BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024.
B.Sc. Physics Course Structure under CBCS
(For the candidates admitted from the academic year 2010-2011 onwards)

Semester	Part	Course	Title	Instr Hours/ Week	Credit	Exam Hours	Marks Int.	Marks Extn.	Total
I	I	Language Course – I (LC) – Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course - I (ELC)		6	3	3	25	75	100
	III	Core Course – I (CC)	Properties of matter and Acoustics	6	5	3	25	75	100
		Core Course – II (CC)	Major Practicals - I	4	-	***	-	-	-
		First Allied Course –I (AC)		5	3	3	25	75	100
		First Allied Course – II (AC)		3	-	***	-	-	-
Total				**30**	**14**				**400**
II	I	Language Course – II (LC) - – Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course – II (ELC)		6	3	3	25	75	100
	III	Core Course – II (CC)	Major Practicals - I	2	3	3	40	60	100
		Core Course – III (CC)	Mechanics and Relativity	5	5	3	25	75	100
		First Allied Course – II (AC)		2	3	3	25	75	100
		First Allied Course – III (AC)		5	4	3	25	75	100
	IV	Environmental Studies		2	2	3	25	75	100
	IV	Value Education		2	2	3	25	75	100
Total				**30**	**25**				**800**
III	I	Language Course – III (LC) – Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course - III (ELC)		6	3	3	25	75	100
	III	Core Course – IV (CC)	Thermal Physics and Statistical Mechanics	6	5	3	25	75	100
		Core Course – V (CC)	Major Practicals - II	3	-	***	-	-	-
		Second Allied Course – I	.	5	4	3	25	75	100
		Second Allied Course – II		2	-	***	-	-	-
	IV	Non Major Elective I - for those who studied Tamil under Part I a) Basic Tamil for other language students b) Special Tamil for those who studied Tamil upto +2 but opt for other languages in degree programme	Energy Physics	2	2	3	25	75	100
Total				30	17				500
IV	I	Language Course –IV (LC) - Tamil*/Other Languages ** #		6	3	3	25	75	100

	II	English Language Course – IV (ELC)		6	3	3	25	75	100
		Core Course – V (CC)	Major Practical II	2	4	3	40	60	100
	III	Core Course – VI (CC)	Electricity, Magnetism & Electromagnetism	5	5	3	25	75	100
		Second Allied Course - II		2	2	3	25	75	100
		Second Allied Course - III		5	4	3	25	75	100
	IV	Non Major Elective II - for those who studied Tamil under Part I a) Basic Tamil for other language students b) Special Tamil for those who studied Tamil upto +2 but opt for other languages in degree programme	Laser Physics	2	2	3	25	75	100
	IV	Skill Based Elective I		2	4	3	25	75	100
Total				**30**	**27**				**800**
V	III	Core Course – VII (CC)	Optics & Spectroscopy	5	5	3	25	75	100
		Core Course – VIII (CC)	Atomic & Nuclear Physics	5	5	3	25	75	100
		Core Course – IX (CC)	Analog Electronics	5	5	3	25	75	100
		Core Course – X (CC)	Major Practical III	3	-	***	-	-	-
		Core Course – XI (CC)	Major Practical IV	3	-	***	-	-	-
		Major based Elective – I	Material Science	5	5	3	25	75	100
	IV	Skill based Elective –II		2	4	3	25	75	100
		Skill based Elective – III		2	4	3	25	75	100
Total				**30**	**28**				**600**
VI	III	Core Course – X (CC)	Major Practical III	**4**	4	3	40	60	100
		Core Course – XI (CC)	Major Practical IV	**4**	4	3	40	60	100
		Core Course – XII (CC)	Elements of Theoretical Physics	**6**	5	3	25	75	100
		Core Course – XIII (CC)	Digital Electronics and Microprocessor Fundamentals	**6**	5	3	25	75	100
		Major based Elective II	Computer Programming in C	5	5	3	25	75	100
		Major based Elective III	Optoelectronics & Fiber OPIC Communication	4	4	3	25	75	100
	V	Extension activities		-	1	-	-	-	-
		Gender Studies		1	1	3	25	75	100
Total				**30**	**29**				**700**
GrandTotal				**180**	**140**				**3800**

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List of Allied Courses

Group – I	Group – II (Any one)
Mathematics (compulsory)	1. Chemistry 2. Computer Science 3. Geology

செய்முறை பாடங்கள் உள்ள இயைபுப் பாடங்களுக்கு (4+2+4) தரபுள்ளிகள்

செய்முறை பாடங்கள் இல்லாத இயைபுப் பாடங்களுக்கு(3+3+4) தரபுள்ளிகள்

Note : Either group of Allied Course may be offered in the I year / II year.

