FIVE YEAR INTEGRATED M.Sc. PHYSICS
(CHOICE BASED SEMESTER SYSTEM)

REGULATIONS

Common to all Departments of Studies in the Faculty of Science

Mathematics, Statistics, Physics, Chemistry, Botany, Zoology, Earth Sciences and Bio Chemistry.

ELIGIBILITY FOR ADMISSION

Candidates for admission to the first year of the Five Year Integrated M. Sc. Degree Courses shall be required to have passed the final examination of +2/Higher Secondary Course or Equivalent thereto with a minimum pass under academic stream with Physics as one of the papers in the examination conducted by the Board of Secondary Education, Tamilnadu Government or an examination of any other authority accepted by the Syndicate of this University. They shall satisfy the conditions regarding qualifying marks, age and physical fitness as may be prescribed by the Syndicate of the Annamalai University from time to time.

MASTER'S PROGRAMME

A Master's Programme consists of a number of courses, which include a set of Language papers, core, optional and ancillary papers.

Each course may consist of Lectures / Tutorials / Laboratory work / Seminar /Project work / Practical training report / Viva voce etc.

COURSE DURATION

The duration for completion of a Five Year Integrated M.Sc. Programme in any course is Ten Semesters.

An academic year is divided into two Semesters, Odd Semester and Even Semester.

The normal semester periods are:
Odd semester: July to November (90 working days)
Even semester: December to April (90 working days)

CREDITS

The term credit is used to describe the quantum of syllabus for various program in terms and hours of study. It indicates differential weightage given according to the contents and duration of the courses in the Curriculum design.

The entire programme carries credit system. The number and distribution of credits for the courses will be decided by the respective faculties.

Normally, in each of the courses, credits will be assigned on the basis of the Lectures / Tutorials / Laboratory work and other form of learning in a 18 weeks schedule.

The minimum credit requirement for the award of the degree of a Five Year Master's Programme shall be 225.

ATTENDANCE

Every teaching faculty handling a course shall be responsible for the maintenance of Attendance Register for candidates who have registered for the course.

The teacher of the course must intimate the Head of the Department at least Seven Calendar days before the last instruction day in the semester about the particulars of all students who have secured an attendance of less than 75%.

A candidate who has secured the attendance less than 75% shall not be permitted to sit for the End-Semester examination. However, it shall be open to the authorities to grant exemption to a candidate who has failed to obtain the prescribed 75% attendance for valid reasons on medical grounds upto 65%.

EXAMINATIONS

The internal assessment for each theory course carries 25% of marks and practical course carries 40% of marks which is based on two sessional tests and a variety of assessment tools such as seminar and assignment. The pattern of question paper will be decided by the respective faculties. **The tests are compulsory**. If for any valid reason, the student could not attend the test, the prerogative of arranging a special test lies with the teacher in consultation with the Head of the Department. But the student cannot repeat the internal assessment tests.

There will be an End Semester Examination for 75% of marks for 3 hours duration for each theory course and 60% of marks for practicals. The pattern of question paper will be decided by the respective faculties.

EVALUATION

The performance of a student in each course is evaluated in terms of Percentage of Marks (PM) with a provision for conversion to Grade Point(GP). The sum total performance in each semester will be rated by Grade Point Aggregate (GPA) while the continuous performance from the 2nd Semester onwards will be marked by Overall Grade Point Aggregate (OGPA).

MARKS AND GRADING

A student is deemed to have passed a particular paper provided he has secured a minimum of 50% in the end semester examination and an aggregate of 50% of marks in both sessional and end semester examination put together.

The percentage of marks obtained by a candidate in a course will be indicated in a letter grade. The term Grading system indicates a 10 point scale of evaluation of the performance of students in terms of marks, grade points, letter grade and class for each course and overall grade for the Master's Programme.

Marks	Grade Points	Letter Grade	Class
91+	10	S	Exemplary
85-89	9.0	D++	Distinction
80-84	8.5	D+	Distinction
75-79	8.0	D	Distinction
70-74	7.5	A++	First Class
65-69	7.0	A+	First Class
60-64	6.5	A	First Class
55-59	6.0	B	Second Class
50-54	5.5	C	Second Class
49 or Less		F	Fail

The successful candidates in the Core Subjects are classified as follows.

I - Class 60% marks and above in over all percentage of marks (OPM).

II - Class 50-59% marks in over all percentage of marks.

Candidates who obtained 75% and above but below 90% of marks (OPM) shall be deemed to have passed the examination in First Class (Distinction) and who obtained 90% and above (OPM) shall be deemed to have passed the examination in First Class (Exemplary) provided he / she passes all the course prescribed for the programme at the first appearance.

Only the candidates who obtained the highest OPM in all examinations at the first appearance are considered for ranking.

A student is considered to have completed a course successfully and earned the credits if he / she secures over all grades other than F. A letter grade F in any course implies a failure in that course. A course successfully completed cannot be repeated for the purpose of improving the Grade Point.

The F Grade once awarded stays in the grade card of the student and is not deleted even when he / she completed the course successfully later. The grade acquired later by the student will be indicated in the grade sheet of the Odd / Even semester in which the candidate has appeared for clearance of the arrears.

If a student secures F grade in the Project Work / Field Work / Practical Work / Dissertation, either he / she shall improve it and resubmit it if it involves only rewritting incorporating the clarification of the evaluators or he / she can re-register and carry out the same in the subsequent semesters for evaluation.

TRANSITORY REGULATIONS

Wherever there had been change of syllabi, examinations based on the existing syllabus will be conducted for three consecutive years after implementation of the new syllabus in order to enable the students to clear the arrears. Beyond that the students will have to take up their examinations in equivalent subjects, as per the new syllabus, on the recommendations of the Head of the Department concerned.

Details of Course With Credit

(2014 – 2015)

Total Credits up to three years: 135
Total Credits up to five years : 225

Course Code	Course Title	Hours	Credit	Inter. Mark	Exter. Mark	Total
FIRST SEMESTER						
ITAC 11	Part-I Tamil – Cheyyulum Urainadaiyum	3	3	25	75	100
IENC 12	Part – II English – Through Literature I : Prose	3	3	25	75	100
ICEC 13	Civics , Environmental and Health Sciences	3	3	25	75	100
IPHT 14	Properties of Matter **Tutorial**	4 **2**	4 **2**	25 -	75 -	100 -
IPHA 15	Mathematics-I **Bridge Course**	4 **2**	4 **2**	25 -	75 -	100 -
SECOND SEMESTER						
ITAC 21	Part-I Tamil – Payanpattu Tamilum Semmozhi Varalarum	3	3	25	75	100
IENC 22	Part – II English – Through Literature II : Poetry	3	3	25	75	100
ICAC 23	Computer Applications - I	3	3	25	75	100
IPHT 24	Heat and Thermodynamics **Tutorial**	4 1	4 1	25 -	75 -	100 -
IPHP 26	Practical - I	9	3	40	60	100
IPHA 25	Chemistry- I	4	4	25	75	100
IPAP 27	Ancillary Chemistry Practical - I	6	2	40	60	100
THIRD SEMESTER						
ITAC 31	Part-I Tamil– Urainadaiyum Nadahamum	3	3	25	75	100
IENC 32	Part – II English – Through Literature III : Drama	3	3	25	75	100
IPHA 33	Mathematics-II Bridge Course	4 2	4 2	25 -	75 -	100 -
IPHT 34	Mechanics and Relativity	4	4	25	75	100
IPHT 35	Oscillations, Waves and Acoustics	4	4	25	75	100
IPHP 36	Practical - II	9	3	40	60	100
FOURTH SEMESTER						
ITAC 41	Part-I Tamil– Tamil Elakkiya Varalaru	3	3	25	75	100
IENC 42	Part – II English – Through Literature IV : Short Story	3	3	25	75	100
IPHT 43	Optics	4	4	25	75	100
IPHT 44	Semi Conductor Theory and Devices	4	4	25	75	100

IPHP 45	Practical – III	9	3	40	60	100
IPHA 46	Chemistry -II	3	3	25	75	100
IPAP 47	Ancillary Chemistry Practical - II	6	2	40	60	100
FIFTH SEMESTER						
IPHT 51	Electricity and Magnetism	4	4	25	75	100
IPHT 52	Modern Physics	4	4	25	75	100
IPHT 53	Numerical methods	4	4	25	75	100
IPHT 54	Digital Electronics	4	4	25	75	100
IPHT 55	Communication Systems	4	4	25	75	100
IPHP 56	Practical –IV	9	3	40	60	100
SIXTH SEMESTER						
IPHT 61	Laser Physics	4	4	25	75	100
IPHT 62	Analog Electronics	4	4	25	75	100
IPHT 63	Solid State Physics	4	4	25	75	100
IPHT 64	Nuclear Physics	4	4	25	75	100
IPHT 65	Non-linear Optics	4	4	25	75	100
IPHP 66	Practical – V	9	3	40	60	100
SEVENTH SEMESTER						
IPHT 71	Classical and Statistical Mechanics	4	4	25	75	100
IPHT 72	Atomic and Molecular Physics	4	4	25	75	100
IPHT 73	Mathematical Physics-I	4	4	25	75	100
IPHP 74	Practical – VI	9	3	40	60	100
	Soft Skill Communicative English	4	4	25	75	100
EIGTH SEMESTER						
IPHT 81	Mathematical Physics - II	4	4	25	75	100
IPHT 82	Condensed Matter Physics	4	4	25	75	100
IPHT 83	Electromagnetic Theory and Modern Optics	4	4	25	75	100
IPHT 84	Microprocessor and Interfacing Devices	4	4	25	75	100
IPHP 85	Practical - VII	9	3	40	60	100
IPHTEO 86	Optional Course-I	4	4	25	75	100
NINTH SEMESTER						
IPHT 91	Quantum Mechanics – I	4	4	25	75	100
IPHT 92	Materials Science	4	4	25	75	100
IPHT 93	Microcontroller and its Application	4	4	25	75	100
IPHP 94	Practical - VIII	12	4	40	60	100
IPHTEO 95	Optional Course-II	4	4	25	75	100
IPHTO 96	Optional Course-III	4	4	25	75	100
TENTH SEMESTER						
IPHT 101	Quantum Mechanics – II	4	4	25	75	100
IPHT 102	Nuclear and Particle Physics	4	4	25	75	100
IPHT 103	Spectroscopy	4	4	25	75	100
IPHT 104	Physics of Nanomaterials	4	4	25	75	100
IPHP 105	Practical – IX	12	4	40	60	100
IPHTO 106	Optional Course-IV	4	4	25	75	100

OPTIONAL COURSES OFFERED BY THE DEPARTMENT

Subject Code	Theory	Credit			Internal Assessment Marks	End Semester Examination Marks	Total Marks
		L	P	C			
Optional III							
IPHTO 96.1	Instrumentation	4	0	4	25	75	100
IPHTO 96.2	Biophysics	4	0	4	25	75	100
Optional IV:							
IPHTO 106.1	Petrophysics	4	0	4	25	75	100
IPHTO 106.2	Medical Physics	4	0	4	25	75	100

OPTIONAL COURSES OFFERED TO OTHER SCIENCE DEPARTMENTS IN THE VIII, IX and X SEMESTERS

Subject Code	Theory	Credit			Internal Assessment Marks	End Semester Examination Marks	Total Marks
		L	P	C			
OIPHT 01	Physics of Earth	4	0	4	25	75	100
OIPHT 02	Bio-Medical Instrumentation	4	0	4	25	75	100
OIPHT 03	Energy Physics	4	0	4	25	75	100
OIPHT 04	Bio Physics	4	0	4	25	75	100

INTERNAL ASSESSMENT MARKS

THEORY :MARKS

Internal Assessment Test-I : 10
Internal Assessment Test-II : 10
Assignment/Seminar : 05

Total 25

PRACTICAL :MARKS

Test I : 15
Test II : 15
Record : 10

Total 40

SYLLABUS

FIRST YEAR: FIRST SEMESTER

Part – I : Language - Tamil - jkpo; jhs; - 1
ITAC- 11 – nra;ASk; ciueilAk;

myF - 1 - FWe;njhif

ghly; vz;fs;:- 3 6 16 18 24 28 32 37 40 54 57 60 69 74 77 83 85 93 97 99
(,UgJ ghly;fs; kl;Lk;)

myF - 2- GwehD}W

ghly; vz;fs;:- 9 19 27 34 38 45 51 55 66 71 76 82 86 92 96
(gjpide;J ghly;fs; kl;Lk;)

myF - 3 - jpUf;Fws;

md;Glik> nra;ed;wp mwpjy;> mlf;fKilik> Gwq;$whik> <if> mUSilik (MW mjpfhuq;fs; kl;Lk;)

ehybahH - fy;tp> mwpTilik (ehybahH)

myF - 4 - fk;guhkazk;

Ffg;glyk; (mNahj;jpah fhz;lk;)

myF - 5 - ciueil

kh. nghparhkp J}ud; - rpw;gp. ghyRg;gpukzpad;
fhg;gpaj;jpwd; - Nrhk. ,stuR

ghHit E}y;fs;

1. FWe;njhif - c. Nt. rh. gjpg;G
2. GwehD}W - c. Nt. rh. gjpg;G
3. jpUf;Fws; - ghpNkyofH ciu
4. fk;guhkazk; - mz;zhkiyg; gy;fiyf;fofg; gjpg;G
5. FWe;njhifr; nrhw;nghopTfs;
6. FWe;njhifj; jpwdha;T - Nrh. e. fe;jrhkp
7. vl;Lj;njifr; nry;tk; - ny. g. fU. ,uhkehjd; nrl;bah
8. kh. nghparhkp J}ud; - rpw;gp. ghyRg;gpukzpad;> rhfpj;a mfhnjkp> Kjw;gjpg;G- 2000
9. fhg;gpaj;jpwd; - Nrhk. ,stuR – kzpthrfH gjpg;gfk;> nrd;id.

IENC 12 - ENGLISH THROUGH LITERATURE – I : PROSE

Unit -I

Bonnie Chamberlain	"The Face of Judas Iscariot"
Swami Vivekananda	"Speech at World Parliament of Religion"

Unit -II

Stephen Leacock	"My Financial Career"
Bhimrao Ambedkar	"Speech on 4th November 1948 in the Constituent Assembly"

Unit -III

Robert Lynd	"On Forgetting"
Nirad C. Chaudhuri	"Indian Crowds"

Unit -IV

A. G. Gardiner	"All about a Dog"
Ruskin Bond	"My Eccentric Guests"

Unit -V

Martin Luther King (Jr.)	"I Have a Dream"
Khushwant Singh	"The Portrait of a Lady"

Text Book: S.Ayyappa Raja, P.Shanmugasundari, T.Deivasigamani, N.Saravana Prabhakar, B. Karthikeyan, ***English Through Literature: Prose.***

ICEC 13 - CIVICS, ENVIRONMENTAL AND HEALTH SCIENCES

(A) Civics

Unit–I : Introduction

Democracy – Citizenship – duties of Good Citizen – Society, State and Citizen – Limits of State Activity.

Indian Constitution, Preamble – Basic Features – Citizenship – Fundamental Rights – Fundamental Duties.

Unit–II : Political System

Union Government: President – Prime Minister – Parliament – Supreme Court – Electoral System – State Government: Governor – Chief Minister – Center State Relations.

Local Government : Urban Administrative System – Panchayat Raj System.

Reference Books

1) B.L. Fadia, Indian Government and Politics. Agra, Sahitya Bhawan Publication, 1999.
2) S.R. Maheswari, Local Government in India. Agra, Lakshmi Narain Agarwal, 1996.
3) R.C. Agarwal, Indian Political System. New Delhi, S. Chand & Company, 2000
4) Mccrocklin H. James, Building Citizenship. USA, Allyn and Bacon INC, 1961.

B) Environmental Sciences

Unit–I : Ecosystems :

Fundamental Concepts and Principles – Structure and Function – Classification – Modern concept of Ecosystem – Energy flow – Ecological indicators.

Unit–II : Environment

Definition – Natural Resources – Classification – Conservation – Deveopment of Public Water Supply – Need for protected water supply – Per Capital consumption –Sanitation – Sewerage system – Disposal of Sewage – Kinds of pollution – their effects of human beings.

Reference Books

1) E.P. Odum, *Fundamental Ecology.* 3rd Edition, Saunders, 1971.
2) P. Colvinvaux, *Ecology.* John Wiley & Sons, 1986.
3) Agarwal & S.V.S. Rana,. *Environment and Natural Resources*. Society of Biosciences, 1985.
4) K.N. Duggal, *A Text book on Public Health Engineering.* S. Chand & Co, Ramnagar, New Delhi, 1994.

(C) Health Sciences

Unit–I

Physical Health – Introduction to health – Food, Meaning of balanced diet, Sources, Common nutritional deficiencies and prevention.

Personal Health – Cleanliness of body, Care of Skin, Nails, Eye, Hair, Oral Health, Clothing, Body Posture and good habits such as exercises – Importance of avoiding smoking, alcoholism, drugs etc.

Population explosion and Family Planning – Importance, Common Methods of family planning for Men & Women.

Mothers and Children – Immunisation of children (importance, schedule) care of mothers during pregnancy and after delivery.

Communicable Diseases – Symptoms and prevention.

Unit–II

(i) Mental Health – Factors for maintenance of good mental health. (ii) Adolescent problems. (iii) First Aid (iv) Environment – Ventilation, Lighting, Simple methods of purification of water, Sanitary latrine, Prevention of Worm infestation (round worm, hook worm).

Reference Books

1) Murray Grant, *Hand Book of Community Health,* Philadelphia: Lea & Febiger Publications, 1987.
2) Lawrence B.Chenoweth, et al. *Community Hygiene,* New York: F.S.Croft's & Co. 1934.
3) Charles Frederic Boldman, et.al. *Public Health and Hygiene*, Philadelphia: W.B. Saunders Company, 1936.
4) Harold S.Diehl, *Text Book of Healthful Living,* New York: McGraw Hill, 1945.

IPHT 14 - PROPERTIES OF MATTER

Objective: To make the students understand the basic knowledge about, properties of matter which is applicable in day- to- day life.

Unit I : Gravity and Gravitation

Kepler's law - Newton's law of gravitation – Determination of 'G' by Boy's method - Simple pendulum, Bar pendulum - Variation of g with altitude and latitude - Gravitational potential and field due to a spherical shell - Solid sphere - Hollow sphere and thin circular plate.

Unit II : Elasticity

Poisson's ratio – Relation between elastic moduli and Poisson's ratio – Torsion pendulum – Bending of beams – Uniform and Non-uniform bending – Theory and experiment – Work done in bending – Expression for the period of oscillation of a cantilever – Determination of Young's modulus of a cantilever – Dynamic method – Theory and experiment – 'I' form of girders.

Unit III : Surface Tension

Definition and dimensions of surface tension – Excess of pressure over curved surfaces – Variation of surface tension with temperature – Jaeger's experiment – Quincke's method– Vapour pressure over a liquid surface – Determination of surface tension by ripples method–

Factors affecting surface tension.

