I. General Structure for the Career related first degree Programme in Physics & Computer Applications

Sem. No.	Course title	Instructional hours/week		Credit	Uty.Exam duration	Evaluation		Total credit
		L	P			Internal	Uty. exam	
I	EN1111.3 English Lang I	5		3	3 hours	20%	80%	
	ML/HN1111.3 Addl Lang I	5		3	,,			
	PC1121 Foun Course (Core) I	3		3	,,			16
	Core Course (Lab)		2	-	-			
	PC1171 Voc Course I	3	2	3	3 hours			
	MM1131.6 Compl. Course I	5		4	,,			
II	EN1211.3 Eng Lang. II	5		3	3 hours			
	ML/HN1211.3 Addl Lang. II	5		3	,,			
	PC1221 Foun Course(Voc) II	3		2	,,	,,	,,	21
	PC1241 Core Course I	5		4	,,			
	PC1242 CoreCourse II (LabI)		2	3	,,			
	MM1231.6 Compl. Course II	5		4	,,			
	PC1271 Voc.Course II(Lab)		2	3	,,			
III	EN1311.3 Eng Lang. III	5		3	3 hours			16
	PC1341 Core Course III	3	4	3	,,			
	PC1371 Voc.Course III	3	-	3	,,	,,	,,	
	PC1372 Voc.Course IV	3	2	3	,,			
	MM1331.6 Compl. Course III	5		4	3 hours			
IV	EN1411.3 Eng Lang. IV	5		3	3 hours			
	PC1441 Core Course IV	3		3	,,			
	PC1442 Core Course V	3		3	,,			26
	PC1443Core. Course VI	-	2	4	,,	,,	,,	
	(Lab II & Proj) PC1471 Voc. Course V	3	-	3	3 hours			
	PC1472 Voc. Course VI	2	-	2	,,			
	PC1473Voc.Course VII (Lab)	-	2	4	,,			
	MM1431.6 Compl. Course IV	5		4	,,			
V	PC1541 Core Course VII	4	-	3	3 hours			
	PC1542 Core Course VIII	4	4	3	,,			
	PC1571 Voc. Course VIII	3	-	3	,,	,,	,,	16
	PC1572 Voc. Course IX -Lab	-	7	4	,,			
	PC1551 Open Course I(Voc)	3		2	3 hours			

Sem. No.	Course title	Instructional hours/week		Credit	Uty.Exam duration	Evaluation		Total credit
		L	P			Internal	Uty. exam	
VI	PC1641 Core Course IX	3	-	3	3 hours			
	PC1642 Core Course X	3	-	3	,,			
	PC1643 Core (lab III) XI		2	3	,,	,,	,,	25
	PC1644 Core (Lab IV) XII		2	3	,,			
	PC1661 Elective (Core)	3		2	,,			
	PC1671 Voc. Course XI	4		4	,,			
	PC1672 Voc. Course XII	4		3	,,			
	PC1673 Project (Voc)		4	4				

II. Course structure: (a). Core Courses (theory)

SEM	TITLE OF PAPER	Number of hours per week	Number of credits	Total hours/ semester	UE Dura-tion
1	PC 1121- Mechanics, Thermodynamics & Properties of matter (Foundation Course)	3	3	54	3 hrs
2	PC1241- Environmental Studies	5	4	54	3
3	PC1341– Electrodynamics	3	3	54	3
4	PC1441-Classical Mechanics & Theory of Relativity.	3	3	54	3
	PC1442- Optics	3	3	54	3
5	PC1541– Electronics	4	3	72	3
	PC1542–Atomic & Nuclear Physics	4	3	72	3
	PC1641-Solid State Physics	3	3	54	3
6	PC1642– Statistical Mechanics & Quantum Mechanics	3	3	54	3
	PC1661– Elective course	3	2	54	3

(b). COURSE STRUCTURE FOR PRACTICALS AND PROJECT WORK FOR THE CORE COURSE:

Sem	Title of Paper	Duration of Exam	Number of credits	Allotted hours	
				Per week	Per year
2	PC1242- mechanics, properties of matter, measurements and acoustics	3	3	S1—2 S2—2	144
4	PC1443– Electricity, Heat & magnetism	3	4	S3—4 S4—2	144
6	PC1643- Optics & Electronics	3	3	S5—2 S6—2	144
6	PC1644 – Digital electronics & computer science	3	3	S5—2 S6—2	144

III. Course structure:(a). Vocational Courses (theory)

SEM	TITLE OF PAPER	Number of hours per week	Number of credits	Total hours/ semester	UE Dura-tion
1	PC 1171- Introduction to IT	3	3	54	3 hrs
2	PC1221- Introduction to Programming	3	2	54	3
3	PC1371–Operating Systems	3	3	54	3
	PC1372- Data Structures	3	3	54	3
4	PC1471- Software Engineering	3	3	54	3
	PC1472- Object Oriented Programming	2	2	36	3
5	PC1571– Database Management Systems	3	3	54	3
	PC1551-Open Course	3	2	54	3
	PC1671- Introduction To Information Security	4	4	72	3
6	PC1672– Computer Networks	4	3	72	3

(b). COURSE STRUCTURE FOR PRACTICALS AND PROJECT WORK FOR THE VOCATIONAL COURSE:

Sem	Title of Paper	Duration of Exam	Number of credits	Allotted hours	
				Per week	Per year
2	PC1271- Programming Lab – I	3	3	S1—2 S2—2	144
4	PC1473– Programming Lab – II	3	4	S3—2 S4—2	216
5	PC1572- Programming Lab III	3	4	S5—7	252
6	PC1673 – Major Project & Viva	3	4	S6—4	144

IV. Complementary course (Mathematics)

Seme-ster	Title of the course	No. of hours/ week	No. of credits	Total hours per sem.	UE duration
1	MM1131.6- Complex numbers, differentiation & theory of equations	5	4	90	3
2	MM1231.6- Analytic geometry, integration, diff. equations & matrices	5	4	90	3
3	MM1331.6- Vector differentiation, coordinate systems, abstract algebra and Fourier transforms	5	4	90	3
4	MM1431.6- Linear transformations, vector integration & complex analysis	5	4	90	3

PC1121: MECHANICS ,THERMODYNAMICS & PROPERTIES OF MATTER

(54 hours – 3 credits)

Unit 1- Dynamics of Rigid Bodies (13 hrs) (Book: 2, Chapter 8)

Equations of motion for rotating rigid bodies-angular momentum and M.I-Theorems on M.I- calculation of M.I of bodies of regular shapes- uniform rod, ring, disc, annular ring, solid cylinder, hollow cylinder and solid sphere-KE of rotating and rolling bodies-torque-Determination of M.I of a fly wheel (theory, experiment and applications).Motion of a body rolling down an inclined plane.

Unit 2-: Thermodynamics (18 hrs) (Book 3)

Thermodynamic systems, Thermodynamic equilibrium, Zeroth Law, concept of heat,First law of Thermodynamics, differential form ,Second law of thermodynamics- Clausius and Kelvin statements-Carnot engine-Carnot's theorem, Thermodynamic scale of temperature, Principle refrigerator. Working and efficiency of Otto engine and Diesel engine. Clausius-Clepeyron Equation, application, effect of pressure on boiling point, melting point, calculation of latent heat.

Preliminary ideas, definition of entropy, Entropy and adiabatic, change of entropy in carnot's cycle, change of entropy in any reversible, irreversible cycle, Clausius inequality, entropy and available energy,. Entropy, probability and disorder.Nernst heat theorem and third law of thermodynamics.Temperature entropy diagram, T-S diagram for carnot's cycle.

Unit 3-Elasticity (4hrs) Book 1&2 (Ref)

Modulus of elasticity & relation(revision)-bending of beams-bending moment –centrally loaded-uniformly loaded-experimental determination of Y using bending of beams(uniform) Static torsion-theory & experiment-I section girders

Unit 4-Fluid Mechanics (13 hrs) Book 1&2 (Ref) (Book: 2, Chapter 16)

Surface tension-surface energy-expression for excess pressure on a curved liquid surface-excess pressure inside a spherical drop, determination of surface tension by Quincke's method, Newmann's triangle, -measurement of ST by capillary rise method, variation of surface tension with temperature.

Streamline and turbulent flow-equation of continuity-Euler equation- Bernoulli's theorem-application-venturimeter, Torricelli's theorem

Unit 5: Transference of heat (6 hrs) chapter 8 Ref 3

Thermal conductivity - determination by Lee's Disc method for bad conductor radial flow of heat, cylindrical flow ,thermal conductivity of rubber, Wiedmann-Franz law.Radiation of heat, Stefan's law, determination of Stefan's constant, solar constant,determination of solar temperature

Books for Study

1 Mechanics- Hans H.S and Puri. S.P ,THM: Second Edition)

2 Mechanics- J.C. Upadhyaya (Ramaprasad)

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

Books for reference

1.	Properties of matter	D.S.Mathur
2.	Properties of matter	Brijlal and Subrahmanyam
3.	Statistical mechanics	Sinha (TMH)

PC1241: ENVIRONMENTAL STUDIES (50 hours – 4 credits)

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

Definition, scope and importance, need for public awareness.

Unit 2 : Natural Resources : Renewable and non-renewable resources (8 lectures)

Natural resources and associated problems.

a) Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

b) Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources : World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

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

f) Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Unit 3 : Ecosystems (6 lectures)

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystems :-
    a. Forest ecosystem
    b. Grassland ecosystem
    c. Desert ecosystem
    d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit 4 : Biodiversity and its conservation (8 lectures)

- Introduction – Definition : genetic, species and ecosystem diversity.
- Biogeographical classification of India
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values
- Biodiversity at global, National and local levels.
- Inida as a mega-diversity nation
- Hot-sports of biodiversity.

- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

Unit 5 : Environmental Pollution (8 lectures)

Definition

- Cause, effects and control measures of :-
  a. Air pollution
  b. Water pollution
  c. Soil pollution
  d. Marine pollution
  e. Noise pollution
  f. Thermal pollution
  g. Nuclear hazards
- Solid waste Management : Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Diaster management : floods, earthquake, cyclone and landslides.

Unit 6 : Social Issues and the Environment (7 lectures)

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

Unit 7 : Human Population and the Environment (6 lectures)

- Population growth, variation among nations.
- Population explosion – Family Welfare Programme. VII
- Environment and human health.
- Human Rights.
- Value Education.

- HIV/AIDS.
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies.

Unit 8 : Field work (Field work Equal to 5 lecture hours)

- Visit to a local area to document environmental assets river/ forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

REFERENCES

a) Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.

b) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad –380 013, India, Email:mapin@icenet.net (R)

c) Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p

d) Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)

e) Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p

f) De A.K., Environmental Chemistry, Wiley Eastern Ltd.

g) Down to Earth, Centre for Science and Environment (R)

h) Gleick, H.P. 1993. Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p

i) Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)

j) Heywood, V.H & Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.

k) Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.

l) Mckinney, M.L. & School, R.M. 1996. Environmental Science Systems & Solutions, Web enhanced edition. 639p.

m) Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)

n) Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)

o) Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p

p) Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ. Co. Pvt. Ltd. 345p.

q) Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut

r) Survey of the Environment, The Hindu (M)

s) Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science

t) Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards, Vol I and II, Enviro Media (R)

u) Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (TB)

v) Wanger K.D., 1998 Environmental Management. W.B. Saunders Co. Philadelphia, USA 499p

(M) Magazine

(R) Reference

(TB) Textbook

PC1341-ELECTRODYNAMICS (54 hours -3 credits)

Unit 1-Electrostatic Field (10hrs)

Electric field*: Introduction*, Coulomb's Law*, Electric field*, continuous charge distribution*Divergence and curl of electrostatic fields; Field lines, flux and Gauss' law,the divergence of E, applications of gauss's law, the Curl of E Electric potential: Introduction to potential, Comments on potential, Poisson's and Laplace's equations, Potential of a localized charge distribution, electrostatic boundary Work and energy in Electrostatics: The work done to move a charge, The energy of a point charge distribution, The energy of a continuous charge distribution.

Unit 2-Electrostatic fields in matter (10 hrs)

Polarization: Dielectrics, induced dipoles, Polarization, The field of a polarized object: Bound charges, Physical interpretation of bound charges, and the field inside a dielectric. Electric displacement: Gauss's law in the presence of dielectrics, Boundary conditions

Unit 3-Magnetostatics (8hrs)

Introduction*, The Biot-Savart law*, Ampere's force law*, Magnetic torque, Magnetic flux and gauss's law for magnetic fields, Magnetic vector potential, Magnetic intensity and Ampere's circuital law, Magnetic materials.

Unit 4-Electromagnetic Induction (8hrs)

Electromotive force: Ohm's law Electromagnetic induction: Faraday's law, the induced electric field Maxwell's Equations: Electrodynamics before Maxwell, How Maxwell fixed Ampere's law, Maxwell's equations, Magnetic charge, Maxwell's equations in matter, Boundary conditions

Unit 5-Electromagnetic waves (8hrs)

Waves in one dimension: The wave equation Electromagnetic waves in vacuum: Thewave equation for E and B, Monochromatic plane waves, Energy and momentum in electromagnetic waves

Unit 6-Alternating current (6 hrs)

AC through series LCR (acceptor circuit) and parallel LCR circuit (rejecter circuit)- Qfactor, Power in AC-power factor -AC bridges Maxwell's L/C bridge and Owens's bridge.

Unit 7-Circuit Theory (4 hrs)

Ideal voltage and current sources- Thevenin's and Norton's theorems, Maximum power transfer theorem, h parameters applied to two port networks* Revision topics

Books fo r study

1. Electrodynamics - David J Griffith (PHI rd edition)
2. Electromagnetic theory fundamentals- Bhag Guru and Huseyin Hizirogulu (Cambridge University Press 2nd edition)
3. Electricity and Magnetism – J.H. Fewkes & John Yarwood (University tutorial press

Reference Books

1. Elecricity and Magnetism-Murugesan (S.Chand & Co.)
2. Elecricity and Magnetism – E.M. Purcell, Berkley Physics course, Vol.2 (MGH)
3. Elecricity and Magnetism -_K.K.Tiwari (S.Chand & Co.)

4. Electricity and Magnetism- D.C.Tayal (Himalaya Publishin Co)
5. Electricity and Magnetism_ - Muneer H. Nayfeh & Norton K. Bressel (John Wiley & Sons)
6. Classical Electrodynamics- Walter Greiner (Springer International Edition)
7. Electromagnetic waves and radiating systems-Jordan & Balmain (PHI)
8. Electromagnetics B.B.Laud (Wiley Eastern Ltd.2nd edition)
9. Introduction to electrodynamics-Reitz &Milford (Addison Wesley)

TOPICS FOR DISCUSSION IN TUTORIAL SESSION/ASSIGNMENTS (SAMPLE)

1. Comment on how electrostatic energy is stored in a field
2. Discuss the electrostatic properties of conductors
3. What is meant by electrostatic shielding? In what way it help us?
4. Discuss the peculiarities of electric displacement D and electric field E. How they are incorporated in Maxwell's Equations
5. Discuss the properties of linear dielectrics. What differentiates a dielectric to be linear or not
6. Discuss applications of Ampere's circuital law
7. Compare electrostatics and magnetostatic
8. Why magnetic forces cannot do work
9. Discuss about cyclotron motion & cycloid motion
10. Discuss whether there existed any stand-off between ohm's law and Newton's second law
11. A battery has an emf. Can this emf. is a 'force' ? How will you interpret electromotive force?
12. Discuss the role of motional emf in power generation
13. Discuss the orthogonality of E, B and propagation vector k
14. A wave function can have a sinusoidal representation. Solve the wave equation for this function and discuss the various terms related to a wave such as amplitude,frequency, phase, wave number, frequency etc.
15. Complex representation of wave function has g o o d advantage. Why? Discuss the linearity of wave function. (Use complex notation)
16. Discuss AC through LC, LR and CR circuits
17. Show that sharpness of resonance is equal to Q- factor
18. What is a choke coil? Discuss the advantage of using a choke coil instead of a resistor.