Note:

	Internal Marks	External Marks
1. Theory	25	75
2. Practical	40	60

3. Separate passing minimum is prescribed for Internal and External marks

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]

The passing minimum for University Examinations shall be 40% out of 75 marks [i.e. 30 marks]

*   for those who studied Tamil upto +2 (Regular Stream)

 ** Syllabus for other Languages should be on par with Tamil at Degree level

\#   those who studied Tamil upto 10th or +2, but opt for other languages in degree level under Part I should study special Tamil in Part IV

*** Examination at the end of the next semester.

        Extension activities shall be out side the instruction hours.

<u>கற்பிக்கும் கால அளவு</u>

மொழிப் பாடங்கள் - 1 மதிப்பீடு   = 2 மணிநேரம் கற்பித்தல் வகுப்பு
கலை மற்றும் அறிவியல் பாடங்கள் :1 மதிப்பீடு = 1 மணிநேரம் கற்பித்தல் வகுப்பு [Lecture]
                                = 2 மணிநேரம் பயிற்சி வகுப்பு [Tutorial]
                        = 2-3 மணிநேரம் செய்முறை வகுப்பு [Practical]

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CC– I : PROPERTIES OF MATTER AND ACOUSTICS

UNIT –I : Elasticity :

Stress – strain diagram – Elastic Moduli, Work done per unit volume in shearing strain – Relation between elastic constants – Poisson's Ratio – Expression for Poisson's ratio in terms of elastic constants – Twisting couple on a wire – Work done in twisting – Torsional pendulum – determination of rigidity modulus of a wire.

UNIT – II : Bending of beams:

Expression for bending moment – Cantilever – Expression for depression – Experiment to find Young's modulus – Cantilever oscillation – Expression for period – Uniform bending – Expression for elevation – Experiment to find Young's modulus using microscope – Non Uniform bending – Expression for depression – Experiment to determine Young's modulus using mirror and telescope.

UNIT – III : Surface tension & Low Pressure

Definition and dimensions of surface tension – Excess of pressure over curved surfaces – Variation of surface tension with temperature – Jaegar's experiment.

Production and measurement of low pressure – Grades' molecular pump – Knudsen's absolute gauge – Detection of leakage.

UNIT – IV : Viscosity :

Streamlined motion – Turbulent motion – Coefficient of viscosity and its dimension – Rate of flow of liquid in a capillary tube – Poiseuilles' formula – Experiment to determine the coefficient of viscosity of liquid.

UNIT – V : Acoustics:

Music and noise – Characteristics of musical sound, quality of tone, consonance and dissonance – musical scale – tempered scale – decibel – noise pollution.
 Source in an enclosure – reverberation and time of reverberation – Sabine's formula – Erring Formula – Optimum reverberation – measurement of reverberation time – absorption coefficient - acoustics design – Ultrasonics – production , properties and applications.

Books for study and reference:
1. Properties of matter – Brijlal and Subramanian
2. Properties of matter – D.S.Mathur.
3. Properties of matter – Subramania Iyer and Jeyaraman.
4. Oscillations, waves and sound – L.P. Sharma, H.C.Saxena.
5. A text book of sound – R.L.Saigal.
6. A text book of sound – N.Subrahmanyam and Brijlal.

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CC – II- Major Practical – I

1. Non-uniform bending – Pin and Micrscope.
2. Uniform bending – Optic lever.
3. Surface tension – Capillary rise.
4. Sonometer – Verification of laws and determination of frequency
5. Melde's Experiment – Transverse and longitudinal.
6. Compound pendulum – g and k.
7. Cantilever depression – scale and telescope.
8. Specific heat capacity of a liquid – Newton's law of cooling.
9. Thermal conductivity of a bad conductor – Lee's disc.
10. Long focus convex lens – f, R, μ.
11. Concave lens – 'f'
12. Newton's Rings – 'R' determination, μ of liquid.
13. Spectrometer – μ of solid prism.
14. Air wedge – thickness of insulation.
15. P.O.Box – Temperature coefficient.
16. Meter Bridge – Specific Resistance

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CC – III – MECHANICS & RELATIVITY

UNIT – I : Dynamics Projectile, Impulse, Impact.

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

UNIT – II : Dynamics of rigid bodies.

Kinetic energy of rotation – Theory of compound pendulum – Equivalent simple pendulum – Reversibility of centres of oscillation and suspension – Determination of g and radius of gyration of a bar pendulum – period of oscillation of a Bifilar pendulum with and without parallel threads - Centre of mass – Velocity and acceleration of centre of mass – determination of motion of individual particle – system of variable mass – equation for a Rocket – Conservation of linear and angular momentum.

UNIT – III

Gravitation and Centre of Gravity - Gravitational potential and field due to spherical shell - Gravitational energy – Boy's method of determination of G – Centre of gravity of solid and hollow tetrahedron. Solid and hollow hemisphere – Stability of equilibrium.

UNIT – IV: Centre of Pressure.

Vertical rectangular lamina – Vertical triangular lamina - Vertical circular lamina – Atmospheric pressure its variation with altitude – Reasons for such variation.

