

PART-III AGENDA ITEMS FOR THE 69TH MEETING OF THE ACADEMIC COUNCIL SCHEDULED ON 16TH AND 17TH JUNE, 2003.

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2:1(1)

REPORTING ITEM

i) Constitution of various Committees

As decided by the Academic Council in its 68th meeting held on 4th and 5th December '02 various Committees were constituted as follows :

Sl.No:	Academic Council's decision	Action taken
1	2	3
1.	<u>AC: 68: 2002: 1: (ii)-</u> "to perform the academic and administrative audit for the University"	Report awaited
2.	<u>AC: 68: 2002: 5: 1(ii)-</u> to frame the Ordinances on the following i) Manner in which the Deans of Schools and Heads of Departments are to be removed. ii) Functioning of Departments and Schools of Studies iii) Provisions for removal of other Officers for whom such provisions donot exist. iv) Re-examination/elaboration of powers and functions of Heads of Departments/Deans of School of Studies.	Report awaited
3.	<u>AC: 68: 2002: 5: 5: (i)-</u> "to frame an Ordinance for BE and other professional Courses"	Report received
4.	<u>AC: 68: 2002: 5: 6: (ii)-</u> "to prepare a vision plan for Jowai Campus vis-a-vis the Shillong and Tura Campus"	Report awaited
5.	<u>AC: 68: 2002: 5: 6(iii)-</u> " to declare the centres as non-vacational after re-organisation of centres.	Report awaited

The matter is placed before the Council as Reporting item.

3:4(1)

iv) Panel of Examiners for Ph D/M Phil

The respective School Board considered and approved the panel of Examiners in respect of the following candidates and the matter is placed before the Council for consideration.

<u>Sl.No:</u>	<u>Name of the Candidates</u>	<u>Departments</u>	<u>Degree</u>
1.	Nang Helina Mantaw	Geggraphy	Ph D
2.	Mithu Sinha	Geggraphy	Ph D
3.	Ketshukeituo Dzuovichu	Anthropology	Ph D
4.	Mr Omarlin Kyndiah	Biochemistry	Ph D
5.	Ms Aparajita Dutta	Zoology	Ph D
6.	Ms Quendarisa Kharbuli	Zoology	Ph D
7.	Mr Bidhyadhar Das	Zoology	Ph D
8.	Mr Shanwell Khongwir	Zoology	Ph D
9.	Ms Buromlang Gashnga	Botany	Ph D
10.	Mr Ksh Lal Bihari Singha	Botany	Ph D
11.	Mr Jag Mohan Singh Tomar	Botany	Ph D
12.	Ms Kh Ashalata Devi	Botany	Ph D
13.	Mr Lakhan Kma	Biochemistry	Ph D
14.	Ms Vanlalhrunai Ralte	Botany	Ph D
15.	Vallerio Pakyntein	Geography	M Phil
16.	Palmis Surong	Geography	M Phil
17.	Sailalsiom	Geography	M Phil

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3:5:(1)

v) Declaration of Ph D Results

The School Board of Life Science held on 15th May'03 considered and approved the following Ph D results and the matter is placed before the Council for ratification.

<u>Sl.NO.</u>	<u>Name of the Candidates</u>	<u>Departments</u>	<u>Degree</u>
1.	Ms Kabita Kumpawat	Zoology	Ph D
2.	Mr Upal Sengupta	Zoology	Ph D
3.	Ms Larisha M	Zoology	Ph D
4.	Mr Putul Bhuyan	Botany	Ph D
5.	Mr Dainingstar Marngar	Zoology	Ph D
6.	Ms Carina Goswami	Zoology	Ph D
7.	Mr Om Prakash Tripathi	Botany	Ph D

vii) Regulation on the Certificate Course in Floriculture

Prof (Mrs) B Lynden(Laso) Distance Education, NEHU vide her letter placed as Annexure-'A' has submitted a draft Regulation relating to the Certificate Course in Floriculture in consultation with the Controller of Examination and the Botany deptt. NEHU as advised by the Dy. Registrar, (Acad) vide letter No: 50-4/ Acad/Dist Edn/2001-2718 dated 31.3.03 placed as Annexure-'B'.

The Regulation framed for the above course is placed as Annexure-'C'.

The matter is placed before the council for consideration.