Unit IV : Viscosity

Stream line and turbulent motion – Coefficient of viscosity and its dimensions – Rate of flow of liquid in a capillary tube – Poiseuille's formula – Correction for Poiseuille's method- Poiseuille's method for determination of coefficient of viscosity of liquid – Searle's Viscometer - Viscosity of gas - Rankine's method – Comparison of viscosities – Ostwald's viscometer.

Unit V : Diffusion and Osmosis

Diffusion - Graham's law of diffusion – Fick's law – Experimental measurement of diffusivity - Transpiration and transfusion – Osmosis – Osmotic pressure - Laws of Osmotic pressure - Van't Hoff law – Osmosis and vapour pressure of solution - Osmosis and boiling point of a solution – Osmosis and freezing point of a Solution – Determination of molecular weight using boiling point.

Text Books and References:

1. Properties of Matter, Brij Lal and Subramaniyam, Chand and Co., 2003.
2. Properties of Matter, D.S.Mathur, S.Chand and Co., 2003.
3. Properties of Matter, J.B. Rajam, S.Chand and Co., 2003.
4. Properties of Matter, R. Murugesan, S.Chand Publications, 2010.

IPHA 15 - MATHEMATICS – I

Unit – I

Series, Comparision test, Integral test, Comparision of ratios, D'Alembert's ratio test, Cauchy's root test, Alternating series, Convergence of exponential series, Uniform convergence.

Unit – II

Matrix operations, Rank of a matrix, Normal form of a matrix, Inverse of a matrix, Eigen values and Eigen vectors, Caley-Hamilton theorem, Reduction to a diagonal form.

Unit - III

Expansion of sin nθ, cos nθ, tan nθ in powers of sin θ, cos θ and tan θ, Exponential function of a complex variable, circular function of a complex variable, Hyperbolic functions, Inverse hyperbolic functions.

Unit - IV

Differentiation, Successive differentiation, Meaning of derivative.

Unit – V

Maxima and minima, Rolle's theorem and Mean value theorem, Expansions of functions, Partial differentiation.

Text Book:

1) Content and treatment as in the book "Higher Engineering Mathematics" by B.S. Grewal, Khanna Publishers, 2008.

Unit I Chapter 9 Sections 9.3 to 9.17 except 9.14
Unit II Chapter 2 Sections 2.5 to 2.9 and 2.14 to 2.17
Unit III Chapter 19 Section 19.6 to 19.11

2) Content and treatment as in the book "Calculus" Vol. I by S. Narayanan and T.K. Manicavachogam Pillay, S. Viswanathan Printers, 2009.
Unit IV Chapters 2, 3 and 4
Unit V Chapters 5, 6, 7 and 8 (Sections 1.1 to 1.7)

Reference Books:

1. G.B.Thomas, R.L.Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edn., Mass. (Indian Print) 1998.
2. M.K.Venkataraman, Engineering Mathematics-Part B. National Publishing Company, Chennai, 1992.

FIRST YEAR : SECOND SEMESTER
Part – I : Language - Tamil - jkpo; jhs; - 2
ITAC- 21 – gad;ghl;Lj;jkpOk; nrk;nkhop tuyhWk;;

Nehf;fk;;: nkhopaikg;gpid tpsf;Fjy;: nkhopg; gad;ghl;by; cUthd – cUthFk; khw;wq;fisg; Gyg;gLj;Jjy; jpir nkhopfspd; fyg;gpdhy; jkpo; nkhopapy; Vw;;gLk; khw;wq;fis tpsf;Fjy; nkhopf; FLk;gq;fs; Fwpj;Jk; nrk;nkhopj; jkpopd; rpwg;Gfs; Fwpj;Jk; nrk;nkhop Vw;Gf; Fwpj;Jk; tpsf;Fjy;.

myF - 1

vOj;Jf;fspd; vz;zpf;ifAk; tiffSk;> vOj;Jfspd; khj;jpiu> fhy ,ilepiyfs;> %tifg; Nghypfs>; ,Utifg; gjq;fs;> GzHrrpfs;.

myF - 2

nrhw;nwhlH tiffs; (%tif nkhop) njhlhpyf;fzj;jpy; fhzg;ngWk; tOTk>;
tO mikjpAk; gj;jpaikg;igAk; epWj;jw; FwpaPLfs; gad;ghLk;. Ciueil vOJk; NghJ Nkw;nfhs;s Ntz;ba tpjpKiwfs;.

myF - 3 Nkilj;jkpo;

ePq;fSk; Ngr;rhsH Mfyhk; - Fkhp mde;jd; Nkilg;Ngr;Rf;F jahH nra;jy;- Ngr;rhsUf;Fhpa jFjpfs;- NgRk; Kiwfs; - gof;f tof;fq;fs;.

myF - 4 gilg;Gj;jpwd;

rpWfij- ftpij- fl;Liu- Xuq;f ehlfk;- E}y; Fwpj;j jpwdha;T vOjg; gapw;rpjuy;.

myF - 5 gad;ghl;Lj; jkpOk; nrk;nkhop tuyhWk;

nkhop- tpsf;fk;- nkhopf;FLk;gq;fs; cyfr; nrk;nkhopfs;- ,e;jpar; nrk;nkhopfs;- nrk;nkhopj; jFjpfs;- tiuaiufs;- thOk; nrk;nkhopj; jkpo;- jkpopd; njhd;ik- jkpopd; rpwg;Gfs;- jkpo;r; nrk;nkhop E}y;fs;. jkpo; nrk;nkhop mwpe;Njw;G- ghpjpkhw;fiyQH Kjy; jw;fhy mwpQHfs; tiu (mwpQHfs;- mikg;Gfs;- epWtdq;fs;- ,af;fq;fs; njhlH Kaw;rpfs;-

mwg;Nghuhl;lq;fs;- cyfj; jkpo;r; nrk;nkhopehL. Nfhit -2010)

ghHit E}y;fs;

1. Nrhk. ,stuR. ed;D}y; fhz;bif ciu> kzpthrfH gjpg;gfk;> nrd;id.
2. m. fp. gue;jhkdhH. ey;y jkpo; vOj Ntz;Lkh? ghhp epiyak;> nrd;id.
3. Ngr;Rf;fiy- Nf. tPuuhftd;. tyk;Ghp gjpg;gfk;. jpUepd;wT+H- 602 024.
4. Fkhp mde;jd;> ePq;fSk; Ngr;rhsH Mfyhk;> G+k;GfhH gpuRuk;> nrd;id.
5. vOJtJ vg;gb? kfuk; (njh. M) godpag;gh gpujH];> nrd;id.
6. k. jpUkiy- Ngr;Rf;fiy- kPdhl;rp Gj;jf epiyak; - 2008> kJiu.
7. Rhypdp ,se;jpiuad;> jkpo; nrk;nkhop Mtzk;> kzpthrfH gjpg;gfk;> nrd;id> 2005.
8. fhy;Lnty;>"jpuhtpl nkhopfspd; xg;gpyf;fzk;"- fof ntspaPL> nrd;id.
9. r. rhujhk;ghs;- rq;fr; nrt;tpay;> kPdhl;rp Gj;jf epiyak;> kJiu (1993)
10. th.Nr.Foe;ijrhkp -cyfr; nrt;tpay; nkhopfspd; thpirapy; jkpo;> ghujpggjpg;gfk;> nrd;id.
11. [p. [hd; rhKNty;- nrk;nkhop thpirapy; jkpo;> nrd;id 2004.
12. rhypdp ,se;jpiuad;- jkpo;r;nrk;nkhop Mtzk;> kzpthrfH gjpg;gfk;> nrd;id> 2004.
13. R. mfj;jpaypq;fk; - rq;f ,yf;fpak;- nrt;tpay; ghHit nka;ag;gd; gjpg;gfk;> rpjk;guk;- 2004
14. kzit. K];jgh- nrk;nkhop cs;Sk; GwKk;> mwptpay; jkpo; mwf;fl;lis> nrd;id.

IENC 22 – ENGLISH THORUGH LITERATURE – II : POETRY

Unit - I

1. William Shakespeare "Sonnet 29"
2. William Blake "A Poison Tree"
3. Robert Bridges **"**A Red, Red Rose"

Unit - II

4. PB Shelley "Ozymandias"
5. Alfred Tennyson "The Brook"
6. HillaireBellock "Matilda"

Unit - III

7. Robert Fros "Stopping by Woods on a Snowy Evening"
8. Walt Whitman "O Captain, My Captain"
9. Sylvia Plath "Mirror"

Unit - IV

10. Toru Dutt "The Lotus"
11. A. K. Ramanujan "A River"
12. Keki N. Daruwala "Pestilence in Nineteenth Century Calcutta"

Unit - V

13. Gabriel Okara "Once Upon a Time"
14. Maki Kureshi "The Kittens"
15. Robert Finch "Peacock and Nightingale"

Text Book: S. Karthik Kumar, V.Gnanaprakasam, G.Arputhavel Raja, C.Shanmugasundaram, R.Vijaya, *English Through Literature: Poetry.*

ICAC 23 - COMPUTER APPLICATIONS - I

Unit – I

Introduction to computers, Applications of computers, Concepts of data and information, A typical computer system, Memory concepts, History of computers, Types of computers.

Input, output divices, data storage divices, software, the difinition, the role of software, house keeping.

Unit – II

The computer internals, typical PC configuration, booting, virus, antivirus, vaccine, versions of software.

Opertating system, definition, classification, basics of MSDOS, introduction to windows operating system, features of windows OS, desktop and desktop icons, starting programs, brawsing and managing windows explorer, setting, Taskbars and creating shortcuts.

Unit – III

Introduction to internet, client sever basics,E-mail, Telnet and Archie, FTR – Gopher, Jughead and Veronica, WAIS and world wide web, fundamentals of HTML, TCP / IP and E – Commerce.

Unit – IV

Issues involved in web site management, addressing, designing web sites with front page.

Unit – V

Multimedia, concept, requirements, applications and future, hardware and software requirements for Multimedia development and delivery platforms, multimedia methodologiesm fundamental and use of hepertext, hypermedia, sound, images, animation, video.

Using multimedia, multimedia inteface, planning and development of multimedia projects.

Text Books & References

1. Ron Mansfield, Obsorne, Windows 95 for Busy People, McGraw Hill, 1997.
2. Ron White, How computers work, BPB, 2016.
3. Christian Crumlish – The ABCs of the Intenet.
4. Alexies Leon and Mathews Leon "Internet in a nutshell" Leon Press, Chennai and Vikas Publishing House, New Delhi.
5. Tay Vaughan, Multimedia Making it work, Osborne, Tata McGraw Hill, 1996.
6. Computer fundamentals and Windows with Internet Technology by Krishnan, Scitech Publications Pvt Ltd, Chennai, India.
7. Windows and MS-Office 2000 with database concepts, by Krishnan, Scitech Publications Pvt Ltd, Chennai, India.

IPHT 24 - HEAT AND THERMODYNAMICS

Objective: This paper aims to gain depth of knowledge regarding the properties of thermodynamics and also it deals with the methods and applications of heat radiation.

Unit I : Thermometry and Calorimetry

Thermometry- Types of thermometers, liquid and gas thermometers - Platinum resistance thermometer - Seebeck effect – Thermo electric thermometer - Low temperature measurement - Liquefaction of helium and adiabatic demagnetization – Calorimetry - Specific heat - Methods of mixtures – Copper block calorimeter - Newton's law of cooling - Joules electrical method - Two specific heats of a gas - Joly's differential steam calorimeter and Regnault's method - Bunsen's ice calorimeter.

Unit II : Thermal Expansion

Expansion of solids – Coefficient of linear, superficial and cubical expansion - measurement – Comparator method - Hennig's method - Expansion of crystals - Expansion of liquids- Volume thermometer method- Weight thermometer method - Real expansion of liquids – Thermostat - Expansion of Gases - Determination of volume coefficient of gas - Pressure coefficient expansion - Experimental methods.

Unit III : Thermal Conductivity

Conduction, Convection and Radiation - Conductivity of solids - Coefficient of thermal conductivity – Searle's method - Forbe's method - Flow of heat: cylindrical and spherical shell method - Thermal conductivity of Rubber and glass - Conductivity of liquids - Lee's disc method - Column method – Film method - Conductivity of gases.

Unit IV : Radiation

Radiation – Thermopile - Properties of thermal radiations – Applications of heat radiations – Black body – Kirchhoff's laws of heat radiation – Stefan's law – Determination of Stefan's constant - Experimental verification of Stefan's law – Optical pyrometer – Total radiation pyrometer – Energy in the spectrum of a black body – Solar constant - Temperature of Sun- Angstrom's pyroheliometer.

Unit V : Thermodynamics

Heat engines - First and second laws of thermodynamics - Concept of entropy – reversible and irreversible processes - Carnot engine - Proof – Carnot's theorem – Rankine's Cycle- Steam engines - Otto cycle - Petrol and diesel engines - Refrigeration principle and function of air conditioner.

Text Books and References:

1. Heat and Thermodynamics, Brij Lal and Subramaniyam, S.Chand and Co., 2008.
2. Heat and Thermodynamics, D.S. Mathur, S. Chand and Co., 2002.
3. A Text book of Heat, Saha and Srivasatava, Science Book Agency, 1967.
4. Thermal and Statistical Physics, Brij Lal and Subramaniyam, S.Chand and Co, 2009.

IPHP 26 - PRACTICAL –I

(Any **Ten** experiments out of **Sixteen**)

1. Surface Tension – Capillary rise method.
2. Young's modulus – Non uniform bending (pin and microscope).
3. Young's modulus –uniform bending (pin and microscope).
4. Young's modulus – Koenig's method.

5. Potentiometer – Low range voltmeter.
6. Potentiometer – Internal resistance of a cell.
7. Compound pendulum- Determination of g and k.
8. Coefficient of viscosities- Hare's apparatus.
9. Lee's disc-Thermal conductivity of a bad conductor.
10. Thermal conductivity -Forbe's method.
11. Specific heat capacity of liquid by method of mixtures.
12. Specific heat capacity of liquid by method of cooling.
13. Quinck's drop – Surface tension of Mercury.
14. Drop weight method - Surface tension of a liquid.
15. Rigidity Modulus – Static torsion.
16. q, n, σ – Searle's method.

IPHA 25 - CHEMISTRY - I

Unit–I : Basic Organic Chemistry

Classification of organic compounds - Hybridization in methane, ethane, acetylene, benzene - Classification of reagents - electrophiles, nucleophiles and free radicals - Classification of reactions - addition, substitution (nucleophilic & electrophilic) , elimination, condensation and polymerisation - Polar Effects-Inductive effect, resonance, hyper-conjugation, steric effect.

Unit–II : Chemistry of Some Useful Organic Compounds

Structure and uses of the following:

Paracetamol, Penicillin, Morphine, Camphor, Thiopental Sodium, BHC, DDT, CF_2Cl_2. Synthesis, properties and uses of, PTFE, PVC, Bakelite, Nylon 6, 6

Unit–III : Acid-Base Equilibria

Bronsted definition, Lewis definition, K_a K_b, pK_a and pK_b for Bronsted acids and bases. Relative strengths of Bronsted acids and bases. pH Buffer solution. Henderson's equation. Theory of acid-base indicators.

Unit–IV : Coordination Chemistry

Definition of terms-classification of ligands-chelation- Nomenclature of coordination compounds. Effective Atomic Number and its application to $Ni(CO)_4$, $[Ni(CN)_4]^{2-}$, $[Co(CN)]_6^{3-}$ Role of metal ions in biological systems such as Hemoglobin, Vitamin B12.

Unit–V : Chemical Kinetics and Photochemistry

Rate of chemical reaction, Differential rate expression, order and molecularity, Integrated rate expressions for first, second, and zero order reactions, Half-life period. Effect of temperature on reaction rate - Activation energy. Arrhenius equation, Catalysis - Homogeneous and heterogeneous catalysis.

Introduction to photochemistry - Grothus - Draper Law, Stark-Einstein's Law. Quantum Yield. Fluorescence, Phosphorescence, Photsensitisation.

Text Books and References

1) Veeraiyan V., Text book of Ancillary Chemistry, Highmount Publishing house, 2006.
2) Huheey, Inorganic Chemistry, Addison Wesley, 2005.
3) Soni P.L. and Others, Textbook of Organic chemistry, Sultan Chand and Company, 2006.
4) Soni P.L. and Others, Text book of Inorganic Chemistry, Sultan Chand and Company, 2006.
5) Puri B.R., Sharma and Pathania, Text book of Physical Chemistry, Vishal Publishing Co., 2006.
6) Dara S.S., Text book of Environmental chemistry and Pollution Control.- S.Chand and Co., 2006.
7) Vaithyanathan S. and Others, Textbook of Ancillary Chemistry, Priya Publications, 2006.

IPAP 27 - ANCILLARY CHEMISTRY PRACTICAL – I

Titrimetric Analysis

1) Estimation of sodium hydroxide with standard sodium carbonate using HCl as a link solution
2) Standardization of given sodium hydroxide solution using potassium hydrogenphthalate.
3) Estimation of commercial caustic soda for carbonate and hydroxide content.
4) Titration involving $KMnO_4$ and standard sodium oxalate.
5) Estimation of Mg^{2+} using EDTA and EBT as indicator.
6) Estimation of Zn^{2+} using EDTA and EBT as indicator.

SECOND YEAR: THIRD SEMESTER

Part – I : Language - Tamil - jkpo; jhs; - 3

ITAC- 31 - ciueilAk; ehlfKk;

Nehf;fk;: ,yf;fpaq;fspd; rpwg;GfisAk; fUj;JfisAk; ciueil topahfg; Gyg;gLj;jy; - ciueil jpwid vLj;Jiuj;jy;

myF– 1

,yf;fpa tpsf;fk; - MrphpaH (t. R. g. khzpf;fk;)

,yf;fpa tpsf;fk; - ,yf;fzf; Fws;fs; - thpirg;ghl;L – tho;thq;F– J}a ,yf;fpak; - eilKiw mwq;fs; - ,yf;fpaf;fiy

myF– 2

Fwszpfs; - ,yf;fpa nts;sk; - jd;neQ;rk; - ,yf;fpaj;jsk; - Fws; tpsf;fk; - ek;gpf;if E}y; -

ePjp tpsf;fk;

myF– 3

kh. g. nghparhkpj;J}ud; - (MrphpaH - rpw;gp. ghyRg;gpukzpad;)
tho;Tk; gzpAk; - md;gpy; jpisj;j ftpij – rpWfijg; gilg;Gfs;
ehlfq;fSk; fPHj;jidfSk; - fl;Liur; nry;tk;

myF– 4

rpWtH ,f;fpak; mwptpay; E}y;fSk; gpwTk; - fiyf;fsQ;rpag; gzp – ghujp jkpo; - J}ud; vd;nwhU kdpjH.

myF– 5

ehlfk; - Njhif tz;zk; (MrphpaH – lhf;lH r. rtfHyhy;)

ghHit E}y;fs;

1. t. R. g. khzpf;fk; - ,yf;fpa tpsf;fk; kzpthrfH gjpg;gfk;> Kjw;gjpg;G– 1971
2. rpw;gp. ghyRg;gpukzpad; & kh. g. nghparhkpj;J}ud; - rhfpj;a mfhnjkp> Kjw;gjpg;G 2000
3. lhf;lH r. rtfHyhy; - Njhif tz;zk;> godpak;khs; ntspaPL> nrd;id> Kjw;gjpg;G 2008 Iq;fud; mLf;ffk>; சையத்காதத் mntd;A+ - tpUfk;ghf;fk;> nrd;id– 92.

