IV

CH4C01U – Physical Optics, Laser Physics and Superconductivity

Credits – 3 (Theory 2+ Practical 1)

No. of contact hours –54

Scope: This syllabus will cater the basic requirements for their higher studies.

Prerequisites: Basic knowledge of optics, Properties of matter, mathematical tools.

Module I

Interference (12 hrs)

Interference of light- Principle of superposition- conditions for maximum and minimum intensities- coherent sources- Interference by division of wave front and division of amplitude- Young's double slit experiment (division of wave front) –Expression for fringe width- Newton's rings by reflected light (division of amplitude) - measurement of wavelength of sodium light by Newton's rings- interference in thin films

Diffraction (8 hrs)

Introduction – Difference between Interference and diffraction- Fresnel and Fraunhofer diffraction- Fresnel Diffraction at a straight edge- Theory of plane transmission grating- Determination of wavelength (normal incidence) – resolving power- dispersive power

A text book of Optics- N. Subrahmanyam, Brijlal and M.N.Avadhanulu (S. Chand and Co.)

Optics- Satyaprakash (Ratan prakash Mandir)

Optics- A. Ghatak (Tata McGraw-Hill)

Module II

Polarization (15 hrs)

Introduction- polarized and unpolarized light- plane of vibration –plane of polarization - polarization by reflection- Brewster's law- polarization by refraction through pile of plates – law of Malus- uni-axial and biaxial crystals – double refraction- principal plane- polarization by double refraction- polarization by selective absorption- polaroid- polarization by scattering- elliptically and circularly polarized light- half wave and quarter wave plates

A text book of optics- N. Subrahmanyam, Brijlal and M.N.Avadhanulu (S. Chand and Co.)

Optics- Satyaprakash (Ratan prakash Mandir)

Optics- A. Ghatak (Tata McGraw-Hill)

Module III

Laser Physics (10 hrs)

Interaction of electromagnetic radiation with matter- stimulated absorption- spontaneous emission- stimulated emission- principle of laser-population inversion- Einstein's coefficients- Types of lasers- Ruby laser-Neodymiun YAG laser- He-Ne laser- Properties of laser beams- Application of laser beams

Superconductivity (9 hrs)

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

Solid State Physics- R. K. Puri and V.K. Babbar (S. Chand and Co.)

Reference:

Introduction to Modern Physics- H.S. Mani and G.K. Mehta (Affiliated East West press Pvt. Ltd)

Concepts of Modern Physics- A. Beiser (Tata McGraw-Hill, 5th Edn.)

Modern Physics- R. Murugeshan (S. Chand and Co.)

Modern Physics- G.Aruldas and P.Rajagopal (PHI Pub)

Solid State Physics- R. K. Puri and V.K. Babbar (S. Chand and Co.)

SYLLABUS FOR PRACTICAL – COMPLEMENTARY COURSES

Complementary Physics for Chemistry and Geology

A minimum of 8 experiments should be performed in each practical course

SEMESTER I

1. Vernier Calipers - Volume of a cylinder, sphere and a beaker
2. Screw gauge - Volume of a sphere and a glass plate
3. Beam balance - Mass of a solid (sensibility method)
4. Radius of a capillary tube- Using (1) travelling microscope
5. U-Tube – Density of a liquid
6. Viscosity of a liquid - Variable pressure head
7. Surface Tension – Capillary rise method.
8. Cantilever - Pin & Microscope – Determination of Young's Modulus
9. Symmetric Compound Pendulum-Determination of radius of gyration(K) and Acceleration due to gravity (g)
10. Spectrometer – Angle of the Prism.

SEMESTER II

1. Cantilever – Scale and Telescope-Determination of Young's modulus
2. Asymmetric Compound Pendulum-Determination of K and g
3. Coefficient of Viscosity – Constant pressure head
4. Spectrometer - Refractive Index of material of prism.
5. Liquid lens - Refractive Index of glass using liquid of known refractive index
6. Potentiometer-Calibration of low range voltmeter
7. Characteristics of Zener diode
8. Construction of half wave rectifier with and without filter – Ripple factor and Load regulation
9. Mirror Galvanometer – Figure of merit
10. Torsion pendulum - Rigidity modulus

SEMESTER III

1. Non-uniform bending-Young's modulus-Pin and Microscope method
2. Spectrometer – Prism – Wavelength
3. Carey Foster's Bridge - Measurement of resistivity
4. Liquid lens - Refractive index of liquid
5. Searle's vibration Magnetometer-magnetic moment
6. Tangent Galvanometer – Ammeter calibration
7. Spectrometer – Prism – Dispersive power
8. Potentiometer-Calibration of low range ammeter
9. Construction of full wave rectifier with and without filter – Ripple factor and Load regulation
10. Construction of regulated power supply using Zener diode

SEMESTER IV

1. Uniform bending – Young's modulus-Optic lever method
2. Torsion pendulum (Equal mass method) - Rigidity modulus and Moment of Inertia
3. Fly wheel - Moment of Inertia
4. Static Torsion - Rigidity modulus
5. Spectrometer - Grating Dispersive power
6. Newton's rings - Wave length
7. Deflection and Vibration Magnetometer- m & B_h
8. Conversion of Galvanometer into voltmeter
9. Transistor characteristics- CE configuration
10. Gates – AND , OR, NOT- verification of truth table
11. Construction of CE amplifier – gain

References

1. Properties of Matter - D.S. Mathur
2. Optics - Subrahmanyan & Brijlal

3. Electricity &Magnetism - Sreevastava
4. Electronics Lab Manual (Vol.1) - K.A.Navas
5. Laboratory manual for electronic devices and circuits- David A Bell
6. Electronic Laboratory Primer- A design approach- S Poorna Chandra and B Sasikala.
7. A text book of Practical Physics _ Indu Prakash and Ramakrishnan.

VOCATIONAL COURSES (1): APPLIED ELECTRONICS

SEMESTER I

PH1B11U: **Principles of Electronic Components**

Credits: 2

Contact hours: 36 Hrs.

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

Prerequisites: Basic Physics and Mathematics

Module I (12 hours)

Resistors: (6Hrs)

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 – Resistor Colour bands – Resistors under 10 Ohm – Resistor troubles – Checking Resistors with an Ohmmeter –Measurement of resistance-bridge method

Inductors: 6Hrs.

Basic Ideas – Comparison of different cores – Inductance of an Inductor – Mutal Inductance – Co-efficient 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-Universal bridge method.

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

Module II (12 hours)

Capacitance: 8Hrs.

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 a Capacitor – Capacitor connected across and AC source – Capacitive Reactance – Q factor – Power factor – Measurement of Capacitance-Universal bridge method.

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

Transformers: 4Hrs.

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

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

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

Module III (12 hours)

Switches and Relays: 9Hrs.

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 Hrs.

LED, LCD, Segmental Displays using LEDs, LCDs Segmental gas discharge displays.

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

SEMESTER I

PH1B12U **Electronic Applications**

Credits: 3 (Theory 2 + Practical 1)

Contact hours: 36 hrs.

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

Prerequisites: Basic Electronics, Physics and Mathematics

Module I

Measuring Instruments (Basic ideas only): 6 Hrs.

Introduction – PMMC Multimeter – Digital Voltmeter (DVM) – Electronic Voltmeter – Distortion Factor Meter – Cathode Ray Oscilloscope – Frequency Counter – Q meter – RLC Bridge – Insulation Tester – RF Signal Generator – Audio Signal Generator – Pulse Generator – Function Generator – Power Meters – SWR Meter.

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

Tuning Circuits and Filters: 6Hrs.

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: 6Hrs.

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 – Sweep Circuit Using Unijunction 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: 6Hrs.

General information-LDR-Thermistor – Thermocouple – Photodiode – Phototransistor – LVDT-Piezoelectric transducer – Microphones: (basic ideas)

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

Electronic Instrumentation (2 Ed.) H.S. Kalsi, TMH (2006).

Module III

Optical Recording: 8Hrs.

Types of optical recording of sound – Methods of optical recording of sound of films – Variable density method – Variable area method – Reproduction of sound from films – Compact Disc – Optical recording of disc – Master disc – Father disc – Mother disc – Son disc – Consumer disc – CD playback process – Advantages and disadvantages of compact discs.

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

Printed Circuit Board: 4Hrs.

General Information – Types of PCBs-Board construction-Steps involved in development of PCB-Advantage of PCB

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

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

SEMESTER II

PH2B11U **Basics of Power Electronics**

Credits: 2

Contact hours: 36 hrs.

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

Prerequisites: Basic Electronics, Physics and Mathematics

Module I

Field-Effect Transistors: 12 **hrs.**

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)

Module II

MOSFET: 12Hrs.

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)

Module III

FET Amplifiers: 12Hrs.

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)

SEMESTER II

PH2B12U **Power Electronics**

Credits: 3 (Theory 2 + Practical 1)

Contact hours: 36 hrs.

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: (12 hrs.)

Basic ideas and Types of Thyristors

Basic construction of Silicon Controlled Rectifier – SCR biasing – SCR operation – SCR equivalent Circuit – Turning ON Turning OFF – V-I characteristics – Forward characteristic – Reverse characteristic – SCR ratings – Applications.

Basic construction of Diac:- V-I characteristic- Applications

Basic construction of Triac:- Operation – V-I characteristic – Applications – Difference between SCR and Triac.

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

Module II

Uni Junction Transistors, Silicon Controlled Switch: (12 hrs.)

Unijunction Transistors (UJT) : Basic construction-Equivalent circuit-Intrinsic Stand-off ratio UJT operation. V-I characteristic – Applications.

Basic ideas of Silicon Controlled Switch-SCS operation-SCS application-Silicon Unilateral Switch (SUS)-Silicon Bilateral Switch (SBS) – Silicon Asymmetrical Switch (SAS).

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

Module III

Controlled Rectifiers: 12Hrs.

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)

SEMESTER III

PH3B11U **Linear Integrated Circuits**

Credits: 4 (Theory 3 + Practical 1)

Contact hours: 54 hrs.

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)

Integrated Circuits: 9 Hrs.

Advantages of ICs – Limitations – Classification – Monolithic Integrated Circuits – Thick and Thin film ICs – Hybrid or Multichip ICs – Comparison among different Integrated circuits – Lineal ICs – Non linear ICs – IC Terminology – Fabrication of Monolithic ICs – Fabrication of IC components: Bipolar Transistors, Field Effect Transistors, JFETs, Diodes, Resistors and Capacitors – Complete Monolithic Integrated circuits

Operational Amplifiers: 9 Hrs.

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

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

Module II (18 hours)

Op-amp Applications: 18Hrs.

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)

Module III (18 hours)

IC Timer (555): 9Hrs.

Monostable Multivibrator – Applications, Astable Multivibrator – Applications,

Bistable Multivibrator – Applications, Schmitt trigger - Applications

Phase – Locked Loops (PLL): 9Hrs.

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

Op-Amps and Linear Integrated Circuits, Ramakant.A.Gayakwad-PHI(2004)

SEMESTER III

PH3B12U **Communication Electronics**

Credits: 4 (Theory 3 + Practical 1)

Contact hours: 54 hrs.