SG

**NORTH EASTERN HILL UNIVERSITY
Bijni Complex Shillong -793003 (Meghalaya)**

**PROF(MRS) B.LYNDEM(LASO)
DISTANCE EDUCATION**

**No.F.46/Dist/F.C/03-3023
Dated : 10/6/03**

To

The Deputy Registrar
Conference
NEHU, Shillong.

Sub: Regulation for Floriculture Course.
Ref: No.50-4/Acad/Distance Education /2001-2718
Dated 31/3/03

Sir,

I would like to draw your kind attention that the Regulation for the Floriculture Course has been framed in consultation with the Controller of Examination, NEHU and the Botany Department, NEHU as per the advice of Deputy Registrar, Academic (letter enclosed). The course was placed in the Academic Council and at this stage the matter may be finalized only by the same body.

Yours faithfully

Sd/-

(Prof.(Mrs)B.Lyndem(Laso)

5: 1: 7(3)

**NORTH EASTERN HILL UNIVERSITY
SHILLONG**

No.50-4/Acad/Distance Education/2001-2718

March 31st, 2003.

To

The Incharge,
Unit for Distance Education,
NEHU, Shillong.

Sub: Lanching of Correspondence Courses.

Ref: Your letter No.F.46/Dist/F.C/03-2974 dated 18.3.2003.

Madam,

With reference to the above, I am to inform your that the rules on the following are required to be framed and approved by the Academic Council and Executive Council before launching the correspondence course :-

- (a) The fee structure i.e. Course fee and other fees.
- (b) The pattern of Examination and Exam. Fee(s) thereof.

Kindly frame the rules in consultation with the Controller of Examinations, for Submission to the Academic Council for consideration.

Yours faithfully
Sd/-
J M S Khongwir
Deputy Registrar

Copy to:-

The Controller of Examination, NEHU, Shillong.

**REGULATIONS
ON THE CERTIFICATE COURSE IN FLORICULTURE
(UNDER ORDINANCE OA 3 AND OA 5)**

OBJECTIVES:

NEHU proposes to offer vocational education on Floriculture through correspondence course to generate employment opportunities for the unemployed youth.

Floriculture is reckoned as the emerging vocational subject having promising economic prospects. Therefore the course intends to disseminate knowledge of advanced methods of cultivation of flowers and use of various technical skills for establishment of nurseries and mass propagation of ornamental plants.

SYLLABUS:

The syllabus for the course shall be prescribed by the Steering Committee of the Centre from time to time.

COURSE STRUCTURE & ADMISSION CRITERIA:

The eligibility for admission to the courses shall be as under:

There shall be a Certificate Course on Floriculture of six-months duration for the graduates and General Course on Floriculture of six-week duration for class X passed students.

EXAMINATION:

- i) Examination will be conducted by the University at the end of the course on the date and place to be notified by the University.
- ii) The medium of instruction and examination shall be in English.
- iii) Paper setters and Examiners shall be from

5: 1: 7(5)

the panel as approved by the University.

- iv) The course of six-month duration will have two theory papers, one practical and one project each having 100 marks. The Total aggregate marks for the course shall be 400.
- v) The six-week course on General Floriculture will have one theory paper and one practical paper each carrying 100 marks. The total aggregate marks of the course shall be 200.
- vi) The duration of examination for theory paper will be three hours and for Practical it will be four hours.

Each paper:-

Full marks:- 100

Pass marks:- 35 %

Results:-

Division I 60 % and above

II 50 % to below 60 %

III 40 % to below 50 %

Aggregate pass marks = 40 % and above

vii) The University will declare the results and issue the certificates.

viii) The dropped/failed student has to take fresh admission.

FEE STRUCTURE:**I. For six-month Certificate Course on Floriculture :**

1. Cost of study material	Rs. 300/-
2. Laboratory fee	Rs. 300/-
3. Miscellaneous	Rs. 50/-
4. Library (caution money)	Rs. 200/-
5. Marks-sheet	Rs. 100/-
6. Identity Card	Rs. 25/-
7. Practical Examination fee	Rs. 100/-
8. Admit Card fee	Rs. 50/-
9. Admission fee	Rs. 200/-
10. Examination fee	Rs. 300/-
11. Tuition fee	Rs. 875/-
Total	Rs 2500/-

II. For six-week General Course on Floriculture:

1. Cost of Study Material	Rs. 250/-
2. Laboratory fee	Rs. 300/-
3. Miscellaneous	Rs. 75/-
4. Library (caution money)	Rs. 200/-
5. Marks-sheet	Rs. 100/-
6. Identity Card	Rs. 25/-
7. Practical Examination fee	Rs. 100/-
8. Admit Card fee	Rs. 50/-
9. Admission fee	Rs. 100/-
10. Examination fee	Rs. 300/-
Total	Rs. 1500/-

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viii) Student strength in M.A. Sociology.