PC 1441 -CLASSICAL MECHANICS & THEORY OF RELATIVITY (54 hrs 3 credits)

Unit 1 -Oscillations (14 hrs.) (Book: 1,Chapter 9)

Simple harmonic motion – Energy of harmonic oscillators-simple pendulum-mass on a spring-oscillation of two particles connected by a spring- compound bar pendulum-interchangeability of suspension and oscillation-four points collinear with C.G about which the time period is the same-conditions for maximum and minimum periods-Determination of g using symmetric bar pendulum. Damped harmonic Oscillator, power dissipation, quality factor.

Unit 2- Motion in central force field (10 hrs): Book 3; Chapter 5 & Book 4; Ch. 4

Equivalent one body problem-motion in central force field-general features of motion-motion in an inverse-square law force field-equation of the orbit-Kepler's laws of planetary motion and their deduction.

Unit 3 - Lagrangian Dynamics (10 hrs): Book 4; Chapter 2

Constraints - generalized coordinates - principle of virtual work - D' Alembert's principle, Lagrange's equation from D' Alembert's principle , - applications of Lagrange's equation in simple pendulum, Atwood's machine and compound pendulum (comparison of Lagrangian approach with Newtonian approach).

Unit 4 - Special theory of relativity (20 hrs): Book 2; Chapter 11 & 12

Inertial frames of reference-Galilean transformation-non-inertial frames - reference frame with translational acceleration-uniformly rotating frame fictitious forces-centrifugal forces and coriolis forces. Origin and significance of special theory of relativity – search for universal frame of reference – Michelson-Morley experiment – postulates of special theory of relativity – consequences – Lorentz transformation equations – kinematical consequences of Lorentz Transformation – length contraction – time dilation – twin paradox - space like and time like intervals – variation of mass with velocity – mass energy equivalence – transformation of relativistic momentum and energy –tachyons.

Books for study :

1. Mechanics- J.C. Upadhyaya (Ramaprasad)
2 Mechanics – H.S.Hans and S.P.Puri (Tata-McGraw Hill).
3 Introduction to classical mechanics – R.G.Thakwale and P.S.Puranik (Tata- McGraw Hill).
4. Classical Mechanics – J C Upadhyaya (Himalaya Publishing House)

Books for reference:

1. Classical Mechanics – Goldstein.
2. Classical Mechanics- Vimal Kumar Jain (Ane Books Pvt Ltd)
3. Modern Physics – (Schaum's outlines)
4. Classical Mechanics - Systems of Particles & Hamiltonian Dynamics – Walter Greiner.
5. Concepts of Modern physics-Arther Bieser (Tata-McGraw Hill).
6. Classical Mechanics – N.C Rana and P.S.Joag
7. Basic Relativity – Richard A.Mould, Springler, Ane Books India Pvt Ltd

PC1442- OPTICS (54 hours -3 Credits)

Unit 1. Interference of light (12 hrs) (Book 1: Chapter 14 & 15 and Book 3: chapter 12 & 13)

The principle of superposition - coherent sources – Double slit interference (theory of interference fringes and band width)- interference in thin films –reflected and transmitted system, fringes of equal inclination- fringes of equal thickness - wedge shaped films- testing of optical flatness - Newton's rings (reflected system)-refractive index of a liquid - Michelson interferometer –determination of wavelength

Unit 2. Diffraction (12 hrs) (Book 1: Chapter 17, 18 & 19 and Book 3: Chapter 16 & 17)

Fresnel diffraction: - Half-period zones - explanation of rectilinear propagation of light diffraction at a circular aperture– diffraction at a straight edge-zone plate. Fraunhofer diffraction: - Diffraction at a single slit, double slits – planetransmission grating - Rayleigh's criterion for resolution - resolving power of a telescope, microscope, prism and diffraction grating.

Unit 3. Polarisation (12 hrs) (Book 1: Chapter 20 and Book 3: chapter 19)

Plane polarized light - polarization by reflection – Brewster's law - pile of plates - Malus law - Double refraction - Huygens explanation for double refraction in uniaxial crystals - Nicol prism - Nicol prism as a

polarizer and analyzer – Theory of production and analysis of plane, circularly and elliptically polarized light - quarter and half wave plates.

Unit 4. Dispersion (4 hrs) (Book 2: Chapter 11)

Normal dispersion - Elementary theory of dispersion - Cauchy's and Hartmann dispersion formula - anomalous dispersion - Wood's experiment for anomalous dispersion of sodium vapour.

Unit 5. Fiber Optics (6 hrs) (Book 1: Chapter 24 and Book 3: chapter 24)

Introduction, optical fiber, the numerical aperture, coherent bundle, pulse dispersion in step index fiber, graded index fiber, single mode fiber, multimode fiber, fiber optic sensors-examples -fiber optic communication (qualitative), Advantages of fiber optic communication system.

Unit 7. Laser: (8 hrs)(Book 2: Ch. 12, Book 1: Ch. 23, Book 3: chapter 23 and Book 4: Ch. 6)

Basic principle of laser operation , Einstein's coefficients-light propagation through medium and condition for light amplification, population inversion by pumping - optical resonators (qualitative) Q factor, various laser systems –Ruby laser - He-NE laser, (working principle only) -characteristics of laser beams -spatial coherence -Temporal coherence.

Books of Study

1.	Text Book of Optics	N. Subramaniam & Brijlal, M.N.Avadhanulu,23rd edition (2006)
2.	Optics and spectroscopy	R.Murugesan.
3.	Optics	Ajoy Ghatak
4.	Lasers: Principles, Types and applications	K.R.Nambiar

References

5.	Optics	P.Vivekanandan
6.	Fundamentals of Optics	Jenkins and White
7.	Modern Classical Optics	Geoffrey Brooker.
8.	Principles of Optics	B.K.Mathur
9.	Fundamentals of Optics	Khanna and Gulati
10.	Lasers &Non-Linear Optics	B.B.Laud
11.	Electronic Communications	Dennis Roddy & John Coolen

Topics for assignments/discussion in the tutorial session (sample)

1. Michelson's interferometer-Standardization of metre.
2. Diffraction at a rectangular aperture.
3. Optical activity-Fresnel's theory of optical rotation.
4. Constant deviation spectrometer.
5. Laurent's half shade polarimeter.
6. Harmonic generation.
7. Laser applications.
8. Study of Fraunhofer lines using spectrometer.
9. Study of absorption spectra of KMnO4.
10. Determination of refractive index of liquid by Newton's rings method.
11. Comparison of radii of curvature by Newton's rings method.

PC 1541 - ELECTRONICS (72 hours -3 Credits)

Unit 1. Diode Circuits: (10 hours); [Ref. 1: Chapter. 2, Ref. 2: Chapter 17, Ref. 3: Chapter 9]

PN junction - PN junction under forward and reverse biased conditions – *rms* value and peak inverse voltage – diode characteristics - ac and dc resistances - half wave and full wave rectifiers (average dc value of current, ripple factor and efficiency) - different types of filters (shunt capacitor, LC and CLC) - breakdown mechanism in diodes - Zener diode - voltage regulator.

Unit 2. Transistor: (14 hours); [Ref. 1: Chapter 4, Ref. 2: Chapter 18]

Theory of BJT operation - CB, CE and CC characteristics - alpha and beta and gamma - relation between transistor currents - biasing circuits (CE configuration) - stability factors - selection of operating point - ac and dc load lines - collector feed back; base resistor and potential divider methods - small signal BJT amplifiers - input and output resistances - graphical analysis of the small signal CE amplifier (frequency response, band width and gain in dB) - effect of Q point on AC operation.

Unit 3. Large signal (power) amplifiers: (10 hours); [Ref. 2: Chapter. 22]

Amplifier classes and efficiency - class A operation - transformer coupled class A amplifier - class B amplifier - push pull amplifier - basic ideas of class AB and class C operation - multi stage amplifiers - frequency responses - distortion in amplifiers.

Unit 4. Feed back & Oscillator circuits: (8 hours); [Ref. 1: Chapter. 6, Ref. 2: Chapter. 25]

Feed back principles – negative feed back – emitter follower – advantages of negative feed back - positive feed back - principle of sinusoidal feed back oscillation - Barkhausen criterion for oscillations - RC phase shift, Hartley.

Unit 5. Modulation: (6 hours); [Ref. 1: Chapter. 14]

Fundamentals of modulation - AM, FM and PM - frequency spectrum of AM - power in AM - modulated class C amplifier - linear demodulation of AM signal - frequency spectrum for FM - super heterodyne AM receivers.

Unit 6. Operational amplifiers (IC741): (12 hours); [Ref. 1: Chapter. 7, Ref. 4: Chapter. 16]

Introduction – Schematic symbol and pin configuration - circuit configuration and block diagram representation – ideal OP amp. - equivalent circuit – CMRR – dual input, balanced output differential amplifier - voltage gain, input and output resistances – differential mode and common mode – virtual ground principle – parameters of OP amp. - inverting amplifier - non inverting amplifier - differential amplifier - summing and subtractor amplifiers.

Unit 7. Digital electronics(12hrs)

Binary no system, binary addition & substraction. Logic gates AND, OR NOR,NOT, NAND, XOR, Realization of other logic gates using NAND,NOR, Boolean laws, De Morgan's theorem.

Half adder, full adder, controlled inverter, binary adder- subtractor, flip flop- SK flip flop, JK flip flop, Master Slave, D & T flip flop.

Books for study:

1. Basic Electronics- Santiram Kal
2. Basic electronics- B. L. Theraja
3. Principles of electronics- V. K. Mehta
4. A first course in Electronics- Anwar A. Khan, Kanchan K. Dey

Books for references:

5. Electronic Devices and Circuits- Theodore F.Bogart,Jr. –Universal book stall
6. Electronic devices and Circuit theory- Robert Boylestad & Louis Nashelski-Vth edition PHI
7. Electronic fundamentals & applications- John D Ryder-Prentice Hall of India Pvt. Ltd.
8. Electronic Communications- Dennis Roddy, John Coolen, Fourth edition.

Topics for assignments/discussion in the tutorial session (sample)

1. Electronic projects using flip flops
2. Electronic projects using logic gates
3. Electronic projects using IC 741 OP amp.
4. Electronic projects using timer 555
5. Electronic projects using IC 311
6. Constant voltage power supplies
7. Constant current sources
8. Oscillators of different frequencies
9. Low range frequency generators
10. High range frequency generators
11. Voltage regulated dc power supplies with variable output
12. Voltage regulated dual power supplies with variable output
13. Instrument for the measurement of capacitance
14. Instrument for the measurement of dielectric constant of a liquid/ solid
15. Effect of temperature on electronic components

PC1542- ATOMIC AND NUCLEAR PHYSICS (72 hrs -3 Credits)

Unit 1- Vector Atom Model: (10hrs)

Introduction- Various quantum numbers associated with vector atom model-, L.S and j.j couplings – application of spatial quantization- Pauli's exclusion principle – magnetic dipole moment of electron due to orbital and spin motion - Stern and Gerlach experiment-Spin-Orbit coupling.

Unit 2- Atomic Spectra (12 hrs)

Optical spectra-Spectral terms and notations - selection rules - Zeeman effect - Larmor's theorem – quantum mechanical explanation of normal Zeeman effect. Anomalous Zeeman effect –Paschen-Back effect-Stark effect.

Unit 3- Molecular spectra (15 hrs)

Characterisation of electromagnetic radiation, the quantization of energy, regions of the spectrum,Rotational spectra of diatomic molecules-rotational energy levels-selection rules-rotational spectrum-isotope effect- bond length and atomic mass. The intensities of spectral lines, Diatomic vibrational spectra-vibrational energy levels-selection rule- vibrational transitions-Vibrating diatomic molecule as a harmonic oscillator,The anharmonic oscillator, diatomic vibrating rotator.

Unit 4 - Introduction to the nucleus (10 hrs)

Constituents of nuclei-nuclear charge-binding energy-angular momentum of the nucleus-magnetic moment-nuclear quadrupole moment-nuclear stability-models of nuclear structure-The liquid drop model-shell model-collective model., Nuclear forces, characteristics, Meson theory of nuclear forces

Unit 5 – Radioactivity (10 hrs)

Alpha, beta and gamma rays, rate of decay, half life and mean life-units of radioactivity-conservation laws in radioactive series-decay series-radioactive equilibrium-secular and transient equilibrium-radioactive dating-range of alpha particles-Geiger-Nuttal law-alpha decay-Gamow's theory-alpha particle disintegration energy-beta ray spectra-magnetic spectrograph-origin of line and continuous spectrum-neutrino theory of beta decay-gamma decay.

Unit 6 – Nuclear fission and fusion (10 hrs)

Nuclear fission-energy released in fission-Bohr and Wheeler's theory-chain reaction- multiplication factor-critical size-atom bomb-nuclear reactors-breeder reactors-uses of nuclear reactors. Nuclear fusion-sources of stellar energy-thermonuclear reactions-hydrogen bomb- controlled thermonuclear reactions-magnetic bottle.

Unit 7 - Elementary Particles (5 hrs) (Book 4)

Fundamental interactions in nature-classification of elementary particles-conservation laws-lepton conservation-baryon conservation-strangeness-isospin-hyper charge-resonance particles- The quark model-Fied bosons, the standard model and beyond.

Books for Study:

1. Modern Physics- G.Aruldas and P.Rajagopal, PHI, New Delhi, 2005.
2. Modern Physics by R.Murugesan, S.Chand & Co., Reprint, 2008.
3. Atomic and Nuclear Physics- N.Subramaniam & Brijlal, S.Chand & Co.
4. Concepts of Modern Physics by A. Beiser, Tata McGraw-Hill, New Delhi, 6th edition.

Books for Reference:

1. Atomic Physics - J.B.Rajam, S.Chand & Co.
2. Fundamentals of Molecular Spectroscopy - Banwell (TMH)
4. Spectroscopy- Walker & Straw, Chapman & Hill.
5. Molecular Spectroscopy- G.Aruldas.

Topics for assignments/discussion in the tutorial session (sample)

1. Bohr model of atom and correspondence principle.
2. Molecular bond and electron sharing.
3. Width of spectral lines.
4. Spectroscopic techniques.
5. X-ray diffraction for identification of samples

PC1641- SOLID STATE PHYSICS – (54 hrs -3 Credits)

Unit I- Crystal Structures and inter-atomic forces (25 hrs) (Book 1: Chapter 1&3)

Introduction-crystalline state-basic definitions-Fourteen Bravais lattices and seven crystal systems-elements of symmetry-nomenclature of crystal directions and crystal planes-Miller indices-examples of simple crystal structures-amorphous solids and liquids-interatomic forces-types of bonding. generation and absorption of X-rays-Bragg's law-scattering from an atom-scattering from a crystal-reciprocal lattice and X-ray diffraction-diffraction condition and Bragg's law-experimental techniques-neutron diffraction-electron diffraction.

Unit 2 – Conduction in metals and Free electron model (8 hrs) (Book 1: Chapter 5)

Introduction-conduction electrons-free electron gas-electrical conductivity-electrical resistivity versus temperature-heat capacity of conduction electrons-Fermi surface- electrical conductivity-effects of the Fermi surface-thermal conductivity in metals-Hall effect (Book 2, ch.10 & Book 3, ch.9)-failure of free electron model.

Unit 3- Thermal properties of Solids (3 hrs)(book 2 chapter 5)

Classical specific heats, Quantum theory of heat capacity- Average thermal energy of a harmonic oscillator, Einstein theory of specific heats, phonon density of states, Debey model of lattice specific heat. Energy bands in solids

Unit 4- Optical, Magnetic and Dielectric properties of Material (6 hrs)
(Book 1 chapter 8, 9, chapter 15)

Introduction- dielectric constant and polarisability–sources of polarazability- electronic, ionic and dipolar polarizability, piezoelectricity Introduction- review of magnetic formulas and its susceptibility- classification of materials-Langevin diamagnetism- paramagnetism –classical and quantum theory.Comparison of ferro ferri and antiferro magnetism

Unit 5-Superconductivity (8 hrs) (Book 1: Chapter 10)

Introduction- Zero resistance-perfect diamagnetism or The Meissner effect-The critical field-electrodynamics of superconductors-Theory of superconductivity-tunneling and the Josephson effect-miscellaneous topics (intermediate state, Type I & II superconductors).