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 (8Hrs)

Communication Systems- Information, Transmitter, Channel, Noise, Receiver- Modulation-need for modulation, Bandwidth requirements, Frequency spectrum of non-sinusoidal waveforms.

Electronic Communication Systems- Kennedy & Davis, TMH, 4th Edition.

Electronic Devices: Floyd, Pearson , 6th Edition.

Radio waves (10Hrs)

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 (7Hrs)

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 (11Hrs)

Detection of AM wave- Diode detector (qualitative) - Detection of FM waves- Slope detector, phase discriminator, Phase Locked Loop (PLL), 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 (12Hrs)

Antenna – Half-wave dipole – Antenna parameters – Dipole antenna with reflector and director – Yagi-Uda Antenna - Monochrome TV systems, Monochrome TV transmitter & receiver (Explanation with block diagram) – Scanning, TV bands and standards, Camera tube, Basic ideas of Color TV transmitter & receiver, Natural light & properties of colors - Principles of radar, Radar range equation, Basic pulsed radar set, Applications of radar.

Forms of communication systems (6Hrs)

Other communication systems: Fiber optic communication- Satellite communication- Microwave communication- Mobile communication- Introduction to cordless telephone- Cellular mobile communication (Basic ideas only).

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

SEMESTER IV

PH4B11U Micro Processor and Interfacing Devices

Credits: 4 (Theory 3 + Practical 1)

Contact hours: 54 hrs.

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

Prerequisites: Basic Electronics, Physics and Mathematics

Module I (27 hours)

Intel 8085 (27Hrs)

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.

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

Module II (27 hours)

Peripheral Devices (27 Hrs)

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.(6^{th} Edn.)

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

SEMESTER IV

PH4B12U **Applications of Microprocessors**

Credits: 4 (Theory 3 + Practical 1)

Contact hours: 54 hrs.

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

(18Hrs)

Delay Sub routine – 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

(10Hrs)

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 (26Hrs)

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 Data Input/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 I

Experiments for Practical Course PH1B12U

(Minimum 8 experiments)

1 Familiarization of passive components

2 Familiarization of active components

3 Familiarization of CRO

4 PCB layout and fabrication (Hartley,Colpitt's oscillators,RC coupled amplifier)

5 Zener Diode Characteristics

6 RC Integrator (Design – Set up – Its response to pulses or square waves)

7 RC Differentiator (Design-Set up-its response to pulses or square waves)

8 RC low pass filter (Study the frequency response)

9 RC high pass filter (Study the frequency response)

10 Photo diode –Characteristics

Reference:

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

Digital Electonics Theory and Experiments, Virendra Kumar-New Age International Publishers.

Electronics Laboratory Primer- Poorna Chandra and B. Sasikala – S. Chand

SEMESTER II

Experiments for Practical Course PH2B12U (Minimum 8 experiments)

1. Soldering practice

2. Construction & study of regulated power supply using regulator IC's 78xx 79xx Line regulation(for a given full load) and load regulation
3. JFET characteristics (Static drain characteristics – Calculation of parameters)
4. UJT characteristics
5. SCR. Characteristics
6. DIAC Characteristics
7. TRIAC Characteristics
8. UJT relaxation Oscillator
9. Common emitter amplifier ;design and construction.Study
   The influence the biasing resistors on D.C operating point.
   Variation of gain with collector resistor.
   Measure thegain with and without the bypass capacitor
10. Common source JFET amplifier

References:

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

Digital Electonics Theory and Experiments, Virendra Kumar-New Age International Publishers.

Electronics Laboratory Primer, Poorna Chandra and B. Sasikala – S. Chand

SEMESTER III

Experiments for Practical Course PH3B11U (Minimum 8 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

References:

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

Digital Electonics Theory and Experiments, Virendra Kumar-New Age International Publishers.

Electronics Laboratory Primer, Poorna Chandra and B. Sasikala – S. Chand

SEMESTER III

Experiments for Practical Course PH3B12U (Minimum 8 experiments)

1. Amplitude Modulator (Set up – Study using CRO)
2. Demodulator (Set up – Study using CRO)
3. IF Tuned amplifier (Frequency response graph)
4. Mixer Circuit for 455Hz (Design and set up)
5. Frequency modulation using IC 566
6. Pulse width modulation using IC 555

7. LED- Characteristics
8. LDR- Characteristics
9. PhotoDiode-Characteristics
10. OptoCoupler- Characteristics

References:

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

Digital Electonics Theory and Experiments, Virendra Kumar-New Age International Publishers.

Electronics Laboratory Primer, Poorna Chandra and B. Sasikala – S. Chand

SEMESTER IV

Experiments for Practical for Course PH4B11U

(Minimum 8 experiments)

1. µP – Conversion of 8 bit binary to BCD/BCD to binary
2. µP – Square of a number
3. µP – Square root of a number
4. µP – Multi byte decimal addition
5. µP – Largest among the set of numbers
6. µP – Smallest among the set of numbers

7. µP – Hex number to ASCII Hex Code conversion
8. µP – ASCII Hex Code to Hex number conversion
9. µP – Binary to BCD conversion
10. µP – BCD to Binary conversion

Reference:

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

SEMESTER IV

Experiments for Practical for Course PH4B12U

(Minimum 8 experiments)

1. µP – Move a block of data from one section of memory to another
2. µP – Square from look up table
3. µP – 16 bit multiplication
4. µP – Sorting (ascending order)
5. µP – Sorting (descending order)
6. µP – Factorial of a number
7. µP – Counting the number of occurance
8. µP – Decimal counter to count 00to99

9. µP – Generation of pulse waveform
10. µP – Stepper motor interface

Reference:

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

VOCATIONAL COURSES: (2)COMPUTER APPLICATIONS

SEMESTER I

PH1B21U **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

1. Characteristics of Computers: (7Hrs)

What is a computer. Purpose of using computer. Characteristics of a computer, Capabilities and Limitations of Computers. Type of Computers: Analog-Digital-Hybrid. Classification based on memory size: Micro, Mini and Mainframes, Supercomputers.

Module II

2. Basic Computer Organization: (15 Hrs)

Input unit: Working of keyboard, mouse, joystick and track ball; Scanner : Flat bed, Sheet-fed and Hand-held scanners-Output unit: working of monochrome and colour CRT, LCD Panel; Printers – Working of Dot Matrix, Laser, Inkjet, colour thermal and dye sublimation colour printers- Arithmetic Logic unit-Control unit-Central Processing unit: Basic concepts of Intel 80186, 80286, 80386, 80486 and Pentium processors. Motherboard, Expansion buses, Memory, upgrading / adding memory, BIOS, Storage unit-Primary Memory RAM, ROM, PROM, EPROM and EEPROM. Cache Memory. Secondary Storage Devices.

Module III

3. Computer arithmetic and number systems: (9 Hrs)

Decimal system-Binary system-Octal system-Hexadecimal system-Converting from one system to another-Computer arithmetic-Computer codes-BCD, EBCDIC and ASCII.

4. Computer Software: (5Hrs)

What is software, Relation between Hardware and Software. Type of Software: System software, Application software. Computer Languages-Machine Language, Assembly Language, High-Level Language, Compilers and Interpreters.

Reference

1. Fundamentals of Computers, V Rajaraman, Prentice-Hall of India, New Delhi.
2. Computer and Commonsense, Roger Hunt & John Shelley, PHI
3. Computer Fundamentals, P K Sinha, BPB Publications, New Delhi.
4. Microsoft MS-DOS User's Guide & Reference.
5. Windows-98, User's Guide & Reference.
6. The Internet, Complete Reference, Harley Hahn, Tata Mcgraw-Hill.

SEMESTER I

PH1B22U **Operating System and Computer Networks**

Credits – 3 (Theory 2+ Practical 1)

No. of contact hours –36

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

Prerequisites: Basic mathematics, fundamentals of Electronics.

Module I

1. Operating System organization and Scheduling: (10 hrs)

Operating System organization: Basic functions, General implementation consideration, Contemporary OS kernels, Observing OS behavior- Basics, internal and external commands of MSDOS, Windows, Unix and Linux

Scheduling: Scheduling mechanisms, Strategy selection, Non-preemptive Strategies, preemptive Strategies-

Module II

Memory management: (10 hrs)

Basic ideas, Address space abstraction, Fixed partition memory strategies, Variable partition memory strategies, Dynamic address space binding. – Swapping – Virtual memory – shared memory multiprocessors.

Module III

Computer Networks: (16 hrs)

Concepts of Network - Concepts of Internet, LAN, WAN, MAN, VAN, ISDN, PSTN, Client-Server Model, Peer-to-Peer, Uses of network, Hardware – Network Interface Card (Ethernet), Protocols, ISO-OSI and TCP/IP reference model. Hub and Connectors, Communication Equipments – Modems, Multiplexers, Concentrators, WWW; Web Browsers-Internet Explorer, Netscape Navigator; E-mail, Chatting, Outlook Express, Understanding an Internet address, URL.

Reference

1. Operating systems Gary Nutt 3rd Edn. Pearson.
2. Fundamentals of Computers, V Rajaraman, Prentice-Hall of India, New Delhi.
3. Computer and Commonsense, Roger Hunt & John Shelley, PHI
4. Computer Fundamentals, P K Sinha, BPB Publications, New Delhi.
5. Microsoft MS-DOS User's Guide & Reference.

6. Windows-98, User's Guide & Reference.

7. The Internet, Complete Reference, Harley Hahn, Tata Mcgraw-Hill.

SEMESTER II

PH2B21U **Word and Data Processing –Packages**

Credits – 2

No. of contact hours –36

Scope: This course provides the basic knowledge of Word and data processing

Prerequisites: Basic mathematics, fundamentals of Electronics.

Module I

1. Introduction to Data Processing(5hrs)

Records & File, Data collection, Preparation, Verification, Editing and Checking. Overview of Business functions. Use of computer system for business Applications. Word processor and Electronic Spread sheet Applications.

2. MS Word: (7 hrs)

Basics of Word Processing, Opening, Creating, Editing, Formatting, Saving, Printing and Quitting Documents, Merging Document, Using Mail Merge feature for Labels and Envelopes, Graphics and Using templates and Wizards.

Practical training

Module II

2. Page maker with Practical training (12 hrs)

Page maker Wok Space- Basic tools and applications-Rulers and Guides- Creating, saving and printing new document-Working with text-pointer tools- control palette -importing text, working with layers.

Module III

5. MS Excel: (12 hrs)

Worksheets Basics, Data Entry in cells, Editing, Saving, Formatting and calculations, Working with Charts and Graphics, Database Management, Functions and Macros, Analyzing spreadsheet data using Goal Seek, Solver and Scenarios, Creating and Formatting Pivot tables.

Practical training

Reference s

1. An Introduction to Business Data Processing, Sardino, Prentice Hall.

Microsoft Office 97, Ned Snell, Pustak Mahal, New Delhi.

2. Windows and MS Office 2000 with Database Concepts,

N Krishnan, Scitech Publications Pvt. Ltd, Chennai.

3. PageMaker(r) 7: The Complete Reference(Paperback) Carolyn Connally
4. PageMaker for macintosh and windows David D Busch BPB Publications.

SEMESTER II

PH2B22U **Programming Language - 1 – ANSI C**

Credits – 3 (Theory 2+ Practical 1)

No. of contact hours –36

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

Prerequisites: Basic mathematics, fundamentals of Electronics.