Prof. P.M.Chacko, Head, Department of Sociology, NEHU has submitted a proposal to the Chairman of the Academic Council vide letter No 6422 dt, 10.6.03 placed at Annexure-A with regard to increase of the intake capacity of the students for M.A in Sociology from 40 to 45 from the coming Academic session(August 2003) onwards. This has been duly recommended by the Faculty meeting held on 6.6.03.

The matter is placed before the Council for consideration.

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NORTH-EASTERN HILL UNIVERSIT
DEPARTMENT OF SOCIOLOGY
UMSHING-MAWKYNROH, SHILLONG-793022

Annexure-A

Prof.P.M.Chacko
Head

No.6422
Gram:NEHU
(O) (0364)551551
(0364)551689

Dated 10th June,2003

To

The Vice-Chancellor,
(Chairman, Academic Council)
North-Eastern Hill University
Shillong.

Sub: Students strength in MA Sociology.

Sir,

The present intake capacity of M A students in the department of Sociology is fixed at 40. The faculty in its meeting held on 6th June, 2003 has recommended that the intake capacity of the students for MA in Sociology be increased to 45 from the coming academic session (August 2003)onwards,

However, the faculty requests the relevant university body to kindly fix some Guidelines regarding the optimum strength of the students in the MA programme based on semester system and internal assessment .

Yours faithfully,

Sd/- P.M.Chacko

C.C.

1. The Dean,
School of Social Sciences, NEHU.
2. The Deputy Registrar(Conference)NEHU, Shillong.

5:2:7(1)

vii) Revised Syllabus of M Sc (Physics)

The School Board of Physical Sciences in its special meeting held on 2nd June'03 finalised and approved with some minor corrections the revised syllabus of M Sc(Physics) Minutes of the meeting is placed as Annexure-'A' and the syllabus as Annexure-'B'.

The matter is placed before the Council for consideration.

SG

Annexure-'A'

5:2:7(2)

MINUTES OF THE SPECIAL MEETING OF SCHOOL BOARD
OF PHYSICAL SCIENCES HOLD AT 3 P M JUNE 2,2003
AT PHYSICAL DEPARTMENT LECTURE ROOM.

*1. The revised M So(Physics) syllabus was approved with minor corrections.

2. The following members attended the meeting :

P Shukla, G Das, P N Pandita, Y S Jain, M K Parida,
K Ismail, R H Duncan Lyngdoh, B B P Gupta, C S Shastry,
R A Lal, R K Poddar, K Kumar, S Aravanmudhan, S K Srivastava.

The meeting ended at about 4 p.m. with thanks from the Chair.

Sd/-

(Prabodh Shukla)
Dean,
School of Physical Sciences.
3.6.03

SG

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Department of Physics
North Eastern Hill University
Shillong 793 022

I Semester

1.	Classical Mechanics	(Phys/411)	100
2.	Quantum Mechanics I	(Phys/412)	100
3.	Mathematical Physics	(Phys/413)	100
4.	Laboratory I	(Phys/414)	150

II Semester

1.	Electrodynamics	(Phys/421)	100
2.	Electronics	(Phys/422)	100
3.	Quantum Mechanics II	(Phys/423)	100
4.	Laboratory II	(Phys/424)	150

III Semester

1.	Nuclear Physics	(Phys/531)	100
2.	Solid State Physics	(Phys/532)	100
3.	Atomic and Molecular Physics	(Phys/533)	100
4.	Laboratory III	(Phys/534)	100
5.	Environment	(Phys/535)	50

IV Semester

1.	Thermal Physics	(Phys/541)	100
2.	Computational Techniques and Numerical Methods	(Phys/542)	100
3.	Computational Techniques-Laboratory	(Phys/543)	150
4.	Optional Paper		
	(a) Advanced Solid State Physics	(Phys/544a)	100
	or		
	(b) High Energy Physics	(Phys/544b)	100
	or		
	(c) Laser Physics	(Phys/544c)	100
	or		
	(d) Nuclear Physics	(Phys/544d)	100

Total Marks = 1800

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I Semester M.Sc.(Physics)