Hydrodynamics:

Equation of continuity of flow – Euler's equation for unidirectional flow – Torricelli's theorem – Bernouli's theorem and applications.

UNIT – V : Relativity

Galilean – Newtonian relativity, Galilean transformations – Michelson Morley experiment and its importance – leuristein's postulates – Lorentz transformations and its interpretation – consequence of Lorentz transformation – Length contractor, time dilation – relativistic addition of velocities – Mass energy equivalence – Basic ideas of general theory of relativity.

Books for Study:

1. Mechanics – Part – I & II Naryanamoorthy.
2. Classical Mechanics – H. Goldstein.
3. Statistical Mechanics – Sathyaprakash and C.Agarwal.

Books for Reference:

1. Elementary Statistical Mechanics – Gupta Kumar.
2. Mechanics – D.S.Mathur.
3. Classical Mechanics – Gupta, Kumar and Sharma.
4. Feynman Lecture on Physics – Vol.I – R.P. Feynman.

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CORE COURSE IV - THERMAL PHYSICS AND STATISTICAL MECHANICS.

Unit I: Thermodynamics

Zeroth law of thermodynamics – First law of thermodynamics – Heat engines – Reversible and irreversible process of Carnot's theorem – Second law of thermodynamics, Thermodynamic scale of temperature – Entropy – Change of entropy in reversible and irreversible processes – Temperature – entropy diagram (T.S) – Law of increase of entropy – Maxwell thermo dynamical relations – Clausius's Claypeyron's latent heat equations.

Unit II: Low Temperature

Joule – Thomson's effect – Porous plug experiment – Liquefaction of gases – Linde's method – Adiabatic demagnetization – Liquefaction of He – Practical applications of low temperature – Refrigerating mechanism – Air conditioning machines.

Unit III   Radiation

Radiation – Stefan's law Deduction of Newton's law from Stefan's law – Boltzmann law – Black body radiation – Wein's law – Rayleigh – Jean's law – Planck's law – Angstrom Pyroheliometer – Solar constant – Surface temperature of sun Sources of solar energy –Some everyday applications.

Unit IV: Specific Heat

Specific heat of solids – Einstein's theory of specific heat – Debye's theory –Specific heat of gases – Mayer's Relation – Quantization of various contributions to energy of diatomic molecules – Specific heat of diatomic gases – (Quantum Theory)

Unit V: Statistical Physics

Phase space – Statistical Equilibrium – Microstates and Macrostates – Maxwell – Boltzmann statistics – Application of M.B statistics to molecular energies in an ideal gas – B-E statistics- Application of B-E statistics to photon gases – F-D statistics – Application of F.D statistics to electron gas – Comparison of three statistics.

Books for Study:

1. Brij lal, and Subramaniyam, Heat and Thermodynamics, S.Chand & Co. (2007)
2. J.B.Rajam and C.L Arora, Heat and Thermodynamics.

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CORE COURSE V – MAJOR PRACTICAL – II
[Any Fifteen]

1. Static Torsion – Determination of n
2. Torsional pendulum – n and I
3. Coefficient of viscosity of highly viscous liquid
4. Stoke's method – Viscosity of highly viscous liquid
5. Characteristics of junction and Zener diodes
6. Emissive power of a surface – Spherical calorimeter
7. Joule's calorimeter – Specific heat capacity of liquid (Barton's correction)
8. Carey Foster's Bridge – R and p
9. Potentiometer – Ammeter calibration
10. Potentiometer – Temperature coefficient of R
11. Potentiometer – Calibration of low range voltmenter
12. Figure of merit – Mirror Galvanometer
13. Transistor Characteristics – CE – configuration
14. Spectrometer - μ of a liquid
15. Spectrometer – I-d curve
16. CRO – Study of wave forms – Lissajous figures – f determination
17. Construction of Full wave rectifier
18. Construction of a temperature controller using Pt 100 senor

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NON MAJOR ELECTIVE I – ENERGY PHYSICS

Unit I: Conventional Energy Sources

World's reserve - commercial energy sources and their availability – various forms of energy – renewable and conventional energy system – comparison – Coal, oil and natural gas – applications – Merits and Demerits

Unit II: Solar Energy

Renewable energy sources – solar energy – nature and solar radiation – components – solar heaters – crop dryers – solar cookers – water desalination (block diagram) Photovoltaic generation – merits and demerits

Unit III: Biomass energy fundamentals:

Biomass energy – classification – photosynthesis – Biomass conversion process

Unit IV: Biomass Utilization

Gobar gas plants – wood gasification – advantages & disadvantages of biomass as energy source

Unit V: Other forms of energy sources

Geothermal energy – wind energy – Ocean thermal energy conversion – energy from waves and tides (basic ideas)

Books for Study:

"Renewable energy sources and emerging Technologies", by D.P. Kothari, K.C. Singal & Rakesh Ranjan, Prentice Hall of India pvt. Ltd., New Delhi (2008)

Books for Reference:

"Renewable Energy sources and their environmental impact" – S.A. Abbasi and Nasema Abbasi PHI Learning Pvt. Ltd., New Delhi (2008)

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CORE COURSE VI
ELECTRICITY, MAGNETISM AND ELECTROMAGNETISM.