Module I

1. Overview of C (3 hrs)

Introduction, Simple C Program, Basic Structure of C program, Programming style, executing a C program.

2. Constants, Variables, and Data Types. (3 hrs)

Character set, C tokens, keywords and identifiers, Constants, Variables, Data type, Declaration of variables, Assigning values to variables, Defining symbolic constants.

3. Operators and Expressions. (6 hrs)

Arithmetic, Relational, Logical, Assignment, Increment, Decrement, Conditional, Bit wise and Special Operators. Arithmetic expressions. Evaluation of expressions, Precedence of arithmetic operators. Type conversions in expressions. Operator precedence and associatively, Mathematical functions.

Module II

4. Managing Input and Output Operators. (4 hrs)

Reading a character, Writing a Character, Formatted input, and formatted output.

5. Decision making and branching. (4 hrs)

Decision making with IF statement. Simple IF statement, The IF ELSE statement. Nesting of IF ELSE statement, The ELSE IF ladder, and The Switch statement. The ?: operator, The GOTO statement.

6. Decision making and looping. (4 hrs)

The While statement, The DO statement, The FOR statement. Jumps in loops.

Module III

7. Arrays. (6 hrs)

Introduction, One-dimensional arrays, Two-dimensional arrays, Initializing two-dimensional arrays, Multidimensional arrays.

8. User-Defined Functions. (6 hrs)

Need for user-defined functions. A multi-function program, the form of C function. Return values and their types, Calling a function, Category of functions, No arguments and no return values, Arguments but no return values, Arguments with return values, Handling of non-integer functions, Nesting of function, Recursion, Function with arrays, The scope and lifetime of variables in functions,

References:

1. Programming in ANCI C, Edn. 2.1, Tata McGraw-Hill. Ch 1 to 7 and 9.
2. Programming in ANSI C by Stephen G. Kochan Sams; Rev Sub edition (April 1994)
3. A First Book of ANSI C, Gary J. Bronson Course Technology

SEMESTER III

PH3B21U Concepts Of Object Oriented Programming

Credits – 3

No. of contact hours – 54

Scope: This course is expected provide basic ideas of OOP and preliminary steps in C++ programming

Prerequisites: Basic knowledge computer fundamentals and basic mathematics

Module I

Basic concepts in Object Oriented Methodology (8 hrs)
Benefits; Finding Class & Objects, Characteristics of OOLanguages

C++ Programming Basics(9 hrs)
Program construction, Input Output with cin & cout, Variables, Arithmetic Operators, Assignment & Increment Operators, Relational Operators

Decisions & Loops(9hrs)
if and if else statements for, while & do Loops, switch statement Conditional Operator, Logical Operators Precedents of Operators Nested ifs

Module II

Structures(9 hrs)
Structure specifiers & Definitions Accessing Structure Members Nested Structures Structures as Objects and Data Types, Enumerated Data Types,

Functions (9 hrs)
Function Definitions and Declarations, Arguments and Return Values, Reference Arguments, Overload Functions, Default Arguments, Storage Classes.

Module III

Objects & Classes(10 hrs)
Member Functions And Data, Private and Public, Constructors and Distracters, Objects in the real World, When to Use Objects.

Text Book:

Module I to III: Object-Oriented Programming in Turbo C++, Robert Lafore, Galgotia. Chapter 1-7

Reference Books:

1. Object-Oriented Programming with C++, E Balagurusamy, Tata McGraw-Hill.
2. The Essence Of Programming Using C++, Douglas Bell, Prentice-Hall.
3. Teach Yourself C++, Herbert Schildt, Tata McGraw-Hill.

SEMESTER III

PH3B22U **C++ Programming**

Credits – 3

No. of contact hours – 54

Scope: This course is expected to provide sound knowledge in C++ programming

Prerequisites: Basic knowledge of computer fundamentals and basic mathematics

Module I

Arrays (9 hrs)

Array Definitions, Accessing array Elements, Arrays as Class Members, Arrays of Objects, Strings, String INPUT/OUTPUT..

The Operator Keyword (9 hrs)

Overloading UNARY Operators, Overloading Binary Operators, Constructors as Conversion Routines, Converting between Basic and User Defined Types,

Module II

Inheritance (9 hrs)

Reasons for Inheritance, Base and Derived Classes, Access Control, Class Hierarchies, Multiple Inheritance, Inheritance and Program Development.

C++ Graphics (9 hrs)

Text Mode Graphics, Setting up for Graphics Mode, Shapes, Lines, Color, and Pattern, Graphics Shapes as C++ Objects, Text in Graphics Mode.

Module III

Pointers (9 hrs)

Address Constants and Variables, Pointers and Arrays, Pointers and Function Arguments, Pointers and Strings, Memory Management with new and delete, Pointers and Objects, Linked lists.

Virtual Functions (9 hrs)

Friend Functions, Static Functions, Overloaded assignment Operator, Overload copy Constructor, The this Pointer.

Text Book:

Object-Oriented Programming in Turbo C++, Robert Lafore, Galgotia.

1. Reference Books:
2. Object-Oriented Programming with C++, E Balagurusamy, Tata McGraw-Hill.
3. The Essence Of Programming Using C++, Douglas Bell, Prentice-Hall.
4. Teach Yourself C++, Herbert Schildt, Tata McGraw-Hill.

SEMESTER IV

PH4B21U **Visual Basic Programming**

Credits – 3

No. of contact hours – 54

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

Prerequisites: Basic knowledge of computer fundamentals and basic mathematics.

Module I

Introduction (12 hrs)

VB Developing Environment – Exploring the menu bar – Using the toolbar – Elements of Visual Basic syntax – Using literals – Declaring and using constants – Data types – Declaring and using variables – Using the operators – Subroutines and functions – Looping and decision control structure.

Using intrinsic controls(12 hrs)

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 – Adding check box controls – Adding combo box– Standard MDI form features – Building the MDI form – Using menus – Building a wizard.

Module II

File Handling(18 hrs) Open and close files – Save data to a file – Load data from a file – Add data to an existing file. Procedures and Functions:- Organize program into small parts – Write procedures – Learn to write functions – Discover variable scope – Find out how to pass arguments to procedures and functions.

Module III

Methods, Properties, and Events (12 hrs)

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

Reference Books:

1. Visual Basic 6 - Clayton Walnum, Prentice- Hall of India, New Delhi.
2. Visual Basic 6.0, N Krishnan and N Saravanan, Scitech Publications, Pvt Ltd, Chennai.

SEMESTER IV

PH 4B22U **Computer Web Applications and Graphics**

Credits – 3

No. of contact hours – 54

Scope: This course is expected provide training in graphic packages and its applications in web page designing

Prerequisites: Basic knowledge of computer fundamentals, basic mathematics and HTML tags.

Module I

HTML & Web page Designing (15 hrs)

Basics of HTML, Html tags, Creating a webpage using html, HTML editors (Microsoft front page, dream weaver), JavaScript, Using JavaScript in HTML pages, CSS, Styling HTML pages, Use of Photoshop and Flash in web page designing, Introduction to HTML Web server (IIS - Internet Information Server, PWS - Personal Web Server).

Module II

Web Graphics. (15 hrs)

Introduction to web graphics, Tools used for web graphics (Photoshop, flash, fireworks etc..) Introduction to Adobe Photoshop, Use of Photoshop in web page designing. Familiarizing with Photoshop menus, Using Photoshop tool kit. Introduction to layers. Creating Banners, buttons and icons using photoshop.

Module III

Dynamic web pages (15Hrs)

What is dynamic web page, Languages used for dynamic web pages (PHP, JSP , ASP etc.), Introduction to PHP and its basic commands, Introduction to MYSQL, Creating web pages using PHP & MYSQL, Cookies, Session tracking, AJAX and its advantages. Introduction to Web servers.

Web site development (Project) (9 hrs)

Create a web site on a selected topic, with the help of the teachers and if possible host in on any of the free web hosting services available

References

1. Learning Web Design 2nd Edition by Jennifer Niederst

2. DHTML and JavaScript by Gilorien

3. Beginner's Guide to Adobe Photoshop by Michelle Perkins

4. Beginner's Guide to Adobe Photoshop Elements by Michelle Perkins

5. PHP and MySQL for Dynamic Web Sites: Visual QuickPro Guide by Larry Ullman

SYLLABUS FOR PRACTICAL

SEMESTER I

PH1B22U Practical

Introduction to computers

(Minimum 8 experiments)

1. Introduction to various components of a computer.

2. Preparation and printing of a simple document using DOS TEXT Editor.
3. Development of a batch file to copy all files from a source drive to a target drive.
4. Development of a batch file to copy all the files, directories and all hidden files (if any) from one disk to another identical disk.
5. Development of a batch file to rename any existing directory by giving a new name with all possible error messages.
6. Development of a CONFIG.SYS file.
7. Development of an AUTOEXEC.BAT file.
8. Creating groups and program items under windows.
9. Windows Explorer is used to see all files, folders, create new folder, rename, copy, paste and delete.
10. Working with system tools containing Compression agent, Disk defragmenter, DriveSpace and Scandisk.
11. Composing and sending an E-Mail message.

SEMESTER II

PH2B22U **Practical**

Programming Language ANSI C

(Minimum 8 experiments)

1. Find the average of five numbers.
2. Obtain roots of a quadratic equation in all possible cases.

3. Program that reads a character from keyboard and then prints it in reverse case.
4. Program to compute x to the power n using while loop.
5. program to read the marks obtained in various subjects by each student in a class of n students taking examination in m subjects, and to compute and print the total mark and grade.
6. 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.
7. Program to read the elements of the given two matrices of order n x n and to perform the matrix multiplication.
8. Program to print the first n Fibonacci numbers using function.
9. 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.
10. Program that uses a function to sort an array of integers.

SEMESTER III

PH3B21U **Practical**

Word and Data Processing Packages

(Minimum 8 experiments)

1. 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 2000 and 4000. List the total salary and gross salary in each department.

2. Create the following work sheet. Marks of 4 subjects of 5 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.
3. Create a work sheet for preparing merit list for B Sc admission in your college.
4. A company has types of employees. Create a work sheet and draw a pie chart using the data's. Operator 60, Programmers 80, Analysts 20, Contractors 35, Company name is HELLO.
5. Create two documents using MS WORD exactly the way they are seen.
6. 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.
7. 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.
8. Create two documents using PageMaker exactly the way they are seen.
9. Create two documents using PageMaker. Change its character width, indents, space around paragraphs; add special characters, figures, tables etc.
10. Design a text book cover page with title and pictures using page maker.

SEMESTER III

PH3B21U **Practical**

Development and testing using of C++

(Minimum 8experiments)

1. A program to find the sum and average of a given numbers.
2. Obtain roots of a quadratic equation in all possible cases.
3. 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.

4. A program to find sum of the following series using a function declaration. Sum= $x-(x^3)/3! +(x^5)/5! - (x^n)/n!$ where x and n are entered from the keyboard.
5. A program to read a set of numbers from the keyboard and to find out the largest number in the given array(the numbers are stored in a random order).
6. A program to find area using Trapezoidal rule.
7. A program to find area using Simpson's rule.
8. A program to find roots of an equation using Newton Raphson method.
9. A class of n students takes an examination in m subjects, A program to read the marks obtained by each student in various subjects and to compute and print the total mark and grade.
10. 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.