IENC 32 - ENGLISH THROUGH LITERATURE – III : DRAMA

Unit -I

Stanley Houghton	"The Dear Departed"
Kenneth Sawyer Goodman	"The Game of Chess"

Unit -II

A. A. Milne	"The Princess and the Woodcutter"
Anton Chekhov	"A Marriage Proposal"

Unit -III

Arnold Bennett	"The Stepmother"
Arthur Miller	"Grandpa and the Statue"

Unit -IV

William Shakespeare	King Lear (Act I, Scene i)
William Shakespeare	Julius Caesar (Act III, Scene ii)

Unit -V

Frances Goodrich & Albert Hackett	The Diary of Anne Frank (Act I)
Betty Keller	"Tea Party"

Text Book: S.Florence, G.Aruna Devi, R.Rajamohan, S. Bhuvaneswari, M. Soundararajan, ***English Through Literature: Drama.***

IPHA 33 - MATHEMATICS – II

Unit - I Integration

Introduction, Definite integral, Methods of integration, Integrals of the form

(i) $\int \frac{f'(x)}{f(x)} dx$ ii) $\int F\{f(x)\}f'(x)dx$, (iii) $\int \frac{dx}{ax^2+bx+c} dx$

(iv) $\int \frac{lx+m}{ax^2+bx+c}dx$ (v) $\int \frac{1}{\sqrt{ax^2+bx+c}}$ (vi) $\int \frac{px+q}{\sqrt{ax^2+bx+c}}dx$

Unit - II Integration

Properties of definite integrals, Integration by parts, Reduction formula for the following types

(i) $I_n = \int x^n e^{ax}$ S n→+ve integer (ii) $I_n = \int \cos^n x\,dx$ n, positive integer

(iii) $I_n = \int \sin^n x\,dx$ (iv) $I_{m,n} = \int \sin^m x \cos^n x dx$ Bernoulli's formula.

Unit - III

Area under plane curves, Area of a closed curves, Area between two intersecting curves, Areas in polar coordinates, Volume of the solid of revolution, Length of a curve, Area of surface of revolution.

Unit – IV

Vector differentiation, Scalar functions, Vector functions, Differentiation of a vector, Differentiations formulas, Differentiation of dot and cross products, The Vector differential operator Del, Gradient of a scalar function, Directional derivatives, Divergence of a vector, Curl of a vector, Expansion formulae, Second order differential operators, Solenoidal and irrotational fields.

Unit – V

Vector integration, The line integral, Green's theorem in two dimensions-verification, Gauss divergence theorem (without proof)-verification and evaluation of integrals, Stoke's theorem (without proof)-verification and evaluation of integrals.

Text Book:

1) Content and treatment as in the book "Calculus (Major)" Vol. II by S. Narayanan and T.K. Manicavachogam Pillay, S. Viswanathan Printers, 2003.

Unit I	Chapter 1 Sections 1 to 8
Unit II	Chapter 1 Sections 11 to 15.1
Unit III	Chapter 2 Sections 1.1 to 1.4, Sections 3 to 5

2) Content and treatment as in the book "Vector Calculus and Fourier Series" by M.K. Venkataraman and Manorama Sridhar, by The National Publishing Company, 2002.

Unit IV	Chapter 2 Sections 2.2 to 2.4, 2.6, 2.7.
	Chapter 3 Sections 3.2, 3.3, 3.4, 3.7, 3.9, 3.11, 3.12, 3.15.
Unit V	Chapter 4 Sections 4.1, 4.3, 4.9 and 4.12

Reference Books:

1) G.B.Thomas, R.L.Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edn, Mass, (Indian Print, 1998.
2) M.K.Venkataraman, Engineering Mathematics-Part B. National Publishing Company, Chennai, 1992.
3) P. R.Vittal, Vector Calculus, Fourier series and Fourier Transform, Margham Publications, Chennai, 2004.
4) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2008.

IPHT 34 - MECHANICS AND RELATIVITY

Objective:

To train the students in aspects related to projectile, impulse, impact, concepts of hydrodynamics, dynamics of charged bodies and relativity.

Unit I : Projectile, Impulse, and Impact

Projectile – Range of a projectile in horizontal and inclined plane – Impulse – Impact – Impulsive force – Laws of impact – Impact of a smooth sphere on a smooth horizontal plane – Direct and oblique impacts –Loss in kinetic energy – Motion of two interacting bodies – Reduced mass.

Unit II: Dynamics of Rigid Bodies

Rigid body - Moment of inertia - Radius of gyration - Moment of inertia - Solid cylinder - cylindrical shell - Solid sphere - Spherical shell - Hollow sphere - Compound pendulum - Theory - Equivalent simple pendulum - Reversibility of centers of suspension and oscillation - Determination of g and k - Kater's pendulum.

Unit III : Statics, Centre of Gravity and Hydrodynamics

Centre of gravity of a solid and hollow cone – Solid and hollow hemisphere – Thrust – Centre of pressure – Vertical rectangular lamina.

Streamline and Turbulent flow - Equation of continuity of flow – Energy of a liquid in flow- Bernouli's theorem – Velocity of efflux of a liquid - Torricelli's theorem – Venturimeter.

Unit IV : Basic Concepts of Classical Mechanics

Mechanics of single and system of particles - Conservation law of linear momentum, angular momentum and mechanical energy for a particle and a system of particles - Centre of mass and equation of motion – Constraints - Classification - Degrees of freedom and Generalized coordinates – Principle of virtual work.

Unit V : Relativity

Inertial and non-inertial frames of reference - Newtonian relativity - Galilean transformation equations - Michelson Morley experiment - Ether hypothesis- Postulates of special theory of relativity - Derivation of Lorentz transformation equations - Length contraction - Time dilation - Concept of simultaneity - Addition of velocities - Variation of mass with velocity - Mass energy equivalence.

Text Books and References:

1. Mechanics, H.S. Hans and S.P. Puri, Tata Mc Graw Hill, 2003.
2. Mechanics, D.S. Mathur, S.Chand, 2006.

3. Classical Mechanics, Gupta, Kumar and Sharma, Pragathi Prakashan, 2010.
4. Modern Physics by R. Murugeshan, Kiruthiga Sivaprasath, S. Chand, 2008.

IPHT 35 - OSCILLATIONS, WAVES AND ACOUSTICS

Objective : This paper makes the students to understand the various kinetics involved in oscillations, waves and various acoustical parameters.

Unit I : Oscillations and Vibrating systems

Free, damped and forced vibrations – Expressions and derivations – Principle of resonance - Determination of frequency - Expression for the velocity of longitudinal waves in a gaseous medium - Newton-Laplace's formula - Effect of temperature, pressure and humidity on the velocity of sound in air - Expressions for velocity of transverse wave in a stretched string - Laws of transverse vibrations of string - Theory of tuning fork.

Unit II : Wave propagation

Equation of simple harmonic waves - Differential equation of wave motion – Particle velocity – Wave velocity – Group velocity - Progressive waves – Plane waves – Surface waves – Wave front – Characteristics of progressive and stationary waves – Beats phenomenon – Expression for beats – Reflection – Refraction – Interference and diffraction of sound waves.

Unit III : Acoustics

Doppler Effect – Acoustics of buildings – Characteristics of musical note – Intensity measurement – Pitch – Quality – Decibel – Sabine's empirical formula - Reverberation time – Theoretical treatment – Measurement of absorption coefficient – Factors for good acoustics of hall and auditorium.

Unit IV : Ultrasonics

Ultrasonics – Production of ultrasonic waves - Piezo electric method – Detection of ultrasonic waves – Measurement of velocity of ultrasonic waves – Acoustic grating – applications of ultrasonic waves.

Unit V : Fourier analysis

Fourier theorem – Fourier coefficient – Definition - Evaluation of Fourier coefficients – Analysis of (i) Square wave (ii) Saw tooth wave (iii) Half and Full wave rectifiers output.

Text Books and References:

1. A Text book of Sound, Brijlal and Subramanyam, Vikas publishing House Pvt. Ltd., 1994.
2. Oscillations, waves and Acoustics by M.Ghosh, D.Bhattacharya, S.Chand and company Ltd., 2006.
3. Waves and Oscillations, Vol.III, Berkley, Mc Graw-Hill Publishers, 1968.
4. Waves and Oscillations, Sathya Prakash, Pragati Prakashan, 2010.

5. The Physics of vibrations and waves, H.J.Pain, McMillan, 1975.

IPHP 36 -PRACTICAL –II

(Any **Twelve** experiments out of **Sixteen**)

1. Viscosity – Stokes method.
2. Sonometer – Verification of laws.
3. Spectrometer – Refractive index of a solid prism.
4. Spectrometer – Dispersive power of a prism.
5. Spectrometer – Hollow prism.
6. Spectrometer – Refractive index of a Prism (Minimum deviation).
7. Spectrometer – Hollow Prism – Refractive index of a liquid.
8. Spectrometer – Grating – Normal incidence – λ determination.
9. Air wedge - Diameter of a thin wire.
10. Newton's rings.
11. Coefficient of viscosities- Ostwald's apparatus.
12. Rigidity modulus by torsional pendulum (with symmetric masses).
13. Potentiometer – Comparison of e.m.f of the cells.
14. Young's modulus – cantilever optical method.
15. Latent heat of Ice (Half time cooling correction)
16. Latent heat of Steam (Half time cooling correction)

SECOND YEAR: FOURTH SEMESTER

Part – I : Language - Tamil - jkpo; jhs; - 4

ITAC- 41 - jkpo; ,yf;fpa tuyhW

Nehf;fk; : jkpo; ,yf;fpa tsHr;rp tuyhw;wpid tpthpj;J jkpo; ,yf;fpaq;fs; Fwpj;J mwpKfk; nra;jy;

myF– 1 : rq;f fhyk;> rq;f kUtpa fhyk;

njhy;fhg;gpak; - rq;f fhyk; - Kw;rq;fq;fs; - ghl;Lk; njhifAk; - njhFg;G Kiw–rpwg;Gfs;- rq;fg; GytHfs;- njhy;fhg;gpak;- gjpndz;fPo;f;fzf;F E}y;fs;> Kw;fhg;gpaq;fs;.

myF–2 : gy;yth;> NrhoH fhyk;

irt ,yf;fpaq;fs;- gd;dpU jpUKiwfs;- itzt ,yf;fpaq;fs;- ehyhapu jpt;tpagpuge;jk; -IQ;rpW fhg;gpaq;fs; - fk;guhkhazk; - nghpaGuhzk; - gpw ,yf;fpaq;fs;

myF–3 : ehaf;fH fhyk;

rpw;wpyf;fpaq;fs; - me;jhjp J}J – khiy – Nfhit – guzp – fyk;gfk; - cyh –gps;isj;jkpo; -

Nfhil – gs;S – FwtQ;rp – mUzfphpehjH – FkuFUguH –fhsNkfg;GytH – rptg;gpufhrH – jdpg;ghly;fs;.

myF–4 : lNuhg;gpaH fhyk;

ciueil tsHr;rp – jhAkhdtH ghly;fs; - kPdhl;rp Re;juk; gps;is - ,uhkypq;f mbfs; - Ntjehafk; gps;is – fpwpj;jtHfspd; jkpo;g;gzp - ,];yhkpaHfspd; jkpo;j; njhz;L – ehlfj; jkpo; - kNdhd;kzpak; Re;juk; gps;is – gk;ky; rk;ge;j KjypahH –R+hpaehuhaz rh];jphpahH – gpwH.

myF–5

kuGf;ftpij – ghujpahH– ghujpjhrd;- ftpkzp– ehkf;fy; ftpQH thzpjhrd;> Kbaurd; - fz;zjhrd;. Ciueil– ghpjpkhw;fiyQH– c. Nt. rh.– kiwkiy mbfs;- v];.itahGhpg;gps;is– uh. Gp. NrJgps;is– jpU. tp. f.– K. t– t. Rg. khzpf;fk;- rpWfij– Gjikg; gpj;jd;- F. g. uh – yh. rh. uh. – F. mofphprhkp– jp. [h –Re;juuhkrhkp – tpe;jd; - K. t– ehty; - khA+uk; Ntjehafk;gps;is – khjitah – fy;fp– mfpyd;- jp. [dfpuhkd;- eh. ghHj;jrujp> ty;ypf;fz;zd> gRitah> rp. kzp> Qhdf;$j;jd;> thdk;ghb ,af;fk;- eh. fhkuhrd;> rpw;gp> Nkj;jh> kPuh– mwptpay; jkpo; - ,izaj;jkpo;

ghHit E}y;fs;

1. K. tujuhrd;- jkpo; ,yf;fpa tuyhW> rhfpj;a mfhnjkp ntspaPL 1998
2. G+tz;zd; - jkpo; ,yf;fpa tuyhW> fof ntspaPL nrd;id.
3. jkpoz;zy; - Gjpa Nehf;fpy; jkpo; ,yf;fpa tuyhW> kPdhl;rp Gj;jfhhepiyak;> 1998.
4. rp. ghyRg;gpukzpad; - jkpo; ,yf;fpa tuyhW> ghhp epiyak;> nrd;id. 1987
5. vk;. MH. Milf;fyrhkp- jkpo; ,yf;fpa tuyhW> fof ntspaPL nrd;id 1994
6. kJ. r. tpkyhde;jk; - jkpo; ,yf;fpa tuyhw;Wf; fsQ;rpak;> 1987.

IENC 42 – ENGLISH THROUGH LITERATURE – IV : SHORT STORY

Unit - I

1. O' Henry "After Twenty Years"
2. Ernest Hemingway "A Day's Wait"

Unit - II

1. Flora Annie Steel "Valiant Vicky"
2. Oscar Wilde "The Selfish Giant"

Unit - III

1. R. K. Narayan "An Astrologer's Day"
2. ShashiDeshpande "I Want"

Unit - IV

1. Leo Tolstoy "Where Love is God is"
2. Somerset Maugham "The Ant and the Grasshopper"

Unit - V

1. Chinua Achebe "Marriage is a Private Affair"
2. Bessie Head "Heaven is not Closed"

Text Book: A.Selvaraj, P.Dinakaran, M. Madhavan, K. Ganeshram, SP.Shanthi, *English Through Literature: Short Story.*

IPHT 43 - OPTICS

Objective: To understand the concepts of dispersion, intensity, diffraction and polarization of light waves and their applications.

Unit I : Geometrical Optics

Convex lens – Principal focus and focal plane – Power of a lens – Cardinal points of optical system – Focal points, principal points, nodal points and Corresponding planes – Newton's formula for graphical construction – Aberrations – Spherical aberrations in lenses – Reducing spherical aberration – Chromatic aberration in lenses – Condition for achromatism – Astigmatism.

Unit II : Eye-Piece and Dispersive Power

Huygene's eye-piece, Ramsden's eye-piece – Comparison and their cardinal points – Velocity of light – Determination of velocity of light – Kerr cell method.

Cauchy's dispersion formula – Dispersive power – Dispersion without deviation – Direct vision spectroscopy - Rainbow – Primary rainbow – Secondary rainbow – Haloes.

Unit III : Interference

Introduction – Interference in thin film due to reflected and transmitted light – Colour of thin films – Wedge shaped thin film – Test for optical flatness – Newton's rings by reflected light – Determination of wavelength - Haidinger fringes - Michelson's interferometer – types of fringes – Difference in wavelength.

Unit IV : Diffraction

Introduction – Fresnel's assumptions – Rectilinear propagation of light – Zone plates – Difference between zone plate and a convex lens – Fresnel's diffraction at a circular aperture. Fraunhofer diffraction – Double slit – Plane transmission grating – Determination of wavelength (normal incidence).

Unit V : Polarization

Introduction – Brewster's law – Brewster window – Malus's law – Phenomenon of double refraction – Nicol prism – Huygen's explanation of double refraction in uniaxial crystals. Quarter and half wave plates – Production and detection of plane, circularly and elliptically polarized light.

Optical activity – Fresnel's explanation of rotation – Specific rotation – Determination of specific rotator power by Laurent's half-shade polarimeter.

Text Books and References:

1. A text book of Optics, N. Subramaniyam and Brij lal, Revised by M.N. Avadhanulu, S. Chand and Co., 2004.
2. Optics and Spectroscopy R. Murugesan and Kiruthiga Sivaprasath, S.Chand and Co., 2006.
3. Geometrical and Physical Optics, P.K. Chakrabarti, New Central Book Agency (P) Ltd., 2005.
4. Optics, D.R. Khanna and H.R. Gulati, S.Chand and Co., 1979.
5. Engineering Physics, G. Vijayakumari, Vikas Publications, 2007.
6. Optics, Eugene Hecht, 4th Edition, Pearson Education, 2007.
7. Fundamentals of Optics, Jerkins A. Francis and White E. Harvey, McGraw Hill Inc., 1976.
8. Optical Physics, S.G. Lipson, H. Lipson and D.S. Tannhauser, Cambridge University Press, 1995.
9. Fundamentals of Optics, M.G. Raj, Anmol Publications, Pvt. Ltd., 1996.

IPHT 44 - SEMI CONDUCTOR THEORY AND DEVICES

Objective: This paper provides the basic ideas of semiconductor and properties of semiconductor devices.

Unit I : Semi Conductor Theory

Band formation in simple conductors – Insulators and Semiconductors – Intrinsic and Extrinsic semiconductors - Band model – N-type and P-type semiconductors – Fermi Dirac distribution applied to semiconductors - Fermi level as a function of temperature - Carrier densities in terms of Fermi level shift.

Unit II : Junction Diode

Construction of PN Junction – V-I characteristics of PN Junction diode – Diode resistance – Zener diode - Characteristics and its applications – Voltage regulator - Voltage rectification - Half, Full wave and Bridge rectifier.

Unit III : Bipolar Junction Transistor (BJT)

PNP and NPN structures - Active and saturation regions - Characteristic of BJT – CE, CB and CC configurations - Input and output characteristics, Two-port network analysis of transistor – Transistor biasing – Essentials of transistor biasing circuit – Methods of transistor biasing – Base resistor method – Voltage divider bias method.

Unit IV : Field Effect Transistor (FET)

Classification and fabrication of FET – JFET – Drain characteristics of JFET - Biasing of JFET - Depletion MOSFET - Enhancement MOSFET - Construction, working and characteristics of UJT.