Unit I   Electrostatics

Coulomb's inverse square law – Gauss theorem and its applications (Intensity at a point due to a charged sphere & cylinder) – Principle of a capacitor – Capacity of a spherical and cylindrical capacitors – Energy stored in a capacitor – Loss of energy due to sharing of charges.

Unit II Current Electricity

Ampere's circuital law and its applications - Field along the axis of a circular coil and Solenoid – Force on a conductor in a magnetic field – Theory of Ballistic Galvanometer – Figure of merit – Damping Correction – Wheatstone network – Carey Foster's Bridge – Potentiometer - Measurement of current, resistance and low voltage.

Unit III   Electromagnetic Induction

Laws of electromagnetic induction – Self and mutual induction – Self inductance of a solenoid – Mutual inductance of a pair of solenoids – Coefficient of coupling – Experimental determination of self and mutual inductance (Rayleighs method) Growth decay of current in circuit containing Land R – Growth and decay of charge in circuit containing C and R – High resistance by leakage – Charging and discharging of capacitor through Land R.

Unit IV   AC Circuits

Alternating EMF – Alternating EMF applied to circuits containing L and R – C and R – Alternating EMF applied to circuits containing L, C and R – Series and Parallel resonance circuits – Sharpness of resonance – Q factor – Power in AC circuits – Power factor – Wattless current

Unit V: Magnetism

Intensity of magnetization -   Susceptibility – Types of magnetic materials – Properties sara, dia and ferro magnetic materials – Cycle of magnetization – Hysterisis – B-H curue – application of BH curve– Magnetic energy per unit volume.

Books for Study

1. Brij lal and Subramaniyam – Electricity and Magnetism – S.Chand & Co.
2. R.Murugesan, Electricity and Magnetism, S.Chand & Co.

Books for Reference:

1. Narayanamoorthy and Nagaratnam, Electricity and Magretism NPC, Chennai.

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Non Major Elective II – LASER PHYSICS

Unit I: Fundamentals of LASER

Spontaneous emission – stimulated emission – meta stable state – Population inversion – pumping – Laser Characteristics

Unit II: Production of LASER

Helium – Neon Laser – Ruby Laser – CO_2 Laser – Semiconductor Laser

Unit III: Industrial Applications of LASER

Laser cutting – welding – drilling – Hologram – Recording and reconstruction of hologram

Unit IV: Lasers in Medicine:

Lasers in Surgery – Lasers in ophthalmology – Lasers in cancertreatment

Unit V: Lasers in Communication

Optic fibre communication- Total internal reflection – Block diagram of fibre optic communication system – Advantages of fibre optic communication

Book for Study:

An introduction to LASERS – N. Avadhanulu, S. Chand & Company (2001)

Books for Reference:

1. Laser fundamentals – William T. Silfvast Cambridge University Press – Published in South Asia by foundation books, 23, Ansari Road, New Delhi

2. LASER Theory and Application – K. Thyagarajan and A.K. Ghatak, Mac millan, India Ltd.

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CC VII : OPTICS AND SPECTROSCOPY

Unit I: Geometrical optics

Spherical aberration- Spherical aberration of a thin lens – Ray tracing - Methods of reducing spherical aberration – Coma – Aplanatic surface – Astigmatism – Curvature of the field – Meniscus lens - Distortion – Ramsden's eyepiece – Huygen's eyepiece.

Unit II: Interference

Air wedge – Newton's rings – Haidinger's fringes – Brewster's fringes – Michelson Interferometer and its applications – Fabry perot Interferometer – Interference filter – Stationary waves in light – colour photography (ideas only) – Holography – Construction and reconstruction of a hologram – applications.

Unit III: Diffraction

Fresnel's diffraction – Diffraction at a (1) circular aperture (2) Straight edge (3) narrow wire. - Fraunhofer diffraction at a single slit – Double slit – Missing orders in a Double slit, Diffraction pattern – Grating with theory – Oblique incidence – Overlapping of spectral lines – Diffraction pattern – Grating with theory – Oblique incidence – Overlapping of spectral lines
Resolving power of optical instruments
Resolving power – Rayleigh's criterion of resolution. Resolving power or a (1) Telescope (2) Grating – Dispersive power and resolving power of a grating.

Unit IV: Polarization.

Nicol prism – Nicol prism as an analyzer and polarizer – Huygens's explanation of Double refraction in uniaxial crystals – Double Image polarizing prisms – Elliptically and circularly polarized light – production and detection – quarter wave and half wave plate – Babinets compensator – optical activity – Fresnel's explanation of optical activity – Laurent's Half shade polarimeter.