SEMESTER IV

PH4B21U **Practical**

Development and testing using of C++

(Minimum 8experiments)

1. Program to read the elements of the given two matrices of order n x n and to perform the matrix multiplication.

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. 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.

5. A program to concatenate using two strings into one string using a pointer method.
6. Stokes' experiment for measurement of terminal velocity of an object falling freely in a highly viscous medium.
7. Projectile motion: Assuming initial velocity and angle of projection, find out time of flight, horizontal range, maximum height.
8. Convex lens: Assuming the values of 'u' and 'v', find out the focal length.
9. Conversion of Decimal to Binary and Binary to Decimal
10. Conversion of Decimal to Hexadecimal and Hexadecimal to Decimal.

SEMESTER IV

PH4B22U **Practical**

Using Visual Basic

1. Create a new Standard EXE project; enter the code in the Form lad event procedure.

2. 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.
3. Create a project to change the shape of a shape control at the interval of one second using Timer control.
4. Create an event procedure to convert a text from lowercase to uppercase.
5. Create a function procedure to find simple interest.
6. Create a program to accept a number and print it in the reverse order.
7. Create a program to accept a set of numbers and find the largest and smallest number.
8. Create a simple calculator with Min, M+, M- and MR.
9. Create a program to count the number of vowels in a string and replace with '*' symbol.
10. Create a program to check whether a given string is palindrome or not.

B. Sc. Physics Programme Model III

5- ELECTRONIC EQUIPMENT MAINTENANCE

FIRST SEMESTER SYLLABUS

PH1B51U - **PRINCIPLES OF ELECTRONICS**

Credits: 4 (theory: 3, practical: 1)

No. of contact hours: 54

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

Seriesl and Parallel response

Integrator and Differentiator using RC circuits, Clipper and Clamper circuits

Module II

Transistors

PNP and NPN- Configurations, characteristics and constants, Phototransistors

Transistor Amplifiers – Biasing and stabilization, frequency response

Operational amplifier (OP-AMP) - basic principle

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.

Power Supplies

Rectifiers – Half and Full wave

Filter circuits – Capacitor input, L - section and π filter

Voltage regulators – series, shunt and IC regulators

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

SEMESTER I

PH1B52U - Power Electronics And Communication Engineering

Credits: 3 (theory: 3)

No. of contact hours: 54

Module I

Power electronics

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

Power Semiconductor Diodes and Transistors – Characteristics of power diodes, types of power diodes, power transistors, Power MOSFETS, Insulated Gate Bipolar transistor (IGBT), MOS controlled Thyristor (MCT)

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

Module II

Communication Systems

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 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. Power Electronics – Dr. P S Bimbhra
2. Principles of Electronic Communication systems – Kennedy
3. Monochrome and colour television – R R Gulati

SEMESTER II

PH2B51U **- Fundamentals Of Microprocessors**

Credits: 2 (theory: 2)

No. of contact hours: 54

Module I

Introduction to number systems – binary, hexadecimal, octal, Excess three , BCD, Grey codes, Interconversions of different number systems, concept of parity and floating point representation of numbers

Binary arithmetic and Boolean algebra – Boolean axioms, De Morgan's theorems-statement, verification and applications, 1's complement and2's complement, half adder and half subtractor, full adder and full subtractor

Module II

Logic gates – Positive and negative logic, NOT, AND, OR, EXOR, NAND, NOR (symbol and truth table), inverting and non inverting buffers

Logic families – TTL, ECL, CMOS (parameters like power dissipation, speed, supply requirements, logic level, fan in fan out and noise immunity

Combinational and sequential circuits – Flip flops – RS, JK, D, T, M/S JK, Shift registers, counters semiconductor memories, multiplexers, coders decoders

Module III

555 timer – Basic principle, astable and monostable multivibrator

References

1. Digital computer fundamentals – Thomas Bartee
2. Digital principles – Malvino
3. Digital Fundamentals – Thomas L Floyd
4. Digital electronics – R P Jain

SEMESTER II

PH2B52U - Communication Engineering

Credits: 3 (theory: 2, practical: 1)

No. of contact hours: 54

Module I

Camera Tubes – Basic principles

Picture tube – Monochrome and colour beam deflection, picture tube characteristics, picture tube bias circuits and controls.

Colour television receiver

Chroma section, AFT, auto tuning, system control, luminance section, X radiation protection, RGB output amplifier, RGB matrix

Module II

Telephones and Mobile phones

Basic principles of telephone communication and mobile phone communication, block diagrams, troubleshooting procedures, EPBAX

Module III

Colour Television

Principles of colour television transmission and reception, colour signal generation and processing in transmitter, composite colour video signal, channel bandwidth, colour signal processing in CTV receiver

References:

1. Principles of Electronic Communication systems – Kennedy
2. Monochrome and colour television – R R Gulati
3. Modern telephone servicing – Manohar Lotia

SEMESTER III

PH3B51U **– MICROPROCESSORS**

Credits: 4 (theory: 3, practical: 1)

No. of contact hours: 54

Module I

The 8085 Microprocessor

Block Diagram and functions, architecture of microprocessor, machine and assembly languages, Instruction cycle, timing diagram, RISC and CISC

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

Module III

Programming Concept of 8085 µP

Straight line programmes, Mathematical programmes, branching programmes, looping programmes, programmes using subroutine and time delay

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

SEMESTER III

PH3B52U - Troubleshooting & Maintenance Of Audio Equipments

Credits: 4 (theory: 3, practical: 1)

No. of contact hours: 54

Module I

Magnetic Recording

Basic principle (VCR & Tape recorder)

VCR – Block diagram, rotating head, helical scan, tape transport system, different motor drives, servo system, luminance and chrominance signal processing.

Module II

CD player

Audio and video – Functional blocks, principles of recording and playback, troubleshooting procedure, servo systems, system control, different motor drives

Module III

Frequency Synthesized Tuning, Remote Control and AFT

Phase – locked loop, microcomputer control of receiver functions, frequency synthesized channel selection and control, sensory and switching circuits, Program presetting, Remote control of receiver functions, remote control operation, electronic touch tuning, Automatic frequency tuning (AFT), Common faults in computer controlled systems, faults in AFT circuits

References:

1. Monochrome and colour television principles and practice – R R Gulati
2. Modern MP3, VCD servicing manual – Manahar Lotia

SEMESTER IV

PH4B51U - **APPLICATIONS OF MICROPROCESSOR**

Credits: 4 (theory: 3, practical: 1)

No. of contact hours: 54

Module I

Interfacing the microprocessor

Introduction, interfacing with ROM and RAM, input/ output interfacing, interfacing with practical I/O ports, synchronising I/O data transfer using interrupts, address decoding

Module II

Applications

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

MODULE III

Microcomputer fundamentals

Introduction, simplified architecture, simplified memory organisation, simplified CPU organisation, microcomputer operation.

References:

1. Microprocessor and its applications – R Theagarajan, S Dhanashekharan, and S Dhanpal
2. Advanced microprocessors and peripherals – A K Ray
3. Fundamentals of microprocessors and microcomputers – B Ram
4. Microprocessor architecture, programming and applications with the 8085 – Gaonkar

SEMESTER IV

PH4B52U - COMPUTER HARDWARE AND NETWORKING

Credits: 4 (theory: 3, practical: 1)

No. of contact hours: 54

Module I

Microprocessors – Basic concepts of Intel 80186, 80286, 80386, 80486 and Pentium processors. Motherboard, Expansion buses, Memory, upgrading / adding memory, BIOS

Module II

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

Module III

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

References:

1. IBM PC and CLONES- Hardware, troubleshooting and maintenance – B Govindarajalu
2. PC Hardware, a beginners guide – Ron Gilster

SEMESTER V

OPEN COURSE

PH5D51U - TROUBLESHOOTING & MAINTENANCE OF VIDEO EQUIPMENTS

Credits: 4 (theory: 3, practical: 1)

No. of contact hours: 54

Module I

Television

Troubleshooting procedure in monochrome and colour television – various blocks, power supply, sweep section, RF tuner, VIF section, video amplifier, sound strip, system control

Module II

LCD and Plasma TV - Basic principles

HDTV - basic principles, requirements and applications

Module III

Alignment and servicing equipment – Antistatic and low leakage multimeter, soldering iron, VTVM, CRO, signal generator, Video pattern generator, colour bar generator, vector scope, high voltage probe, shielding and grounding

References:

1. Monochrome and colour television principles and practice – R R Gulati

SEMESTER VI

CHOICE BASED COURSE

PH6B51.1U **- COMPUTER HARDWARE AND SOFTWARE INSTALLATION**

Credits: 3 (theory: 2, practical: 1)

No. of contact hours: 36

Module I

Motherboard – removing, installing / configuring motherboards, BIOS set up, troubleshooting memory

Module II

Hard disks- installing / upgrading, troubleshooting, formatting.

Error codes, BIOS disk routines

Module III

Printer installation

Software installation – DOS, windows 95, 98, Linux, windows NT – installation, administration

Installing PASCAL, C, ORACLE, VISUAL BASIC

Software diagnostics – PC tools, Norton utilities, XT/AT diagnostics, Viruses and ant viruses.

References:

1. IBM PC and CLONES- Hardware, troubleshooting and maintenance – B Govindarajalu
2. Hardware, a beginners guide – Ron Gilster

ELECTRONIC EQUIPMENT MAINTENANCE (PRACTICALS)

SYLLABUS

SEMESTER I

Minimum 8 experiments

PH1B51U - Electronic Equipment Maintenance Practical

BASIC CIRCUITS LAB

1. Diode characteristics – PN junction diode & zener diode
2. Integrator and differentiator using RC circuit
3. Clipper and clamper circuits
4. Single stage & two stage RC coupled amplifier – comparison of gain and bandwidth
5. Oscillators – RC phase shift, Wein bridge, Hartley & colpitts
6. Multivibrators – astable & monostable
7. Rectifiers – half wave & full wave (ripple factors with and without filters)
8. Transistor characteristics – CB & CE
9. Power amplifier

SEMESTER II

Minimum 8 experiments

PH2B51U - Electronic Equipment Maintenance Practical

POWER ELECTRONICS & COMMUNICATION ENGINEERING LAB

1. JFET Characteristics
2. UJT Characteristics
3. MOSFET characteristics
4. SCR characteristics
5. Triac characteristics
6. AM generation and detection
7. Frequency modulation and demodulation using 565 PLL
8. AGC generation using IC
9. IF tuned amplifier

SEMESTER III

PH3B51U- Electronic Equipment Maintenance Practical

Minimum 8 experiments

DIGITAL ELECTRONICS LAB

1. Verification of De Morgan's theorem
2. Half adder, half subtractor and full adder, full subtractor
3. Flip – flops using gates
4. Shift registers
5. Asynchronous counters
6. Synchronous counters
7. Astable multivibrator using 555 timer IC
8. Monostable multivibrator using 555 timer IC
9. VCO using 555 timer IC

SEMESTERIII

PH3B52U- Electronic Equipment Maintenance Practical

TROUBLESHOOTING & SERVICING OF A/V EQUIPMENTS – I

1. Study of multimeter (analog and digital)
2. Study and familiarisation of passive components

- General purpose resistor
- Precision resistor
- Wire wound resistor
- Ceramic encased resistors
- Capacitors(non electrolyte, electrolyte, colour coded)
- Inductors (general purpose, colour coded)
- Surface mount devices(SMD)

3. Study of electrical components
    - Transformers (low power and power)
    - Basics of house wiring
    - Electrical relays
    - Mechanical switches
    - Familiarisation of electrical home appliances
4. Study of semiconductor devices
    - Diodes, Transistors, FETs
5. Practicing different types of soldering works
6. Familiarisation of tools in lab and workshops
7. How to draw schematic diagrams
8. Assembling practice on various media
    - On bread board
    - On PC type bread board
    - On Printed circuit board
9. Fabrication of PCB
10. Power supply – assembling and fault finding
    - Unregulated
    - Regulated (Shunt)
    - Series regulated(transistorised)
    - Series regulator(IC version)
11. Assembling of regulated variable power pack
12. Assembling and fault finding of SMPS

SEMESTER IV

PH4B51U Electronic Equipment Maintenance Practical

Minimum 8 experiments

MICROPROCESSOR LAB

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 to 99

SEMESTER IV

PH4B52U **- Electronic Equipment Maintenance Practical**

Minimum 8 experiments

COMPUTER HARDWARE MAINTENANCE WORKSHOP –I

01) Parts identification and assembling a P.C system.