UNIT V : Optoelectronic Devices

Photodiode – Photo transistors – LED, LCD and LDR – Opto couplers. Special semiconducting devices**:** Tunnel diode, Gunn diode, SCR and their applications.

Text Books and References:

1. Physics of Semiconductor Devices, S.M.Sze, Wiley Interscience, 1969.
2. Electronic Devices - Applications and Integrated Circuits, Satnam P.Mathur, John Wiley and Sons, 1986.
3. Integrated Electronics, Millman and Halkias, Tata McGraw Hill Publications, 1972.
4. Integrated Circuits, Bhotkar, Khanna Publishers, 2010.

IPHP 45 - PRACTICAL – III

(Any **Twelve** experiments out of **Sixteen**)

1. Spectrometer – Cauchy's constant.
2. B.G. – Figure of merit.
3. Field along the axis of a circular coil - Determination of H (Using Vibration Magnetometer).
4. Carey Foster bridge – Temperature co-efficient of resistance of a coil.
5. Potentiometer – Calibration of an Ammeter.
6. Internal resistance of a cell –using B.G.
7. Thermo e.m.f using B.G.
8. Series and parallel resonance circuits.
9. B.G. – comparison of mutual inductance.
10. B.G. – Absolute capacity of a condenser.
11. Potentiometer – High range voltmeter.
12. Anderson's bridge.
13. Resistance by Post Office box.
14. Resistance by Meter Bridge.
15. Dead beat (aperiodic) Galvanometer – figure of merit.
16. Field along the axis of a circular coil – deflection magnetometer.

IPHA 46 - CHEMISTRY - II

Unit–I : Chemistry of Natural Products

Terpenoids: Structure and uses – Camphor, vetivones.

Alkaloids – Structure and uses, papavarine, cocaine

Structures and important biological properties

Unit–II : Electrochemistry

Galvanic cells – emf - standard electrode potential - reference electrodes -electrochemical series and its applications-glass electrode and pH determination - Electroplating process -Nickel and Chrome plating - Different types of cells - primary cell, secondary cell. Fuel cells. Corrosion and methods of prevention.

Unit–III : Industrial Chemistry

Production and uses of gaseous fuels like water gas, producer gas, liquefied petroleum gas, gobar gas and compressed natural gas - Fertilizers-manufacture and uses of urea, ammonium

sulphate, superphosphate, Hardness of water: temporary and permanent hardness, disadvantages of hard water - Softening of hard water - Zeolite process, Purification of water for domestic use: use of chlorine, Ozone and UV light - Definition and determinations of BOD and COD.

Unit–IV : Analytical Chemistry-I

Introduction to Quantitative Analysis and separation techniques - Principle of volumetric and gravimetric analysis-Estimation of hardness by EDTA method. Estimation of Ni, Ba and Cu by gravimetric methods. Electrogravimetry – theory of electrogravimetric analysis – determination of copper (by constant current procedure) - Separation techniques - extraction - distillation – crystallization.

Unit–V : Analytical Chemistry-II

Colorimetric methods, Beer's law and its validity, estimation of fluoride ion by photocolorimeter, flame photometry and atomic absorption spectroscopy- NMR spectroscopy: Nuclear spin and conditions for a molecule to give rise to NMR spectrum – theory of NMR spectra, number of NMR signals, equivalent and non-equivalent protons, position of NMR signals, shielding, de-shielding, chemical shift – δ and τ scales, peak area and number of protons – splitting of NMR signals – spin-spin coupling.

Books for Reference

1) Veeraiyan. V, Text book of Ancillary Chemistry, Highmount Publishing house, 2006.
2) Vaithyanathan. S, Textbook of Ancillary Chemistry, Priya Publications, 2006.
3) Soni. P. L, Text book of Organic chemistry, Sultan Chand and Company, 2006.
4) Puri, Sharma and Pathania, Text book of Physical Chemistry, Vishal Publishing Co., 2006.
5) Dara. S.S, Text book of Environmental chemistry and Pollution Control- S.Chand and Co., 2006.
6) Day. R.A and Underwood. A.L, Quantitative Analysis, Prentice Hall, 1999.
7) Kemp.W, Organic spectroscopy, 1989.
8) Silverstein R.M and F.X.Webster, Spectrometric identification of organic compounds, John Wiley, 1998.
9) Jag Mohan, Organic spectroscopy (Principles & Applications), Narosa Publishing house, 2000.

IPAP 47 - ANCILLARY CHEMISTRY PRACTICAL - II

Organic Analysis

Detection of Elements (N,S, Halogens)

To distinguish between aliphatic and aromatic Saturated and unsaturated compounds. Functional group tests for phenol, acids (mono, di) aromatic primary amine, amide, aldehyde & Carbohydrate Glucose. Systematic analysis of organic compounds containing one functional group and characterization by confirmatory test.(Phenol/cresol, cinnamic acid, benzoic acid, phthalic acid, Succinic acid, benzamide, ureaS, glucose, benzaldehyde & aniline).

Reference

Basic Principles of practical Chemistry: Venkateswaran,Veerasamy & Kulandaivel, S.Chand & Co., 2007.

THIRD YEAR: FIFTH SEMESTER

IPHT 51 - ELECTRICITY AND MAGNETISM

Objective: To make the students understand the basic concepts of electric and magnetic effects and their behaviour in a variety of materials.

Unit I : Electrostatics

Electric intensity - Intensity due to a point charge - Electric potential - Relation between potential and intensity.

Unit of Capacity - Capacity of a spherical, parallel plate and cylindrical capacitors - Energy of a charged capacitor.

Unit II : Thermoelectricity

Definition of ampere and the value of permeability of free space - emf and internal resistance of a cell - Calibration of ammeter and voltmeter (high and low range).

Thermoelectricity - Measurement of thermo emf using potentiometer - Peltier and Thomson coefficients - Applications of thermodynamics to thermocouple - Determination of the coefficients - Thermoelectric diagrams.

Unit III : Magnetic Properties of Materials

Electron theory of matter - Magnetic properties due to circulating electronic currents in atoms - Explanation of dia and para magnetism on the basis of electron theory - Domain theory of ferromagnetism - Curie temperature.

M-H curve by magnetometer method - B-H curve by Ballistic method - Energy loss due to hysteresis - Determination of susceptibility: Curie balance method - Guoy's method.

Unit IV : Electromagnetic Induction

Force on a current carrying conductor (straight) in a magnetic field - Moving coil ballistic galvanometer - Theory and uses.

Expression for induced emf - Self and mutual induction - Coefficient of coupling - Determination of self and mutual inductance - A.C, bridges - Anderson's and Owen's bridges.

Unit V : Transient Currents

Growth and decay of current in a circuit having L and R - Time Constant - Growth and decay of charge in a circuit having C and R - High resistance by leakage - Growth and decay of charge in a circuit containing L, C and R - Condition for discharge to be oscillatory - Frequency of oscillation.

Theory, construction and working of transformers – Losses - Skin effect.

Text Books and References:

1. Electricity and Magnetism, Sehagal and Chopra, S. Chand and Sons, 2005.
2. Electricity and Magnetism, D.N. Vaudeva, S. Chand and Co., 2012.
3. Electricity and Magnetism, Brijlal and Subramaniyam, Ratan Prakashan Mandir, Agra, 1966.
4. Physics, Vol. III - Resnic and Halliday, Willey Eastern Limited, 1988.
5. Electricity and Magnetism, R. Murugesan, S. Chand and Co, 2004.

IPHT 52 - MODERN PHYSICS

Objective :

1. To study the aspects related to discharge of electricity through gases.
2. To study the principles, applications of photoelectric effect and various atom models and their importance.
3. To understand the concepts of dualistic nature of matter.

Unit I : Cathode rays and Positive rays

Discharge of electricity through gases - Cathode rays – Properties – Thomson's and Dunningtons method for measuring e/m for electrons – Millikan's oil drop method – Positive rays -Properties – Analysis: Thomson's parabola method.

Unit II : Photoelectric Effect

Photoelectric effect- Lenard, Richardson and Compton experiments - Laws of photoelectric emission – Einstein's photoelectric equation - Millikan's experiment - Verification of photoelectric equation - Photoelectric cells – Types and Applications - Compton effect – Theory and experimental verification.

Unit III : Atomic Structure

Bohr and Sommerfield atom models - Vector atom model – Quantum numbers associated with vector atom model - Pauli's exclusion principle - Explanation of periodic table - Various quantum numbers - Angular momentum and magnetic moment - Coupling schemes - LS and JJ coupling - Bohr magneton – Stern and Gerlach experiment.

Unit IV : Ionisation Potential and Splitting of Energy Levels

Excitation and ionization potential – Frank and Hertz's experiment - Davis and Goucher's method- Spectral terms and notations - Selection rules - Intensity rule and interval rule - Fine

structure of sodium D lines - Alkali spectra - Fine structure of alkali spectra - Spectrum of Helium - Zeeman effect - Larmor's theorem - Debye's explanation of normal Zeeman effect. Anamalous Zeeman effect - Lande's `g' factor – Paschen - Back effect - Stark effect (qualitative study only).

Unit V : Dual Nature of Matter

de Broglie concept of matter waves – de Broglie wavelength – Wave velocity and group velocity for the de Broglie waves – Experimental study of matter waves – Davison and Germer experiment – G.P. Thomon's experiment for verifying de Broglie relation – Heisenberg's uncertainty Principle – Electron microscope – Gamma ray microscope.

Text Books and References:

1. Modern Physics, R. Murugeshan, Kiruthiga Sivaprasath, S. Chand and Co., 2008.
2. Principles of Modern Physics, A.K. Saxena, Narosa Publishing House, 2010.
3. Atomic Physics, J.B. Rajam, S. 20th Edition, Chand and Co., 2004.
4. Modern Physics, B.L. Theraja , 16th Revised Edition, S.Chand, 2008.

IPHT 53 - NUMERICAL METHODS

Objective: This paper explains the topics such as the solution of algebraic and transcendental equations, interpolation, numerical integration and differentiation.

Unit I : Algebraic and Transcendental Equations

Solutions of algebraic and transcendental equations – Bisection method – Regula falsi method – Newton Raphson method – Gauss elimination – Gauss-Jordan – Gauss-Seidel methods of iteration.

Unit II : Interpolation

Gregory-Newton Forward and Backward interpolation formula – Theory and problems Central difference interpolation formula – Stirlings and Bessel's formula – Theory and problems – Relative accuracy of the interpolation formula – Lagrange's interpolation formula for unequal intervals.

Unit III : Numerical Differentiation and Integration

Newton's forward difference formula – Newton's backward difference formula – Newton's divided difference formula – Theories and problems - Numerical Integration – Trapezoidal rule – Romberg's method – Simpson's one third rule – Theory and Problems.

Unit IV : Numerical Solution of Ordinary Differential Equations

Ordinary differential equations – Taylor series method – Merits and Demerits – Theory and Problems – Euler's method, Improved Euler's method, Modified Euler's method - Runge –

Kutta methods - Second and fourth order.

Unit V : Curve Fitting

Empirical laws and Curve fitting – The principle of least squares – Fitting a straight line – Parabola and power curve - Normal equations - Errors and their types – Propagation of errors – Approximations and residuals.

Text Books and References:

1. Numerical methods for Scientific and Engineering Computation, M.K.Jain, S.R.K.Iyangar and R.K.Jain, 3rd Edition, Willey Eastern Ltd., 1993.
2. Numerical methods in Science and Engineering, M.K.Venkataraman, National Publishing Company, 1991.
3. Numerical Methods, S.S.Sastry, Prentice hall, 2005.
4. Numerical Methods for Scientists and Engineers (Dover Books on Mathematics), R. W. Hamming, Dover Publications, 1987.
5. Numerical Solutions of Engineering Problems, K. Nandakumar, University of Alberta, 1998.
6. Numerical Analysis for Engineering, Douglas W. Harder, Richard Khoury, University of Waterloo, 2010.

IPHT 54 - DIGITAL ELECTRONICS

Objective: This paper highlights the concept of digital electronics and functioning of various digital devices.

Unit I : Number System and Logic Gates

Binary, Octal, Decimal and Hexadecimal number systems – Code conversion – Weighted binary code – Non-weighted binary code – Gray code – Error detection code – Alphanumeric code.

Boolean algebra – Fundamental concepts – Boolean theorems – Duality theorem – De Morgan's theorem – Basic logic gates – Universal gates.

Unit II : Simplification of Logic Expressions

Introduction to combinational logic – SOP and POS forms of expressions – Minterms and Maxterms – Reducing Boolean expressions using Boolean laws – Karnaugh map – Karnaugh map simplification.

Unit III : Combinational Logic Circuits (CLC)

Half adder – Full adder – Half subtractor – Full subtractor – 2's complement adder, Subtractor circuit – BCD adder – Decoder – Encoder – Multiplexer – Demultiplexer.

Unit VI : Sequential Logic Circuits

R-S flipflop using NAND gates – Clocked R-S-flipflop, D-flipflop, T-flipflop, J-K flipflop - Shift registers - Counters: Synchronous counter – Ring counter – Decade counter.

Unit V : D/A and A/D Converter

Construction and working of D/A Converter: Binary ladder – Weighted resistor A /D Converter: Successive approximation - Dual slope A /D Converter.

Text Books and References:

1. Digital Computer Electronics, Albert Paul Malvino, Tata- McGraw Hill, 1983.
2. Digital Electronics, Tokhein, Schaum Series, 1994.
3. Modern Digital Electronics, R.P.Jain, Tata McGraw Hill, 2006.
4. Digital integrated Electronics, Taub and Schilling, McGraw Hill, 2004.
5. Digital integrated Electronics, Gothmann, McGraw Hill, 2008.

IPHT 55 - COMMUNICATION SYSTEMS

Objective: To make the students understand the basic knowledge about various communication systems.

Unit I : Communication Systems

Communication Systems - Information, Transmitter, Channel, Noise, Receiver - Modulation - Need for modulation, Bandwidth requirements, Frequency spectrum of non-sinusoidal waveforms - Detection of AM wave - Diode detector (qualitative) - Detection of FM waves - Slope detector.

Unit II : 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.

Unit III : Antenna

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

Unit IV : Digital Communication

Pulse amplitude modulation - Pulse code modulation - Delta modulation - Pulse frequency modulation - Pulse time modulation - Pulse position modulation - Pulse width modulation – Digital carrier systems – Amplitude shift keying - Frequency shift keying - Phase shift keying - Differential and quadrapolar phase shift keying - Error control coding - Multiplex

transmission - Frequency and time division multiplexing.

Unit V : Forms of Communication Systems

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

Text Books and References:

1. Electonic communication, Dennis Roddy and John Coolen, 4th edition, PHI private Ltd., 1999.
2. Electronic communication system,G. Kennedy and Davis, Tata McGraw Hill, 1999.
3. Optical Fiber Communication, Gerd Keiser, 3rd Edition, McGraw Hill, Singapore, 2000.
4. Mobile and Personal Communication Services and Systems, Raj Pandya, Prentice Hall of India Private Ltd., 2003.
5. Electronic Communication Systems, Sanjeev Gupta, Khanna Publications, 1995.
6. Communication Electronics, N.D.Despandae, P.K Rangole, Tata McGraw Hill Pvt. Ltd., 1998.
7. Optical Fiber Communication and Sensors, M. Arumugam, Anuradha Agencies, 2002.

IPHP 56 - PRACTICAL –IV

1. V-I characteristics of junction diode.
2. Characteristics of Transistor CB and CE Configuration.
3. Characteristics of UJT.
4. R-C Coupled amplifier- Single stage .
5. Characteristics of FET.
6. Hartley oscillator- BJT.
7. Colpitt's oscillator - BJT.
8. Logic gates – Discrete components.
9. Half wave and full wave rectifier.
10. Bridge rectifier.
11. Regulated power supply - Zener diode.
12. V-I Characteristics of Zener diode.
13. Op- Amp - Mathematical operations I.
14. Basic logic gates using transistors.
15. NAND and NOR as universal building blocks.
16. Adder and Subtractor.

THIRD YEAR: SIXTH SEMESTER

IPHT 61 - LASER PHYSICS

Objective: This paper aims to provide in depth knowledge regarding Laser and its applications.

Unit I : Basic Theory

Introduction to Laser – Absorption, Spontaneous emission and stimulated emission - Relation between Einstein's A and B coefficients - Population inversion - Pumping – Types of pumping – Main components of laser and Principle of laser action.

Unit II : Laser Beam Characteristics

Introduction – Directionality – Divergence - Intensity – Coherence – Temporal coherence – Spatial coherence - Monochromaticity – Polarization – Speckles.

Unit III : Types of Lasers

Classification of lasers – Solid State Lasers – Ruby Lasers - Nd : YAG laser – Gas lasers – Helium – Neon laser – CO_2 laser – Semiconductor lasers – Diode laser – Free electron laser.

Unit IV : Techniques for Control of Laser Output

Introduction – Selecting a narrow frequency range – Selection of TEM_{00} mode and single longitudinal mode – Generation of high power pulses - Q-factor – Q-switching for giant pulses – methods of Q–Switching – Rotating mirrors – Electro – Optic shutter.

Unit V : Applications of Lasers

Laser in material processing – Laser in electronic industry – Laser in nuclear energy – Medicine and surgery – Applications in dentistry – Laser angioplasty – Endoscopy - LIDAR - Holography – Optical communication using laser.

Text Books and References:

1. An introduction to Lasers theory and applications, M.N. Avadhanulu and P.S. Hemne, S. Chand and Co. Ltd., 2011.
2. Optics, Ajoy Ghatak, Tata McGraw Hill, 2002.
3. Laser fundamentals, William T.Silfvast, Cambridge University press, 2009.

IPHT 62 - ANALOG ELECTRONICS

Objective: This paper aims at providing extensive analog operations for understanding and interpreting various analog circuit problems.

Unit I : Amplifiers

Small signal amplifiers – Load line concepts – Selection of operating point – RC coupled amplifiers – Feedback concept – Gain with feedback – General characteristics of negative feedback amplifiers - Types of feedback and their effect on gain – Multistage feedback amplifiers.

Unit II : Power Amplifiers

Power BJT – Class A, Class B, Class AB and Class C amplifiers – Efficiency and figure

of merit – Push pull amplifiers – Band pass amplifiers – Differential amplifiers.

Unit III : Oscillators and Multivibrators

Basic principles of oscillators – Hartley, Colpitt and Crystal Oscillators: Construction and Working – Derivation for frequency of oscillation - Multivibrators: Construction and Working, Astable, Monostable and Bistable.

Unit IV : IC Fabrication

Monolithic integrated circuit technology – Epitaxial growth, Masking and Etching – Diffusion of impurities – Monolithic diodes – Integrated resistors, capacitors and inductors – Bipolar transistor fabrication - Fabrication of FET.

Unit V : Linear Analog Circuits

Op – Amp – Characteristics of ideal Op Amp - Virtual ground – Inverting and Non-inverting amplifiers – Basic operational amplifier - Applications – Sign changer - Scale changer – summing, multiplication and differential amplifier – Voltage follower - Averager – Analog integration and Differentiation circuits – Analog computation – Solution of differential equations and simultaneous equations.