Books for Study:

1. Elementary Solid State Physics – Principles and Applications, M.A.Omar.
2. Elements of Solid state Physics-J.P.Srivastava
3. Solid State Physics – Structure and Properties of Materials, M.A.Wahab, 2nd edition, Narossa Publishing House.

Books for Reference :

1. Introduction to Solid State Physics, Kittel, Wiley & Sons, 7th edition.
2. Concepts of Modern Physics by Beiser, Tata McGraw Hill, 5th Edition, 1997.
3. Fundamentals of Solid State Physics, Saxena-Gupta-Saxena, 9th edition (2004-05), Pragathi Prakasan, Meerut.
4. Fundamentals of Physics, 6th Edition, by D.Halliday, R.Resnick and J.Walker, Wiley. NY, 2001.
5. Physics, 4th Edition, Vols I, II & II Extended by D.Halliday, R.Resnick and K.S.Krane, Wiley, NY. 1994.
6. The Feynman Lectures on Physics, VoIs. I, II, and III, by R. P. Feynman, RB Leighton and M Sands, Narosa, New Delhi, 1998.
7. Introductory Solid State Physics by H.P.Myers, Viva books, New Delhi, 1998

Topics for assignments/discussion in the tutorial session (sample)

1. Crystal imperfections-point, line and surface imperfections
2. Types of colour centers.
3. Liquid crystals.

4. Amorphous semiconductors.
5. Polymers.
6. Biological Applications.
7. Enzyme study.
8. Carcinogenic activity.

Books for Study

1. Modern Physics by R. Murugesan, S. chand & Co., Reprint, 2008.
2. Modern Physics – G. Aruldas and P. R. Rajagopal, PHI, New Delhi, 2005
3. Nuclear Physics – D. C. Tayal, Himalaya Publishing House, 4th edition.

References

1. Concepts of Modern Physics by A. Beiser, Tata McGraw-Hill, New Delhi, 6th edition.
2. Atomic and Nuclear Physics – N. Subramaniam and Brijlal, S. Chand & Co.
3. Nuclear Physics – S. N. Ghoshal, S. Chand & Co.
4. "Nuclear Physics" – Kaplan (Narosa)
5. Atomic Physics – J. B. Rajam, S. Chand & Co.

Topics for assignments /discussion in the tutorial session (sample)

1. Fusion reactors.
2. History of the Universe (elementary particle).
3. Linear accelerator.
4. Ionization chamber and Wilson cloud chamber.
5. Solid state detectors and proportional counter.

PC1642- STATISTICAL PHYSICS AND QUANTUM MECHANICS (54 hrs- 3 credits)

Unit 1 –: Statistical Physics (20 hrs) (Book 1)

Statistical probability, Macro& Microstates, Phase space, Statistical ensemble , Postulate of equal probability, Entropy and thermodynamic probability, Statistical ensembles, microcanonical ensemble, canonical ensemble, Grand canonical ensembles.Maxwell Boltzmann distribution, Velocity distribution.Indistinguishability of identical particles, Bose Einstein and Fermi Dirac distribution functions, comparison of three statistics, Application of BE & FD statistics, Bose- Einstein condensation.

Unit 2 – The Emergence of Quantum Mechanics (14 hrs) Book 2; Chapter 1

Black body radiation-photoelectric effect-The Compton effect-wave properties of matter and electron diffraction-The Bohr atom -The Rutherford planetary model-The Bohr postulates-The correspondence principle.

Unit 3 – The Wave Function (20 hrs) Book 3; Chapter 1 & Book 4

The Schrödinger equation-The statistical interpretation-probability normalization- momentum-The uncertainty principle. Stationary states-infinite square well- The harmonic oscillator-free particle-The Delta-Function potential

Books for study.

1. Thermal and Statistical Mechanics- S.K. Roy (NewAge International)

2. Concepts of Modern Physics – Arthur Beiser (TMH)
3. Quantum Physics (3/e) - Stephen Gasiorowicz, John Wiley and Sons (2003).
4. Introduction to Quantum Mechanics – D.J.Griffiths, PHI (1995).
5. Quantum Mechanics – G. Aruldhas, PHI.
6. Heat thermodynamics and statistical physics- Brijlal &Subrahmanyam (S.Chand & co)

Books for Reference

1. Quantum Mechanics: An Introduction (4/e), W.Greiner, Springler (2001)
2. Schaum's Outline of Theory and Problems of Quantum Mechanics, Y. Peleg, R.Pnini, E.Zaarur, Schaum's outline series, MGH (ISBN 0070540187)
3. A Text book of Quantum Mechanics, P.M.Mathews and S.Venkatesan, TMH.
4. A text book of Quantum Mechanics, Ghatak and Lokanathan.
5. Principles of Quantum Mechanics (2/e), R.Shankar, ISBN 0-306- 44790-8, Plenum Press.
6. Elements of Statistical Mechanics- Kamal Singh & S. P. Singh (S. Chand &Co)
7. Thermal Physics, Statistical Physics and Solid state Physics – C. J. Babu (Calicut University Press)
8. Statistical mechanics – Sinha (TMH)

PC1661.1. ASTRONOMY AND ASTROPHYSICS (54 hours -3 credits)

UNIT I-Introduction 4 hrs (Book 2, Chapter 1, P 1 – 6)

Astronomy and Astrophysics, Importance of Astronomy, Methods of Astronomy and Astrophysics**,** The Scientific Methods, Scope of Astronomy

UNIT II - Astronomy **15 hrs (Book 1, Chapter 4, 5, P 65-70, 78-101)**

Birth of the Universe, Ancient astronomy, Medieval Astronomy, Renaissance Astronomy, Modern Astronomy

UNIT III-The Objects in the Sky 15 hrs ((Book 1, Chapter 6, P 102-127)

The Microwave background radiation, The Sun, The Stars, Neutron Stars and Black holes, Supernovae, Galaxies

UNIT IV -The Solar System 15 hrs (Book 1, Chapter 7, P 128-154)

Sun and Planets, Formation of the Planets, Comets, Planets and Satellites, Asteroids, Meteorites

UNIT V -Earth in Space 5hrs (Book 1, Chapter 8, P 155-162)

Motion of the Earth, The Calendar, The Seasons

Books for Study

1. Planet Earth, Cesare Emiliani , (Cambridge University Press, 1995)
2. Astrophysics - K. D. Abhayankar (University Press,2001)

Books for reference

1. Fundamentals of Geophysics William Lowrie(Cambridge University Press, 1997)
2. Modern Physics- R. Murugeshan, Kiruthika Sivaprasath (2007), S.Chand & Company Ltd.

3. Introduction to Astrophysics – Baidyanadh Basu
4. Modern Trends in Physics Vol I , C. J. Babu
5. Space Science –Louise K. Harra& Keith O.Mason(Imperial College Press, London, 2004)

PC 1661.2 GENERAL METEOROLOGY(54 hours -3 Credit)

Unit 1(20 hrs)

Introduction to Meteorology-The atmosphere-Solar energy-Global Circulation – Climatology-Tropical weather-Global climate system. Atmospheric composition-primary gases-Greenhouse gases-reactive gas species-aerosols- Temporal and spatial variation of atmosphere. Mass of atmosphere-total pressure and vapour pressure. Standard Atmosphere-Vertical Structure of earth's atmosphere-Troposphere, Stratosphere, Above Stratosphere,The Energy Balance- Black body radiation -Radiation laws-The atmosphere and solar radiation –Reflection, Scattering, absorption and Transmission. The Greenhouse effect Earth's surface and solar energy-the steady state systems

Unit 2(20 hrs)

Atmospheric temperatures-daily temperature changes –day time heating-Night time cooling-Factors influencing the vertical distribution of temperature-horizontal distribution of temperature-Moisture in the atmosphere-changes of states-Hydrological cycle-ralative humidity-evaporation and transpiration-precipitation-regional variation in precipitation –water balance –inter annual variation in the climate-El-Nino and La-Nina.

Unit 3 (6 hrs)

Concepts of equilibrium, atmospheric equilibrium, adiabatic process of temperature changes, adiabatic lapse rate, atmospheric stability and lapse rate, atmospheric equilibrium in saturated air.

Unit 4 (8 hrs)

Theory of global warming-Evidence for global warming. Changes in Temperature record.Changing levels of atmospheric carbon dioxide- Rising sea levels-The other contributions to global warming-Theory of ozone depletion-Ozone chemistry-CFC and ozone hole.

References:

1. Atmosphere, weather and climate (8e), Roger G Barry and Richard J Chorley 2.Climatology: D S Lal
3. Global Warming: A complete Guide John Houghton ,
4. Atmospheric Science: An Introductory Survey, John M Wallace & Peter V Hobbs 5.Physical Meteorology, H.G.Houghton,
6. Atmosphere weather and climate K.Siddhartha, Kisalaya Publications

PC1661.3. SPACE SCIENCE (54 hrs -3 credits)

Universe (12 hrs)

Large Scale Structure of the Universe: Astronomy and Cosmology, Our Galaxy, Galaxy types, Radio sources, Quasars, Structures on the largest scale, Coordinates and catalogues of astronomical objects, Expansion of the Universe

Ref; Introduction to Cosmology- J. V. Narlikar (1993), Cambridge University Press, Art. 1.1 to 1.8 (Pages 1 to 26)

The evolution of Stars (9 hrs)

Introduction, Classification of Stars: The Harvard classification, Hertzsprung -Russel diagram, Stellar evolution, White dwarfs, Electrons in a white dwarf star, Chandrasekhar limit, Neutron stars, Black holes, Supernova explosion, Photon diffusion time, Gravitational potential energy of a star, Internal temperature of a star, Internal pressure of a star.

Ref; Modern Physics- R. Murugeshan, Kiruthika Sivaprasath, S.Chand & Company Ltd. (2007), Art. 78.1 to 78.15(Pages 963 to 976)

The active Sun (10 hrs)

Introduction, Sunspots and Solar storms, Sunspots and Solar activity, Cosmic rays of Solar origin, The Solar wind, Solar corona and the origin of the solar wind, Disturbed Solar wind.

Ref; Earth's Proximal Space- Chanchal Uberoi (2000), Universities Press (India) Limited, Art. 3.1 to 3.6 (Pages 36 to 55)

The earth's Atmosphere (15 hrs)

Introduction, Nomenclature and temperature profile, Temperature distribution in the troposphere, Temperature of stratosphere, temperature of mesosphere and thermosphere, Temperature variability, The pressure profile, Scale height, Density variation. The Ionosphere: Effect on scale height, Ionospheric electric fields, Ionization profile, Layer of charge, Ionospheric hydrogen and Helium.

Ref; Introduction to Space Science- Robert C. Haymes (1971) John Wiley & Sons Art. 3.1 to 3.9 and 3.12 to 3.17 (Pages 54 to 65 and 69 to 78)

Magnetosphere (8 hrs)

Introduction, The magnetic field of Earth, Earth's variable magnetic field, Solar activity and Earth's magnetic weather, solar wind interaction, The Chapman-Ferraro closed magnetosphere, Dungey's open magnetosphere, Structure of the magnetosphere: Magneto tail and Plasma sheet, Plasma sphere, Earth's radiation belts.

Ref; Earth's Proximal Space- Chanchal Uberoi (2000), Universities Press(India) Limited, Art. 4.1 to 4.6 and 4.8 to 4.8.3 (Pages 56 to 67 and 71 to 74)

Books for Study

1. Introduction to Space Science – Robert C Hymes (1971), John Wiley & Sons Inc.
2. Earth's Proximal Space- Chanchal Uberoi (2000), Universities Press (India)
3. Introduction to Cosmology- J. V. Narlikar (1993), Cambridge University Press
4. Modern Physics- R. Murugeshan, Kiruthika Sivaprasath (2007), S.Chand & Company Ltd.

Books for reference

1. Space Physics and Space Astronomy – Michael D Pappagiannis (1972), Gordon and Breach Science Publishers Ltd.
2. Introductory Course on Space Science and Earth's environment-Degaonkar (Gujarat University, 1978)
3. Introduction to Ionosphere and magnetosphere- Ratcliffe (CUP, 1972)
4. The Physics of Atmospheres-Houghton (Cambridge University Press)
5. Introduction to Ionospheric Physics-Henry Rishbeth & Owen K. Garriot (Academic Press, 1969)
6. Space Science –Louise K. Harra& Keith O. Mason(Imperial College Press, London, 2004)

7. Introduction to Space Physics- Kivelson and Russel
8. Introduction to Astrophysics – Baidyanadh Basu
9. Astrophysics - K. D. Abhayankar (University Press)

PC1661.4. PHOTONICS (54 hours -3 credits)

Unit 1: (7 hrs)

Photons in semiconductors-semiconductors-energy band and charge carriers-semi conducting materials-electron and hole concentrations-generation, recombination and injection-junctions-hetero junctions-quantum wells and super lattices.

Unit 2: (6 hrs)

Semiconductor photon sources-light emitting diodes-injection-electroluminescence- LED characteristics-internal photon flux-output photon flux and efficiency-responsivity- spectral distribution-materials-response time-device structures.

Unit 3: (8 hrs)

Semiconductor laser amplifiers-gain-amplifier band width-optical pumping-electrical current pumping-hetero structures-semiconductor injection lasers-amplification-feedback and oscillators-resonator losses-gain condition-internal photon flux-output photon flux and efficiency-spectral distribution-spatial distribution-single frequency operation-quantum well lasers (qualitative).

Unit 4: (8 hrs)

Semiconductor photon detectors-The external photo effect-photo electron emission-The internal photo effect-semiconductor photo detection-quantum efficiency-responsivity- devices with gain-response time-photoconductors- photo diodes-PIN photo diodes-heterostructure photo diode- Schotky barrier photodiodes-array detectors-avalanche photodiodes-gain and responsivity- response time.

Unit 5: (8 hrs)

Electro optic, Pockels and Kerr effects- electro optic modulators and switches-scanners-directional couplers-spatial light modulators-electro optics of liquid crystals-wave retarders and modulators-spatial light modulators.

Unit 6: (7 hrs)

Non linear optics-second order and third order optical non linearity-intensity dependent refractive index-optical Kerr effect-self focusing.

Unit 7: (10 hrs)

Photonic switching and computing-opto mechanical, electro optic, acousto optic and magneto optic switches-all optical switches- bistable systems-principle of optical bistability- bistable optical devices- optical inter connectors-optical computing-digital optical computing-analog optical processing.

Book of Study

1. Fundamentals of Photonics: BFA Saleh and M.C.Teich, John Wiley & Sons, Inc.

Reference books

1. Semiconductor optoelectronic devices: Pallab Bhattacharya, Printice Hall of India.
2. Optics and Photonics- An introduction: F. Graham Smith and Terry A.King, John Wiley & Sons, Inc.
3. Lasers and Non linear Optics: B.B.Laud, New Age International Pvt Ltd.

PC1661.5 NANOSCIENCE ANTECHNOLOGY (54 hours.5.)

Unit 1 Introduction to Nanoscience and Nanotechnology (10 Hours)

Nanoscience and nanotechnology- Definition-Historical development, scope and applications

[Book 1, Chapter 1].

Comparison of bulk and nanomaterials-, classification of nanostructured materials: one, two and three dimensional confinement, size and dimensionality effects - size effects,conduction electronsand dimensionality, Fermi gas and density of states, Potential wells,Partial confinement,Properties dependent on density of states,excitons.

[Book 2 Chapter 9.1, 9.3, 9.4]

Unit 2 Properties of nanomaterials and scaling laws (6 Hours)

Introduction, size dependent properties, Properties of nanomaterials-chemical reactivity, solubility, melting points, electronic energy levels, electrical conductivity, Super-paramagnetism, Electron confinement, Integrated optics, Optical properties, Mechanical properties, Thermodynamic properties, scaling laws.