02) Trouble shooting and identifying most common complaints related to a P.C

03) Partitioning and formatting a HDD using fdisk.exe and format.com commands.

04) Partitioning and formatting a HDD using Disk Manager Utility.

05) Install operating system - Windows 98 second edition.

06) Install operating system - Windows XP.

07) Install operating system - Windows Vista.

08) Install operating system - Linux.

Text Book;

1. IBM PC & clones by Govinda Rajalu
2. PC Trouble shooting

Equipments:

1. PC Trainer kit (Vi Microsystems)
2. Motherboard 8086, 80486, Pentium.
3. Memory SIMM SDRAM
4. SMPS
5. VCH (ACP), FDC, HDC, Sound card, LAN card, cables, Connectors etc.
6. Cabinet
7. VCA monochrome monitor.

SEMESTER V

PH5B51U - **Electronic Equipment Maintenance Practical**

Minimum 8 experiments

TROUBLESHOOTING & SERVICING OF A/V EQUIPMENTS – II

Assembling and fault finding of transistor radio

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. Application of power electronics
5. Fault finding of TV power supply(SMPS)
6. Fault finding of TV horizontal sweep stage
7. Fault finding of TV CRT stage
8. Fault finding of TV vertical sweep stage
9. Fault finding of TV Y-C sub processor
10. Fault finding of TV RF and IF stages
11. Fault finding of TV audio stage
12. Fault finding of TV µP stage
13. Assembling and fault finding of VCD
14. Assembling and fault finding of DVD
15. Assembling and fault finding of LCD TV

SEMESTER VI

PH6B51U - **Electronic Equipment Maintenance Practical**

Minimum 8 experiments

COMPUTER HARDWARE MAINTENANCE WORKSHOP - II

01) Install Office software - Office XP/Office2003/Office2007.

02) Install Programming Software - Visual Studio / Oracle.

03) Install DTP software like Photo Shop / Corel Draw / Page Maker.

04) Install and configure Printers (Dot-matrix/Inkjet/Laser jet).

05) Install and configure Webcam.

06) Network card configuration and create local area network using windows O.S

07) Install and Configure a dial up / broad band modem & Internet connection settings.

08) Familiarization of diagnostic tools (Norton Utility, Norton Antivirus etc.)

Text Book;

1. IBM PC & clones by Govinda Rajalu
2. PC Trouble shooting

Equipments:

1. PC Trainer kit (Vi Microsystems)
2. Motherboard 8086, 80486, Pentium.
3. Memory SIMM SDRAM
4. SMPS
5. VCH (ACP), FDC, HDC, Sound card, LAN card, cables, Connectors etc.
6. Cabinet
7. VCA monochrome monitor.

Complementary courses: COMPUTER APPLICATION

SEMESTER I

PH1C51U **- COMPUTER FUNDAMENTALS**

Credits: 3 (theory: 2, practical: 1)

No. of contact hours: 36

Module: 1

Basic concepts – Characteristics and evolution of computer- Computer generation – Basic computer organization – I/O unit – Storage unit – ALU, CU – CPU.

Module: 2

Number Systems – Binary number systems – Converting from one number to another – Computer Arithmetics. Primary and secondary storage devices – I/O devices.

Module: 3

C++ programming basics – program constructions – variables operators.

References

1. Fundamentals of Computers, V Rajaraman, Prentice-Hall of India, New Delhi.
2. Computer and Commonsense, Roger Hunt & John Shelley, PHI
3. Computer Fundamentals, P K Sinha, BPB Publications, New Delhi.
4. Object-Oriented Programming with C++, E Balagurusamy, TMH.
5. The Essence Of Programming Using C++, Douglas Bell, Prentice-Hall

SEMESTER II

PH2C51U **- OBJECT ORIENTED PROGRAMMING C++**

Credits: 3 (theory: 2, practical: 1)

No. of contact hours: 36

Module: 1

Structure - Data types – Function.

Module: 2

Arrangement and return values – reference arrangement – function overloading - Storage class.

Module: 3

Object and class – member functions – constructors and destructors.

Reference Books:

4. Object-Oriented Programming with C++, E Balagurusamy, Tata McGraw-Hill.
5. The Essence Of Programming Using C++, Douglas Bell, Prentice-Hall.
6. Teach Yourself C++, Herbert Schildt, Tata McGraw-Hill.

SEMESTER III

PH3C51U **- JAVA PROGRAMMING LANGUAGE**

Credits: 4 (theory: 3, practical: 1)

No. of contact hours: 54

Module: 1

Introduction to Java - Features of Java - Object oriented programming - Principles of OOP – Creation of Java programme.

Module: II

Data type variables and arrays – One dimensional, Multidimensional arrays.

Operators – Arithmetic, Bitwise, Relational, Boolean and Assignment operators – Operator precedence.

Module: III

Control statements – if – switch – iteration statements – jump statements introduction to class – class fundamentals – introducing methods – constructors – this keyword – finalize ( ) method. Overloading methods – Recursion – Introducing Nested and inner classes.

Reference. :

1. The complete Reference. – Naughton and Schildt.
2. Java™ How to Program, Seventh EditionP. J. Deitel - Deitel & Associates, Inc.; H. M. Deitel - Deitel & Associates, Inc. Prentice Hall

SEMESTER IV

PH4C51U- **THE JAVA LIBRARY**

Credits: 3 (theory: 2, practical: 1)

No. of contact hours: 54

Module: 1

Introduction to inheritance – Inheritance Basics – Using Super Method overriding – Using abstract class – Using final packages and interfaces – Defining package – Access protection – Importing packages – interfaces.

Module: II

Exception Handling – Fundamentals – Exception Types – Using try and catch – throw – throws – finally. Multithreaded programming thread model – thread priorities – synchronization.

Module: III

Applet – Applet class – Architecture – Skeleton – methods – HTML tag – The audio clip interface – Applet stub interface – Introducing AWT – Working with Windows.

Reference. :

3. The complete Reference. – Naughton and Schildt.

4. Java™ How to Program, Seventh EditionP. J. Deitel - Deitel & Associates, Inc.; H. M. Deitel - Deitel & Associates, Inc. Prentice Hall

COMPUTER APPLICATIONS (For EEM)- PRACTICAL SYLLABUS

Minimum 8 experiments in each course

SEMESTER I

PH1C51U PRACTICAL - C++ PROGRAMMING

1. WAP to print 'n' Fibonacci series.
2. WAP to check whether the given number is Palindrome or not.
3. WAP to check whether the given number is prime or not.
4. WAP to find the greatest and smallest numbers.
5. WAP to accept a binary number and find its decimal.
6. WAP to accept a decimal number and find its binary.

7. A program to read the marks obtained in various subjects by each student in a class of n students taking examination in m subjects, and to compute and print the total mark and grade.
8. 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.
9. WAP to find the product of two numbers.

SEMESTER II

PH2C51U PRACTICAL - C++ PROGRAMMING

1. WAP to arrange the numbers is ascending order.
2. WAP to find the roots of a quadratic equation.
3. WAP for finding the area of different shapes (triangle, rectangle, circle) using function overloading.
4. WAP to accept a particular student, Roll No., Name & 3 marks and find total and average marks and print the details using class.
5. Write a program to accept data members, account number, name & balance & member functions to input values and display information.
6. Stokes' experiment for measurement of Terminal velocity of an object falling freely in a highly viscous medium.
7. Projectile motion: Assuming initial velocity and angle of projection, find out time of flight, horizontal range, Maximum height.
8. Convex lens: Assuming the values of 'u' and 'v', find out the focal length.
9. i-d curve: Assuming values of 'i' and 'd', find out the angle of minimum deviation and hence the refractive index.
10. A program to concatenate using two strings into one string using a pointer method.

SEMESTER III

PH3C51U PRACTICAL - JAVA PROGRAMMING

1. WAP to find the factorial of a number.
2. WAP to find the reverse of a given number.
3. WAP to find the multiples of 7 less than 100.
4. WAP to find the sum of digits of a number
5. WAP to Conversion of Decimal to Binary and Binary to Decimal
6. WAP to Conversion of Decimal to Hexadecimal and Hexadecimal to Decimal.
7. WAP to program to find the sum and average of a given numbers.
8. WAP to obtain roots of a quadratic equation in all possible cases.
9. WAP to read a set of numbers from the keyboard and to find out the largest number in the given array(the numbers are stored in a random order).

SEMESTER IV

PH4C51U PRACTICAL - JAVA PROGRAMMING

1. WAP to read a string and print the reverse string.
2. WAP to check whether the given string is palindrome or not.
3. WAP to sort a list of numbers in descending order.
4. WAP to get the following output.

```
*
*   *
*   *   *
*   *   *   *
*   *   *   *   *
```

5. WAP 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.
6. WAP to read the elements of the given two matrices of order n x n and to perform the matrix multiplication.
7. Program to print the first n Fibonacci numbers using function.
8. 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.
9. WAP that uses a function to sort an array of integers.

B Sc Physics Programme

Model III: (6) INSTRUMENTATION

SYLLABUS

SEMESTER I

PH1B61U **Instrument Mechanism**

No of credits 2

Total hours: 54

OBJECTIVIES :

Understand various Manufacturing processes; Understand the properties of moulding and casting. Appreciate the operations of shaping, planning and slotting Machines

Module I

Manufacturing processes:

Introduction-Primary shaping processes : Casting, forging, Rolling, bending, drawing, squeezing, extruding, shearing, forming,piercing, spinning, crushing.

Machining processes:

Turning, drilling, grinding, threading, boring, slotting, planning, milling, hobbing,sawing, broaching, knurling**.**

Surface finishing processes:

Sand blasting, buffing, lapping, honing, belt grinding, polishing, electro- plating, metal spraying, tumbling, super finishing, anodizing, phosphating, pickling, hot dipping, galvanizing, parkerising, sheradising, painting, inorganic coating.