Phys/411 : Classical Mechanics

- U-1.** Hamilton's variational principle; derivation of Lagrange's equations; velocity dependent forces; dissipation. Charged particle in an electromagnetic field. Space time symmetries and conservation laws. Virial theorem. Space transformation. (9)
- U-2.** Two-body problem; central forces; classification of orbits; differential equation for orbits. Kepler problem; scattering in laboratory and center of mass frames; transformation of cross sections, energies. Coulomb scattering. Kinematics of decay of a particle (into two particles). (9)
- U-3.** Rigid body motion. Fixed and moving coordinate systems; orthogonal transformations Euler angles; angular momentum; rotational kinetic energy. Principal axes transformation; Euler equations; force free motion of a rigid body-symmetric top. (9)
- U-4.** Legendre transformation; Hamiltonian equations; significance of Hamilton's function. Cyclic coordinates and conservation theorems. Poisson brackets – Poisson bracket of angular momentum with coordinates, etc. Canonical transformation theory, contact transformation; integral invariants. (9)
- U-5.** Special Theory of Relativity
Lorentz transformations. four dimensional formulation. Force, momentum and energy in relativistic mechanics. Properties of space-time in relativity. Two body decay of a particle. (9)

Text Books:

1. H. Goldstein, C. Poole and J. Safko, Classical Mechanics, Pearson Education Asia (2002)
2. N.C. Rana and P.S. Joag, Classical Mechanics, Tata McGraw Hill (2001)
3. K.C. Gupta, Classical Mechanics of Particles and Rigid Bodies, Wiley Eastern(1988)
4. D.T. Greenwood, Principles of Dynamics, Prentice Hall (1988)

Reference Books:

1. W. Greiner, Classical Mechanics, Springer (2003)
2. J.B. Marion, Classical Mechanics of Particles and Systems, Academic Press (1999)
3. L.D. Landau and E.M. Lifshitz, Mechanics, Addison Wesley (1960)
4. W. Hauser, Introduction to the Principles of Mechanics, Addison Wesley (1965)

I Semester M.Sc. (Physics)

Phys/412: Quantum Mechanics I

- U-1. Introduction and review: Inadequacy of classical mechanics; basic postulates of Quantum Mechanics; Ensemble and Copenhagen interpretation. Schrodinger equation; continuity equation; Ehrenfest theorem; admissible wave functions; stationary states. One dimensional problems; potential well and potential barriers. Harmonic oscillator by Schrodinger equation. (9)
- U-2. Schrodinger, Heisenberg and Dirac representations; equations of motion in these representations. Application to linear harmonic oscillator (7)
- U-3. Three dimensional problems: Separation of variables; orbital angular momentum; spherical harmonics. Harmonic oscillator in cartesian and polar coordinates. Coulomb problem in spherical and parabolic coordinates. (11)
- U-4. Spinors and their transformation properties. Pauli spin matrices. Identical particles and statistics. addition of angular momenta. Clebsch-Gordon coefficients. Winger-Eckart theorem. (9)
- U-5. Symmetry in quantum mechanics. reflections, time reversal, space inversion, particle exchange. Displacement in space and time, space translation and rotational symmetry. selection rules and conservation laws. (9)

Text Books:

1. E. Merzbacher, Quantum Mechanics, John Wiley (1999)
2. G. Aruldhas, Quantum Mechanics, Prentice Hall (1998)
3. L.I. Schiff, Quantum Mechanics, McGraw Hill (1998)
4. V.K. Thankappan, Quantum Mechanics, New Age Int. Pub. (1996)
5. P.T. Mathews and S. Venkatesan, Quantum Mechanics, Tata McGraw Hill (2001)

Reference Books:

1. S. Gasiorowiz, Quantum Mechanics, Wiley (1995)
2. A. Messiah, Quantum Mechanics, Interscience (1961)
3. K. Gottfried, Quantum Mechanics, Benjamin (1986)
4. J.J. Sakurai, Modern Quantum Mechanics, Addison-Wesley (1990)

I Semester M. SC. (Physics)

Phys/413: Mathematical Physics

U-1. Functions of a complex variable

Analytic functions; derivatives of an analytic function.

Series of analytic functions; the Taylor series; the Laurent series; zeros and isolated singular points of an analytic function.

The calculus of residues; theorem of residues; evaluation of integrals; Jordans lemma; the principal value of an integral.

Multivalued functions; Riemann surfaces; evaluation of an integral involving a multivalued function; analytic continuation; dispersion relations.