[Book 1 Chapter 3.1 to 3.4]

Unit 3 Synthesis and characterisation (16 Hours)

Synthesis of nanoscale materials and structures, Zero Dimensional materials-Inert gas condensation, Inert gas expansion, Sonochemical processing, Sol-gel deposition, Molecular self assembly, 1D and 2D- Foil beating, Electro-deposition, PVD, CVD, 3D- Rapid solidification, Equiangle extrusion, Milling and Mechanical alloying, Micromachining,Consolidation of nanoclusters and milled powders, Methods for nanoprofiling.

[Book 3 chapter 8.1]

Electron microscopy, Scanning probe microscopy, Optical microscopy, XRD

[Book 4,Chapter 2.1 to 2.4, 2.6]

IR and Raman Spectroscopy, Photoemission and X-ray spectroscopy

[Book 2 Chapter 3.4]

Unit 4 Carbon nanostructures (10 Hours)

Carbon nanostructures-carbon molecules, carbon clusters, Fullerene-structure of C-60 andits crystal-larger and smaller fullerenes-other bucky balls. Carbon nanotubes-fabrication-structure-electrical properties-vibrational properties-mechanicalproperties. Applicationsof carbon nano tubes-Field Emission and shielding-computers-fuel cells-chemical sensors-catalysis-mechanical reinforcement.

[Book 2, Chapter 5]

Unit 5 Nanomachines and nanodevices (12 Hours)

Resonant Tunneling diode, quantum cascade lasers, single electron transistors- operating principles and applications.

[Book 5, Chapter 9.1 to 9.4]

Books for study

1 Nanotechnology, An Introduction to synthesis, Properties and Applications of Nanomaterials, Thomas Varghese and KM Balakrishna, Atlantic Publishers and Distributors (P) Ltd, New Delhi

2 Introduction to Nanotechnology, Charles P. Poole Jr and Frank J Ovens, Wiley Interscience, USA

3 Nanomaterials, Nanotechnologies and design, Michael F Ashby, Paulo J Ferreira and Daniel L Schodek, Elsevier Publishers, UK

4 Nano, The Essentials, T. Pradeep, Tata Mc Graw Hill, New Delhi

5 Nanotechnology and Nanoelectronics, W.R. Fahrner, Springer, Newyork.

References

1 Encyclopedia of Nanoscience and Nanotechnology, H.S.Nalwa (Ed),American Scientific Publishers, Los Angels

2 Nanotubes and Nanowires, C.N.R. Rao and Govindraj, RSC Publishing

3 Nanotehnology, An Introduction, Jeremy J Ramsden, Elsevier Publishers,UK

4 Nanotechnology, Mick Wilson, Kamali Kannagara, Geoff Smith, MichelleSimmons and Burkhard Raguse, Overseas Press, New Delhi

PC1661.6. COMPUTER HARDWARE & NETWORKING (54 hrs -3 credits)

Unit 1. (3 hrs)

P.C. Architecture Functional block diagram of a computer. Processors Introduction to Microprocessor. CISC, RISC processors

Type of Processors and their specification.(Intel: Celeron, Pentium family- PII, PIII, PIV, dual core, core 2duo - AMD-K5,K6 series)

Unit 2 (10 hrs)

Motherboards:Motherboard components

Types, Form factor, Different components of Motherboard (BIOS, CMOS, BICMOS, RAM, CMOS Battery, I/O slots, I/O connectors), Riser architecture, Main Memory

(SIMM, DIMM, RIMM), extended/expanded/cache memories. Chipsets (Intel &AMD)-ROM, DRAM, SDRAM, CDRAM, RDRAM, WRAM. Bus standards:Types of Buses (PC, ISA, MCA, AGP, PCI, USB, IEEE FireWire). Add on Cards Different latest Add on Cards (TV Tuner Card, DVR card, Video Capture, Internal Modem, Sound Card)

Unit 3 (9 hrs)

Drivers:

1. Floppy Disk Drive- Floppy Drive Components(overview only)
2. Hard Disk Drive (HDD)

Types, Capacity, Hard Disk Components (Media, Read/Write Head, Spindle Motor Head Actuator), Connector, Jumper setting, trouble shooting in HDD. Hard Disk Controller (HDC) – Block diagram, Working, Interfacing (IDE, SCSI, ATA and SATA series)

Configuration of HDD- Installation, Formatting, File Format (FAT, NTFS). Pen drive, i-pods

3. Optical Disk Drive

Types (ROM, R/W, DVD ROM, DVD R/W), Capacity, Difference between CD & DVD (capacity, format)-trouble shooting.

Unit 4 (5 hrs)

Peripherals

Keyboard and Mouse- operation

Types of VDU (CRT, LCD, and TFT), Resolution, and Dot pitch Printers – Types (dot matrix, inkjet, laser) Scanner- operation.

Power conditioning Device:SMPS- Block diagram, operation

UPS- Types (online, off line, Hybrid)-trouble shooting in all these devices.

Unit 5 (4 hrs)

Viruses & Vaccines

Virus- Introduction, infection methods,Types of viruses, Different symptoms of virus attack, precautions. Vaccine- Method of vaccine, Different types of Antivirus used in PC, Firewalls

Unit 6 (7 hrs)

NETWORKING ESSENTIALS Introduction Need for networking Network Topology OSI Model Types of networks (LAN, WAN, MAN) Protocols, LAN Protocols-Classification, Examples, Ethernet networking WAN Protocols- PPP, X .25, PPTP, L2TP, ISDN

Unit 7 (8 hrs)

LAN Connectivity Devices- NIC, Repeater, Hub, Switch, Bridge.Internet Connectivity Device- Routers, Gateways, CSU/DSU TCP/IP Protocol SuiteWhat is TCP/IP, Importance, OSI vs TCP/IP

Unit 8 (6 hrs)

IP Addressing

Overview, Address classes, Network ID, Host ID and Subnet Mask, Addressing guidelines, Reserved IP Address, Subnetting and Supernetting(overview)

Unit 9 (2 hrs)

Emerging Technologies, Wireless Technology - Bluetooth, WAP Mobile Technology- GSM, CDMA, GPRS

Books for Study:

1. D. Balasubramanian, "Computer Installation & Servicing", Tata McGraw Hill.
2. Rom Gilster, Black book, "PC Upgrading and Repairing", Dream tech, New Delhi.
3. Street Smart, James Pyler, "PC Upgrading and Repairing", Wiley Publishing, Inc.
4. Stephen.J.Bigelow,"Bigelow's Troubleshooting, Maintenance & Repairing PCs", Tata McGraw Hill
5. Craig Zacker, "The Complete Reference- Networking", Tata McGraw Hill
6. Douglowe, "Networking All in One Desk Reference"-3Edn, Wiley India Pvt Ltd.

References:

1. Mark Minasi, "The Complete PC Upgrade & Maintenance Guide" BPB Publication
2. C.A. Schmidt, "The Complete Computer Upgrade & Repair Book", Dreamtech
3. Craig Zacker, John Rourke, "The Complete Reference- PC Hardware" Tata McGraw Hill
4. Scott Mueller, "Upgrading & Repairing PC's", Pearson Education
5. Vishnu Priya Sing & Meenakshi Singh, "Computer Hardware Course", Computech
6. Manahar Lotia, Pradeep Nair, Payal Lotia, "Modern Computer Hardware Course", BPB Publication.
7. Richard Mc Mohan, "Introduction to Networking", Tata McGraw Hill.

InternetResources:

www.edugrid.ac.in/webfolder/cou rses/cn/cn_resourses.htm www.howstuffwork.com www.e-tutes.com www.learnthat.com www.intel.com, www.amd.com., http://en.wikipedia.org

PRACTICALS

PC1242- MECHANICS, PROPERTIES OF MATTER, HEAT AND ACOUSTICS
(Minimum 16 experiments to be done)

1. Simple pendulum-Study of variation of period with length, mass and amplitude.
2. Spring mass system-spring constant
3. Fly Wheel - Moment of Inertia
4. Compound Bar Pendulum – Symmetric
5. Compound Bar Pendulum – Asymmetric
6. Uniform Bending—Y—Pin and Microscope
7. Uniform bending—Y- optic lever method
8. Non-uniform bending-Y-Optic lever& telescope
9. Non- Uniform bending –Y pin &microscope method
10. Young's Modulus- Cantilever-Angle between tangents.
11. Young's Modulus- Cantilever-Pin & Microscope
12. Rigidity modulus –Static torsion
13. Torsion pendulum-Rigidity modulus
14. Kater's pendulum-Acceleration due to gravity
14. Melde's string——Frequency of fork
15. Viscosity of a liquid——Stoke's method
16. Viscosity-Continuous flow method using constant pressure head.
17. Viscosity-Variable pressure head arrangement
18. Surface tension-Capillary rise
19. Surface Tension –Quincke's Method
20. Sonometer-frequency of A.C
21. Kundt's tube-determination of velocity of sound.
22. Comparison of least counts of measuring instruments.
23. Evaluation of errors in simple experiments.

References

1. Yarwood and Wittle; Experimental Physics for Students, Chapman & Hall Publishers.
2. An advanced course in practical physics, Chathopadhyaya, Rakshit and Saha, New central agency, Kolkata.
3. A text book of practical physics, S.Viswanathan & Co., Chennai.
4. Advanced Practical Physics, B.L.Worsnop and H.T.Flint, Khosla Publishers, Delhi.

PC1443- HEAT, ELECTRICITY AND MAGNETISM

(Minimum 16 experiments to be done)

1. Phase transition-determination of M.P of wax.
2. Determination of thermal conductivity of rubber
3. Lee's disc-determination of thermal conductivity of a bad conductor.
4. Potentiometer-Resistivity.
5. Potentiometer-Calibration of ammeter
6. Potentiometer –Reduction factor of T.G
7. Potentiometer –Calibration of low range voltmeter
8. Potentiometer – Calibration of high range voltmeter
9. Thermoemf-measurement of emf using digital multimeter.
10. Carey Foster's bridge-Resistivity
11. Carey Foster's bridge-Temperature coefficient of resistance.
12. Mirror galvanometer-figure of merit.
13. BG- Absolute capacity of a condenser
14. Conversion of galvanometer into ammeter and calibration using digital Multimeter
15. Conversion of galvanometer into voltmeter and calibration using digital Voltmeter.
16. Circular coil-dipole moment
17. Study of network theorems-Thevenin's & Norton's theorems and maximum power transfer theorem.
18. Circular coil-Study of earth's magnetic field using compass box.
19. Absolute determination of m and Bh using box type and Searle's type vibration magnetometers.
20. Searle's vibration magnetometer-comparison of magnetic moments.

References

1. Yarwood and Wittle; Experimental Physics for Students, Chapman & Hall Publishers.
2. An advanced course in practical physics, Chathopadhyaya, Rakshit and Saha, New central agency, Kolkata.
3. A text book of practical physics, S.Viswanathan & Co., Chennai.
4. Advanced Practical Physics, B.L.Worsnop and H.T.Flint, Khosla Publishers, Delhi.

PC 1643 OPTICS AND BASIC ELECTRONICS

1. Spectrometer-A, D and n of a solid prism.
2. Spectrometer –Dispersive power and Cauchy's constants
3. Spectrometer Grating—Normal incidence- N & wavelength
4. Spectrometer-i-d curve
5. Spectrometer- Hollow prism
6. Liquid lens-refractive index of liquid and lens
7. Newton's Rings—Reflected system
8. Air wedge-diameter of a wire
9. Spectrometer – small angled prism
11. Spectrometer –Grating Minimum deviation

12. Standardisation of meter using He-Ne Laser
13. PN junction Diode (Ge & Si) characteristics To draw the characteristic curves of a PN junction diode and to determine its ac and dc forward resistances.
14. Full wave (centre tapped) rectifier To construct a full wave rectifier using junction diode and to calculate the ripple factor with and without shunt filter (10 readings for RL 100 to 5000).
15. Full wave (centre tapped) rectifier To construct a full wave rectifier using junction diode and to study effect of L, C, and LC filters on the ripple factor (for different RL).
16. Bridge rectifier To construct a bridge rectifier using junction diodes and to calculate the ripple factor with and without shunt filter (10 readings for RL 100 to 5000).
17. Bridge rectifier- Dual power supply To construct a dual power supply using bridge rectifier and measure the output voltages for different pair of identical load resistors.
18. Zener diode characteristics To draw the I-V characteristic of a Zener diode and to find the break down voltage and the dynamic resistance of the diode.
19. Zener diode as a voltage regulator To construct a voltage regulator using Zener diode and to study the output voltage variation (i) for different RL and (ii) for different input voltage with same RL.
20. Transistor characteristics-CE To draw the characteristic curves of a transistor in the CE configuration and determine the current gain, input impedance and output impedance.
21. Transistor characteristics-CB To draw the characteristic curves of a transistor in the CB configuration and determine the current gain, input impedance and output impedance.
22. Single stage CE amplifier- To construct a single stage CE transistor amplifier and study its frequency response

PC1644—ELECTRONICS AND COMPUTER SCIENCE
(Minimum 15 experiments to be done – 5 from computer science)

1. OP amp. IC741- Inverting amplifier To construct an inverting amplifier using IC741 and determine its voltage gain.
2. OP amp. IC741- Non inverting amplifier To construct a non inverting amplifier using IC741 and determine its voltage gain.
3. Phase shift oscillator To construct a phase shift oscillator using transistor and measure the frequency of the output waveform.
4. Logic gates- OR and AND To verify the truth tables of OR and AND gates using IC
5. Logic gate- NOT, NAND To verify the truth tables of NOT gate using IC
6. Transistorised Multivibrator- Astable
7. Astable Multivibrator using IC 555
8. SR Flipflop using 7400/7410 9.Schimdt trigger using IC 7414
10. Analogue to Digital convertor
11. Study of LCR Circuit
12. Adder and Subtractor using Basic gates

COMPUTER SCIENCE

1. Program to find the roots of a quadratic equation (both real and imaginary root)
2. Program to sort a given list containing the name of students and their total marks and print the rank list.
3. Programs to plot the functions Sin x, Tan x and e^{-x} .
4. Program to find the product of two n×n matrices.

5. Program to find the dot product and cross product of vectors
6. Program to simulate the trajectory of the projectile thrown (a) horizontally and (b)at an angle.
7. Program to study the motion of a spherical body in a viscous fluid.
8. Program to study the motion of a body under a central force field.
9. Program to fit a straight line through the given set of data points using least square fitting algorithm.
10. Program to integrate a given function using Simpson's rule.
11. Program to integrate a given function using Trapezoidal rule.
12. Program to find the solution of differential equation by RK2 method.

References:

1. Basic electronics and linear circuits; N.N. Bhargava, D.C. Kulshreshtha, S.C. Gupta
2. OP- Amps and linear integrated circuits; Ramakant A. Gayakwad
3. Basic electronics; Santiram Kal
4. Basic electronics; B. L. Theraja
5. Principles of electronics; V. K. Mehta
6. A first course in Electronics; Anwar A. Khan, Kanchan K. Dey

VOCATIONAL COURSES

Career Related First Degree Programme in BSc Physics and Computer Applications (PCA)

Scheme and Syllabus

SCHEME

Division of Marks (Lab Examination)

(Computer Science)

1. First program should be sufficiently simple **25 marks**
   (Logic – 10 marks, Successful compilation – 10 marks, Result – 5 marks)
2. Second program should be based on advanced concepts **30 marks**
   (Logic – 15 marks, Successful compilation – 10 marks, result – 5 marks)
3. Viva Voce **15 marks**
4. Lab Record **10 marks**

Total Marks **80 marks**

Sem	Course code	Course	No. of hrs/week	No. of credits	Hrs/ Sem.	CE	ESE
1	PC1171	Introduction to IT	3	3	54	20%	80%
2	PC1221	Introduction to Programming	3	2	54	"	"
2	PC1271	Programming Lab – I	S1- 2 S2 - 2	3	S1-36 S2-36	"	"
3	PC1371	Operating Systems	3	3	54	"	"
3	PC1372	Data Structures	3	3	54	"	"
4	PC1471	Software Engineering	3	3	54	"	"
4	PC1472	Object Oriented Programming	2	2	36	"	"
4	PC1473	Programming Lab – II	S3-2 S4-2	4	S3-36 S4-36	"	"
5	PC1571	Database Management Systems	3	3	54	"	"
5	PC1551	OPEN COURSE	3	2	54	"	"
	1551.1	Internet Technology					
	1551.2	Linux Environment					
	1551.3	Business Informatics					
5	PC1572	Programming Lab III	7	4	136	"	"
6	PC1671	Introduction To Information	4	4	72	"	"
		Security					
6	PC1672	Computer Networks	4	3	72	"	"
6	PC1673	Major Project & Viva	4	4	72	"	"

PC 1171 INTRODUCTION TO IT

1. AIM:

To create overall generic awareness about scope of the field of IT and to impart basic personal computing skills.