Joining processes

Welding,soldering, brazing, reveting, sintering, adhesive joining, screwing, pressing.

Lathe and lathe work

Type of Lathe ,center lathe,tool room lathe, bench lathe and Speed lathe,lathe construction,lathe parts, function of each part,lathe accessories.Work holding and tool holding devices,-metal cutting—speed, feed and depth of cut- operations, cylindrical turning ,taper turning methods, thread cutting, forming, multiple-threads, drilling, boring and reaming.

Shaping machines:

General use of a shaper-parts -operations-quick return motion. Crank and slotted lever mechanism-hydraulic method

Slotting machines :General use of a slotter – parts-operations

Planning machines:General use of planer parts-operations

Drilling machines: Types-bench type, pillar type portable type, radial type-parts - Types of drill bits

Milling machine- general use of milling-types-plain-universal-milling operations-Plain milling-key and key

ways-gang milling –T-slot milling-up milling, down milling

Moulding and casting-pattern making-classification-single piece-split-gate- sweep-loose patterns-Type of

moulding sand-green sand-dry sand-parting sand- loom sand-facing sand-core sand-moulding boxes-Method of

moulding- bench moulding-pit moulding-floor moulding-sweep moulding-types of casting- sand casting-

permanent mould casting-(describe the sand casting method)

Reference books

Work shop technology ---R.S.Khurmi,J.K.Gupta, S.Chand publishers

Machine design ---Dr.P.C.Sharma, Dr.D.K.Aggarwal, Katson books

Module II

Bearings-classification -Sliding contact bearing-journal bearings-thrust bearing-pivot bearing-bushed bearing- pedestal bearing-Rolling contact bearings-classification-ball bearings-roller bearings - types of rolling contact bearings- single row-double row-angular contact and self aligning ball bearings-cylindrical- roller bearings- needle bearings-taper roller bearings-spherical roller bearings-thrust ball bearings-advantages and disadvantages–bearing materials

Shaft couplings-introduction-classification-rigid couplings –flexible couplings-Disengaging couplings-non aligned coupling , Rigid couplings-sleeve or muff couplings-

flange coupling-protected flange coupling- Solid flange coupling (fig of muff and flange coupling only) Flexible coupling- Oldham flexible coupling (fig) -bushed-pin type flange coupling,Universal flexible coupling (no fig)

Clutches -Types of clutch-mechanical clutch –electromagnetic fluid and power clutch-fluid clutch-classification of mechanical clutch-Positive contact clutch-jaw clutch(clawclutch and spiral jaw clutch)-tooth clutch.

Friction clutch -disc clutch-cone clutch-tyre pneumatic clutch (no fig) ---centrifugal – clutch-over running or free-wheeling clutch- magnetic clutch-single revolution clutch (no fig)

Energy storing elements-Introduction –springs-pplication-classification-helical tension and compression spring-helical torsion spring-spiral spring-leaf spring- disc or Belleville spring- spring materials

Reference books

Machine design ---Dr.P.C.Sharma, Dr.D.K.Aggarwal, Katson books

Module III

Power transmission-introduction--belt drive –flat belt--V-belt--linked belt-open- belt drive cross belt drive- velocity ratio-slip-creep-belt materials- advantages and – disadvantages

Rope drive-application-fiber rope and wire ropes-materials-multiple system-continues system -construction of wire rope materials

Chain drive-application-types of chain drive-driving or power transmission chain-crane chains-tractive chain or pulling chains-construction of chain-roller chains-- silent chain.

Gear drive-introduction-classification --spur gear-helical gear-bevel gear-worm gear-simple gear train – compound gear train-velocity – ratio-advantages of gear drive-limitations-gear materials Basic link mechanism-

Introduction-definition and explanation -link or element- kinematic pair-kinematic chain-mechanisms-inversion of mechanisms-types of- constrained motion-higher pair lower pair-four bar chain-single and double slider- crank chain.

Reference books

1. Elements of precision engineering --- R.Raman,Oxford & IBH Pubishing,New Delhi
2. Machine design ---P.Kannaiah, SCITECH publications
3. Machine design ---Dr.P.C.Sharma, Dr.D.K.Aggarwal, Katson Books
4. Machine drawing ---N.D.Junnarker,Pearson education, Publishers

SEMESTER I

PH1B62U: **Mechanical Measurements**

No. of credits: 3

Contact hours: 54

Aim: To familiarize the various process parameters and study its measurement.

Requirements: Should know the fundamentals of Physics.

Module I (15 hours)

Basic concepts of Instrumentation:

Introduction- types and applications of measurement. Instrumentation- configuration of measuring instruments- static & dynamic performance, different types of errors. Characteristics of instruments- analysis of experimental data.

Measurement of displacement, area and velocity:.

Electrical and mechanical methods, planimeters, stroboscopes, revolution counters, tachometers

Reference:

1. Measurement systems- application and design, Doeblin. E. U.
2. Industrial instrumentation and control, S.K.Singh

Module II (18 hours)

Measurement of force, torque, shaft power and strain:

Strain gauge, differential transformer, piezoelectric types of transducers, dynamometers

Measurement of pressure:

High Pressure Measurement: Dead weight gauges, manometers, electrical pressure pick-ups, bourdon tubes

Low pressure(vaccum) measurement: Thermocouple gauges, pirani gauges, ionization gauges.

Measurement of sound

Sound level meter, microphones.

Liquid level measurement

Float type, capacitance type, radiation type

***Reference*:**

1.Measurement systems- application and design, Doeblin. E. U.

2.Industrial instrumentation and control, S.K.Singh

Module III (21 hours)

Measurement of flow

Pitot- static probes, venturimeter, orifice plates, flow nozzles, rotameters, vane type, hot-wire/hot-film anemometers, electromagnetic flow meters, ultrasonic techniques

Measurement of temperature and heat flux

Thermocouples, different types of thermocouples, resistance thermometry, radiation pyrometers, heat flux sensors

Miscellaneous measurements

Vibration instruments, humidity, chemical composition

Reference:

1. Measurement systems- application and design, Doeblin. E. U.

2. Industrial instrumentation and control, S.K.Singh

3. Basic instrumentation, O'Higgin. P. J

4. A course in Electrical and Electronic measurements and instrumentation,

A.K.Sawhney

SEMESTER II

PH2B61U Electrical Networks And Measuring Instruments

Credits – 2

No. of contact hours – 54

Objectives: Familiarisation of Tuned amplifiers,switching circuits and measurement using PMMC ,CRO

Requirements: Should know the basics of electronics.

Module I (18 Hours)

AC Fundamentals;-Frequency, TimePeriod, Phase concepts, Average, Effective values ,Form factor ,Peak factor, Phasor representation.

A.C. Circuits:-AC through pure resistance only, AC through pure inductance only, AC through pure capacitance only ,non sinusoidal waveforms, harmonics ,series circuits-RL,RC,RLC circuits ,skin effect, resonance in RLC circuits, resonance curve. Bandwidth, Q factor, half power bandwidth of a resonance circuit ,parallel resonance ,two branch parallel circuits ,resistance variation ,resonance at all frequencies.

Tuned Amplifiers:-Need for tuned voltage amplifiers, resonance, single tuned amplifier, double tuned voltage amplifier

Switching Circuits:-Electronic switch ,switching transistors ,multivibrators , astable multivibrator , monostable multivibrator and bistable multivibrator

Ref: Basic Electronics and Linear Circuits By N. N. Bhargava D.C Kulshreshtra S.C. Gupta

Basic Electrical Technology Volume 1 B.L.Theraja

Basic Electronics Solid State B.L.Theraja

Module II (18 Hours)

Circuit Transients:-Laplace transformation of some functions ,Initial and final value theorems-DC Transients--RL Transients ,Decay of currents in RL circuits-RC Transients –Decay of currents in RC circuits-RLC Transients :over damped Critical damped and under damped .AC Transients—RL,RC,RLC Circuits

4 Hours

Network Functions:- Introduction ,network function for one port Network ,Network function for two port network ,Transfer functions ,Poles and zeros of Network functions.

Parameters of Two-port Networks:-Short Circuit Admittance parameters (Y parameters), Open circuit Impedance parameters(Z parameters), Hybrid Parameters(h parameters),Transmission parameters (ABCD Parameters),Relation between Different parameters

Ref: Electric circuit Theory by Dr.M.Arumugam N. Premakumar

Network Analysis by G.K Mithal

Network Theorems And Systems by Roe Chowdhary

Module III (18 Hours)

Electronic Instruments :- Analog and digital Instruments –function of Instruments. Permanent magnet moving coil(PMMC)-Construction, principle of operation, characteristics of moving coil meter movement, variation of basic meter movement

Converting basic meter into DC ammeter, multirange, converting basic meter into DC voltmeter, multirange, meter sensitivity, ohmmeter ,multi meter ,The digital voltmeter

Cathode Ray Oscilloscope(CRO)Different parts of CRO, cathode ray tube-construction, deflection sensitivity of CRT, dual trace CRO, dual beam CRO, Block diagram of CRO

Applications of CRO- measurement of voltage ,current and frequency(Lissajous Figures)

Measuring Instruments: Principles of moving coil , moving – iron, dynamometer and thermal ammeters and voltmeters, electrostatic voltmeters , wattmeters and energy meters , megger, The DC potentiometer and its uses.

Reference : Basic Electronics and Linear Circuits By N. N. Bhargava, D.C Kulshreshtra, S.C. Gupta

Basic Electronics Solid State B.L.Theraja

A course in Electrical & Electronics Measurement & Instrumentation A.K.Sawhney

Additional referencess:

1.Electronic Principles-Sahdev (Dhanpat Rai Co.)

2.Electronic Principles and Applications-Schuler(McGrawHill)

3.Foundations of Electronics-D Chattopadhyay,P.C.Rakshit,B Saha,N.N.Purkait(New Age International Publishers)

4.Principles of Electronics-V.K.Mehta(S.Chand Co.)

SEMESTER II

PH2B61U **METROLOGY**

Credits – 2

No. of contact hours – 54

Objectives : Understand the various standards of Measurements. Appreciate the features of comparison instruments. Understand the surface roughness

Requirements : Basic knowledge of Physics

Module I 18 Hours

Standard of measurements:-

Standard of length ,end standards, vernier calipers, fixed gauges-inside, depth, and height gauges, gauge block, end bars, slip gauges ,surface plates, micrometers

Angular measurements-sine bar, angle gauges, levels, clinometers, taper gauges, Direct measuring tools and instruments, optical projectors and microscopes(Horizontal, vertical and cabinet profile projectors, toolmakers and workshop microscopes) no figure

Mathematical concepts in measurements:-

Limiting mean, range, variance, standard deviation, normal distribution, confidence intervals, principle of sampling.

References

1. Engineering Metrology : R.K.JAIN, Khanna publishers,Delhi
2. Metal working and Metrology : K.L.Narayana, S.sudhakara Reddy, P.Divakara Rao, SCITECH publishers

Module II 18 Hours

Comparison measurements:-

Comparators—mechanical comparators, dial indicator, reed type, sigma, electrical comparators, optical comparators, pneumatic comparators and electronic comparators.