Unit V: Spectroscopy Lasers

Types of spectra – Emission and absorption spectra – Continuous, band and line spectra – Solar spectrum – Fraunnoffer lines – Raman effect – Characteristics of Raman lines – Experimental verification of effect – IR and uv spectroscopy – sources – Detection – Properties and applications – induced absorption – spontaneous cmission – optical pumping – Ruby laser – He – Ne Laser – Applications of lasers.

Books for Study:

1.Optics by Brijlal and Subramaniam.
2. Optics by Khanna and Gulati.

Books for Reference

1. Optics – Jenkings and White, McGraw Hill.
2. Optics – Ajoy Chatak (TMH).
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CORE COURSE VIII - ATOMIC AND NUCLEAR PHYSICS

Unit I   Cathode Rays and Tue Rays.

Cathode rays – properties – e/m of cathode rays – Milliken's oil drop method – Positive rays – Properties – e/m of Positive rays: Thomson's parabola method – Aston's Bain's bridge - Determination of critical Potential – Franck and Hertz's experiment - Davi'srs and Goucher method.

Unit II Vector Atom model

Various quantum numbers, L-S and j-j Couplings – Pauli's exclusion principle – electronic configuration of elements and periodic classification – magnetic dipole moment of electron due to orbital and spin motion – Bohr magnet ion stern and Gerlach experiment.

Unit III   Fine structure of special lines

Special terms and notations – selection rules- intensity rule and internal rule – Fine structure of sodium D lines – Alkali spectra – Fine structure in Alkali spectra – spectrum of Helium – Zeeman effect - Larmor's theorem – Debye's quantum mechanical explanation of the normal Zeeman effect – Anamolous Zeeman effect – theoretical explanation, Lande's 'g' factor and explanation of splitting of D_1 and D_2 lines of sodium.

Unit IV   Nucleus I

Review of basic properties of nuclei – mass, radius, binding energy, nuclear moments – isotopes – isobars – radioactivity cyclotron – Betatron – Geiger Muller counter – cloud chamber – Q value of nuclear reaction – discovery of neutron, positron.

Unit V   Nucleus II

Liquid Drop Model – application to fission, fission fragments, neutrons in fission process – nuclear energy – thermo nuclear reactions – atom bomb. Shell Model – magic numbers – spin orbit coupling – Basic ideas of a nuclear reactor. Bethe's Theory of fusion – Solar energy – hydrogen bomb.
Basic classification of subatomic particles – photons, leptons – meson – baryons.

Books for study

1. Murughesan, R., Modern Physics S.Chand & Co.,(2006).

Books for Reference

1. Arthus Beiser, Concept of Modern Physics: Mc Graw Hill Ed. V (1999).

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CORE COURSE IX - ANALOG ELECTRONICS

Unit I   Semiconductors and diodes

Intrinsic and extrinsic semi conductor – PN junction diode – Biasing of PN junction – VI Characteristics of diode – Rectifiers – Half wave – full wave and bridge rectifiers – Break down mechanisms – Zener diode characteristics of Zener diode – Zener diode as voltage regulator.

Unit II Bipolar Transistors

Bipolar junction transistor – Basic configurations Relation between α and β – Characteristic curves of transistor – CB,CE mode – DC load line – DC bias and stabilization – fixed bias – voltage divider bias – Transistor as an amplifier – Transistor as a two port network – h Parameters.

Unit III   Amplifiers and Oscillators

Single stage CE amplifier – Analysis of hybrid equivalent circuit – Power amplifiers – Efficiency of class β Power amplifier – Push – pull amplifier - General theory of feedback – Properties of negative feedback – Criterion for oscillations – Hartley oscillator – Colpitt's oscillator.

Unit IV   Special Semiconductor devices

FET – JFET – MOS FET – FET parameters – Comparison between FET and Transistor – Photo transistor – SCR – SCR as a switch – UJT – UJT relaxation oscillator.

Unit V Operational Amplifiers

Differential amplifier - Common mode rejection ratio – Characteristics of an ideal op-amp – Virtual ground – Inverting amplifier – Non inverting amplifier – Applications.   Adder – subs tractor – Integrator – Differentiator – Unity gain buffer.

Books for study

1) Mehta V.K., Principles of Electronics, S.Chand and company Ltd.
2) Chattopadhyay, D., Raxshit, P.C., Sara, B.and Purkait, New Age International (P) Ltd.

Books for Reference

1) Theraja . B.L., Basic electronics solid state, S.Chand and Company Ltd (2002).
2) Sedha R.S., A text book of applied Electronies, S.Chand & company Ltd (2002).

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MAJOR BASED ELECTIVE I - MATERIALS SCIENCE

Unit I   Chemical Bonds

Review of Atomic structure – Interatomic Forces – Different types of chemical bonds – Ionic covalent bond or homopolar bond – Metallic bond – Dispersion bond – Dipole bond – Hydrogen bond – Binding energy of a crystal – Elastic properties.