To create background knowledge for the various courses in the programme.

2. OBJECTIVES:

To introduce the basic terminology in the field of IT

To impart functional knowledge about PC hardware, operations and concepts To impart functional knowledge in the use of GUI Operating System

To impart functional knowledge in a standard office package (word processor, spread sheet and presentation softwares and popular utilities

To impart functional knowledge about networks and internet.

To give an overview of computer application in various fields and an overall generic awareness about the scope of the field of IT

3. SYLLABUS

Module–I:Computer characteristics: Speed, storage, accuracy, diligence; Digital signals, Binary System, ASCII; Historic Evolution of Computers; Classification of computers: Microcomputer, Minicomputer, mainframes, Supercomputers; Personal computers: Desktop, Laptops, Palmtop, Tablet PC; Hardware & Software; Von Neumann model.

Module–II: Hardware: CPU, Memory, Input devices, output devices. Memory units: RAM (SDRAM, DDR RAM, RDRAM etc. feature wise comparison only); ROM-different types: Flash memory; Auxiliary storage: Magnetic devices, Optical Devices; Floppy, Hard disk, Memory stick, CD, DVD, CD-Writer; Input devices - keyboard, mouse, scanner, speech input devices, digital camera, Touch screen, Joystick, Optical readers, bar code reader; Output devices: Display device, size and resolution; CRT, LCD; Printers: Dot-matrix, Inkjet, Laser; Plotters, Sound cards & speaker.

Module-III: Software- System software, Application software; concepts of files and folders, Introduction to Operating systems, Different types of operating systems: single user, multitasking, time-sharing multi-user; Booting, POST; Basic features of two GUI operating systems: Windows & Linux (Basic desk top management); Programming Languages, Compiler, Interpreter, Databases; Application softwares: Generic Features of Word processors, Spreadsheets and Presentation softwares; Generic Introduction to Latex for scientific typesetting; Utilities and their use; Computer Viruses & Protection, Free software, open source.

Module–IV: Computer Networks- Connecting computers, Requirements for a network: Server, Workstation, switch, router, network operating systems; Internet: brief history, World Wide Web, Websites, URL, browsers, search engines, search tips; Internet connections: ISP, Dial-up, cable modem, WLL, DSL, leased line; email, email software features (send receive, filter, attach, forward, copy, blind copy); characteristics of web-based systems, Web pages, introduction to HTML.

NB:- Activities and assignments are not meant for End_Semester_Examination

Activities & Assignments: *Applications of Computers in various fields: office automation, education, entertainment, medicine, commerce, governance, resource management, law and order, communications, science and technology, defence; Historic evolution of IT; Pioneers in IT; Debates in IT : Computer Creativity, Digital Divide, IT Policy, IT and Development etc; IT in India (major initiatives, key institutions, statistics), IT in Kerala (major initiatives, key institutions, statistics); Careers in IT.*

4. REFERENCES

4.1 Core

E. Balaguruswamy, *Fundamentals of Computers*, McGraw hill, 2014

4.2 Additional

Dennis P Curtain, *Information Technology: The Breaking wave*, McGrawhill, 2014
Peter Norton, *Introduction to Computers*, McGrawhill, Seventh edition

4.3 Internet resources:

- www.fgcu.edu/support/office2000
- www.openoffice.org *Open Office Official web site*
- www.microsoft.com/office *MS Office web site*
- www.lgta.org *Office on-line lessons*
- www.learnthenet.com *Web Primer*
- www.computer.org/history/timeline
- www.computerhistory.org
- http://computer.howstuffworks.com
- ohttp://vmoc.museophile.org *Computer History*
- www.dell.com *Dell Computers*
- www.intel.com *Intel*
- www.ibm.com *IBM*
- www.keralaitmission.org *Kerala Govt. IT Dept*.
- www.technopark.org

PC1221 INTRODUCTION TO PROGRAMMING

1. AIM:

To Expose students to algorithmic thinking and problem solving and impart moderate skills in programming in a industry-standard programming language

2. OBJECTIVES:

To expose students to algorithmic thinking and algorithmic representations To introduce students to basic data types and control structures in C.

To introduce students to structured programming concepts

To introduce students to standard library functions in C language

3. SYLLABUS

Module–I: Introduction to programming: Algorithm & Flow charts: Definitions, Symbols used to draw flowcharts, Examples, Editor, Program Writing – Structure of the Program, top-down design, Source code, Object code, Executable file, Extensions of different files, Program Compilation, Running of a Program; Header file concept. Variables and Constants, Rules for naming the Variables/Identifiers; Basic data types of C, int, char, float, double; storage capacity – range of all the data types; Storage classes;

Module-II: Basic Elements: Operators and Expressions: Assignment Operator, Arithmetic Operator and Arithmetic expression, Relational Operator and Relational exp., Logical Operator and how it is used in condition, Expression Evaluation (Precedence of Operators); simple I/O statements, Control structures, if, if else, switch-case, for, while, do-while, break, continue. Arrays, Defining simple arrays, Multi-dimensional arrays, declaration, initialization and processing;

Module-III: Functions & Pointers: concept of modular programming, Library, User defined functions, declaration, definition & scope, recursion, Pointers: The & and * Operators, pointer declaration, assignment and arithmetic, visualizing pointers, call by value, call by reference, dynamic memory allocation.

Module–IV: Advanced features: Array & pointer relationship, pointer to arrays, array of pointers. Strings: String handling functions; Structures and unions; File handling: text and binary files, file operations, Library functions for file handling, Modes of files.

Activities and assignments: *Pre-processor directives: #include, #define, macros with arguments, the operators # and ##, conditional compilations, multiple file programming; creating header files, program verification, algorithm efficiency analysis; int86 functions and graphic functions.*

4. REFERENCES

4.1 Core

Ashok N. Kamthene, *Programming in C*, Pearson Education, Second edition

4.2 Additional

E.Balaguruswamy, *Programming in ANSI C*, McGrawhill, Sixth Edition

NB:- Activities and assignments are not meant for End_Semester_Examination

PC1271PROGRAMMING LAB – I

1. AIM:

To provide an opportunity for hands-on practice of basic features of DOS, Windows, software tools(word processor, spread sheet, presentation s/w) and algorithmic thinking and problem solving in a industry standard programming language

2. OBJECTIVES:

After the completion of this course, the student should be able to:

Create, Save, Copy, Delete, Organise various types of files and manage the desk top in general

Use a standard word processing package Exploiting popular features

Use a standard spread-sheet processing package Exploiting popular features Use a standard presentation package Exploiting popular features

Also, this course will provide hands-on practice in the following topics, under a variety of programming situations with a focus on writing, debugging and analyzing structured programs: basic data types in C. basic control structures in C. arrays, structures and files standard library functions in C language solving moderately complex problems involving the above and requiring selection of appropriate data structures and efficient algorithms

3. SYLLABUS

1. Familiarization of important DOS/Windows/Linux features
2. Practice on basic features of word processor, spread sheet and presentation software.

Part A

The C laboratory work will consist of 15-20 Experiments

1. Testing out and interpreting a variety of simple programs to demonstrate the syntax and use of the following features of the language: basic data types, operators and control structures.

Part II

2. 1-D Arrays: A variety of programs to declare, initialise, read, print and process 1-D arrays of various basic data types. Processing to include, selection, sum, counting, selective sum, selective counting, reversing etc.
3. Pointers: A large number of trivial programs involving all possible data types to familiarize the syntax of pointers in a variety of situations and to draw memory diagrams based on the observations.
4. Structures: A variety of programs to declare, initialise, read, print and process structures made up of a variety of data types and structures.
5. 2-D Arrays: A variety of programs to declare, initialise, read, print and process 2-D arrays of various basic data types. Processing to include, selection, sum, counting, selective sum, selective counting, reversing etc.
6. Array of Structures and Structure of Arrays: Programs to demonstrate declaration and processing of structure of arrays and array of structures.
7. Pointers to Arrays: A number of programs to demonstrate handling of 1-D and 2-D arrays using pointers and to draw memory diagrams based on the observations.
8. Pointers to Structures: A number of programs to demonstrate use of pointers to structures and to draw memory diagrams based on the observations.
9. Functions –I: Simple Examples of declaring and using functions of the following categories (i) no argument, no return, (ii) argument, no return, (iii) no argument, return, (iv) argument, return, all pass by value
10. Functions –II: Declaring and using functions with pass by reference, Passing and Returning structures, Recursive functions.
11. Files: Simple Example involving use of multiple files: declaring, opening, closing, reading from and writing to text files.
12. Files: Example involving use of multiple files: declaring, opening, closing, reading from and writing to binary files.
13. Library functions: A variety of Examples demonstrating (i) string processing functions (ii) a variety of selected library functions
14. Debugging programs involving syntactic and/or logical errors

16-20: Developing programming solutions to problems including program design, algorithm development and data structure selection.

4. REFERENCES

4.1 Core

Deitel & Deital, *C: How to Program*, Pearson Education Alan R Feuer, *The C Puzzle Book*, Pearson Education Yashvant Kanetkar, *Test Your C Skills*, BPB Publications, 3rd Edition

4.2 Internet resources:

- www.cprogramming.com
- www.programmersheaven.com o comp.lang.c*newsgroup*
- www.cplusplus.com
- cwx.prenhall.com/bookbind/pubbooks/deitel
- www.fgcu.edu/support/office2000
- www.openoffice.org Open Office Official web site
- www.microsoft.com/office MS Office web site
- www.lgta.org Office on-line lessons
- www.learnthenet.com Web Primer

PC 1371 OPERATING SYSTEMS

1. AIM:

To introduce students to basic functions and the theoretical underpinnings of modern operating systems

2. OBJECTIVES:

To introduce students to:

Fundamental concepts of systems software Functions of operating systems as a resource manager Strategies for constrained resource allocation Strategies for process scheduling Memory and I/O Management techniques Salient features of popular operating systems.

3. SYLLABUS

Module I:Introduction to operating system: Operating system as the main component of system software; OS as a resource manager, Structure of OS- shell, utilities, resource management routines, kernel, evolution of OS, multiprogramming, time sharing, real-time systems, parallel systems, distributed systems, OS functions, Characteristics of modern OS; **Process Management:** Process description and control: process control block, Process states: operations on processes; concurrent process; threads; processes and threads; symmetric multiprocessing; micro Kernels. CPU Scheduling: Schedulers, Scheduling methodology, CPU Scheduling algorithms, performance comparison.

Module II: Process synchronization- independent and concurrent processes, critical section, mutual Exclusion, Petersons solution, semaphore, classical synchronization problem-bounded buffer and reader/ writer problem. Concept of inter-process communication. **Deadlock**- deadlock and starvation, conditions for deadlock, resource allocation problem, methods for handling deadlock-deadlock prevention, deadlock avoidance- Bankers algorithm, deadlock detection, deadlock recovery.

Module III: Memory Management & Protection: Concept of memory, address binding, Logical address, physical address, swapping, contiguous allocation- fixed partition, variable partition, fragmentation. Non-contiguous allocation– paging, segmentation. Virtual memory- demand paging, page fault, replacement algorithms, thrashing. Protection and security – mechanisms and policies, threats, accidental data loss, protection mechanisms, user authentication, attacks from inside, virus, antivirus.

Module IV:I/O & File Management I/O management – I/O hardware, application I/O interface, kernel I/ O subsystem. Disk I/O, disk scheduling, RAID, disk cache. File management- file concept, access methods, directory structure, file system structure & implementation, directory implementation, allocation methods, free space management.

Assignments and activities: *case study of popular Operating Systems- MS DOS, UNIX, Windows 2000, Windows NT, Linux, Sun OS, Solaris. Process management –Windows, Linux, Solaris. Concurrency management - Windows, Linux, Solaris. Memory management - Windows, Linux, Solaris.*

NB:- Activities and assignments are not meant for End_Semester_Examination

4. REFERENCES

4.1 Core

Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, *Operating System Principles*

4.2 Additional

Achyut S Godbole, *Operating systems*, McGRawhill, Third Edition

4.3 Internet resources:

- www.aw.com/cs_supplements/nutt3/index.html
- www.aw.com/cs_supplements/nutt/index.html
- cwx.prenhall.com/bookbind/pubbooks/tanenbaum2/
- www.gnu.org,
- www.linux.org,
- www.linuxcentral.com

PC1372 DATA STRUCTURES

1. AIM:

To introduce students to various data structures and their features and applicability.

2. OBJECTIVES:

By the end of the course, students should be:

Able to write well-structured programs in C

Be familiar with data structures like array, structures, lists, stacks, queues, trees and graphs

Able to implement the above data structures in C/C++

Able to appreciate various searching and sorting strategies

Able to select appropriate data structures for solving a given problem

3. SYLLABUS

Module–I: Review of Arrays, Structures, pointer to structures, passing structures as arguments to functions. Linked Lists: Concept of static versus dynamic data structures, implementation of linked lists using pointers, operations on linked lists: insertion, deletion and traversing. Doubly linked lists and circular linked lists, applications of linked lists.

Module- II: Stacks and Queues: FIFO and LIFO data structures – stacks using (i) pointers and (ii) arrays. Queues using (i) pointers and (ii) arrays, applications, polish notation.

Module-III: Trees: Concept of linear versus non-linear data structures, various types of trees – binary, binary search trees. Creating a binary search tree, traversing a binary tree (in-order, pre-order and post-order), operations on a tree –insertion, deletion and processing, expression trees, implementation using pointers, applications.

Module–IV: Searching: sequential searching, binary searching, Hashing – linear hashing, hash functions, hash table searching, Sorting: exchange sort, selection sort and insertion sort, Graphs, graph traversal- depth-first and breadth-first traversal of graphs, applications.

Assignments and Activities: *Multi-way search trees, B-trees, Huffman trees, case-studies.*

NB:- Activities and assignments are not meant for End_Semester_Examination

4. REFERENCES

4.1 Core

A.K.Sharma, *Data Structures Using C*, Pearson, Second edition, 2011

4.2 Additional

Nair A.S., Makhalekshmi,*Data Structures in C*, PHI, Third edition 2011.

4.3 Internet resources:

- www.keralauniversity.edu/csbos
- http://warrior-101.tripod.com/dstut/dstut.html: Tutorial on data structures.
- http://crasseux.com/books/ctutorial/Data-structures.html

PC1471 SOFTWARE ENGINEERING

1. AIM:

To enable the students to have a thorough understanding of the activities in development projects using (a) Structured Analysis and Design and (b) Object Oriented Analysis and Design

2. OBJECTIVES:

At the end of the course, the students should be able to :

Appreciate the importance of having a process for software development.

Understand the various activities undertaken for a software development project following the Function oriented Design & Object oriented design

Understand the issues in code design and development

Test software developed using SSAD and OOAD methodologies.

Have in depth knowledge about the different OOAD Themes and compare them with SSAD

3. SYLLABUS:

Module 1: Introduction : Characteristics of Software, Product and Process, Need for Software Process, Characteristics of a Software Process, Software Development Process models, Software Development Life Cycle Model: Waterfall Model, Prototyping, iterative development, Spiral Model, time-boxing model; Comparison of different Life Cycle Models, Software Project Management, Project Estimation Techniques, Software Requirements Analysis and Definition: Software Requirements, Overview of SA/SD Methodology, Requirements Specification: Need for SRS, Characteristics of an SRS, Components of an SRS, Specification Languages, Structure of a Requirements document. Functional Specification with Use cases, developing use cases, Structured Analysis, Matrics, quality metrics, Planning a project, effort estimation, COCOMO model, quality plan, risk management-assessment, control.