Limits, fits and tolerance:-

Definitions of limits-fits, tolerance, geometrical tolerance, Dimensional tolerance-hole basis and shaft basis system, definition of clearance, transition and interference fit.

Surface roughness terminology:-

Symbols indicating surface texture, symbols representing direction of lay ,roughness grade number.

Measurement of surface finish:-

Method of measurement by qualitative assessment,

visual inspection, nail test—comparison microscope (no fig), quantitative assessment,

mechanical ,electrical, optical, pneumatic and electronic method.

References

1. Metal working and metrology : K.L.Narayana, S.sudhakara Reddy, P.Divakara Rao, SCITECH publishers

2. .Industrial instrumentation : Austin E Fribance,T M H Edition

Module III 18 Hours

Measurement of screw threads :-

Thread elements—measurement of major diameter, minor diameter, pitch diameter (micrometer, two wire method, three wire method)measurement of pitch, errors in flank angle-external and internal thread gauges.

Testing of gears:-

Gear nomenclature ,run out, pitch, profile, lead, backlash ,tooth thickness, roundness measurements.

Alignment test on lathes:-

Leveling of the machine, true running of main spindle, axial slip of shoulder face—true running of head stock center, parallelism of main spindle to saddle –Parallelism of tailstock sleeve to saddle movement, alignment of both centers in vertical plane

Parallelism of tailstock guide ways with carriage

References

1. Engineering Metrology : R.K.JAIN, Khanna publishers,Delhi

2. Metal working and metrology : K.L.Narayana, S.sudhakara Reddy, P.Divakara Rao, SCITECH publishers

3.Industrial instrumentation : Austin E Fribance,T M H Edition

SEMESTER III

PH3B61U **Vacuum Instrumentation**

No. of credits: 3

Contact hours: 54

Aim: To study the vacuum measurement, components and its applications in instrumentation field.

Requirements: Should know the fundamentals of physics.

Module I (18 hours)

Introduction to vacuum:

Fundamentals. Gas flow mechanisms, conductance calculations, concept of throughput and pumping speed.

Vacuum pumps:

Rotary, root blowers and oil free pumps, diffusion and sorption pumps, turbo molecular, cryo and ion pumps.

Reference:

1. Vacuum technology, A. Guthrie, John Wiley and Sons.
2. Modern vacuum practice, Nigel Harris, McGraw Hill

Module II (18 hours)

Vacuum measurement:

Hydrostatic, thermal conductivity and ionization gauges. Gauge calibration using spinning rotor, diaphragm and Mcleod gauges.

Vacuum components:

Traps, baffles, valves, seals and feedthroughs.

Vacuum materials and fabrication techniques.

Leak detection techniques, mass spectrometer and residual gas analysis.

Reference:

1.Vacuum technology, A. Guthrie, John Wiley and Sons.

2Modern vacuum practice, Nigel Harris, McGraw Hill

Module III (18 hours)

High vacuum systems design.

Thin film deposition techniques:

Thermal evaporation and modifications. Sputtering process- advantages, limitations and various modifications. Film thickness- measurement and monitoring.

Vacuum applications:

Freeze drying, food processing industry, lamp industry, vacuum metallurgy, and vacuum impregnation.

References:

1. Vacuum technology, A. Guthrie, John Wiley and Sons.
2. Modern vacuum practice, Nigel Harris, McGraw Hill
3. Introduction to the theory and practice of High vacuum technology, L.Ward and J.P.Bunn, Butterworths, London.

SEMESTER III

PH3B62U **Transducers and Signal Conditioners**

No. of credits: 4

Total hours: 90

Aim: To study the various electronic instruments and its applications.

Requirements: Should know the fundamentals of electronics.

Module I (30 hours)

Introduction:

Basic concepts of measurement. Generalized system configuration. Measuring instruments and control instruments, open and closed loop systems, role of instruments in monitoring and control. Relationship between input and output, method of output correction.

Transducer classification:

Definition, classification-Active and passive transducers, primary and secondary transducers, analog and digital transducers, electrical transducers. Basic requirements of a transducer- ruggedness, linearity etc. Static and dynamic response.

Instrumentation system:

Definition, transfer function, standard test signals, zero order, first order, second order systems – dynamic responses and dead time element specifications.

Signal generation and processing:

Sine wave generation and amplitude stability, linear frequency control and quadrature output. Sawtooth wave (linear), square wave generator, stair case generator.

References:

1. A course in Electrical and Electronic measurements and instrumentation, A.K.Sawhney
2. . Instrumentation Devices and systems, Rangan, Mani & Sharma

Module II (30 hours)

Signal conditioners:

Instrumentation amplifiers, characteristics, linearization, D.C. amplifiers, amplitude modulation, frequency modulation, pulse width modulation. Phase sensitive detectors and its importance in extracting signals buried under noise, precision rectifiers, peak detectors, sample and hold circuits, comparators, logarithmic amplifiers, isolation amplifiers, optical isolators. Reference voltage and current.

Filters:

Passive and active filters, types of filters- first and second order, low pass, high pass, band pass, band reject and their frequency and phase response.

Reference:

1. A course in Electrical and Electronic measurements and instrumentation,

A.K.Sawhney

2 . Instrumentation Devices and systems, Rangan, Mani & Sharma

Module III (30 hours)

Display systems:

LED, LCD, SEVEN SEGMENT, CRT, and DOT MATRIX.

Transducers:

i) Temperature: thermocouple, platinum resistance thermistor- merits and demerits

ii) Strain gauges: different bridge configurations (wheatstone, quarter, half and full bridge), methods of balancing, one typical load cell.

iii) LVDT for displacement or acceleration measurement- full details.

iv) Hall effect devices and change amplifiers

v) Pressure: Solid-state devices- piezoresistance and piezojunction

References:

1. Instrumentation Devices and systems, Rangan, Mani & Sharma

2. A course in Electrical and Electronic measurements and instrumentation,

A.K.Sawhney

3. Electronic measurement and instrumentation, Oliver & Cage

4. Electronic instrumentation and measuring techniques, Cooper

SEMESTER IV

PH4B61U **Process Control Instrumentation**

No. of credits: 3

Total hours: 54

Aim: To study the control of process parameters.

Requirements: Should know the working of measuring instruments.

Module I (18 hours)

Introduction:

An overview of process control, process control principles and process control block diagram,

Final control:

Final control operation, signal conversions, analog and digital electrical signals, pneumatic signals, actuators, electrical, pneumatic and hydraulic actuators, control elements, mechanical, electrical and fluid valves, control valves.

Controller principles:

Process characteristics, control system parameters, controller modes, discontinuous controller modes, two position mode, multiposition mode, floating control mode, continuous controller modes, proportional control mode, integral control mode, derivative control mode, composite control modes, PI,PD and PID control modes.

Reference:

1. Process control instrumentation technology, Curtis Johnson, Prentice Hall of India
2. Principle of process control, Patranabis. D, TMH

Module II (18 hours)

Analog controllers:

General features, electronic and pneumatic controllers, mode implementation, design consideration

Digital controllers:

Digital electronic methods, simple alarms, multivariable alarms, computer in process control, programmable controllers, data logging, supervisory control, computer based control, controller software for different modes with examples. Discrete state process control, relay controllers, introduction to PLC

***Reference*:**

Process control systems- application, design and tuning, Shinsky.F.G., McGraw Hill

Module III (18 hours)

Control loop characteristics:

Control system configurations, single variable, cascade control, feed forward control, ratio control, selector control, inverse derivative control, anti reset control, multivariable control systems, analog control, supervisory and direct digital control(DDC), control system quality, definitions and measure of quality, stability

Process loop tuning:

Open loop transient response method, Ziegler-Nichols method, frequency response method, process reaction method and other methods for process loop tuning, dynamic elements in control loop, dead time and capacity.

References:

1. Process control instrumentation technology, Curtis Johnson, Prentice Hall of India
2. Principle of process control, Patranabis.D, TMH
3. Process control systems- application, design and tuning, Shinsky.F.G., McGraw Hill

SEMESTER IV

PH4B61U **Optical and Biomedical Instrumentation**

No. of credits: 5

Total hours: 90

Aim: To study the making and testing of Optical & Biomedical Instruments.

Requirements: Should know the fundamentals of Optics and Physiology.

Module I (30 hours)

Optical components and their characteristics:

Plane mirrors, curved mirrors, achromatic prisms, direct vision prisms, right angle prisms, roof prisms, erecting prisms, cube corner prisms, beam splitter prisms, lenses, and ophthalmic lenses.

Optical materials and fabrication techniques: optical glasses and their characteristics, crystalline materials.

Testing optical components:

Michelson's interferometers, Newton's interferometers, Fizeau interferometers, Twyman- green interferometers, Mach-Zehnder interferometers, multiple beam interferometer, polarization interferometer, shearing interferometer, distance measuring interferometers. Autocollimators, Rochi grating test, Foucault knife edge test. Haitmann and other screen tests,Bull testing comparators.

References:

1. Fundamentals of optics, Jenkins and White, McGraw Hill
2. Optics and optical instruments, Johnson, Dover
3. Lasers- theory and Applications, Thygarajan K & Ghatak A.K.
4. Fibre optics- devices and laser systems, Cheo P.K, PHI

Module II (30 hours)

Fibre optics:

Principle of optical fibres, materials for optical fibres, step index and graded index fibres, multimode and single mode fibres. Fibre fabrication, fibre optic components- sources, detectors, couplings. Application of optical fibres- illuminators, imaging bundle, endoscopy, communication, fibre optic sensors. Phase modulated optical fibre sensors, interferometric sensors, fibre gyroscope, temperature, pressure, force and chemical sensors.

Laser instrumentation:

Principle, properties, construction, Applications in distance measurement, industrial, medical and holography.

References:

1.Fundamentals of Optics, Jenkins and White, McGraw Hill

2.Optics and optical instruments, Johnson, Dover

3.Lasers- Theory and Applications, Thygarajan K & Ghatak A.K.

4.Fibre optics- devices and laser systems, Cheo P.K, PHI

Module III (30 hours)

Biomedical Instrumentation

Introduction:

Generalized system, Electrical activity of excitable cells, SD curve, introduction to transducers and its applications, recording electrodes, surface electrodes, needle electrodes, micro electrodes, working principles of electrocardiogram, electroencephalogram, electromyogram, electrodes for measuring ECG, EEG and EMG, metal plate electrode, floating electrode, disposable electrode, polarisable and non polarisable electrodes.

Blood pressure measurement:

Direct measurements: harmonic analysis of blood pressure waveform, system for measuring venous pressure, heart sounds, phonocardiography, cardiac catheterization

Indirect blood pressure measurement: electromagnetic blood flow meters, ultrasonic blood flow meters, plethysmography, sphygmomanometer, introduction to hemodynamics.

Hemodialysis, lithotripsy, ventilators, infant incubators.

Reference:

1. Handbook of biomedical instrumentation, TMH

2 .Medical instrumentation- application and design, Webster J.G, John Wiley.