Unit II   Modern Engineering Materials

Classification of Polymers – Ceramics – Super strong materials – Cermets – High temperature materials – Thermo electric materials – Electrets – Nuclear engineering materials.

Unit III   Non Destructive Testing:

Radiographic methods – Photo elastic method - Magnetic methods – Electrical methods – Ultrasonic methods – Visual and other optical methods – Thermal methods – Surface defect detection by NDT – Equipments used in non destructive testing – Metallurgical microscope – Election microscope – Coolidge x-ray tube – Production of ultrasonic waves – Magnetostriction Ultrasonic generator - Pilzo electric ultrasonic generator.

Unit IV   New Materials

Metallic glasses – Fibre reinforced plastics – Metal matrix composites –Material for optical sources and detectors – Fiber optic materials and their applications – Display materials – Acoustic materials and their applications – SAW materials – Biomaterials – High temperature superconductors.

Unit V Mechanical Behavior of Materials

Different mechanical properties of Engineering materials – Creep – Fracture – Technological properties – Factors affecting mechanical properties of a material – Heat treatment - cold and hot working – Types of mechanical tests – metal forming process – Powder – misaligning – Deformation of metals – Bauschinger effect – Elastic after effect – Deformation of crystals and poly crystalline materials.

Reference
1. Materials Science by M.Arumugam, Anuradha Publishers. 1990 Vidayalkaruppur,
    Kumbakonam.
2. Materials Science and Engineering V.Raghavan Printice Hall India Ed. V 2004. New
    Delhi.

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CORE COURSE X – MAJOR PRACTICAL – III

SECTION – A- General
(Any 12 experiments only).

1. Koenig's method – Uniform bending – Y.
2. Spectrometer i-i curve.
3. Spectrometer – small angle prism.
4. Spectrometer – Grating – Normal incidence.
5. Spectrometer – Grating minimum deviation and dispersive power.
6. Spectrometer – Cauchy's constants.
7. Spectrometer – Fraunhofer lines.
8. Spectrometer – Hartmann's Formula.
9. Field along the axis of a coil – determination of M.
10. M and H – Absolute determination using deflection and vibration magnetometer.
11. Potentiometer – EMF of a thermocouple.
12. Potentiometer x of thermistor.
13. Potentiometer - High range voltmeter calibration.
14. Ballistic Galvanometer – Figure of merit.
15. B.G. – Absolute capacity of condenser.
16. B.G. – Absolute L.
17. B.G. – Absolute M.
18. Anderson's bridge – AC self inductance of a coil.
19. Construction of capacitance meter
20. Maxwell's Bridge
21. Desanty's Bridge

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COURSE – XI : MAJOR PRACTICAL – IV

Section – A – Electronics
(Any 12 experiments only).

1. Series and Parallel resonance circuits (CRO can be used).
2. Regulated power supply using Zener, Percentage of regulation.
3. Single stage – RC coupled amplifier – Transistor.
4. Emitter follower amplifier – Frequency response.
5. Hartley oscillator using transistor.
6. Colpitt's oscillator.
7. Astable multivibrator.
8. Monostable multivibrator.
9. FET Characteristics.
10. FET amplifier.
11. Logic gates – AND, OR and NOT gates using discrete components – Truth table.
12. Universal gates NAND/NOR and basic gates from Universal gates.
13. Adder and Subtractor – Half and Full.
14. BCD to 7 segment decoder – 7 segment LED display.
15. Op – Amp – Adder and Subtractor.
16. Op – Amp – Integrator and Differentiator.
17. Demorgan's theorem and Boolean algebra.
18. Flip Flop using gates.
19. Constmation of a signal generator with square, triangular and sinusoidal output.
20. Construction of power amplifier.
21. Dc differential amplifier – Determination of Thermo e.m.f

Section – B – Microprocessor 8085.
(Any 3 experiments only).

22. 8-bit addition and 8-bit subtraction.
23. 8-bit multiplication and Division.
24. Conversion from decimal to hexadecimal system.
25. Conversion from hexadecimal to decimal system.
26. 16-bit addition.

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CORE COURSE XII - ELEMENTS OF THEORETICAL PHYSICS

Unit I   Lagrangian formalism.

Mechanics for a system of particle – Constraints – Generalized Co-ordinates – Transformation equations – Configuration space – Principle of virtue work – D' Alemibert's principle – Applications of Lanrange's equations – Atwood's machine – Simple pendulum.

Unit II   Hamiltonian formalism

Phase space – Generalized momentum – Cyclic co-ordinates –Conservation theorem for generalized momentum – Conservation theorem for energy

Unit III   Dual Nature of Matter

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

Unit IV   Schrödinger's wave Mechanics

Basic postulates of wave Mechanics – Development of Schrödinger wave equation – Time independent and dependent forms of equations – Properties of wave function – Orthogonal and normalized wave function Eigen function and eigen values – Applications of Schrödinger equation – particle in a box- Linear harmonic oscillator – The barrier penetration problem.