Text Books and References:

1. Microelectronics, Jacob Millman and Grabel, 2nd Edn., McGraw Hill, 1987.
2. Integrated Electronics, Jacob Millman and Halkias, McGraw Hill, 1972.
3. Electronic Circuits, Linear and Digital, Bapat, Tata McGraw Hill, 1991.
4. Modern Digital Electronics, R.P.Jain, Tata McGraw Hill, 1991.

IPHT 63 - SOLID STATE PHYSICS

Objective: This paper provides the elementary ideas about the crystalline structure of solids and the physical properties of solids.

Unit I : Elements of Crystal Structure

Crystalline structure – Non crystalline structure – Crystal translational vector - Unit cell – Lattice - Basis - Symmetry operations - Bravais lattices two dimensional and three dimensional - Crystal planes and Miller indices - Simple crystal structure: BCC, FCC and HCP.

Unit II : Diffraction of X-Rays by Crystals

Bragg's law in one dimension – Laue treatment – Reciprocal lattice, Geometrical interpretation of the Bragg condition - Brillouin zone - Atomic scattering factor and Geometrical scattering factor.

Experimental method of X-Ray diffraction: Laue method - Rotating crystal method - Powder diffraction method - Electron diffraction and Neutron diffraction.

Unit III : Crystal Types and Bonding

Ionic crystal, covalent crystal, metal crystal, molecular crystal, hydrogen bonded crystal – Calculation of binding energy of ionic, covalent and metal crystals - Crystals of inert gases.

Unit IV : Elastic Constant of Crystal

Analysis of stress, strain – Elastic compliance and Stiffness constant, Elastic energy density – Elastic stiffness constant of cubic crystal – Elastic waves in cubic crystal, Experimental determination of elastic constant.

Unit V : Lattice Vibrations

Concept of lattice mode of vibration – Phase velocity and group velocity of harmonic waves – Dynamics of monatomic and diatomic lattices – Concept of phonon – Momentum of phonons – Inelastic scattering: Photons by phonons and Neutrons by phonons.

Text Books and References:

1. Introduction to Solid, Azaroff, Tata McGraw Hill, 1992.
2. X-Ray Crystallography, M.M Woolfson, Cambridge University Press, 1970.
3. Solid State Physics, B. S. Saxena, R.C. Gupta and P.N. Saxena, Pragathi Prakashan, 1970.
4. Solid State Physics, S.L. Gupta, V. Kumar, 5th Edition, Kedar Nath and Ram Nath Co. Ltd., 1970.
5. Solid State Physics, Adrianus. J. Dekker, Macmillan India Limited, 1986.
6. Solid state Physics, R.L. Singhal, Kedar Nath Ram Nath and Co. Ltd., 2000.
7. Solid State Physics, C.M. Kachhava, Tata McGraw Hill, 1992.
8. Solid State Physics, H.C. Gupta, Vikas Publishing House, 1995.
9. Solid State Physics, H.V. Keer, Willey Eastern Limited, 1993.
10. Solid State Physics, S.O. Pillai, 3rd Edition, New Age Internationals, 2006.
11. Introduction to Solid State Physics, C. Kittel, 4th Edition, Wiley Eastern Ltd.,1971.

IPHT 64 - NUCLEAR PHYSICS

Objective: This paper is designed to impart knowledge on general properties of nuclei and their mass measurements. It also provides knowledge on particle accelerators, detectors and nuclear models.

Unit I : General Properties of Nuclei

Scattering of alpha particles - Nuclear radius, mirror nuclei, nuclear mass - Constituents of nuclei – Proton - Electron hypothesis, proton - neutron hypothesis - classification of nuclei - Atomic mass and binding energy of stable isotopes - Packing fraction - Mass defect - Binding energy of nucleus.

Mass Spectrometers: Doublet method of measurement of mass – Bainbridge, Bainbridge and Jordan mass spectrograph - Determination of charge by Mosley's laws.

Unit II : Radioactivity

Laws of disintegration - activity and its units - Half life - Mean life - Alpha decay - Properties of α–particles - α-spectrum, Range of α-particles, Geiger-Nuttal law - Gamow's theory of α-decay - Beta decay – Properties - β-ray spectrum - Neutrino and antineutrino - Detection of neutrino and antineutrino - Artificial radioactivity - Applications of radioactivity.

Cosmics rays - Nature, properties, effect of latitudes, altitudes and longitudes.

Unit III : Particle Accelerators

Principle – Construction – Working - Advantages and limitations - Linear accelerator - Wave guide accelerator - Betatron- Synchrocyclotron - Proton synchrotron.

Unit IV : Gamma Decay and Detection of Nuclear Radiations

Gamma decay - Properties, interaction of gamma rays with matter - Photoelectric absorption - Compton scattering - Pair production.

Detectors: Principle - Working - Merits and Demerits of ionisation chamber - Proportional counter - GM counter, Scintillation counter, Cloud chamber - Applications of counters.

Unit V : Nuclear Models and Nuclear Energy

Liquid drop model - Semi empirical mass formula - Merits and Demerits - Basic ideas of shell model-(spin -orbit coupling) - Predictions of the shell model and Collective model.

Basic ideas of nuclear fission - Types of fission - Nuclear fusion - Thermo nuclear reactions in Sun and Stars- P-P and C-N cycle - Controlled thermo nuclear reactions.

Text Books and References:

1. Elements of Nuclear Physics, M.L. Pandiya and P.R.S Yadav, Kedar Nath, Ram Nath, 1993.
2. Basic nuclear Physics, S. Srivastava, Pragathi Prakashan, 1998.
3. Nuclear Physics, S.N. Ghoshal, S. Chand and Co., 2006.
4. Nuclear Physics, D.C. Tayal, Himalaya Publishing house, Mumbai, 1995.
5. Nuclear and Particle Physics, V.K. Mittal, R.C. Verma and S.C. Gupta, PHI Learning Ltd., 2011.
6. Perspectives of Modern Physics, Arthur Beise, 5th Edition, McGraw Hill, 1995.
7. Introduction to Modern Physics, F.K. Richtmy, E.H. Kennord and J.N. Copper, 6th Edition, McGraw Hill, 1997.
8. Modern Physics, R. Murugesan, S. Chand and Co., 2005.
9. Atomic Physics, J.B. Rajam, S. Chand and Co., 2005.
10. Atomic and Nuclear Physics, Albright Semat, James Elkins and Hilton 2003.
11. Atomic and Nuclear Physics, Little field and Thorley, ELBS, 2002.
12. Basic Nuclear Physics and Cosmic rays, B.N. Srivatsava, Pragathi Prakashan, 1993.
13. Concepts of Nuclear Physics, Bernald L. Cohen, TMH, 1971.

IPHT 65 - NONLINEAR OPTICS

Objective: To make the students understand the nonlinear behaviour in optical materials.

Unit I : Introduction to Nonlinear Optics

Wave propagation in an anisotropic crystal – Polarization response of materials to light – Harmonic generation – Second harmonic generation – Sum and difference frequency generation – Phase matching – Third harmonic generation – Bistability – Self focusing.

Unit II : Multiphoton Processes

Two photon process – Theory and experiment – Three photon process - Parametric generation of light – Oscillator – Amplifier – Stimulated Raman scattering – Intensity dependent refractive index - Optical Kerr effect – Photorefractive, electron optic effects.

Unit III : Nonlinear Optical Materials

Basic requirements – Inorganics – Borates – Organics – Urea, Nitroaniline – Semiorganics – Thiourea complex – X-ray diffraction, FTIR, FTNMR - Second harmonic generation – Laser induced surface damage threshold.

Unit IV : Nonlinear Optical Susceptibility

Introduction to nonlinear optics – Descriptions of nonlinear optical process – Definition of the nonlinear susceptibility – Properties of the nonlinear susceptibility – Kramers Kroning relation.

Unit V : Fiber Optics

Step – Graded index fibers – Wave propagation – Fiber modes – Single and multimode fibers –Numerical aperture – Dispersion – Fiber bandwidth – Fiber loss – Attenuation coefficient – Material absorption.

Text Books and References:

1. Lasers and Nonlinear Optics, B.B. Laud, 2nd Edn., New Age International (P) Ltd., 1991.
2. Nonlinear Optics, Robert W. Boyd, 2nd Edn., Academic Press, 2003.
3. Fiber-Optics Communication Systems, Govind P. Agarwal, 3rd Edn., John Wiley and Sons, 2003.
4. Laser Fundamentals, William T. Silvast, Cambridge University Press, 2003.
5. Nonlinear Optics, Basic Concepts, D.L. Mills, Springer, 1998.

IPHP 66 - PRACTICAL – V

1. RC coupled amplifier – Two stage - BJT.
2. Feedback amplifier – BJT.

3. Mathematical operations –II. Op-Amp IC 741.
4. Solving Simultaneous equations using Op-Amp IC 741.
5. BCD-counter –Decode Seven Segment Display.
6. Schmitt Trigger.
7. Multivibrator - Astable, Monostable - IC 555.
8. Multivibrator - Astable - IC 741.
9. Multivibrator - Monostable – IC 555.
10. D/A Converter (Two methods).
11. Arithmetic Logic Unit - IC 74181.
12. Study of Flip-flops.
13. Synchronous and Asynchronous counter - IC 7473.
14. Multiplexers and Demultiplexers.
15. Shift Registers - IC 7474.
16. Ring counter and Ripple counter – IC 7474.

FOURTH YEAR : SEVENTH SEMESTER

IPHT 71 - CLASSICAL AND STATISTICAL MECHANICS

Objective: Classical Mechanics is a handy tool in denoting that part of mechanics where the objects are too big or too small. The most important aspect of statistical mechanics is its Correlation with thermodynamics.

Unit-I: Mechanics of a Particle and System of Particles

Mechanics of a Particle and System of particles – Constraints – Degrees of freedom – Generalized coordinates and its advantages – Hamilton's variational principle – Lagrange's equation of motion – D'Alembert's principle – Applications of Lagrange's equation of motion – Linear harmonic oscillator and simple pendulum. Cyclic co-ordinates – Equivalence of Lagrange's and Newton's equations – Principle of least action.

Unit-II: Canonical transformations

Canonical transformation and Conditions for transformation to be canonical with examples – Hamilton-Jacobi method. Hamilton's principal function – Solution of harmonic oscillator problem by Hamilton-Jacobi method – Poisson brackets, Properties and Invariance of Poisson brackets, Equation of motion in Poisson bracket – Small oscillations – Normal modes and Normal Coordinates – Free vibrations of a linear triatomic molecule.

Unit-III: Maxwell – Boltzmann Statistics

Postulates of kinetic theory of gases – Maxwell-Boltzmann distribution of velocities – Derivation of Maxwell – Boltzmann distribution equation – Significance of Maxwell-Boltzmann equation – Phase Space – Ensembles and their types – Liouville's theorem – Statement and Proof.

Unit-IV: Equipartition of Energy and Partition Function

Principle of equipartition of energy – Partition function and their properties – Connection

between the partition function and thermodynamic quantities – Mean values obtained from distribution law – Gibb's paradox – Explanation and proof for occurrence of paradox – Sackur – Tetrode equation and its significance.

Unit-V: Quantum statistics

Differentiation of B-E and F-D particles – Derivations of B-E and F-D distributions – Comparison of M-B,B-E and F-D statistics – Black body radiation and the Planck radiation law – Derivation with explanation – Ideal Bose gas – Gas degeneracy – Derivation - Bose Einstein Condensation – Derivation with explanation (Example: Liquid Helium)

Text Books and References:

1. Introduction to Classical Mechanics, R.G.Takwale and P.S.Puranik, Tata Mc Graw Hill, New Delhi, 1979.
2. Classical Mechanics of Rigid Bodies, Kiran C.Guta, New Age Publications, 1997.
3. Classical Mechanics, B.D.Gupta and Satya Prakash, Keder Nath Publishers, Meerut, 2004.
4. Statistical Mechanics, R.K.Agarwal and Melvin Eisner, New Age Publisher, 2011.
5. Statistical Mechanics and Properties of Matter, E.S.R.Gopal, The Mc Millan Company of India Ltd., 1976.
6. Quantum Mechanics, A.K.Ghatak and S.Lokanathan, The Mc Millan Company.
7. A Text Book of Quantum Mechanics, P.M. Matheews and Venkatesan, Tata Mc Graw Hill Company, Ltd., 1976.
8. Classical Mechanics, H.Goldstein, Addision Wesley Publishing Company, Massachusetts, 1961.
9. Statistical and Thermal Physics, F.Reif, Mc Graw Hill Book Co., 1992.
10. Thermodynamics, Sears, Addison, Wesley Publishing Company, 1969.

IPHT 72 - ATOMIC AND MOLECULAR PHYSICS

Objective: To understand the concept of atomic and molecular model through different theories. It also helps to understand the interaction between electromagnetic radiations such as microwave, IR and X rays with matter.

Unit-I: Atom Model for Two Valence Electrons.

Sommerfield's elliptical orbits and space quantization – Total energy of a stationary state – Hydrogen fine structure – Dirac electron – Fine structure and the spinning electron – Doublet fine structure alkali metals – Selection rules for doublet – Intensity rules for fine structure doublet – Spinning electron and the vector atom model – Electron spin – Orbit interaction – Penetrating and non-Penetrating orbits, Atom model for two valence electrons – Coupling schemes for two electrons – Interaction energies for LS coupling – Lande's interval rule – j-j coupling in the carbon group of elements – Branching rule – Selection rule – Intensity relations.

Unit-II: Magnetic and Hyperfine Structure

Zeeman Effect in single and two valent atomic systems – Influence of varying magnetic field strengths – Hyperfine structure of spectral lines – Nuclear Zeeman effect. Back - Goudsmit

effect – Determination of nuclear moments – Anomalous Zeeman Effect. Paschen - Back effect– Zeeman patterns for typical spectral transitions.

Unit-III: Microwave and Infrared Spectroscopy

Microwave spectroscopy – Rotational spectra of diatomic and polyatomic molecules – Symmetric and asymmetric molecules – Techniques and instrumentation – Infrared spectroscopy – Vibrational study of diatomic molecules – Simple gaseous polyatomic molecules – Vibrational frequencies and qualitative analysis – Quantitative IR analysis – Determination of bond moment and bond length – Detection of interstellar atoms and molecules – IR spectrometer – Elementary ideas of FTIR.

Unit-IV: Vibrational Raman Spectroscopy

Raman effect – Raman shift – Definitions – Observation of Raman spectra – Raman spectrometer- Quantum theory of Raman effect – Probability of energy transition in Raman effect - Vibrational Raman spectra – Structure determination from Raman and IR Spectroscopy – General features of electronic spectra of diatomic molecules – Frank-Condon principles – Electronic states – Configuration of some typical molecules.

Unit-V: Photoelectron and Photo Acoustic Spectroscopy.

Basic principles – Photoelectron spectroscopy – Design of X-ray PES and UV PES – Chemical information from PES - Basic concept of Augur electron spectroscopy – Principle of PAS –Block diagram of PAS – Different types of detecting systems – Application of PAS

Text books and References:

1. Spectroscopy and Molecular Structure, G.W. King, Holt, Rinehart and Winton, New York, 1964.
2. Fundamentals of Modern Physics, Eisberg. Robert, John Wiley and Sons, New York, 1961.
3. Spectroscopy Vol (I-II), Stanley D. Walker, H. Straw, Macmillan, 1962.
4. Fundamental of molecular spectroscopy, C.N Banwell, Tata Mc Graw Hill, 1972.
5. Spectroscopy (vol.II), B.P.Straugham and S.Walker, Chapman and Hall,1976.
6. Elements of Spectroscopy, S.L Gupta, V.Kumar and R.C.Sharma, Pragathi and Prakashan Publication company Meerut, 2006.
7. Spectroscopy (Atomic and Molecular), Gurdeep Chatwal and Sham Anand, Himalaya Publication house, 2004.
8. Vibrational Spectroscopy, D.N.Sathyanaryana, New Age International (P) Ltd., 1996.

IPHT 73 - MATHEMATICAL PHYSICS – I

Objective: Mathematics has become an integral part of physics. This paper aims to provide extensive mathematical formalism for understanding and interpreting various physical problems.

Unit-I: **Vector Analysis and Vector Spaces**

Concept of gradient, divergence and curl - Gauss's divergence theorem, Green's theorem

and Stoke's theorem (statement and proof) - Orthogonal curvilinear coordinates - Expression for gradient, divergence, curl and Laplacian in cylindrical and spherical co-ordinates (Theory).

Linearly dependent and independent sets of vectors - Inner product (problems)- Schmidt's orthogonalization process.

Unit-II: Special Functions

Beta and Gamma functions - Power series techniques in solving Bessel, Legendre, Hermite's and Laguerre differential equations - Generating functions - Recurrence relations - Rodrigue's formula - Orthogonal properties.

Unit-III: Partial Differential Equations

Solution of Laplace Differential Equation - Two dimensional flow of heat in cartesian and cylindrical co-ordinates. Solution of heat flow equation in one dimension - Solution of wave equation - Transverse vibrations of a stretched string (Theory).

Unit-IV: Fourier Analysis

Definition - Dirichlet's theorem – Properties-convergence, integration, differentiation. Fourier sine and cosine series - Problems using the sine and cosine series. Physical applications - Full wave rectifier and forced vibration (Theory) - Complex form of Fourier series (Theory) - Expression for Fourier- Integrals.

Unit-V: Group Theory

Definition - Subgroups - Cyclic groups and abelian groups - Homomorphism and isomorphism of groups - Classes - Symmetry operations and symmetry elements - Representations of groups - Reducible and irreducible representations - Character tables for simple molecular types (C_{2v} and C_{3v} point group molecules)

Text Books and References:

1. Mathematical Physics, B.D. Gupta, Vikas Publishing House Pvt. Ltd, 1995.
2. Mathematical Physics, B.S.Rajput, 20th Edition, Pragati Prakashan, 2008.
3. Mathematical Physics, H.K. Dass and Rama Verma, S.Chand and Company Ltd, 2010.
4. Mathematical physics, P.K. Chattopadhyay, Wiley Eastern Limited, 1990.
5. Introduction to Mathematical physics, Charlie Harper, Prentice Hall of India Pvt.Ltd, 1993.
6. Applied Mathematics for Engineers and Physicists, L.A. Pipes and L.R. Havevill, McGraw Hill Publications Co., 3rd Edition, 1971.
7. Theory and Problems of Laplace Transforms, Murray R. Spigel, Schaum's outline series, McGraw Hill, 1986.
8. Matrices and Tensors in Physics, A.W. Joshi, Wiley Eastern limited, 3rd Edition, 1995.