SEMESTER V

PH5B61U **MICROPROCESSORS**

No of credits : 3

No of contact hours: 54 hours

Module I (18 Hours)

Introduction:

What is microprocessor. Need of microprocessor in instrumentation. Advantage of microprocessor based instrumentation over conventional instrumentation

Review of digital electronics

Shift Register ,counters, decoders, encoders, Tristate Buffer and multiplexed display systems

Microprocessor Architecture

1.**Memory organization**:

Types of memories-RAM,ROM,EPROM,PROM,DRAM.Basic concepts of memory organization-

Number of address lines required, arrangement of memory cells, control lines, memory extention.Concept of control lines such as Read/Write chip enable. Register to Register transfer via data bus

2.Arithmetic and Logic Unit(ALU)

Function of ALU, Detail design of a small "ALU". An "ALU" which performs four basic(4 bit) operations(ADD,SUB,OR,AND),Need for instruction Decoder, Integration of ID with "ALU" to form an ALU with control signals

3.Control and Timing Unit

Need for this unit, concept of sequence of execution of an instruction, Detail design of control unit.

Integration of all the three(1,2,3) to form C.P.U

References:

1.Microprocessor Architecture, Programming and Applications By Gaonkar

2.Digital Computer Electronics By Albert Paul Malvino(TMH)

Module II (18Hours)

Introduction to 8085 Architecture

Block diagram ,Address Bus, Control Bus, Data Bus, Need to multiplex address and data bus. Memory organization(with emphasis on demultiplexing address and data bus during memory read or memory write). Control and timing unit. ALU details. Registers, Flags, memory mapped I/O and I/O mapped I/O.

Instruction Set

Introduction, classification of instruction set, opcode format some basic instructions

(1)Data transfer instructions, this must include(a)immediate Addressing (b) Register Addressing (c) Direct Addressing (d) Indirect addressing

(2) Arithmetic and Logic Instructions-Add, Sub, AND,OR,XOR,CMP

Reference Books

1.Microprocessor Architecture, Programming and Applications By Gaonkar

2.Microprocessors's and Applications By Mathur

Module III (18 hours)

Control and Timing

Sequence of execution of instructions cycle machine. Various types of machine cycles along with associated control and status signals (opcode fetch, memory read, memory write, I/O Read, I/O Write,IO/M,SO,S1,MR,MW)Detail timing diagrams of some instructions

Advanced Instructions

Branching, conditional and unconditional subroutines: conditional and unconditional concept of stack, need for stack pointer

Interfacing

Concept of interrupts, classification of interrupts, various types of interrupts(5.5,6.5,7.5,TRAP,Hardware,software interrupts RST0 to RST7)

Instructions associated with interrupts(RIM,SIM,EI,DI)Typical examples illustrating usage

Interfacing with peripherals

Concept of Input and output ports. Study of 8255,8279,8253(General description, how to programme, usage)

Interfacing of A/D and D/A converters.

Reference Books

1.Microprocessor Architecture, Programming and Applications By Gaonkar

2.Microprocessors's and Applications By Mathur

SEMESTER VI

PH6B61U **Analytical & Environmental Instrumentation**

No. of credits: 4 (Theory 3 + Practical 1)

Total hours: 54

Aim: To study the quantitative and qualitative analysis of matter.

Requirements: Should know the fundamentals of Optics.

Module I (18 hours)

Analytical instrumentation:

Introduction:

Basic components of analytical instruments, need for an integrated approach.

Spectrophotometers:

UV/Visible/IR Spectrophotometers, working principle, laws of photometry, Beer Lambert Law, radiation sources, monochromators, filter, prism and grating types, single beam and double beam type, operation and data analysis.

Atomic Absorption Spectrophotometers:

Sources, components and instrumentation, plasma excitation sources.

NMR spectrometer:

Principle of operation, construction details, sample preparation and data analysis, stability of magnetic fields.

ESR Spectrometer:

Principle of operation and data analysis, Electron microscope.

References:

1. Hand book of analytical instruments, Khanpur R.S., TMH
2. Instrumental method of analysis, Williard, Merrit, Dean & Settle, CBS.

Module II (18 hours)

Mass spectrometer:

Application areas, working principles, magnetic deflection type, time of flight spectrometer and analysis of data.

Raman spectrometer:

Principle of operation and data analysis.

X-ray spectrometer:

Fluorescence spectrometry, absorption spectrometry, diffraction spectrometry and and their applications to radiography, analysis of data.

Mossbauer spectrometers:

Principle of operation, measurement of radioactivity and analysis of data.

References:

1. Hand book of analytical instruments, Khanpur R.S., TMH

2. Instrumental method of analysis, Williard, Merrit, Dean & Settle, CBS.

Module III (18 hours)

Environmental instrumentation:

Introduction:

Physical aspects like pressure, temperature, humidity, noise, visibility, air quality and water quality.

Humid atmosphere:

Dry and wet bulb hygrometers and dew point instruments, controlled humidity environment.

Thermal comfort meter, heat stress monitor and temperature monitors, Solar flux, pyranometers and pyrheliometers.

Wind velocity and effect on dispersion of pollutants. Cup anemometer, hot wire anemometer, ridar.

Noise measurement:

Sound level meters, tape recorders, noise dosimeters, sound level monitors and acoustical calibrators.

Water quality:

Turbidity meter, calorimeter, pH meter, microscopes, AAS.

Air quality:

Gas chromatography, high pressure liquid chromatography, mass spectrometry and conductivity meter.

Particulate matter in air, soiling index and visibility.

Congenial environmental for work, artificial lightings, acoustic consideration and airconditioning.

References:

1. Environmental instrumentation, Frichtschen, L.J. and Gay
2. Air pollution, Mathur C.S., Academic press
3. Pollution control in industries, Mahajan.S.P, TMH

SEMESTER VI

PH6B62U **Computer Hardware and Networks**

Credits – 3

Number of contact hours: 90

Scope: This course provides a basic knowledge about the role of operating system in the functioning of computers and potential of networks.

Prerequisites: Basic mathematics, fundaments of electronics.

Module I (30 hrs)

1. Operating System organization and scheduling.

Operating system organization: Basic functions, General implementation considerations, Contemporary OS Kernels, Observation OS behavior – Basic, internal & external commands of MS-DOS, Windows, UNIX and LINUX.

Scheduling: Scheduling mechanisms, strategy selection, Non-preemptive strategies, Preemptive Strategies.

References:

1. Operating systems, Gray Nutt 3rd Edition, Pearson.
2. Fundamentals of computer, V.Rajaraman, Prentice-Hall of India, New Delhi.

Module II (30hrs)

2. Memory management.

Basic ideas, Address space abstraction, fixed partition memory strategies, Variable partition memory strategies, and Dynamics address space binding – Swapping – virtual memory- shared memory, multiprocessors.

References:

1. Operating systems, Gray Nutt 3rd Edition, Pearson.

Module III (30hrs)

3. Computer Networking.

Concepts of Internet: LAN, WAN, MAN, VAN, ISDN, PSTN, Client Server Model, Peer-to-Peer, users of network, Hardware- Network Interface card (Ethernet), Hub and connectors, communication equipments- Modem, Multiplexes, Concentrators, concepts of http, ttp and other protocols, various hardware used for networking- different ports, network cards, other basic hardware concepts- HDD, FDD, FD, HD, CPU.

References:

1.Computer & Commonsense, Roger Hunt & John Shelly, PHI.

2.Microsoft MS-DOS Users Guide & Reference.

3.Windows-98 Users Guide & Reference.

4.The Internet, Complete Reference, Harley, Hahn, Tata Mc Graw-Hill.

Model III- Instrumentation Practical Syllabus

Minimum 8 experiments shall be done in each Course.

SEMESTER I

PH1B62U **INSTRUMENT MECHANISM & MECHANICAL MEASUREMENT LAB**

LIST OF EXPERIMENTS

INSTRUMENT MECHANISM &:MECHANICAL MEASUREMENTS

1.Understand about the geometrical constructions.

2.Know the construction of conic section.

3.Know orthographic - Multiview projections.

4.Appreciate the isometric and oblique projections.

5.Draw sectional views of simple objects.

6.Free hand sketch of simple assembled views of devices and instrument

7.Introduction to Gauges

8.Precision measurements using Gauges

9.Study of Dial Indicator

10.Measuring the flatness of the surface

SEMESTER II

PH2B61U **METROLOGY & ELECTRONICS LAB**

1.Study of linear measuring instruments

2.Understand the use of dial indicators

3.Know the measuring method of slip gauges

4.Practice the method of measuring angular dimensions

5.Understand the method measuring various parameters of screw threads

6. Series Resonance circuit. (Frequency Response graph, Bandwidth, Q Factor)

7. Parallel Resonance circuit. (Frequency Response graph, Bandwidth, Q Factor)

8. Transistor as switch to drive a relay & LED.

9. Astable Multivibrator using Transistors.

10. Monostable Multivibrator using Transistors.

SEMESTER III

PH3B61U **TRANSDUCER LAB**

1.OP- AMP- µA741- inverting &non-inverting amplifier.

2.OP- AMP- µA741- comparator, buffer.

3.OP- AMP- µA741- integrator.

4.OP- AMP- µA741- differentiator

5.OP-AMP-µA741-Adder

6.OP-AMP-µA741-Subtractor

7.Astable multivibrator Using IC 555

8.Strain gauge

9.Solar cell

10.LVDT

SEMESTER IV

PH4B61U **- OPTICAL LAB**

1. Numerical aperture of optical fiber
2. Wavelength determination by

   - diffraction

   - He-Ne lamp.

   -scale and grating

3. Slit width: determination of wavelength
4. LED characteristics
5. Michel son's interferometers: determination of wavelength(λ) and refractive index(μ)
6. Biprism-determination of wavelength
7. Photodiode characteristics

8. Inverse square law Verification

9. Optical constraints of convex and concave lenses

10. Divergence of laser beam

SEMESTER V

PH5B61U- **MICROPROCESSOR LAB**

1. Addition of N bytes of pure binary numbers.

2. Addition of multiple byte binary numbers.

3. BCD addition – for multi digits.

4. Sorting the block of data.

5. Multiplication of 2 nos: 8 bit X 8 bit, 16 bit X 16 bit.

6. Division of 2 nos: 8 bit / 8 bit, 16 bit / 16 bit.

7.Output a block of data to an 8 bit D/A converter interfaced to 8255 and observe the output voltage and waveform.

8. Set up an A/D interface unit and determine the input analog voltage.

9. Seven segment display using 8255.

10. Traffic control using 8255.

SEMESTER VI

PH6B61U **Computer Hardware Maintenance Workshop**

1. Parts identification and assembling a P.C. system.
2. Trouble shooting and identifying most common complaints related to a P.C.
3. Partitioning and formatting a HDD using fdisk.exe and format.com commands.
4. Partitioning and formatting a HDD using disk management utilities.
5. Study of basic DOS commands and installation.
6. Install operating systems – Windows 98 second edition.
7. Install operating systems – Windows Xp.
8. Install operating systems – Linux
9. Installation of a standard modem.
10. Installation of a standard printer.

List of Participants- Workshop on Restructuring UG Curriculum.

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56. Johnykutty J. Ozhukayil, LSG, Department of Physics, M.E.S. College, Nedumkandam.

57. Smitha Thankachan, Lecturer, Department of Physics, Mar Athanesius College, Kothamangalam.

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