Module II: Function oriented design: Problem partitioning, abstraction, modularity, Top-down and Bottom-up Strategies, coupling, cohesion, design notations-structure charts, structured design, Data Flow Diagrams, Developing the DFD Model of a system, Entity Relationship Diagram, Developing ERD of a system, Decision Trees, Decision Tables, Structured English, first-level factoring, factoring input, output and transform branches, transaction analysis, verification.

Module III: Object-oriented design: Object-oriented design concepts, Comparison between Algorithmic Decomposition and Object Oriented Decomposition Unified Modelling Language, Object Oriented Design using UML, Class Diagram, Sequence Diagram, Collaboration Diagram; detailed design, PDL, algorithm design, state modelling of classes, design walkthroughs, critical design review, consistency checkers, other UML diagrams.

Module IV: Coding and testing: common coding errors, structured programming, coding standards, incremental coding process, test driven development, source code control and build, refactoring, verification-code inspections, static analysis, unit testing, combining different techniques. Testing- error, fault and failure, test oracles, test cases, Black Box Testing, Equivalence Class Partitioning, Boundary Value Analysis, Cause Effect Graphing, White Box Testing- control flow based and data-flow based testing, test plan, test case specifications, defect logging and tracking, Comparison of Different Techniques.

Activities and Assignments*: Preparing various documents, case studies, preparing test plans, UML diagrams, Metrics for various development phases, Agile Programming Methodologies, extreme Programming, Formal Methods, CASE Tools.*

NB:- Activities and assignments are not meant for End_Semester_Examination

4. REFERENCES:

4.1 Core

Rajib Mall, *Fundamentals of Software Engineering,* Second Edition, PHI

4.2 Additional

PankajJalote**,** *An Integrated Approach to Software Engineering***,** Narosa

Waman S Jawadekar, *Software Engineering*, McGraw hill, 2013

Journals and Magazines: (*i***)** Software Development, CMP Media. (ii) Software Quality Professional, ASQ.

4. Internet Resources:

- http://courses.cs.vt.edu/csonline/SE/Lessons/
- http://www.omg.org/gettingstarted/what_is_uml.htm
- http://www-106.ibm.com/developerworks/java/library/co-design5.html
- http://www-106.ibm.com/developerworks/java/library/j-jmod0508/
- www.rspa.com
- http://www.math-cs.gordon.edu/local/courses/cs211/ATM

PC1472 OBJECT ORIENTED PROGRAMMING

1. AIM:

To introduce the student to the basic concepts of object orientation and impart skills in an industry standard object oriented language

2. OBJECTIVES:

On the completion of this course, the student will be able to

Understand the concepts of classes and object

Define classes for a given situation and instantiate objects for specific problem solving

Reuse available classes after modifications if possible Possess skill in object oriented thought process

3. SYLLABUS

Module–I: Concept of Object orientation – why related data and methods should be kept as a single unit – comparison with procedural and structured programming – Classes and objects – data abstraction, encapsulation, inheritance, polymorphism, dynamic binding, message passing. Advantages of object orientation – reusability, maintenance, security, comfort in programming. Input and output streams in C++; Basic data types and declarations.

Module–II: Classes and objects in C++, access modifiers, static members, friend functions, Constructors and Destructors, polymorphism, Operator Overloading and type conversion, anonymous objects

Module-III: Inheritance- parent and child classes, private, public and protected inheritance, Multiple inheritance and multi-level inheritance, Virtual base classes. C++ and memory models – new and delete operators, Heap, dynamic objects.

Module–IV: Binding & Polymorphism: Early binding, Late Binding, Pointers to derived class objects, virtual functions, Pure virtual functions, abstract classes, object slicing, exception handling in C++: try, throw and catch.

Assignments and activities: *Evolution of OOP – history of C and C++, Review of features of C++ common with C and also minor variations; study of File stream classes in C++. Templates – class and function templates, Templates versus macros, String objects in C++, Standard Template Library in C++ - containers, associative containers Name spaces.*

4. REFERENCES

4.1 Core

Ashok N. Kamthane, *Object oriented Programming with ANSI & Turbo C++,* Pearson

4.2 Additional

H M Deitel and P J Deitel, *C++: how to program*, Pearson Education

Robert Lafore, *Object Oriented Programming in Turbo C++*, Galgotia Publications

NB:- Activities and assignments are not meant for End_Semester_Examination

PC1473 PROGRAMMING LAB – II

1. AIM:

To provide an opportunity for hands-on practice of object oriented programming and problem solving in a industry-standard programming language and also hands-on practice in various user-defined static and dynamic data structures.

2. OBJECTIVES:

This course will provide hands-on practice in a the following topics, under a variety of programming situations with a focus on writing, debugging and analyzing object oriented programs: basic data types and control structures in C++. managing classes and objects in a variety of situations solving moderately complex problems involving the above and requiring selection of appropriate structures and algorithms

3. SYLLABUS

The laboratory work will consist of 15 20 experiments, only by using class concept

Part A

1. Testing out and interpreting a variety of simple programs to demonstrate the syntax and use of the following features of the language: basic data types, operators and control structures.
2. Solving a problem using (i) structures and (ii) classes and comparison between the two (the problem logic and details should be kept minimal and simple to enable focus on the contrast between the two methods, for example declaring result of a set of students defining the name and total marks in the program itself).
3. Class definitions and usage involving variety of constructors and destructors

Part B

4. Programs involving various kinds of inheritances,
5. Programs involving operator overloading and type conversions
6. Programs involving virtual base classes, friend functions
7. Program to demonstrate early and late binding
8. Program to allocate memory dynamically
9. Program involving class and function templates
10. Programs to demonstrate(i) string processing (ii) file streams (iii) a variety of selected library functions
11. exception handling
12. Handling of 2-D arrays using pointers
13. Debugging programs involving syntactic and/or logical errors

4. REFERENCES

Deitel&Deital, *C++: How to Program*, Pearson Education

PC1571 DATABASE MANAGEMENT SYSTEMS

1. AIM:

To introduce basic concepts of data bases, and related techniques and tools

2. OBJECTIVES:

Be aware of basic concepts of data bases and data base management systems Be aware of concepts of relational data bases.

Know to normalize relational data bases

Skilled in using relational algebra and relational calculus Develop skills to write database queries

3. SYLLABUS

Module–I: Introduction: evolution of data base systems, overview of database management systems, Relational data model, mathematical definition, candidate, primary and foreign keys, set operations on relations, insertion, deletion and update operations, attribute domains.

Module-II: Relational algebra and relational calculus, Introduction to SQL, Table creation, selection, projection and join using SQL

Module-III: Functional Dependencies – Inference axioms, normalization, 1NF, 2NF, 3NF and Boyce-Codd Normal forms, Lossless and lossy decompositions.

Module-IV: The E-R Model, Entities and attributes, 1-1 and many-1, many-many relationships. Security – Physical and Logical, Design and maintenance issues, integrity.

Assignments and activities: *Study of features of MS Access, Open Office Base, Oracle, mySQL, emerging areas.*

4. REFERENCES

4.1 Core

Ramon A. Mata-toledo and Pauline K. Cushman, *Fundamentals of Relational Data Bases*, Schaum Outlines, Tata McGraw Hill

4.2 Additional

Atul Kahate, *Introduction to Data Base Management Systems*, Pearson Education

4.3 Internet resources:

- www.pearson.co.in/AtulKahate,
- www.edugrid.ac.in/webfolder/courses/dbms/dbms_indEX.htm

NB:- Activities and assignments are not meant for End_Semester_Examination

PC1551 OPEN COURSE

PC 1551.1 INTERNET TECHNOLOGY

1. AIM:

Give an introduction about the components of internet, its working and the way in which web pages are designed.

2. OBJECTIVE:

At the end of this course, the students will be able to

Discuss various components of internet

Explain different devices used for networking Explain the working principle of Internet

Design web pages using HTML

3. SYLLABUS:

MODULE I- Introduction to Computer Networks- Advantages of Networks, Goals of Networks, Types of Networks- LAN,MAN,WAN, Internet , Public Networks, LAN topologies- Bus, Star, Ring, Mesh.

MODULE II- Networking Devices- Interconnecting Issues, Connectivity Devices, Hubs, Switch, Bridges, Routers.

MODULE III- Introduction to Internet -Meaning of Internet, WWW- History, Working of Internet, Browsing, Searching the Web, Internet protocols- TCP/IP Protocol suite, UDP, IP addresses, IP Versions – IPV4, IPV6, Services of the Internet- FTP, HTTP, Email.

MODULE IV- HTML- Understanding HTML, Text tags; Graphics, Video and Sound Tags; Link and Anchor Tags; Table Tags; Frame Tags; Miscellaneous tags (layers, image maps etc);

4. REFERENCES

4.1 Core

Douglas E Comer, *Computer Networks and Internets*, 4/e, Pearson Education

4.2 Additional

Andrew S. Tanenbaum, *Computer Networks*, 4/e, Pearson Education

PC 1551.2 LINUX ENVIRONMENT

4.1 AIM:

To familiarize with Linux working environment

4.2 OBJECTIVES:

Introduction to Operating Systems

Introduction to linux

Introduction to OpenOffice.org

3. SYLLABUS

Module I- Operating Systems- Necessity of OS, Types of OS-Batch Systems, Time Sharing Systems, Real time Systems, Basic Structure of An OS- Kernel, Shell, File System, OS as a Resource Manager, General principles of Resource Management

Module II- Introduction to Linux**-** History and Features of Linux, Various flavours of Linux, Linux Kernel and Shell, Graphical Desktops- GNOME, KDE, Linux File System and Directories, Linux commands bc, cal, cat, cd, chgrp, chmod, clear, cmp, cp, kill, rm, rmdir, tty, wc, who, grep, write, telnet, whois, mv, find, ps, mkdir, more, date, mount, show, mount etc. Pipeline and redirection concepts, using floppy and cd- rom in linux

Module III-Open Office.org-Open Office Writer-Parts of the OpenOffice.org Window, Editing and Writing a Writer document, spell checker, autocorrect, Thesaurus, create table, table formatting, finding items in a document, header and footer, create and modify page numbers, adding graphics, borders and colors

Module IV- Open Office.org-Open Office Calc- Entering data in a spreadsheet, spreadsheet math, columns, lookup functions, charting data, Open Office Impress- Create a new presentation , insert, copy and delete slides, formatting text, bulleted and numbered lists, adding clipart, pictures, charts and spreadsheets, slide settings and transitions, animating slides, previewing and running a slideshow

Assignments and Activities: *Packages in Linux, Case study of open source softwares, comparison of Linux with Windows*

4. REFERENCES

4.3 Core

Pramod Chandra P Bhat, *An Introduction to Operating Systems: Concepts and Practice,* 2/e PHI,2007

4.4 Additional

Richard Peterson, *Linux Programming: A Beginners Guide*,DreamTech

NB:- Activities and assignments are not meant for End_Semester_Examination

PC1551.3 BUSINESS INFORMATICS

1. AIM:

To create an awareness about role of IT in business and to introduce concepts and techniques of e-commerce

2. OBJECTIVES:

By the end of this course, the student should be able to:

Have an awareness about role of IT in business

Have knowledge of basic concepts of e-commerce

Be aware of different types of e-commerce web sites and different modes of payments

Be aware of security and legal issues in e-commerce

3. SYLLABUS

Module–I: History of e-commerce, definition, classification- B2B, B2C, C2C, G2C, B2G sites, ecommerce in education, financial, auction, news, entertainment sectors, Doing e-Commerce.

Module–II: Electronic payment systems – relevance of currencies, credit cards, debit cards, smart cards, e-credit accounts, e-money, security concerns in e commerce, authenticity, privacy, integrity, non-repudiation, encryption, secret key cryptography, public key cryptography, digital signatures, firewalls

Module–III: Mass marketing, segmentation, one-to-one marketing, personalization and behavioural marketing, web advertising, online advertising methods, advertising strategies and promotions, special advertising and implementation topics.

Module IV-Mobile Commerce: attributes and benefits, Mobile Devices, Computing software, Wireless Telecommunication devices, Mobile finance applications, Web 2.0 Revolution, social media and industry disruptors, Virtual communities, Online social networking: Basics and examples, Web 3.0 and Web 4.0, Civil law, intellectual property law, common law and EC legal issues

Assignments and Activities*: Case study of two internationally successful e-commerce web sites and two Kerala-based e-commerce web sites; IT act (India) and e-commerce.*

4. REFERENCES

4.1 Core

Erfan Turban et.al., *Electronic Commerce–A Managerial Perspective*, Pearson Education

4.2 Additional

R Kalokota, Andrew V. Winston, *Electronic Commerce – a Manger's guide*, Pearson

NB:- Activities and assignments are not meant for End_Semester_Examination

4.3 Internet resources:

- www.ecommercetimes.com,
- www.online-commerce.com,
- www.rsa.com,
- www.ntsecurity.com
- www.easystorecreator.com/ecommercetutorial.asp

PC1572- PROGRAMMING LAB III

1. Visual Tools

Part A (30 hrs)

A list of Exercises, covering the basic aspects of VB, shall be prepared by the faculty in charge.

The list should provide guided and structured learning facility such that students can do case studies/ Projects using VB.

Ex:- Using KEYPRESS EVENT restrict only numeric values into textbox.
Calculator Program.
Simple word processing Program.

Part B (42hrs)

Candidates should do and record a case study of substantial standard. Questions based on the case study shall be included in the viva-voce

2. DBMS

Part A(52 Hrs)

- Students should do and records assignments based on SQL given by the faculty in charge.
- Questions for the internal lab test should be based on this part and of comparable standard.

Part B (20Hrs)

- Students should do and record a case study of substantial standard.

PC1671 INTRODUCTION TO INFORMATION SECURITY

1. AIM:

To introduce internetworking and the issues and methods of information security over internetworks.

2. OBJECTIVES:

On completion of this course student shall:

Be aware of principles and protocols of internetworks understand the basic issues in information security understand the concept of ciphers and cryptography. To impart an idea on various ciphers understand the concept of digital signatures and e-mail security policies to impart an idea on malicious softwares and remedies.

3. SYLLABUS

Module I: Information Security: Network security, Confidentiality, integrity, authentication, security policy, basic network security terminology, cryptography, symmetric encryption, substitution ciphers, transposition ciphers, steganography, Block ciphers, modes of operation, Data Encryption Standard, Public key cryptography, applications, strength and weakness, RSA algorithm, key distribution (concepts only).

Module II: Authentication, authentication methods, message digest, digital signatures, digital signature algorithm, DSS, E-mail security: Pretty Good Privacy, working of PGP, S/MIME, MIME, IP Security, Architecture, IPSec: strengths and benefits, IPv4, IPv6, ESP protocol, Web Security: Secure Socket layer, SSL session and connection.

Module III: Malicious Software, viruses, working of anti-virus software, worms, Trojans, spyware, firewall, characteristics of firewall, packet filters, application level gateways, firewall architecture, trusted systems.

Module IV: Security and Law:- Regulations in India. Information Technology Act 2000/2008.Cyber Crime and the IT Act 2000/2008.Indian Contract Act 1872, Indian Penal Code, Indian Copyright Act, Consumer Protection Act. Future Trends – The Law of Convergence.

Assignments and activities: *AES, Blowfish algorithms, Kerberos, Comparison of PGP and S/MIME, study of common malicious software, antiviruses.*

4. REFERENCES

4.1 Core

Brijendra Singh, *Cryptography & Network Security*, PHI.

Pachghare, V.K., *Cryptography and Information Security,* PHI.

NB:- Activities and assignments are not meant for End_Semester_Examination

PC1672 COMPUTER NETWORKS

1. AIM:

To introduce computer networks and through knowledge of data communication networks, their structures, techniques as well as some common standards.

2. OBJECTIVES:

On completion of this course student shall:

Be aware of evolution of development of networks understand the basic transmission technologies and characteristics understand the use of layer architecture for networking systems understand the main design issues of transport protocols and the mechanism to control traffic flow and congestion.