Unit V   Photo electric and Compton effects

Photo electric effect – Lenard, Richardson and Compton experiments – laws of photoelectric emission – Einstein's photoelectric equation – Millikan's experiment- Determination of planck's constant – photo emissive cell – photo – voltaic cell – photo conductive cell – photo multiplier – Compton effect – Theory – Experimental Verification.

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CORE COURSE XIII
DIGITAL ELECTRONICS AND MICROPROCESSOR FUNDAMENTALS

Unit I   Number Systems and Logic Gates

Introduction to decimal, binary, octal, hexadecimal number systems – Interconversions – BCD code, Excess – 3 code, Gray code – One's and two's complements – Simple binary arithmetic operations – Addition, subtraction, multiplication and division – Binary subtraction using one's and two's complements – Positive and negative logic – Basic and derived logic gates, symbols and their truth tables – AND, OR, NOT, NAND, NOR, XOR, and XNOR – Universality of NAND and NOR gates.

Unit II   Boolean Algebra and Simplification of Logic Expressions

Boolean algebra – Basic laws of Boolean algebra – De-Morgan's theorems Reducing Boolean expressions using Boolean laws – SOP and POS forms of expressions miniterms and maxterms – Karnaugh map simplification.

Unit III Combinational digital Systems

Half and full adders – Binary address – Half and full subtractors – Binary subtractor Two's complement adder / subractor circuits – Decoder – Encoder – Multiplexer – Demultiplexer – A/D conversion – Successive approximation method – D/A conversion – R-2R ladder network.

Unit IV Sequential Digital Systems

Flip flop – RS – clocked RS – T and D flip flops – JK and master slave flip flops – Counters – Four bit asynchronous ripple counter – Mod-10 counter – Ring counter – Synchronous counter – Shift registers – SISO and SIPO shift registers.

Unit V Microprocessor (8085)

Introduction to microprocessor – Basic components of a microcomputer – I/O devices – Memory – ROM – RAM – Architecture of 8085 – Address bus – Data bus – Control bus – Pin configuration – Registers Arithmetic and logic unit – Flags – Instruction format – Types of instructions – Addressing modes – Assembly language programming – Programmes for addition, subtraction, biggest and smallest from the given list.

Books for Study

Digital Principles and Application, A.P. Malvino, D.P.Leach, IV Edition, McGraw Hill, New Delhi, 1986.
Digital Fundamentals, V.Vijayendran, S.Viswanathan, Printers & Publishers Private Ltd, Chennai, 2004.
Fundamentals of Microprocessor – 8085, V.Vijayendran, S.Viswanathan, Printes & Publishers Private Ltd, Chennai, 2004.

Books for Reference

1. Fundamentals of Microprocessor and Microcomputers, B.Ram, Dhanpat Rai
   Publications, New Delhi, 2006.
2. Digital Electronics, W.H.Gothmann, Prentice Hall of India, Pvt, New Delhi 1996.
3. Fundamentals of Digital Electronics and Micropocessors, Anokh Singh, A.K.Chhabra,
    S.Chand & Co, New Delhi, 2003

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MAJOR BASED ELECTIVE II
COMPUTER PROGRAMMING IN C

Unit I

Introduction: Importance of C – Basic structure of C Programs – Programming Style. Constants, Variables and Data Types: Character set, Keywords and Identifiers – Constants – Variables – Data Types – Declarations of Variables – Assigning Values of variables.
Operators and Expressions: Arithmetic, Relational, Logical, Assignment, Increment and Decrement, Conditional, Bitwise, Comma Operators – Arithmetic expressions – Procedure and Associativity.

Unit II

Input Output Operator: getchar, putchar, Formatted output (printf) and Formatted input (scanf).
Control Structure: Decision making with if, - if. Else – switch – go to – The break and continue statements – while – do, while – for statements.
Arrays. One – dimensional and two dimensional arrays, declaring arrays, storing arrays in memory – initializing arrays.

Unit III

Functions: Basic functions – Return values and their types – calling functions – function arguments – external variables and scope rules.
Structures and Union: Structures – Arrays of Structures – Arrays within structures – structures and functions – Unions.

Unit IV

Pointers: Pointers and functions – arguments – Pointers and arrays – address arithmetic – character points and functions – Pointer arrays – Point arrays – Point on Pointers. Preprocessor: Macro substitution – File inclusion – Complier control directives – opening and closing a file – reading and writing data – error handling – Random Access.