IPHP74 - PRACTICAL – VI
(Any <u>Sixteen</u> Experiments)

1. Young's modulus of a specimen plate- by Newton's interference method.

2. Bi-prism on spectrometer- Wavelength (λ) and Refractive index (μ) of a liquid-using Laser source.
3. Charge of an electron- Spectrometer
4. Study of Hall effect in semiconductors.
5. Polarizability of Liquids- Hollow prism on spectrometer.
6. Hg-Cu spectrum- Hartmann's constants and wavelength.
7. Planck's constant.
8. Zeeman Effect.
9. Thermoluminescence
10. Krishnan Torsion Balance.
11. Microprocessor 8085 - Addition, Subtraction, Multiplication & Division
12. Microprocessor 8085 - Logical operation
13. Microprocessor 8085 - Solving expression, Factorial of N Numbers
14. Microprocessor 8085 - Code conversion
15. Microprocessor 8085 – Flashing and Rolling of Name display
16. Microprocessor 8085 – Stepper Motor
17. Microprocessor 8085 – ADC Interfacing
18. Microprocessor 8085 – DAC Interfacing
19. Microprocessor 8085 – Biggest and Smallest Numbers
20. Microprocessor 8085 – Ascending and Descending Order

FOURTH YEAR : EIGTH SEMESTER

IPHT 81 - MATHEMATICAL PHYSICS – II

Objective: To bring exposure to the mathematical concepts and interpreting various physical problems

Unit - I: Matrices

Rank and inverse of a matrix - Symmetric and antisymmetric matrices - Hermitian and Skew Hermition matrices - Orthogonal and unitary matrices - Eigen values and Eigen vectors of the matrices - Cayley - Hamilton's theorem (statement, proof and problems using the above methods)

Unit - II: Tensor Analysis

Law of transformation of tensors - Algebraic operations - Rank of a tensor - Contravarient, covariant and mixed tensors - Symmetric and anti symmetric tensors - Kronecker delta (theory)

Application of Tensor:

Tensor forms of gradient, divergence, Laplace operator and curl - Application of tensor - dynamics of a particle - Stress and strain tensors (theory)

Unit - III: Complex Variables

Complex analysis - Function of complex variables - Analytic function - Cauchy Riemann conditions - Cauchy's integral theorem (statement and proof) - Residues and singularities - Cauchy's residual theorem (statement and proof) - Evaluation of simple standard integral

(problems using the above methods)

Unit - IV: Integral Transforms

Fourier transforms - cosine and sine transforms - Linearity theorem - Parseval's theorem - solution of differential equation. Laplace transforms - Definition - Linearity, shifting and change of scale properties. Inverse Laplace transforms – Definition - Problems - Solution of differential equation (problems using the above methods)

Unit - V: Green's function

Green's function - Definition -Green's function for one - Dimensional case - Properties of Green's function - Solution of inhomogeneous differential equations $\psi''=f(x)$ - Subject to the homogeneous boundary conditions and subject to the inhomogeneous boundary conditions (without involving derivatives) - Subject to the homogeneous boundary conditions and subject to the inhomogeneous boundary conditions (with involving derivatives).

Text Books and References:

1. Mathematical Physics, B.D. Gupta, Vikas Publishing, 1995.
2. Mathematical Physics, B.S. Rajput, 20th Edition, Pragati Prakashan, 2008.
3. Mathematical Physics, H.K. Dass and Rama Verma, Chand and Company Ltd, 2010.
4. Mathematical physics, P.K. Chattopadhyay, Wiley Eastern Limited, 1990.
5. Introduction to Mathematical Physics, Charlie Harper, Prentice Hall of India Pvt. Ltd, 1993.
6. Applied Mathematics for Engineers and Physicists, L.A. Pipes and L.R. Havevill, 3rd Edition, McGraw Hill, 1971.
7. Theory and problems of Laplace Transforms, Murray R. Spigel, International edition, McGraw Hill, 1986.
8. Matrices and Tensors in Physics, A.W. Joshi, 3rd Edition, Wiley Eastern limited, 1995.

IPHT 82 - CONDENSED MATTER PHYSICS

Objective: This paper provides the basic elements of the Physics of Solids and in particular the study of structure of crystalline solids and their physical properties.

Unit – I: Thermal Properties and Transport Properties

Specific heat of solids – Dulong and Petit's law - Einstein theory and Debye's theory – Conductivity due to electrons and phonons.

Boltzmann transport equation – Sommerfield's theory of electrical conductivity – Hall Effect (solid). Experimental determination of Hall coefficient.

Unit – II: Free Electron Theory of Metals

Free electron gas model– Free electron gas in one dimensional box and three dimensional box – Effects of temperature on the parameters of the free electron gas.

Static properties of the metal: Thermionic emission and photoelectric effect. Transport properties of metals: Drude Lorentz theory of electrical conductivity and thermal conductivity.

Unit – III: Energy Bands in Solids

Wave functions in periodic lattice and Bloch theorem – Kronig Penny model – Motion of electron in one dimension – Negative effective mass and holes – Physical basis of the effective mass values – Easy limiting cases of the true periodic potential- Nearly free electron approximation – Tight - binding approximation – Constant energy curves and surfaces – Overlapping of allowed zones – Distinction between metals, insulators and semiconductors.

Unit – IV: Dielectrics

Polar and non polar dielectrics – Dielectric constant – Polarizability: Electronic, Ionic and dipolar – Lorentz fields - Clasiuss Mossati relation – Measurement of dielectric constant: Schering bridge method – Hetrodyne method – Molecular structure and dielectric properties of materials – Piezoelectricity.

Unit – V: Superconductivity

Superconductivity – Occurrence, application and destruction. Meissner effect (detailed study and discussion). London's equation. Penetration depth and coherence length. Elements of BCS theory. Flux quantization. Normal tunnelling and Josephson's effect. High Tc superconductivity. High temperature superconductors and characterizations: $LaBaCuO_4$ and $YBa_2Cu_3O_7$

Text Books and References:

1. Solid State Physics, M.A. Wahab, Narosa Publishing House, 1999.
2. Fundamentals of Solid State, Physics B.S. Saxena, R.C. Gupta and P.N. Saxena, Pragathi Prakashan. Meerut. 1996.
3. Solid State Physics, Adrianus. J. Dekkar, Macmillan India Ltd., 1981.
4. Introduction to Solid State Physics, C. Kittel, Wiley eastern Ltd., 1971.

IPHT 83 - ELECTROMAGNETIC THEORY AND MODERN OPTICS

Objective: In this paper the ideas of electromagnetic theory and modern optics are integrated within a unfired framework using electromagnetic theory as its foundation, to make the students aware of the most important methods of optical analysis.

Unit – I: Maxwell's Equations and E.M. Waves

Introduction to electromagnetism - Equation of continuity - Displacement current - Modification of Ampere's law - Characteristics of displacement current - Physical interpretation of Maxwell's postulate.

Maxwell's equation and their empirical basis - Derivation and physical significance - Electromagnetic energy - Poynting theorem - Poynting vector - The wave equation - Plane electromagnetic waves in free space - Non-conducting(isotropic dielectric) and conducting medium.

Unit – II: Reflection and Refraction of E.M Waves

Boundary conditions at the surface of discontinuity - Reflection and refraction of e.m waves at the interface of non - Conducting media - Kinematic and dynamic properties - Fresnel's equation - Electric field vector 'E' parallel to the plane of incidence and perpendicular to the plane of incidence - Reflection and transmission co-efficients at the interface between two non-Conducting media - Brewster's law and degree of polarization - Total internal reflection.

Unit – III: Application of E.M Waves

Dispersion - Normal and anomalous dispersion - Various dispersion relations - Dispersion in gases, liquids and solids - Scattering - Theory of scattering of e.m waves to determine scattering parameter (Rayleigh, Resonance and Raman).

Relativistic Electrodynamics

Lorentz transformation - Consequences - Transformation of differential operators - Invariance of D'Alembert's operator - Four vector - Lorentz transformation of space and time in four vector form - Transformation of e.m potential A and φ - Lorentz condition in covariant form - Invariance of Maxwell's field equation in vector form.

Unit – IV: Interference

Two beam interferometry - Michelson's interferometer - Theory – Applications

Multi beam Interferometry

FP Etalon - LG plate - Theory, expression for resolving power - Determination of specific charge of an electron.

Coherence

Types of coherence - Holography - Principle of holography - Characteristics - Recording and reconstruction - Classification - Applications - Non - Destructive testing.

Unit – V: Diffraction

Fresnel, Fraunhoffer diffraction (brief explanation) - Application of Fraunhoffer - Diffraction to rectangular and circular aperture - Fersenel's diffraction by rectangular aperture - Babinet's Principle.

Plasma Physics

Nature and occurance of plasma – Plasma oscillations - Quasineutrality of plasma - plasma behavior in a magnetic field - Plasma as a conducting fluid - Magnetohydrodynamics - magnetic confinement - Pinch effect - Instabilities of plasma - Hydromagnetic waves - Alfven waves.

Text Books and References:

1. Electromagnetic Theory and Electrodynamics, SatyaPrakash, Kedar nath Ram and Co, 1986.
2. Electromagnetics, B.B Laud, Wiley Eastern Company, 2000.

3. Fundamentals of Electromagnetic, Wazed Miah, Tata Mc Graw Hill, 1980.
4. Basic Electromagnetic with Application, Narayana rao, (EEE) Prentice Hall, 1997.
5. Contemporary Optics, Ghatak and Thiyagarajan, Macmillan, 1992.
6. Principles of Optics, M. Born and E. Wolf, Pergamon Press, Oxford, 4th edition, 1970.
7. Introduction to Classical and Modern Optics, Meyer, Ardent, EEE series Prentice Hall, 1990.

IPHT 84 - MICROPROCESSORS AND INTERFACING DEVICES

Objective: This paper presents an extensive knowledge about the architecture, assembly language and interfacing of Intel 8085 and Advanced microprocessors.

Unit-I: Introduction to 8085

Intel 8085 microprocessor: Introduction – Pin configuration- Architecture and its operations - Memory interfacing – I/O interfacing. Instruction classification: number of bytes, nature of operations- Assembly language programming: Instruction format.

Unit-II: Introduction to Assembly Language Program

Instruction set: Data transfer instructions - Addressing modes – Arithmetic operations – Logical operations – Branching and machine control operations. Writing assembly language programs: Looping, counting and indexing. Translation from assembly language to machine language – 16 bit data transfer and arithmetic instructions – Arithmetic operations related to memory. Vectored and non-vectored interrupts.

Unit-III: Introduction to 8086

Intel 8086 microprocessor: Introduction – Architecture - Pin configuration- Operating modes: Minimum mode, Maximum mode. Memory addressing: 8-bit data from even and odd address bank, 16-bit data from even and odd address bank. Addressing modes. Interrupts: Hardware interrupts – Software interrupts –Interrupt priorities.

Unit – IV: Introduction to High End Processor

Intel 80286–80386–80486–Pentium.

Unit – V: Introduction to Interfacing Devices

Basic concepts of programmable device - 8255 Programmable Peripheral Interface (PPI) – 8254 Programmable Interval Timer (PIT) – 8257 Direct Memory Access (DMA) controller – 8259 Interrupt controller. Basic concepts of serial I/O and data communication – 8251 Universal Synchronous Asynchronous Receiver Transmitter (USART).

Text Books and References:

1. Microprocessor Architecture, Programming and Applications with 8085/8080, Ramesh S. Gaonkar, New Age International 6th edition, 2013.

2. Microprocessors and Interfacing-Programming and Hardware, Douglas V. Hall, Tata McGraw Hill, 1993.
3. Advanced Microprocessors and Interfacing, Badri Ram, Tata McGraw Hill, 2001.

IPHP 85 - PRACTICAL – VII
(Any Sixteen Experiments)

1. Michelson Interferometer – Wavelength Determination
2. Energy gap – Four Probe Apparatus.
3. Elastic constants of Glass- Cornu's interference method (Hyperbolic fringes).
4. Solar Spectrum
5. Thermistor characteristics-Band gap energy
6. Reflection grating-Spectrometer
7. Ultrasonic diffractometer – Velocity and compressibility of liquids
8. Characteristics of He-Ne Laser.
9. Diffraction at straight edge using Laser.
10. Magnetostriction
11. Numerical Aperture and Acceptance Angle-Fibre Optics
12. Microprocessor 8086 I – Addition and Subtraction (16 & 32 bits)
13. Microprocessor 8086 II –Multiplication and Division (16 & 32 bits)
14. Microprocessor 8086 - Biggest and Smallest Numbers
15. Microprocessor 8086 - Code conversion
16. Microprocessor 8086 - Solving expression, Factorial of N Numbers
17. Microprocessor 8086 – Sum of elements in an array and factorial
18. Microprocessor 8086 – Sorting of N Elements (Ascending and Descending Order)
19. Microprocessor 8086 – String Operations
20. Wave form generations using 8086.

FIFTH YEAR : NINTH SEMESTER

IPHT 91 - QUANTUM MECHANICS – I

Objective: This paper makes the students to understand the various kinetics involved in advanced physics using approximation methods.

Unit – I: Discrete Eigen Values: Bound States

Linear Harmonic Oscillator – Solution – Properties of Stationary states – Zero point energy – Three dimensional harmonic oscillator – Spherically symmetric particles – Angular

momentum operators – Hydrogen atom wave equation – Separation of variables – Solution of radial and angular equations – Space quantization – Discussion of bound states – Parity. Angular momentum - Eigen functions – Rigid rotator – Application to diatomic molecules – Energy level spacing.

Unit – II: Representation Theory

Schrodinger picture – Heisenberg picture – Interaction picture, energy representation. Identical particles – Physical meaning of identity, symmetric and asymmetric group – Distinguishable of identical particles – Pauli's exclusion principle – Connection with statistical mechanics – Exchange degeneracy.

Operators – Hilbert space – Dirac, Bra and Ket notation – Physical meaning of matrix elements – Harmonic oscillator – Solution using ladder operators and matrix representation.

Unit – III: Approximation Methods: Perturbation

Stationary states – Perturbation theory – Time independent – Non-degenerate cases – First and Second order perturbation – Anharmonic oscillator, degeneracy – Removal of degeneracy– Zeeman effect without electron spin - Stark effect in hydrogen atom – First order perturbation of Helium like atoms- Harmonic Perturbation.

Unit – IV: Approximation Methods: Variation and WKB Approximation

Variation theorem – Ground state of Helium like atom-Hydrogen molecule ion, The Deutron comparison with perturbation method – Electron interaction energy, Vanderwalls interaction's **-** WKB approximation – Asymptotic nature of solution – Validity of WKB approximation – Solution near a turning point – Connection formula – Energy level of a potential well – Bohr – Sommerfield quantization rule – Tunneling through a potential Barrier (qualitative).

Unit – V: Scattering Theory

Kinematics of the scattering process – Differential and total cross section – Wave mechanical picture of scattering – Green's function – Expression for scattering amplitude – Born's Approximation – Validity of Born's approximation – Application to screened coulomb potential.

Partial wave analysis – Asymptotic behaviour of partial waves – Phase shifts – Scattering amplitude in terms of phase shifts – Differential and total cross section – Optical theorem – Low energy scattering – Resonant and non-resonant scattering – Scattering length and effective range – Physical explanation – The Ramsauer – Townsend effect.

Text Books and References:

1. A Text Book of Quantum Mechanics, P.M Mathews and K. Venkatesan, Tata McGraw Hill publishing co. Ltd, 1975.
2. Quantum Mechanics, Leonard I Schiff, 3rd edition, McGraw Hill book company, 2000.
3. Quantum Mechanics, G.S. Chadda, New age International, 2005
4. Quantum Mechanics, V. Devanathan, Weily Eastern, 2005
5. Quantum Mechanics, V.K Thankappan, 2nd edition, New Age International (P) Ltd., 1999.

6. Advanced Quantum Mechanics, Sathyaprakash, PragathiPrakhasan publishing Ltd., Meerut, 1996.
7. Quantum Mechanics, A.K.Ghatak and S.Loganathan, The Mc Millan and Co,1985
8. Quantum Mechanics, G.Aruldas, Prentice Hall of India Pvt. Ltd.,2002

IPHT 92 - MATERIALS SCIENCE

Objective: To make the students to understand the properties of materials with their structure at the electronic, atomic and micro level as well as their behaviour of variety of materials.

Unit – I: Crystal Growth and Thin Films

Growth of crystals – Solution growth method, melt method - Bridgeman and czchrolski method – Vapour deposition technique.

Production of thin films : Thermal evaporation – Chemical vapour deposition – Spary pyrolysis – Sputtering – Spin coating method - Thickness measurement : Fizeau interference method and Weight loss method - Electrical and optical properties of thin films.

Unit – II: Defects

Phase diagram – Basic principle – Simple binary systems – Solid solutions -Eutectic systems – Application

Solid Solution: Interstitial and substitution solid solutions – Hume – Rothery electron compounds – Long range order theory of Bragg and Williams – Super lattices – Intermediate and interstitial phases – Intermetallic compounds. Elementary ideas of corrosion and oxidation

Point defects - Schottky and Frenkel defects – Number of defects as a function of temperature – Diffusion in metals – Diffusion and ionic conductivity in ionic crystals.

Dislocations: Edge and Screw dislocations – Burgers vector – Plastic deformation – Slip.

Unit – III: Optical Properties and Ferro Electrics

Color centers – Photo conductivity – Electronic transitions in photo conductors – Trap, capture, recombination centres – General mechanism – Luminescence – Excitation and emission – Decay mechanisms – Thallium activated alkali halides – Sulfide phosphorous – Simple discussion on Thermoluminescence and electroluminescence

Ferroelectrics: Ferro electricity – General properties – Dipole theory – Ionic displacements and the behaviours of $BaTiO_3$ – Spontaneous polarization of $BaTiO_3$ – Thermodynamics of Ferro electric transitions – Ferro electric domains.

Unit – IV: Magnetism

Ferromagnetism – Spontaneous magnetisation – Weiss theory – Temperature dependence of spontaneous magnetisation – Weiss molecular field – Nature and origin – Exchange interaction – Ferromagnetic domain – Experimental evidence – Origin of domains –

Bloch Wall. Molecular field theory of antiferromagnetism and ferrimagnetism. Explanation for Hysterisis.

Unit – V: Elastic Behaviour, Polymer and Ceramics

Anelastic and viscoelastic behaviour – Atomic model of elastic behaviour – Rubber like elasticity – An elastic deformation - Relaxation process – Model for viscoelastic behaviour.

Polymers: Polymerization mechanism – Polymer structures – Deformation of polymers – Behaviour of polymers.

Ceramic: Ceramics phases – Structure of ceramics phases – Classes – Effect of structure on the behaviour of ceramic phases – Composites.

Text Books and References:

1. Material Science and Engineering, V. Ragavan, Prentice Hall of India, 1995.
2. Fundamentals of Solid State Physics, B.S. Saxena,R.C. Gupta and P.N. Saxena, Pragathi Prakashan, 1996.
3. Soild State Physics, RL. Singhal, Kedar Nath Ram Nath and Co, 2001.
4. Elements of Material Science and Engineering, LH. Van.Vlack, Addison Wesley Publishing Co., 1987.
5. Solid State Physics, RC. M. Kachava, Tata McGraw Hill, 1994.
6. Material Science, M. Arumugam, Anuradha Publications, 2006.
7. Solid State Physics, A.J. Dekker, Mc Millan Publications, 1981.
8. Material Science, G.K. Narula, K.S. Narula, V.K. Gupta, Tata McGraw Hill, 2000.