3. SYLLABUS

Module I Introduction to networks – Data Communication – Data flow simplex, Half duplex, Full duplex- Type of Connection – Point–to-Point, multi-drop. Bandwidth- bit rate, baud rate. Transmission media – Copper wires, fiber optics, Radio transmission, microwave, Satellite. switching-circuit, packet, message.

Module II Protocols – standards- Layering, packets, Layered PDUs, ISO-OSI model, TCP/IP model – Comparison. Framing- bit oriented, byte oriented, Error correction – detection – parity, hamming code, CRC. Flow control, error control- Piggybacking, pipelining, Protocols- Noise less and noisy channels – stop &wait, Stop &wait ARQ, Sliding window.

Module III Access control - pure- slotted ALOHA, CSMA, CSMA/CD. LAN Standards – Ethernet, Token bus, Token ring. Interfacing devices – bridge, hub, switch, router, gateway.

Module IV Internetworking- datagrams, fragmentation – routing-Distance vector routing, Link state routing. Concepts of congestion control-leaky bucket algorithm. Process to Process delivery -TCP, UDP, Application Layer -DNS, Remote login, file transfer protocol(FTP).

Assignments and activities: *Practical networking- networking in LINUX, Peer–to-peer networking, Measurement and packet analysis, blue tooth, emerging topics*

4. REFERENCES

4.1 Core

Brijendra Singh, *Data Communication and Computer Networks*, 2/e, PHI

4.2 Additional

Behrouz A Forouzan, *Data Communication & Computer networks*, 4thed, MGH

Achyut S Godbole, *Data communications and networks*, McGrawHill, Second

4.3 Internet resources:

- www.netbook.cs.purdue.edu, www.labbook.cs.purdue.edu,
- www.edugrid.ac.in/webfolder/courses/cn/cn_indEX.htm

NB:- Activities and assignments are not meant for End_Semester_Examination

PC1673 MAJOR PROJECT & VIVA

1. AIM:

To expose student to industry-standard project practices, through a real-life project work under time and deliverable constraints, applying the knowledge acquired through various courses.

2. OBJECTIVES:

To provide an opportunity to apply the knowledge gained through various courses in solving a real life problem

To provide an opportunity to practice different phases of software/system development life cycle

To introduce the student to a professional environment and/or style typical of a global IT industry

To provide an opportunity for structured team work and project management To provide an opportunity for effective, real-life, technical documentation

To provide an opportunity to practice time, resource and person management.

3. PROJECT GUIDELINES

Group Size – Maximum 3

No. of records – No. of group members + 1 (Department copy) Certificate should include the names of all members

The minimal phases for the project are: Project search, finalization and allocation, Investigation of system requirements, Data and Process Modelling, System Design, Program design, Program coding and unit testing, System integration, System implementation and acceptance testing.

3.1 Planning the Project: The Major Project is an involved Exercise which has to be planned well in advance. The topic should be chosen in Semester 4 itself and the case study of Course CS1302 should as far as possible, be based on the project topic, though on Exceptional cases, for valid reasons, the project guide may waive this condition. Related reading, training and discussions should start from semester 5 itself.

3.2 Selection of project work: Project work could be of 3 types:

a) Developing solution for a real-life problem: In this case, a requirement for developing a computer based solution already Exists and the different stages of system development life cycle is to be implemented successfully. Examples are Accounting Software Package for a particular organization, Computerisation of administrative functions of an organization, Web Based Commerce, etc. The scope for creativity and Exploration in such projects is limited, but if done meticulously, valuable Experience in the industrial context can be gained.

(b) Innovative Product development: These are projects where a clear-cut requirement for developing a computer based solution may not be Existing, but a possible utility for the same is conceived by the proposer. An Example is a Malayalam Language Editor with Spell Checker, Computer Music Software for Indian Music, Heat Engines Simulation Software for eLearning, Digital Water Marking Software,

(c) Research level project: These are projects which involve research and development and may not be as structured and clear cut as in the above case. Examples are Malayalam Character Recognition, Neural Net Based Speech Recogniser, Biometric Systems, Machine Translation System etc. These projects provide more challenging opportunities to students, but at EX level is a difficult choice. If any student identifies proper support in terms of guidance, technology and references from External organizations and also the supervisors are convinced of the ability of the student(s) to take up the project, it shall be permitted. The methodology and reporting of such projects could be markedly different from type (a) and is left to the proposer/external supervisor of the projects.

3.3 Selection of Team: To meet the stated objectives, it is imperative that Major Project is done through a team effort**.** Though it would be ideal to select the team members at random (drawing lots) and this should be strongly recommended, due to practical considerations, students may also be given the choice of forming themselves into teams with 3 to 5 members (teams less than 3 members may be permitted in Exceptional cases, for valid reasons). A gender mix should also be strongly suggested. A team leader shall be elected through drawing lots. Teams shall maintain team meeting minutes and ensure that every team member has tasks assigned in writing. Team meeting minutes shall form a part of the Project Report. Even if students are doing projects as groups, each one must independently take up different modules of the work and must submit the reports also independently (though, in such cases, some common materials is permissible). Evaluation will also be done independently.

3.4 Selection of Tools: No restrictions shall be placed on the students in the choice of platforms/tools/ languages to be utilized for their project work, though open source is strongly recommended, wherever possible. No value shall be placed on the use of tools in the evaluation of the project.

3.5 Selection of Organisation & Guide: No restrictions shall be placed on the students in the choice of organization where project work may be done, in terms of locality, type (public/private) etc. It is the duty of the Head of Institute/Principal of College to ensure that the Aim, Objectives and full project guidelines are communicated to the external organization. The guide should ideally be a post-graduate with minimum 2 years of work experience.

Students may also choose to do project in the college/institute (or partially in the college/institute and partially in an external organization), especially product-based work, but in such cases the supervisors must ensure that (i) industry practices are followed (ii) the students undertake a planned visit to an IT industry with

international operations to make up for the loss of experience and (iii) the services of an external guide with industry experience is obtained.

3.6 Project Management: Head of Institute/Principal of College should publish a list of students, projects topics, internal guide and external organization (if any) and teams agreed, before the end of semester 5. Changes in this list may be permitted for valid reasons and shall be considered favourably by Head of Institute/ Principal of College any time before commencement of the project. Any request for change after commencement should considered by a committee of 3 teachers and their recommendation shall be accepted by Head of Institute/Principal of College.

Gantt-chart of proposed activities and a draft statement of project deliverables (which may subsequently be altered if justified) should be prepared before the commencement of the project. The actual completion of each phase should be noted on the chart in the course of the project work. Students should submit a fortnightly report of progress which could be indication of percentage of completion marked on the orginal Gantt-chart, with any notes attached. Students should ideally keep a daily activity log sheet. Team meetings should be documented in the format given at the end. Changes in the submitted documents are possible, as project development is essentially an evolutionary process. The project guide must ensure that changes are necessary due to the knowledge gained in succeeding phases of the project. The date of completion of a phase should be brought forward if the changes made are deemed to be errors and not due to additional knowledge gained from a succeeding phase.

3.7 Documentation:

The following are the major guidelines: The final outer dimensions of the report shall be 21 cm X 30 cm. The colour of the flap cover shall be light green. Only hard binding should be done, with title of the thesis and the words "<BRIEF TITLE> BSc (CS) Project Report 200…" displayed on the spine in 20 point, Bold, Times New Roman, as in example below. In case the title is too long, a shorter version of it may be used (Like "Image Pro" instead of "Image Pro – An Interactive Image Processing package"). It is highly recommended that Latex be used for documentation.

- The text of the report should be set in 12 pt, Times New Roman, Single Spaced.
- Headings should be set as follows: CHAPTER HEADINGS 20 pt, Times New Roman, Bold, All Caps, Centered.

WEB BASED BILLING SOFTWARE: BSC(CS) PROJECT 2009

1. SECTION HEADINGS 12 pt, Times New Roman, Bold, All Caps, Left Adjusted. 1.1 Section Sub-headings 12 pt, Times New Roman, Bold, Left Adjusted.

Titles of Figures, Tables etc are done in 12 point, times New Roman, Italics, Centered.

<PROJECT TITLE>

<STUDENT'S NAME>

<COLLEGE NAME>

PROJECT REPORT

Submitted in partial fulfilment of the

Requirements for the award of

Bsc (computer science) degree of

University of kerala

2014

Some general guidelines on documentation stylistics are:

- Double quotes and single quotes (“”, ‘’) should be used only when essential. In most cases words put in quotes are better highlighted by setting them in italics. Eg: This process is known as “morphing”. This process is known as *morphing*.
- Page numbers shall be set at right hand top corner, paragraph indent shall be set as 3.
- Only single space need be left above a section or sub-section heading and no space may be left after them.
- Certificate should be in the format: “Certified that this report titled..... is a bonafide record of the project work done by Sri/Kum..... under our supervision and guidance, towards partial fulfillment of the requirements for the award of the Degree of BSC (Computer Science) of the University of Kerala” with dated signatures of Internal; Guide, external guide and also Head of Institute/ College.
- If the project is done in an external organization, another certificates on the letterhead of the organization is required: “Certified that his report titled ..... is a bonafide record of the project work done by Sri/Kum..... under any supervision and guidance, at the ..... Department of..... (Organization) towards partial fulfilment of the requirements for the award of the Degree of BSC (Computer Science) of the University of Kerala”.
- References shall be IEEE format (see any IEEE magazine or transaction). Take care in use of italics and punctuation. While doing the project, keep note of all books you refer, in the correct format, and include them in alphabetical order in your reference list. Eg: A book is cited as: Kartalopoulos, S V Understanding Neural Networks and Fuzzy Logic, BPB Publishers, 1996, pp. 21-27. (pp.21-27 indicates that pages 21-27 have been referred. If the whole book is being referred, this may be omitted. If a single page is referred, say 7, it may be cited as p.7 Report writing is NOT a hasty activity done after finishing the project.

Students must try to develop the report along with the work, so as to give it flesh and blood. Drafts should be read, modified, spell checked and grammar checked at least thrice during the course of the project and before a final printout is taken, the same may be got approved from the internal guide. The students should send two interim reports to internal guides. This will also help the students in their report writing.

The Gantt chart, fortnightly progress reports, and team meeting minutes mentioned in section 3.5 should appear as appendix to the project report. Regarding the body of the report, as an indicative Example, the following is given (though students should not attempt to fit every kind of project report into this format):

- Organizational overview (of the client organization, where applicable)
- Description of the present system
- Limitations of the present system
- The Proposed system- Its advantages and features
- Context diagram of the proposed system.
- Top level DFD of the proposed system with at least one additional level of Expansion
- Structure Chart of the System
- System flowchart
- Menu Tree
- Program List

- Files or tables (for DBMS projects) list. Class names to be entered for each file in OO systems.
- List of fields or attributes (for DBMS projects) in each file or table.
- Program – File table that shows the files/tables used by each program and the files are read, written to, updated, queried or reports were produced from them.
- Reports List with column headings and summary information for each report.
- System Coding and variable/file/table naming conventions
- System controls and standards
- Screen layouts for each data entry screen.
- Report formats for each report.

Program documentation is suggested on the following lines:

- Program id
- Program level run chart
- Program function Explanation
- Data entry screen (reproduced from system documentation).
- Report layout (reproduced from system documentations)
- Program level pseudo code or flowchart.
- Decision tables, decision trees, with English Explanation where necessary.
- Program listing
- Test data & Results

3.8 Methodology:

Wherever applicable, object oriented approach should be used for software development. The project report should generally contain details of the following steps *(though students should not attempt to fit every kind of project into this format):*

(a) Analysis

- Study of existing systems and its drawbacks (general)
- Understanding the functionalities of the system (detailed)
- Preparation of requirement
- Conduct of Feasibility study
- Identification of relevant Objects
- Abstraction of each object (attributed and methods)
- Relationship between objects

(b) Design

- Design of each subsystems
- Design of each classes
- Design of communications between objects
- Design of Algorithms for problem solving
- User interface Design
- Any other steps if necessary

(c) Coding and Impletion

(d) Testing

(e) Security, Backup and Recovery Mechanisms

(f) On line help and User Manuals

(g) Upgradability Possibilities

3.9 Project IPR & Utilisation: The intellectual property rights in all project work done by the students shall vest with the University of Kerala, except in cases where some external organizations seek undertaking from students to concede IPR in all work done in their organization or under their guidance. Where possible, students should attempt to obtain at least a joint IPR for the University. In cases where project works are of public utility, students shall be asked to publish their work including source code and documentation, in so far as their rights are clear.

4. REFERENCES

4.1 Core

S A Kelkar, *Software Project Management*, Prentice Hall of India

W Alan Randolph, Barry Z. Posner, *Effective project planning and management*, PHI

4.2 Additional

Greg Mandanis, *Software Project Management Kit for Dummies*, IDG Books Joel Henry, *Software Project management*

Frederic P B, Mythical Man-month, *Essays on Software Engineering*, Addison Wesley

David Lamport, *Latex: A document Preparation System*, 2/e, Pearson Education

COMPLEMENTARY COURSE

COMPLEMENTARY COURSE (MATHEMATICS) MATHEMATICS-I

(COMPLEX NUMBERS, DIFFERENTIATION AND THEORY OF EQUATIONS) CODE: MM 1131.6 INSTRUCTIONAL HOURS PER WEEK: 5

No. of Credits: 4

Overview of the course:

The auxiliary course intended for students of Physics and computer applications students lays emphsis on the application of mathematical methods.The first module gives an intoduction to complex numbers.The next two modules on Calculus links the topic to the real world and the student's own experience as the authors of the text put it. Doing as many of the indicated exercises from the text should prove valuable in understanding the applications of the theory. Applications of the subject on the lines of those in Physics as given in the text could be obtained from the net. The fourth module covers theory of equations.

Module 1: Complex Numbers

- Review of basic results: Introduction to complex numbers, representation of complex numbers, the Argand diagram, De Moivre's theorem, evaluation of roots of complex numbers, finding nth roots of unity, its properties,
- Expansion of trigonometric functions of multiples of angles, expansion of powers of trigonometric functions, separation into real and imaginary parts

Module 2: Differentiation with applications I

- Functions and graphs of functions with examples . Interpretations of slope. The graph showing direct and inverse proportional variation. Mathematical models (functions as models). Parametric equations. Cycloid.

Exercise set 1.8; Questions 31 - 34.

- Instantaneous velocity and the slope of a curve. Limits. Infinite limits and vertical asymptotes. Limits at infinity and horizontal asymptotes. Some basic limits. Indeterminate forms of the type 0/0.

Exercise set 2.1; Questions 27 and 28.

- Continuity. Slopes and rates of change. Rates of change in applications. Derivative. Exercise set 3.1; Questions 1, 2 and 16.
- Techniques of differentiation. Higher derivatives. Implicit differentiation. Related rates. Local linear approximation. Differentials. Examples 1 - 6.

Exercise set 3.8; Questions 53 - 55.

- Rectilinear motion. Speeding up and slowing down. Analysing the position versus time curve. Free fall motion.

Examples 1 - 7. Exercise set 4.4; Questions 8, 9, 30 - 32.

- Absolute maxima and minima. Applied maximum anmd minimimum problems.

Exercise set 4.6; Questions 47 and 48.

- Statement of Rolle's Theorem and Mean Value Theorem. The velocity interpretation of Mean Value Theorem. Statement of theorems 4.1.2 and 4.83 (consequences of the Mean Value Theorem).

- Inverse functions. Continuity and differentiability of inverse functions. Graphing inverse functions. exponential and logarithmic functions. Derivatives of logarithmic functions and logarithmic differentiation. Derivatives of the exponential function. Graphs and applications involving logarithmic and exponential functions.

Exercise set 7.4; Question 50.

- L' Hospital's Rule for finding the limits (without proof) of indeterminate forms of the type 0/0 and 1/1. Analysing the growth of exponential functions using L'Hospital's Rule. Indeterminate forms of type 0 ·1 and 1-1 and their evaluation by converting them to 0/0 or 1/1 types. Indeterminate forms of type 00, 10 and 11.
- Definitions of hyperbolic functions. Graphs of hyperbolic functions. Hyperbolic identities. Why they are called hyperbolic functions. Derivatives of hyperbolic functions. Inverse hyperbolic functions. Logarithmic forms of inverse hyperbolic functions. Derivatives of inverse hyperbolic functions.