Unit V

Development of algorithm, flowchart and program for the following problem.
      1. Average of a set of numbers.
      2. Conversion of Fahrenheit to Celsius.
      3. Solving quadratic equation.
      4. Finding the factorial using recursion.
      5. To add/subtract/multiply two matrices.
      6. To find the smallest and largest element in an array.
      7. Sorting a set of numbers in ascending/ descending order.
      8. To arrange the names in alphabetical order.

Books for Study

1. Programming in ANSI – C – E.Balagurusamy – Tata McGraw Hill.
2. Schaum's Outline Series Theory and Problems of Programming with C – Byron S.Gottifried, McGraw Hill, Internationals.
3. Programming with C – Venugopal, K.R.and Sudep R.P.Tata McGraw Hill, 1998.

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MAJOR BASED ELECTIVE II
PROGRAMMING IN C++
(B.Sc. Physics – 2008-09 & 2009-10 Batch)

2008-09 மற்றும் 2009-10 கல்வியாண்டுகளில் அமைக்கப்பட்ட இளநிலை இயற்பியல் பயில்திட்டத்தில் சேர்க்கைப் பெற்ற மாணவர்களுக்கு இரண்டாம் ஆண்டு இயைபுப் பாடமாக (Allied Course) Computer Science-யில் "Programming in C" என்ற தாள் பயிற்றுவிக்கப்பட்டிருந்தால் அம்மாணாக்கர்களுக்கு ஆறாம் பருவத்தில் உள்ள துறைசார்ந்த விருப்பப் பாடம் 2-ல் (Major Based Elective II) "Computer Programming in C" என்ற தாளும் ஒரே பாடமாக இருப்பதால் மேற்கண்ட மாணவர்களுக்கு மட்டும் ஆறாம் பருவத்தில் துறைசார்ந்த விருப்பப்பாடம் 2-க்கு (Major Based Elective II) **"Programming in C++"** பயிற்றுவிக்க வேண்டும்.

Unit I

An overview of C++ - C++ console I/O - Differences between C and C++ classes – Constructor and Destructor function – inline function – automatic inlining.

Unit II

Assigning object – passing objects to functions – returning object from function – an introduction to friend function – arrays of objects – using pointers to objects – this pointer – new and delete – references – passing references to objects – returning references.

Unit III

Overloading constructor function – copy constructor – default argument – basis of operator overloading – overloading Binary operator – Overloading unary operator – using friend operator function.

Unit IV

Inheritance – base class access control – constructors, destructors and inheritance – multiple inheritance – virtual base classes.

Unit V

File I/O basics – Unformatted binary I/O – random access – introduction to virtual functions – Exception Handling.

Text Book:

Herbert Schildt, "Teach Yourself C++", Third edition, Tata Mcgraw Hill, 2000.

Reference Books:

1. E.Balagurusamy, "Object Oriented Programming with C++", Tata Mcgraw Hill Publishing Ltd., New Delhi, 2002.
2. Robert Lafore, "Object Oriented Programming in C++", - Galgotia, 1194
3. Yeswant Kanetkar, "Let us C++", BPB Publications, 1999.
4. John R.Hubbard, "Programming with C++", Schaum's Outline Series, 1996.

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MAJOR BASED ELECTIVE III
OPTO ELECTRONICS AND FIBER OPTIC COMMNICATION

Unit I   Interaction of Light with Matter

Introduction – Absorption – optical absorption in metals, dielectrics and semiconductors – Reflection – trap – excitons - color centies – Generation of colour centers – Luminescence – Photoluminescence.

Unit II   Opto electronic Materials of Devices LED Materials

Construction of LED - Advantages of LEDs in electronic display - LCD – Characteristics of LCD materials – Action of LCD display device – Photodetectors
Detector performance parameters – Photo conductive materials – Photo diode – LDR, Phototransistors.

Unit III Lasers

Introduction – Stimulated emission – Einstein's coefficients – Absorption and amplification of radiation – Optical feed back – Threshold condition for lasing – Properties of lasers – Radiant power, Coherence, Coherence length - Laser spot size – Beam divergence. - CO_2 laser, semiconductor laser – Applications.

UNIT IV Fiber optic Communication

Introduction – Principles of light transmission in a fiber - Numerical aperture - Fiber index profiles – Modes of propagation – Losses in fibers – Light sources – Laser diode – Light detector – Avalanche photo diode – Fiber optic communication link (-Block diagram) Advantages of fiber optics communication.

Unit V Optical Data Storage

Surface Storage Phase change recording – Magneto optical data storage - Hi- tech evolved in system development – Automatic focussing – Automatic track following capacity of CD – advantages of CD – holographic storage – Construction of a hologram – Reconstruction of a hologram.

Books for study

1. Palanisamy P.K.Semiconductor Physics and Opto electronics, Ed II Scitech Publications. (2003).
2. Palanisamy P.K. Material Science Ed II Scitech (2003).
3. Tripathi K.N, Mathur P.C, Ainashi Kapoor, Vinod K. Sharma, Opto electronics – BS Publications (2004).

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