IPHT 93 - MICROCONTROLLER AND ITS APPLICATION

Objective: This paper gives a systematic, step by step approach to cover various uses of microcontroller 8051, assembly language programming and interface

Unit – I: Introduction to Microcontroller

Introduction to microcontroller and embedded system – 8051 microcontroller : Pin configuration, Architecture and Key features.

Unit – II: Assembly Language Programming

8051 data types and directives - Data transfer instructions - Addressing modes – Jump, Loop and Call instructions and programs - Arithmetic instructions and programs – Logical instructions and programs – Single bit instructions and programs.

Unit – III: 8051 Serial Communication

Basics of serial communication – Half and full duplex transmission- Asynchronous serial communication –Data communication classification.

Unit – IV: Interfacing to External Memory

Semiconductor memory-memory capacity-Organization-Speed-ROM-PROM-EPROM-Flash memory EPROM-Mask ROM. RAM-Static RAM- Dynamic RAM-Non-volatile RAM.

Unit – V: Applications of 8051 Microcontroller

Applications: LCD interfacing – ADC interfacing – Interfacing with temperature sensor LM34 and LM 35. Interfacing of 8051 with stepper Motor – Key board interfacing – DAC interfacing.

Text Books and References:

1. The 8051 Microcontroller and Embedded systems, Muhammad Ali Mazidi and Janice Mazidi. Pearson Education, 2000.
2. The 8051 Microcontroller Architecture, Programming and Applications. Kenneth J. Ayala. Penram International publishing Pvt. Ltd., second edit, 1996.
3. The 8051 Microcontrollers, Architecture, Programming, Interfacing and System Design, Raj Kamal, Pearson Education, 2012.
4. The 8051 Microcontroller and Embedded Systems using Assembly and C, 2nd Edition, Pearson Education, 2007.

IPHP 94 - PRACTICAL – VIII

(Any Sixteen Experiments)

1. Low field Hysterisis
2. Susceptibility of liquids using Guoy-Balance
3. Susceptibility of liquids by Quinke's method
4. Photo elastic constant
5. Hysterisis loop tracer
6. Cu-Salt (visible) Spectrum
7. Molecular constants-CN Band
8. Channel Spectrum
9. R.F.Oscillator- construction and determination of dielectric constant.
10. Ultrasonic velocity of liquid mixtures- Interferometer
11. Phase diagram of single component-using Potentiometer.
12. G.M. Counter characteristics
13. Microcontroller 8051 Experiment-I (Addition and Subtraction and Logical operations)
14. Microcontroller 8051 Experiment-II(Multiplication and Division and Solving expressions)
15. Microcontroller 8051 Experiment-III (Logical operations, 1's and 2's compliment)
16. Array Operations-I Microcontroller 8051(Sum of elements, biggest and smallest numbers)
17. Array Operations-II Microcontroller 8051(Ascending and descending order)
18. Microcontroller 8051 - Code conversion
19. Microcontroller 8051 – ADC interfacing
20. Microcontroller 8051 - Stepper motor interfacing

FIFTH YEAR : TENTH SEMESTER

IPHT 101 - QUANTUM MECHANICS – II

Objective: To bring exposure to the kinetics of relativistic and non-relativistic concept.

Unit – I: Time Dependent Perturbation

Time dependent perturbation theory – First order perturbation – Density of states – Transition probability per unit time – Fermi's Golden rule – Harmonic perturbation. Semi classical theory of radiation – Absorption and induced emission – Spontaneous emission – Einstein's A and B coefficients – Inter relation – Dipole transition – Selection rules for the single particles – Selection rules for many particles – Photo electric effect – Kramer-Heisenberg dispersion formula – Raman scattering.

Unit – II: Theory of Angular Momentum

Angular momentum of system of particle – Commutation rules – Eigen value spectrum – Matrix representation of J in the Jm> basis – Pauli's spin matrices – Spinars density matrix – Addition of angular momentum – Triangular rule – Coupled and uncoupled representation – CG coefficient for $j_1=j_2= ½$.

Unit – III: Quantum Theory of Valency

Hydrogen ion – Secular equation for energy – Hydrogen molecule – Heitler-London method – Potential energy of the hydrogen molecule – Symmetric and anti symmetric potential – LCAO – MO theory – Hybridisation – Application to methane, benzene and water molecules. Central field approximation – Thomas-Fermi statistical method- Density functional theory – Basic idea of SCF, Hatree and Hatree - Fock method.

Unit – IV: Relativistic Quantum Mechanics

Inadequacy of Schrodinger equation – KG equation – Merits and demerits – application to Hydrogen atom. Dirac's relativistic Hamiltonian – Dirac matrices and their properties – Plane wave solutions – Spin of a Dirac particle. Probability density-Magnetic moment of electron-spin orbit interaction-Radial equation for an electron in a central potential-Hydrogen atom.

Unit – V: Field Quantization

Electromagnetic wave as Harmonic oscillators – Quantization of field oscillators – Photons – Number operator – Creation and annihilation operators of photons – Atom interacting with a quantized radiation – Spontaneous emission – Elements offield quantization for nonrelativistic field – Systems of Bosons fermions – Eigen value spectrum.

Basic ideas of Feynman diagram – World line – Space – Time - Feynman graph for scattering of an electron by a potential.

Text Books and References:

1. Quantum Mechanics, L.I. Schiff, McGraw Hill, 2000.
2. A text book of Quantum Mechanics, P.M Mathews and K. Venkatesan, Tata McGraw Hill publishing company Ltd., 2002.
3. Quantum Chemistry, Eyring Walter and Kimble, McGraw Hill,1968

4. Quatum Mechanics, G.S. Chadda, New Age International,2005
5. Quantum Mechanics, V. Devanathan, Weily Eastern, 2005.
6. Quantum Mechanics, V.K. Thankappan, II edition, New Age International (P) Ltd., 1996.
7. Advanced Quantum Mechanics, Sathyaprakash, Pragathiprakash publishing Ltd,1996.
8. Fundamentals of Quantum Mechanics, Y.R. Weghmare, Wheeler publishing, Chennai, 1974.
9. Relativistic Quantum Mechanics, J.D. Bjorken and S.D. Drell, McGraw Hill, 1964.
10. Quantum Mechanics, G.Aruldhas, Prentice Hall of India, 2002.

IPHT 102 - NUCLEAR AND PARTICLE PHYSICS

Objective: This paper is designed to impart the general properties of nuclei, nuclear forces and various models developed. It also provides the knowledge on the nuclear reactions, nuclear energy, elementary particles and symmetry schemes.

UNIT – I: Nuclear Properties and Mass Spectrographs

Nuclear mass and binding energy- Variation of binding energy with mass - Spin and parity - Isospin- Semi empirical mass formula - Stability of nuclei - Mass parabolas for different types of nuclei.

Magnetic dipole moment - Electric quadrupole moment - Measurement of the charged radius using electron scattering experiment. Double focussing mass spectrograph - Cyclotron mass spectrograph.

UNIT – II: Nuclear Force and Models

Characteristics of nuclear force - Meson theory and Yukawa's potential -n-p scattering at low energies (scattering length, phase shift, spin dependence, coherent scattering, shape independent effective range theory)-similarity between-n-n and p-p forces- exchange forces-non-central forces- theory of ground state of deuteron.

Nuclear models: Degenerate gas model- liquid drop model - Shell model and collective model.

UNIT – III: Nuclear Reactions and Neutron Physics

Types of nuclear reactions - Conservation laws for nuclear reactions - Kinematics of nuclear reactions- Q-value-nuclear reaction cross section- Compound nucleus theory - Breit-Wigner one level formula for scattering.

Neutron physics: discovery of neutrons- neutron sources - Fundamental properties of neutron - Classification of neutrons- Detection of neutrons - Neutron diffusion- Thermal neutron diffusion - Diffusion of fast neutrons and Fermi age equation.

UNIT – IV: Nuclear Energy

Nuclear fission- Energy release in fission reaction - Distribution of fission products-neutron emission in fission - Fissile and fertile materials - Nuclear fission and liquid drop model

-Bohr Wheeler theory.

Nuclear chain reaction - Four factor formula - Nuclear reactors - Critical size of a reactor - Reactor materials - Classification of reactors.

UNIT – V: Elementary Particles and Symmetry Schemes

Classification of elementay particles - Fundamental particle interactions - Conservation laws - CP and CPT invariance - CP violation in neutral K-decay, hyper nuclei-strangeness and associated production - Gell-Mann-Nishijima formula - Gellmann-okubo mass formula.

Quark model, flavours and colours - Isospin and SU(2) symmetry - Eight-fold way and supermultiples- SU(3) symmetry schemes for boson octet, baryon octet and baryon decuplet.

Text Books and References:

1. Elements of Nuclear Physics, M.L. Pandiya and P.R.S Yadav, Kedar Nath, Ram Nath, 1993.
2. Basic Nuclear Physics, S. Srivastava, Pragathi Prakashan, 1998.
3. Nuclear Physics, R.R. Roy and B.P. Nigam, Wiley, Estern Ltd., 1993.
4. Nuclear Physics, S.N. Ghoshal, S. Chand and Co., 2006.
5. Nuclear Physics, D.C. Tayal, Himalaya Publishing House, 1995.
6. Theoretical Nuclear Physics, John. M. Blatt and Victor V. Weisskopf, John Wiley and Sons, 1952.
7. Nuclear Physics, Irving Kaplan, Narosa Publishing House, 1996.
8. Basic Nuclear Physics and Cosmic Rays, B.N. Srivatsava, Pragathi Prakashan, 1992.

IPHT 103 - SPECTROSCOPY

Objective: This paper deals with the different regions of the electromagnetic spectrum for understanding the symmetry of molecular groups, molecular structure, the nature of bonding and its utility in conformation analysis.

Unit-I: Group Theoretical and Force field studies of polyatomic molecules.

Symmetry of polyatomic molecules and molecular vibrations - Selection rules for Raman and IR vibrational normal modes - calculation of normal modes for Raman and IR active to C_2V and C_3V point groups by group theoretical methods.

Representations for molecular vibrations in internal and symmetry coordinates - calculation of F and G matrices - Normal coordinate analysis for simple polyatomic molecules (H_2O and NH_3).

Unit-II: NMR and NQR Spectroscopy

Nuclear Magnetic Resonance Spectroscopy: General principles of NMR - Quantum theory of NMR - design of CW NMR spectrometer - chemical shift - application of chemical shift to molecular structure.

Nuclear quadrupole resonance spectroscopy - Definition of Nuclear quadrupole moment -

asymmetry parameter-Integral spins - Fundamental requirements of NQR spectroscopy - Block diagrams of NQR Spin spectrometer-continuous wave oscillators-principle of super regenerative oscillators - pulsed RF detector - Application of NQR with special reference to chemical bonding.

Unit-III: ESR Spectroscopy.

Origin of electron spin resonance and resonance condition – Thermal equilibrium and relaxation – Quantum mechanical theory of ESR – Representation of ESR spectrometer – Requirements of ESR spectrometer – Block diagram of a simple ESR spectrometer – Hyper fine structure splitting in isotropic systems involving more than one nucleus – contributions to hyperfine coupling – ESR of triplet states – application of ESR to Solid State Physics (crystal defects) Biological applications.

Unit-IV: Mossbauer Spectroscopy.

Principle of Mossbauer Effect –Recoilless emission and absorption – Mossbauer spectrometer – schematic (basic) arrangement – principle of detecting Mossbauer absorption (nuclear volume effect) signal – chemical isomer shift – Theories and interpretation. Electric quadrupole interactions – magnetic interactions – Applications of Mossbauer with special reference to molecular structure, geometrical isomerism, oxidation states and magnetic ordering – geological and biological applications.

Unit-V: Fluorescence and Phosphorescence Spectroscopy.

Origin of Fluorescence and Phosphorescence – resonance fluorescence and normal fluorescence – selection rules – Shpolskii effect – Phosphorescence – triplet states – intensity – delayed fluorescence – spectrofluorimeter design – analytical applications of fluorescence and phosphorescence.

Text Books and References:

1. G.M. Barrow – Introduction to Molecular Spectroscopy, McGraw Hill,1962.
2. C.N. Banwell – Fundamentals of Molecular Spectroscopy- Tata McGraw Hill, 1962.
3. B.P. Straughan and Walker – Spectroscopy – Chapman & Hall, 1976.
4. S.L. Gupta, V. Kumar and R.C. Sharma – Elements of Spectroscopy – Pragathi and Prakashan Publishing Company, Meerut, 1974.
5. Gurdeep Chatwal and Sham Anand – Spectroscopy (Atomic and Molecular) – Himalaya Publishing House**,** 2003.
6. J.E. Wertz & J.R. Boulton – Electron spin resonance – Elementary theory and Practical applications – McGraw Hill – 1972.

IPHT 104 - PHYSICS OF NANOMATERIALS

Objective: Nano Sciences, the emerging area of science brings together physics, chemistry and biology to create a scientific discipline of almost infinite potential. Physics of nano materials is concerned with the study, creation, manipulation and applications of materials at nanometer scale.

Unit – I: Introduction

Introduction – History of nanotechnology - Classification of nanomaterials: Definition of – Zero, one and two dimension nano structures – Examples - Classification of synthesis methods. Surface energy – Chemical potential as a function of surface curvature – Electrostatic stabilization - Steric stabilization – DLVO theory.

Unit – II: Special Nanomaterials

Carbon Fullerenes and Nanotubes: Carbon fullerenes, Fullerene derived crystals, Carbon nanotubes. Micro and Mesoporous Materials: Ordered mesoporous structures, Random mesoporous structures, crystalline microporous materials. Core-shell structures: Metal-oxide structures, Metal-polymer structures, Oxide-polymer structures. Organic- Inorganic Hybrids. Intercalation Compounds – Nanocomposites.

UNIT – III: Properties

Physical properties of nanomaterials: Melting points, Specific heat capacity and lattice constants – Mechanical properties – Optical properties:-Surface Plasmon Resonance – Quantum size effects – Electrical property: Surface scattering, charge of electronic structure, Quantum transport, effect of microstructure: Ferroelectrics and dielectrics – Variation of magnetism with size-Super para magnetism-Diluted magnetic semi conductor.

UNIT – IV: Synthesis

Synthesis of nano materials: Physical vapour deposition - Chemical vapour deposition plasma arching - Sol gel - Ball milling technique - Reverse miceller technique - Electro deposition. Synthesis of Semiconductors: Nanostructures fabrication by physical techniques – Nano lithography – Nanomanipulator.

UNIT – V: Characterization and Applications

Structural Characterization: X-Ray diffraction – Scanning tunneling Microscopy – Transmission Electron Microscopy – Chemical Characterization: Optical spectroscopy.

Applications: Molecular electronics and Nano electronics, Nano electromechanical systems- Colorants and pigments –DNA chips – DNA array devices – Drug delivery systems.

Text Books and References:

1. Nanoscale Materials in Chemistry, Kenneth F. Klablunde, John wiley and sons, Inc., 2001.
2. The Essentials, Pradeep T, Nano: Tata MC Graw-Hill publishing company limited, 2007.
3. Nanobiotechnology: Concepts, Applications and Perspectives, Christof M. Niemeyer, Chad A. Mirkin, 2004.
4. Nanotechnology, Wilson M, K Kannangara, G. Smilt, M. Simmons and B. Boguse-Overseas Press, 2005
5. Nanomedicine, Freitas R A, Landes., TX publication, 1996.
6. Nano Materials, Viswanathan B, Narosa publishing house, 2010.

IPHP 105 - PRACTICAL – IX

(Any Sixteen experiments)

1. Spectrophotometer
2. Co-effeicient of linear expansion-Interference Method.
3. R.F. Oscillator- Dipolemoment of Liquids
4. Susceptibility of Salt solutions/ Solids-Guoy method
5. Susceptibility of liquid mixture- Quinckes method-Calculation of Bohr magneton.
6. Phase diagram-Two component system.
7. Molecular constants –ALO Band
8. Molecular constants- CN Band.
9. Cu-Salt spectrum ultra violet region.
10. Optical rotation of quartz.
11. G.M. Counter -Absorption co-efficient of a foil.
12. F.P. Etalon.
13. Dielectric of Solidsm
14. Particle size analyzer using Laser.
15. Stark Effect.
16. Micro hardness of a Crystal.
17. 8051 Micro controller - Setting bits and Masking bits in an 8-bit number.
18. Microcontroller 8051 - Generate a delay.
19. Microcontroller 8051 - DAC interfacing.
20. Microcontroller 8051 – Display and Rolling of messages.

OPTIONAL COURSES OFFERED BY THE DEPARTMENT

OPTIONAL III

IPHTO 96.1 : INSTRUMENTATION

Objective: This paper highlights the concept of instrumentation and functioning of various analytical instruments in diversified fields.

Unit – I: Transducers

Basic functional elements of a measuring system-Transducers: Definition-Parts-Classification-Types of primary sensing element.

LVDT: Principle –Working –Measurement of displacement.

Electrical Strain Gauge: Principle-Theory-Types-Working -Measurement of Force (or) Pressure.

Capacitive Transducers: Principle-Types-Working-Measurement of linear and angular displacement.

Thermistor: Principle-Working-Measurement of temperature.

Piezo electric transducers: Principle, theory and working of piezo electric crystals.

Unit – II: Digital Instrumentation

Principle, block diagram and working of: Digital Multimeter, Digital Frequenc y counter, Digital P_H meter, Digital conductivity meter, Digital storage Oscilloscope and Q-meter.

Unit – III: Analytical Instrumentation

Principle, working, Instrumentation and applications of UV-Vis Spectrophotometer, ICP-AES, (Inductive coupled plasma-Atomic emission spectroscopy), SEM (Scanning Electron Microscope) and AFM (Atomic Force Microscopy).

Unit – IV: Bio-Medical Instrumentation

Orgin of Bio–potentials: Measurements- Resting and action potentials-Characteristics of resting potential-Bio electric potentials-Types of bioelectric signal and their characteristics.

Components of the Bio-medical instrument system-Electrodes: Equivalent circuit-Theory -Types.

Principle, block diagram and functioning of ECG, EEG and EMG.

Unit – V: Medical Imaging Instrumentation

Magnetic Resonance Imaging: Principle-Magnetic resonance phenomena-Magnetic resonance imaging-Imaging process-Instrumentation.

Ultrasonic Imaging System: Principle-Construction of an ultrasonic transducer-Ultrasonic propagation through tissues-Display-A mode- B mode- M mode-TM mode-Doppler mode-Recording devices.

Computed Tomography: Principle-CAT scanning-Instrumentation-Contrast scale-Scanning components.