Module 3: Differentiation with applications II

- Power series and their convergence. Results about the region of convergence of a power series(without proof). Radius of convergence.Functions defined by a power series. Results about term by term differentiation and integration of power series (without proof). Taylor's theorem with derivative form of remainder (without proof) and its use in approximating functions by polynomials. Taylor series and Maclaurin's series and representation of functions by Taylor series. Taylor series of basic functions and the regions where these series converge to the respective functions. Binomial series as a Taylor series and its convergence. Obtaining Taylor series representation of other functions by differentiaion, integration, substitution etc.
- Functions of two variables. Graphs of functions of two variables. Equations of surfaces such as sphere, cylinder, cone, paraboloid, ellipsoid, hyperboloid etc. Partial derivatives and chain rule (various forms). Euler's theorem for homogeneous functions. Jacobians.

Exercise set 14.3; Questions 47 and 48. Exercise set 14.4; Question 50.

Exercise set 14.5; Question 42.

- Local maxima and minima of functions of two variables. Use of partial derivatives in locating local maxima and minima. Lagrange method for finding maximum/minimum values of functions subject to one constraint.

Exercise set 14.9; Question 20.

Module 4: Theory of equations

- Polynomial equations and fundamental theorem of algebra (without proof). Applications of the fundamental theorem to equations having one or more complex roots, rational roots or multiple roots.
- Relations between roots and coefficients of a polynomial equation and computation of symmetric functions of roots. Finding equations whose roots are functions of the roots of a given equation. Reciprocal equation and method of finding its roots.
- Analytical methods for solving polynomial equations of order up to four-quadratic formula, Cardano's method for solving cubic equations), Ferrari's method (for quartic equations). Remarks about the insolvability of equations of degree five or more. Finding the nature of roots without solving-Des Cartes' rule of signs.

Module 1: 18 hours; Module 2: 24 hours; Module 3: 24 hours; Module 4: 24 hours

Texts:

1. Howard Anton, Irl Bivens, Sephen Davis, Calculus. Seventh Edition, John Wiley & Sons inc
2. Barnard and Child, Higher Algebra, Macmillan.
3. S K Mapa, Higher Algebra (Classical), Sarat Book Dirtibutors, Kolkata. References:

1. James Stewart, Essential Calculus, Thompson Publications, 2007.
2. Thomas and Finney, Calculus and Analytic Geometry, Ninth Edition, Addison-Wesley.
3. Peter V. O' Neil, Advanced Engineering Mathematics, Thompson Publications, 2007

CODE: MM 1231.6 INSTRUCTIONAL HOURS PER WEEK: 5

NO. OF CREDITS: 4 MATHEMATICS-II

(ANALYTIC GEOMETRY, INTEGRATION, DIFFERENTIAL EQUATIONS AND MATRICES)

Overview of the course:

The complementary course in the second semester continues in laying emphasis on applications of integral calculus and differential equations to problems in Physics. Module 1 consists of a review of basic integration techniques and the applications of integration. It also covers multiple integrals. Module 2 deals with differential equations, while Module 3 covers matrix theory.

Module 1: Analytic Geometry

- Geometric definition of a conic-the focus, directrix and eccentricity of a conic. Classification of conics into ellise, parabola and hyperbola based on the value of eccentricity. Sketch of the graphs of conics. Reflection properties of conic sections.

Exercise set 11.4; Questions 39 - 43.

- Equations of the conics in standard positions. Equations of the conics which are translated from standard positions vertically or horizontally. Parametric representation of conics in standard form. Condition for a given straight line to be a tangent to a conic. Equation of the tangent and normal to a conic at a point.
- Asymptotes of a hyperbola. Equation of the asymptotes. Rectangular hyperbola and its parameric representation. Equation of tangent and normal to a rectangular hyperbola at a given point.
- Rotation of co-ordinate axes. Equation connecting the co-ordinates in the original and rotated axes. Elimination of the cross product term in a general second degree equation by suitable rotation. Identifying conics in non-standard positions represented by general second degree equation by suitable rotation of axes. The discriminant of a general second degree equation and its invariance under rotation of co-ordinate axes. The conditions on the discriminant for the general second degree equation to represent a conic, a pair of straight lines or a circle.

Module 2: Integration with applications

- Indefinite integrals (Review only), integral curves, integration from the view point of differential equations, direction fields

Exercise set 5.2; Questions 43 and 44

- (Review only) Definite integral and Fundamental Theorem of Calculus.
- Rectilinear motion: finding position and velocity by integration. Uniformly accelerated motion. The free-fall model. integrating rates of change. Displacement in rectilinear motion. Distance travelled in rectilinear

motion. Analysing the velocity versus time curve. Average value of a continuous function. Average velocity revisited.

Exercise set 5.7; Questions 3, 4, 5, 6, 29 and 55

- Review of integration techniques.
- Use of definite integrals in finding area under curves, area between two curves, volume of revolution, arc length and surface area of a solid of revolution.
- The idea of approximating the volume under a bounded surface in 3-space by volumes of boxes, leading to the definition of double integrals of functions of two variables over bounded regions. Evaluation of double integrals by iterated integrals. Evaluation by changing to polar co-ordinates and by suitably changing order of integration in the iterated integral. Applications to finding the volume of solids under bounded surfaces.

Module 3: Differential Equations

- Review of basic concepts about differential equations and their solutions. Method of solving special types of first order ODEs such as variable separable, exact, homogeneous, and linear. Finding the family of curves orthogonal to a given family.
- Second order linear differential equations. Nature of the general solution of homogeneous and non-homogeneous linear ODEs. Extension to higher order ODEs.• Second order linear homogeneous ODEs with constant coefficients. The characteristic equation and its use in finding the general solution. Extension of the results to higher order ODEs.
- Second order linear non-homogeneous ODEs with constant coefficients. General solution as the sum of complementary function and particular integral. Second order linear differential operator and its properties.The inverse operator and its properties. Operator method for finding the particular integral of simple functions. Extension of the results to higher order equations. Cauchy and Legendre equations and their solutions by reducing to equations with constant coefficients by suitable change of variable.

Module 4: Theory of Matrices

- (Review only) basic concepts about matrices. Operations involving matrices, different types of matrices. Representation of a system of linear equation in matrix form. Inverse of a matrix, Cramer's rule.
- The rows and columns of a matrix as elements of Rn for suitable n. Rank of a matrix as the maximum number of linearly independent rows/columns. Elementary row operations. Invariance of rank under elementary row operations. The echelon form and its uniqueness. Finding the rank of a matrix by reducing to echelon form.
- Homogeneous and non-homogeneous system of linear equations. Results about the existence and nature of solution of a system of equations in terms of the ranks of the matrices involved.
- The eigen value problem. Method of finding the eigen values and eigen vectors of a matrix. Basic properties of eigen values and eigen vectors. Eigen values and eigen vectors of a symmetric matrix.
- Diagonalisable matrices. Advantages of diagonalisable matrices in computing matrix powers and solving system of equations. The result that a square matrix of order n is diagonalisabe (i) if and only if it has n linearly independent eigen vectors (ii) if it has n distinct eigen values. Method of diagonalising a matrix. Diagonalisation of real symmetric matrices. Similar matrices. Module 1: 22 hours; Module 2: 23 hours; Module 3: 22 hours; Module 4: 23 hours Text for Module 2: Howard Anton, et al, Calculus. Seventh Edition, JohnWiley

  Text for Module 4: David C. Lay, Linear Algebra, Thompson Publications,2007.

References:

1. James Stewart, Essential Calculus, Thompson Publications, 2007.
2. Thomas and Finney, Calculus and Analytic Geometry, Ninth Edition, Addison-Wesley.
3. Peter V. O' Neil, Advanced Engineering Mathematics, Thompson Publications, 2007
4. Michael D. Greenberg, Advanced Engineering Mathematics, Pearson Education, 2002.
5. George F Simmons, Differential equations with applications and historical notes, Tata McGraw Hill, 2003

Distribution of instructional hours:

Module 1: 24 hours; Module 2: 24 hours; Module 3: 24 hours; Module 4: 18 hours

CODE: MM 1331.6 INSTRUCTIONAL HOURS PER WEEK: 5NO. OF CREDITS: 4
MATHEMATICS-III (VECTOR DIFFERENTIATION, COORDINATE SYSTEMS, ABSTRACT ALGEBRA AND FOURIER SERIES AND TRANSFORMS)

Module 1: Vector Differentiation

- (Review only) Vectors in 3-space. Addition of two vectors, multiplication of a vector by a scalar and basic properties of these operations. Representation in Cartesian coordinates using standard basis. Dot,cross and triple product of vectors, their significance and properties.• Vector function of a single variable and representation in terms of standard basis. Limit of a vector function and evaluation of limit in Cartesian representation. Continuous vector functions and the idea that such functions represent oriented space curves. Examples.
- Derivative of a vector function and its geometric significance. Derivative in terms of Cartesian components. Tangent vector to a curve, smooth and piecewise smooth curves. Applications to finding the length and curvature of space curves, velocity and acceleration of motion along a curve etc.
- Scalar field and level surfaces. The gradient vector of a scalar field (Cartesian form) at a point and its geometric significance. Gradient as an operator and its properties. Directional derivative of a scalar field and its significance. Use of gradient vector in computing directional derivative.
- Vector fields and their Cartesian representation. Sketching of simple vector fields in the plane. The curl and divergence of a vector field(Cartesian form) and their physical significance. The curl and divergence as operators, their properties. Irrotational and solenoidal vector fields. Various combinations of gradient, curl and divergence operators.

Module 2: Coordinate systems

- Conic sections in polar coordinates. Eccentricity of an ellipse as a measure of flatness. Polar equations of conics. Sketching conics in polar coordinates. Kepler's Laws. Example 4 of section 11.6.
- Triple integrals over bounded regions in three space. Evaluation by iterated integrals. Cylindrical coordinates and spherical coordinates and their relation to Cartesian coordinates. Use of cylindrical and spherical co-ordinates in evaluating triple integrals. Applications of triple integrals to finding volumes of solid objects.
- Spherical co-ordinates, polar co-ordinates, cylindrical co-ordinates, relation to cartesian co-ordinates, application of integration, integration in spherical co-ordinates.

Module 3: Abstract algebra

- Groups–definition and examples, elementary properties, finite groups and subgroups, cyclic groups, elementary properties, symmetry of plane figures • Rings and fields– definition and examples,

- Vector spaces, definition and examples, elementary properties, linear dependence and independence, basis and dimension.

Module 4: Fourier Series and transforms

- Periodic functions, trigonometric series, Fourier series, evaluation of Fourier coefficients for functions defined in (-1,+1), Fourier series for odd and even functions, half range series, Fourier series for odd and even functions, Fourier series of functions defined in (-L,+L).
- Fourier integrals and Fourier transforms.

  Text for Modules 1 and 2: Howard Anton, et al, Calculus. Seventh Edition, John Wiley Text for Module 3: J B Fraleigh, A First Course in Abstract Algebra, Narosa Publications Text for Module 4: Kreyzig, Advanced Engineering Mathematics, 8th edition, John Wiley.

References:

1. James Stewart, Essential Calculus, Thompson Publications, 2007.
2. Thomas and Finney, Calculus and Analytic Geometry, Ninth Edition, Addison-Wesley.
3. D A R Wallace, Groups, Rings and Fields, Springer

Distribution of instructional hours:

Module 1: 27 hours; Module 2: 27 hours; Module 3: 18 hours; Module 4: 18hours

CODE: MM 1431.6 INSTRUCTIONAL HOURS PER WEEK: 5 No. OF CREDITS: 4 MATHEMATICS –IV (LINEAR TRANSFORMATIONS, VECTOR INTEGRATION AND COMPLEX ANALYSIS.)

Module 1: Linear Transformations

- Linear transformations from Rn into Rm. Matrix of a linear transformation relative to a given pair of bases and linear transformation defined by a matrix. Characterisation of linear transformations from Rn into Rm.
- Linear transformations from Rn into Rn and matix of suchtranformations. Matrix representation of simple tranformations such as rotation, reflection, projection etc. on the plane. Relation between matricesof a given transformation relative to two different bases. Method of choosing a suitable basis in which the matrix of a given transformation has the particularly simple form of a diagonal matrix.

Module 2: Vector Integration

- The method of computing the work done by a force field in moving a particle along a curve leading to the definition of line integral of a vector field along a smooth curve. Scalar representation of line integral. Evaluation as a definite integral. Properties. Line integral over piecewise smooth curves. Green's theorem in the plane (without proof) for a region bounded by a simple closed piecewise smooth curve.
- Oriented surfaces. The idea of flux of a vetor field over a surface in 3-space. The surface integral of a vector field over a bounded oriented surface. Evaluation by reducing to a double integral. Use of cylindric al and spherical co-ordinates in computing surface integral over cylindrical and spherical surfaces.
- Stokes' theorem (without proof) for an open surface with boundary a piecwise smooth closed curve. Gauss' divergence theorem (without proof). Verification of the theorems in simple cases and their use in computing line integrals or surface integrals which are difficult to evaluate directly. Physical intrepretation of divergence and curl in terms of the velocity field of a fluid flow.

- Conservative fields and potential functions. Relation of conservative vector fields to their irrotational nature and the path- independence of line integrals in the field (without proof). Significance of these results in the case of conservative force fields such as gravitational, magnetic and electric fields. Method of finding the potential function of a conservative field.

Module 3: Complex Analysis -I

1. Complex Functions

- (Review only) Basic concepts about complex numbers. Real and imaginary parts, modulus of a complex number. Algebra of complex numbers, complex plane, modulus and argument of a complex number, n-th roots of a complex number.
- Sets of points in the complex plane, circle, open disc, closed disc, closed set open set, connected set and limit point of a set.
- Complex functions. The real and imaginary parts of a complex function. Functions as mapping between two complex planes. Polynomial and rational functions. Definition of elementary functions exp(z),sinz,cosz etc by defining their real and imaginary parts in terms of known real functions. Definition of logz as the inverse of exponential function and its multivalued nature. Principal branch of logarithm. Rational and complex powers of a complex number and their multi-valuedness.

2. Complex differentiation

- The limit of a complex function. Limit in terms of real and imaginary parts of the function. Basic properties of limits. Derivative of a complex function. The Cauchy-Riemann equations and the necessary and sufficient conditions for differentiability. Analytic functions. Analyticity of theelementary functions.
- Harmonic functions of two variables. The result that the real and imaginary parts of an analytic function are harmonic. Method of constructingan analytic function with a given harmonic function as real or imaginary part.

Module 4: Complex Analysis -II

Complex Integration

- Curves in the complex plane. Smooth and piecewise smooth curves. Integral of a complex function along a curve. Evaluation of line integrals by reducing to definite integral.
- Cauchy's theorem (without proof) and its implications.Conditions for independence of path in simply connected domains. Fundamental theorem showing connection between line integral of a function and its and anti-derivative (without proof). Cauchy's integral formula for derivatives and its use in computing line integrals over simple closed curves.

Text for Modules 3 and 4: Kreyzig, Advanced Engineering Mathematics, 8th edition, John Wiley. References:

1. James Stewart, Essential Calculus, Thompson Publications, 2007.
2. Thomas and Finney, Calculus and Analytic Geometry, Ninth Edition, Addison-Wesley.
3. Peter V. O' Neil, Advanced Engineering Mathematics, Thompson Publications, 2007
4. Michael D. Greenberg, Advanced Engineering Mathematics, Pearson Education, 2002.

Distribution of instructional hours:

Module 1: 18 hours; Module 2: 27 hours; Module 3: 27 hours; Module 4: 18 hours.

UNIVERSITY OF KERALA

COURSE STRUCTURE AND SYLLABI
FOR
CAREER-RELATED FIRST DEGREE

PROGRAMME IN
PHYSICS AND COMPUTER APPLICATIONS

UNDER

CHOICE BASED CREDIT & SEMESTER- SYSTEM (CBCS)
(2015 admission onwards)

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