Text Books and References:

1. Electrical and Electronics Measurement and Instrumentation, A.K.Sawhney, Dhanpath Rai and Co., Pvt., Ltd., 2000.
2. Electronic measurements and Instrumentation, Dr.Rajendra Prasad, Khanna Publishers, 2002
3. Instrumental methods of analysis, Willard.D. Merrit et.al.,CBS Publishers, 2004.
4. Instrumental methods of analysis, Gurdeep Chatwal and Sham Anand, Himalaya Publishers, 2003.
5. Biomedical Instrumentation, M.Arumugam, Anuradha Publishers, 2001.
6. Hand Book of Biomedical Instrumentation, R.S.Khandpur, TMH, 2004.
7. Instrumentation, B.C.Nakra and K.K.Chawdry, Measurement and Analysis, TMH, 2004.
8. Modern Electronic Instrumentation and Measurement Techniques, Albert D.Helfrock and William D Cooper, Printice Hall of India, 2000.
9. Instrumentation, V.Ramasamy, Swami Publications, 2005.
10. Bio Medical Electronics and Instrumentation, S.K.Venkata Ram, Galgotia Publications Pvt. Ltd., 2001.

IPHTO 96.2 : BIOPHYSICS

Objective: This paper helps to understand the applications of various microscopic tools in cell biology. This paper helps the reader to understand the fundamentals of macromolecular structure and the analytical techniques in characterizing biomolecular interactions and its structure.

Unit I: Cell Organization

Cell as the basic structural unit- Origin & organization of Prokaryotic and Eukaryotic cell- Cell size & shape- Fine structure of Prokaryotic & Eukaryotic cell organization (Bacteria, Cyanobacteria, plant & Animal cell)- Internal architecture of cells- cell organelles- compartment & assemblies membrane system- Ribosome- Polysomes- Lysosomes- Peroxisomes- Connection between cell & its environment- Extracellular Matrix.

Unit II: Tools in Cell Biology

Light microscope- Resolving Power- Phase contrast microscope- Detection of small differences in refractive indices- Interference microscope-, Dark field microscope- Polarization microscope- Fluorescence microscope- Cytophotometry methods- Flowcytometry & cell sorting- Electron microscopy- specimen preparation- Scanning Electron Microscopy (SEM)- Transmission Electron Microscopy (TEM)-Applications.

Unit- III: Macromolecular structure

Nucleic acid structure: Chemical structure of the nucleic acid - Conformational possibilities of monomers and polymers- Double helix structure of DNA- Polymorphism of DNA- DNA nanostructures and the structure of transfer RNA.

Proteins structure: Amino acids and the primary structures of proteins – Secondary – Tertiary - Quaternary structure and virus structure.

Unit-IV: Seperation Techniques

Centrifugation**:** Principle of centrifugation –Analytical ultracentrifugation – Differential centrifugation – Density gradient centrifugation.

Chromatography**:** Principles of chromatography– Paper chromatography – Thin layer chromatography (TLC) – Gas liquid chromatography (GLC) – High performance liquid chromatography (HPLC).

Electrophoresis: Principles – Factors affecting the migration of substances – Supporting media in electrophoresis – Gel electrophoresis – Polyacrylamide gel electrophoresis (PAGE) – Sodium dodecyl sulphate polyacrylamide gel electrophoresis (SDS-PAGE).

Unit V: Optical & Diffraction Techniques.

Circular Dichroism and optical rotator dispersion-: Plane, circular and elliptical polarization of light- Absorption by oriented molecules- Dichroic ratio of proteins and nucleic acids- Circular dichroism (CD) - optical rotatory disperson (ORD) - Relation between CD and ORD- Application of ORD in conformation and interactions of biomolecules.

Crystallization of proteins- preparation of heavy metal derivatives- Patterson synthesis- isomorphous replacement methods- structure factors of centro-symmetric and non-centrosymmetric crystals- General remarks on Protein-Structure determination from X-ray diffraction data-Neutron diffraction-, Electron diffraction-, Synchrotron diffraction, Application in Biomolecular structural studies.

Text Books and References:

1. The Cell: A Molecular Approach, Geoffrey M.Cooper, ASM Press, 2013.
2. Biophysics, Vasantha Pattabhi, N. Gautham, Narosa Publishing, 2009.
3. Biophysics P.S. Mishra, VK Enterprises, 2010.
4. Biophysics, M.A. Subramanian, MJP Publishers, 2005.
5. Bioinstrumentation, L.Veerakumari, MJP Publishers, 2006.
6. Fundamentals of Biochemistry, A.C. Deb, New central book agency, 2011.

OPTIONAL IV

IPHTO 106.1 : PETRO PHYSICS

UNIT – I

Magneto crystalline anisotropy – Dipolar anisotropy – Single ion anisotropy – Anisotropic exchange – Constants. Magnetic properties of mineral systems – Solid- Solid – Solution of oxides of iron – magnetite, haematite magnemites, titano magnetites, titono magnemites, haematite – illmenite solid solution and pyrhotites – Intrinsic properties, magnetization process, weak field remanance.

Remanance properties- NRM, TRM, CRM, DRM, VRM, PRM – their mechanisms – Thermal demagnetization technique – partial TRM – additive law – Neel's theory of TRM. Primary and Secondary magnetization – Testing for stability of remanance.

UNIT – II

Geomagnetic elements of the earth – Field variation and detection - The Magnetic observatory – mapping of secular variations. Diurnal variation of magnetic disturbances – initial susceptibility of rocks – single and multidomain cases – Curie point determination and its importance.

Laboratory and field instruments for magnetic measurements – Astatic magnetometer – spinner magnetometer – Fluxgate magnetometer, Proton procession magnetometer – Theory, practice and applications.

UNIT -III

Classification of rock forming minerals – physical properties of minerals with special reference to optical properties – elementary details of a polarizing microscope and petrographic analysis.

Geophysical prospecting – different methods – Geophysical properties of rocks and minerals – Resistivity methods – Two current electrode method - different electrode layouts – measuring equipment – application to ground water survey.

UNIT – IV

Seismic waves – S waves & P waves – elastic, plastic behavior of rocks – modulus of elasticity in rocks – Time distance curves and the location of epicenters – Derivation properties from the velocities – the recent developments.

UNIT – V

Geochronology – the geological time scale – archaeo-magnetic dating – Radio active methods of dating – Rubidium, Strontium method – Potassium Argon method – Thermo-luminescence dating and interpretation of data.

Text Books and References:

1. Introduction to Geophysics – Howell, McGraw Hill Book Co.
2. Introduction to Geophysics – G.D. Garland, 2nd Edn. Saunder's Book Co.
3. Principles and Applications of Palaemaguetism – T.H. Tarling, Chapmann and Hall.
4. Palaemaguetism and plate tectonics – Mc Elhinny, Cambridge University Press.
5. Introduction to Geophysical propecting – Dobrin, McGraw Hill Book Co.
6. Solid State Physics – RL. Singhal, Kedarnath Ramnath & Co. Meerut.
7. Solid State Physics – A.J. Dekker, Prentice Hill.
8. Solid State Physics – Semana and Gupta and Sexana Pragati Prakash, Meerut.
9. Applied Geophysics – Eve and Keys, Cambridge University Press.
10. Rock and Mineral magnetism – W.O. Reilly, Blackmoore.

IPHTO 106.2 : MEDICAL PHYSICS

Objective :

To understand the working principles of various instruments in medicine and to update the knowledge of various techniques for the reader.

Unit – I: Bio-Electric Potentials

Resting and action potentials - Propagation of action potentials – Bioelectric potentials – Electrocardiogram (ECG) – electroencephalogram (EEG) – Electromyogram (EMG) – Electroetinography – Electrooculography (EOG).

Bio- potential Electrodes – Types of electrodes – Microelectrodes – Body surface electrodes – Depth and Needle electrodes – Chemical electrodes – Distortion in measured bioelectric signals using electrodes – Electrode paste.

Unit – II: Digital X-ray imaging and Computed Tomography

Production of X-rays – Types of X-ray tubes – Generators – Interaction of X and Gamma rays with matter – Image formation and image quality – CR and DR – the image intensifier – fluoroscopy – Equipment for computed tomography scanning – Image reconstruction – Helical and multi-slice scanning – Image quality and artifacts – CT dose index.

Unit – III: Imaging with Ultrasound and MRI

Piezoelectric effect – Interference – Different types of transducers – Modes of scanning – Image quality and artifacts – Doppler methods – Hemodynamic data – The spinning proton – the MR signal – Spin echo sequence – Spatial encoding – Other pulse sequences – functional MRI – Image quality and artifacts – Magnets and coils – Hazards and safe practice –Thermograpy – endoscopy.

Unit – IV: Physics of Nuclear Medicine and Biological effects of Radiation

Radioactivity - Radioactive transformation – Radiopharmaceuticals – Hot lab – Gamma camera – Planner imaging – tomography with radionuclide – PET scanner – Characteristics and quality assurance of images – Precautions necessary in handling open radioactive sources – Ionizing radiation interactions with tissues – Radiation dose and units – Effects of radiation – Principles of radiation protection – ICRP, BARC and AERB – eLORA – Practical aspects of radiation protection.

Unit – V: Medical Imaging Instrumentation

Radiation therapy – Surgery – Chemotherapy – Hormone therapy – Immunotherpy and Radionuclide therapy – Begin and malignant disease – Methods of spread of malignant disease – Staging and grading systems, Treatment intent – Curative and Palliative – Teletherapy and Brachy therapy – Co-60 and other radioactive sources used in the treatment of cancer – Linear accelerator – Modern treatment techniques – Treatment planning – Non-Photon ionizing radiation treatments and challenges.

Text Books and References:

1. Farr's Physics for Medical Imaging, Penelope Allsiy, Rpberts, Jerry R.Villiams, Saunders, Elsevier, Second Edition, 2008.
2. Bio Medical Instrumentation, T.Rajalakshmi, First Edition, 2008.
3. Bio Medical Instrumentation, M.Arumugam, Fourth reprint, 2000.
4. Handbook of Biomedical Instrumentation, R.S.Khandpur, 2007.
5. The Physics of Radiation Therapy, Fiaz M.Khan, 2006.
6. Nuclear Medicine Physics, Ramesh Chandra, 5th Edition, Lea and Febiger.

OPTIONAL COURSES OFFERED TO OTHER SCIENCE DEPARTMENTS IN THE II, III and IV SEMESTERS

OPTIONAL – I

OIPHT 01 : PHYSICS OF THE EARTH

Objective:

To understand the physical structure and behavior of the earth as well as geomagnetic properties of rocks in the Earth's crust.

Unit – 1: Solar System

The earth and the solar system – Important physical parameters and properties of the planet earth; Stress and Strain, Wave and motion, Seismic waves. Travel time Tables and Velocity – Depth curves – Variation of Density within the Earth.

Unit – 2: Gravitation

Rotation of the Earth - Gravitational attraction, Gravitational Theory, Measurements of Gravity, Gravity meters - Principles and method of measuring gravity - Gravity anomalies-Local and regional variations.

Unit – 3: Thermal history of earth

Thermal history of the Earth. Temperature in the Primitive Earth and the Earth's surface and interior. Thermal conductivity. Generation of heat in the Earth. Heat flow measurements, methods and results.

Unit – 4: Elastic properties

Elastic constants and Elastic process in the earth. Earth's free rotation. Latitude variation. Tides of the Solid earth. Numerical values of Love's numbers. Rigidity of the Earth. Bulk modules in the earth. Poisson's ratio in the Earth, Young's modulus and Lame's constant.

Unit – 5: Geomagnetism and Palaeomagnetism

Geomagnetism and palaeomagnetism-Earth's magnetic field. Origin-Theory of earth's magnetic field. Magneto hydrodymics of the Earth. Magnetic reversals. Polar wandering. Tectonic movements and its relation to palaeomagnetism - Measurement of magnetic properties of rocks.

Text Books and Reference:

1. Physics of the Earth and Planets, A.H.Cook , Macmillan, 1973.
2. Physics of the Earth's Interior, Gutenberg, International Geophysics series, Vol.1 Academic press, 1959.
3. Physics and Geology, J.A.Jacobs, R.D.Russel and J.T.Wilson,1974.
4. International student edition. P.J.Wyllie, The Dynamic Earth, John Wiley and sons, 1971.
5. Applied Goephysics, A.S.Eve and Keys,D.A, Cambridge University, 1954.
6. The Solid Earth: An Introduction to Global Geophysics, C.M.R .Fowler, Cambridge University press, 1990.
7. Geomagnetic reversals and Plate tectonics, Alan Cox, Freeman and company, 1973.

OPTIONAL – II
OIPHT 02 : BIO-MEDICAL INSTRUMENTATION

Objective:

To understand the working principles of various instruments in medicine and to update the knowledge of various imaging techniques and physiological parameters for the readers.

UNIT – I: Bio-Electric Potentials

Resting and action potentials – Propagation of action potentials – Bioelectric potentials- Electrocardiogram (ECG) – Electroencephalogram (EEG) –Electromyogram (EMG) – Electroretinography(ERG) - Electrooculography (EOG)

UNIT – II: Bio-Potential Electrodes

Biopotential Electrodes – Types of Electrodes -Microelectrodes – Body surface electrodes – Depth and Needle electrodes- Chemical electrodes –Distortion in measured bioelectric signals using electrodes-Electrode paste

UNIT – III: Imaging Equipments

Ultrasonic Imaging-Reflection-Scattering-A mode display-B mode display-T-M mode display-Ultrasonic imaging instrumentation-Biomedical applications- Magnetic Resonance Imaging (MRI)-Principle-Instrumentation-Advantages of MRI over other medical imaging techniques- Thermography-Endoscopy

UNIT – IV: Measurement of Physiological Parameters

Blood Pressure Measurement-Introduction-Direct Measurement using Catheters-Advance of Direct Method-Indirect Method-Oscillometric measurement method-

Electromagnetic Blood Flow Meters-Ultrasonic Blood Flow Meter-transit time method-Doppler effect based ultrasonic blood flow meter-laser Doppler Blood Flow Meter-NMR Blood Flow Meter

UNIT – V: Laser in Medicine

Introduction- Characteristics of laser light- Generation of laser- Components of laser-Types of laser-Nd-YAG laser-Helium-Neon laser - CO_2 laser- Semiconductor laser- Applications of laser in Medical field.

Text Books and References:

1. Bio Medical Instrumentation, T.Rajalakshmi, First Edition, Sams Publishers, 2008.
2. Biomedical Instrumentation, M.Arumugam, Fourth reprint, Anuradha Agencies, 2000.
3. Hand book of Biomedical Instrumentation, R.S. Khandpur, Tata McGraw Hill, 2007.

OPTIONAL – III
OIPHT 03 : ENERGY PHYSICS

Objective: This paper deals with the practical usage of solar energy in various forms and other

alternative energy sources.

UNIT– I: Conventional Energy Sources

Energy sources and their availability – Various forms of energy – Renewable and conventional energy systems – Comparison – Coal, oil and natural gas.

UNIT – II: Solar Energy

Solar Energy - Thermal application and solar radiation – Energy alternatives – Devices for thermal collection and storage – Thermal applications – Water heating – Space heating – Power generation – Instruments for measuring solar radiation and sun shine.

UNIT – III: Thermal Energy Storage

General characteristics - Definitions - Methods of classifications - Thermal energy storage - Sensible heat storage - Liquids - Solids – Latent heat storage - Thermal chemical storage.

UNIT – IV: Photo Conversion

Photovoltaic conversion - Principle and working of solar cells - Conversion efficiency - Single crystal and Polycrystalline silicon - Cadmium sulphide - Cadmium telluride.

UNIT – V: Other Forms of Energy

Wind energy - Recent developments – Hydel energy - Energy from waves and tides – Thermal energy – Energy from biomass – Bio diesel – Physical and chemical properties of Bio diesel.

Text Books and References

1. Solar energy (Second edition), P. Sukhatme, Tata McGraw-Hill, 2008.
2. Renewable energy sources and emerging Technologies, D.P. Kothari, K.C. Singal and Rakesh Ranjan, Prentice Hall of India, 2008.
3. Renewable Energy sources and their Environmental Impact, S.A. Abbasi and Nasema Abbasi PHI Learning Pvt. Ltd., 2008.

OPTIONAL – IV
OIPHT 04 : BIOPHYSICS

Objective: This paper is aimed at to studying the analytical separation and spectroscopic techniques for characterizing biomolecular interactions.

Unit – I: Seperation Technique

Chromatography- Column Chromatography, Thin layer Chromatography, Paper Chromatography, Adsorption Chromatography, Partition Chromatography, Gas liquid Chromatography, High performance liquid Chromatography.

Electrophoresis-Moving boundary electrophoresis- Zone electrophoresis- Low voltage electrophoresis- High voltage electrophoresis- Gel electrophoresis- Poly acrylamide gel electrophoresis (PAGE) - Sodium dodecyl sulphate poly acrylamide gel electrophoresis (SDS-PAGE) - Iso electric focusing electrophoresis- Continuous flow electrophoresis.

Unit – II: Centrifugation and Laser

Centrifugation- Basic principles of sedimentation - Relative centrifugal force (RCF)- Sedimentation Rate - Svedberg unit or Sedimentation Coefficient - Types of Centrifugation - Analytical Centrifugation - Ultra centrifugation - Preparative centrifugation Differential centrifugation – Density gradient centrifugation-Rate zonal centrifugation - Isopycnic centrifugation.

Introduction- Characteristics of laser light- Generation of laser- Components of laser- Types of laser-Nd-YAG laser-Helium Neon laser - CO_2 laser- Applications of laser in Medical field.

Unit – III: Tools in Cell Biology

Light microscopy- elementary geometrical optics, Limits of resolution. Types of microscopy- Bright field microscopy- Phase contrast microscopy-Fluorescence microscopy-Polarising Microscopy- Electron Microscopy- Scanning electron microscope (SEM) - Transmission electron microscope (TEM) - Preparation of the specimen for electron microscopy - Atomic force microscope.

Unit – IV: Spectroscopy-I

Elecromagnetic radiation- Beer-Lambert's law- Calorimeter- Spectrometer- Single and Double beam Spectophotometer- Ultraviolet and visible Spectroscopy-Origin and theory of UV Spectra –Instrumentation- Applications

Fluorescence spectroscopy- Principles- Single and Double beam spectrofluorimeter – Applications.

Unit –V: Spectroscopy-II

Introduction - Basic concept of IR spectroscopy-IR spectrometer- Infrared Spectroscopy Basic concept of IR Spectroscopy - IR Spectrometer- Principle and instrumentation- Sample handling techniques- FTIR- principle –Instrumentation –Applications

Introduction-Basic concept of Raman Spectroscopy-Raman Spectrometer-Instrumentation and working – Applications

Text Books and References

1) Biophysics, Vasantha Pattabhi, N. Gautham, Narosa Publishing, 2009
2) Biophysics P.S. Mishra, VK Enterprises, 2010
3) Biophysics, M.A. Subramanian, MJP Publishers, 2005
4) Bioinstrumentation, L.Veerakumari, MJP Publishers, 2006