(12)

U-2. Vectors and matrices

Linear vector spaces; linear operators; matrices; coordinate transformations; eigenvalue problems; diagonalization of matrices; spaces of infinite dimensionality.

(10)

U-3. Special Functions

Associated Legendre differential equation and functions; generating functions; spherical harmonics; orthonormality.

Bessel's equation; Bessel functions; spherical Bessel, Nuemann and Hankel functions; expansion of a plane wave into partial waves.

Laguerre and associated Laguerre differential equation and functions; generating functions; recurrence relations; orthonormality.

Hypergeometric and confluent Hypergeometric functions.

(13)

U-4. Integral Transforms

General properties of Laplace transforms; inverse Laplace transform; applications of Laplace transforms; convolution theorem; solution of differential equations with Laplace transforms.

(5)

U-5. Probability and Statistics

Fundamental probability laws; combinations and permutations; the binomial Poisson and Gaussian distributions; general properties of distributions.

(5)

Text Books:

1. G. Arfken, **Mathematical Methods for Physicists**, Academic Press, (1996)
2. J. Mathews and R. L. Walker, **Mathematical Methods of Physics**, The Benjamin/Cummings Publishing Company (1994)
3. P. Dennery and A. Krzywicki, **Mathematics for Physicists**, Harper and Row (1997)

Reference Books:

1. H. Margenau and G. M. Murphy, **Mathematics of Physics and Chemistry (2 Vols.)**, Van Nostrand (1967)
2. J. T. Schwartz, **Introduction to Matrices and Vectors**, McGraw Hill (1991)
3. A. W. Joshi, **Matrices and Tensors in Physics**, Wiley Eastern (3rd Edition, 2000)

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I Semester M. SC. (Physics)

Phys/414: Laboratory I

List of Experiments for M. Sc. Semester I

1. Study of transient response of series LCR circuit.
2. Study of phase difference in an RC Circuit and calibration of an oscillator using Lissajous figures.
3. Experimental verification of Thevenin's theorem.
4. Experimental verification of Norton's theorem.
5. To study the phase shift oscillator.
6. To study the Wein bridge oscillator.
7. To study the Schmitt trigger circuit.
8. To study the characteristics of SCR using the bread board.
9. Determination of difference in wavelengths ($\Delta\lambda$) of Na using a Fabry-Perot interferometer.
10. To study the energy level jumps in Na.
11. To verify the Beer-Lamberts law using UV/visible spectrometer.
12. Verification of inverse square law for γ -ray using GM counter

Note: Students should perform at least 10 experiments from this list.

Recommended Reading:

1. W. T. Eadie et al.: **Statistical Methods in Experimental Physics** (North-Holland Publishing Company, 1971).
2. M. Nelkon and J. M. Osborn: **Advanced Level Practical Physics** (ELBS, 1983).
3. L. K. Maheswari and M. S. Anand: **Laboratory Manual for Introductory Electronic Experiments** (New Age International Publishers, Wiley Eastern Ltd, 1995).
4. **Nuffield Guide to Apparatus** (Western Printing Services, 1968)
5. B. Saraf et al.: **Physics Through Experiments** (Vikas Publishing House, 1979).
6. **Nuffield Physics through Experiments, Vols. III, V** (Western Printing Services, 1968).
7. L. R. Ingersoll et al.: **A Laboratory Manual of Experiments in Physics** (McGraw Hill Book Company, 1953).
8. J. R. Taylor: **An Introduction to Error Analysis** (Oxford University Press, 1982).
9. M. Sayer and A. Mansingh: **Measurement, Instrumentation and Experimental Design in Physics and Engineering** (Prentice Hall of India, 2000).
10. B. Jyrwa: **Laboratory Manual for M.Sc. (Physics) Vol. I (Electronics)** (Alpha-Plus Publishing House, 2002).
11. A. J. Diefenderfer and B. E. Holten: **Principles of Electronic Instrumentation** (Saunders College Publication, 1994).
12. J. Christos and C. Halkias, **Electronics**, (Tata McGraw Hill, 1991)

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II Semester M. SC. (Physics)

Phys/421: Electrodynamics

U-1. Maxwell's equations

Review of Maxwell's equations, boundary conditions at interfaces between different media; Poisson's and Laplace's equations.

(4)

U-2. Magnetostatics

Introduction; Biot and Savart law; Ampere's law; vector potential; vector potential and magnetic induction for a circular current loop.

(5)

U-3. Electromagnetic waves

Linear and circular polarization; Stokes parameters; Poynting theorem of complex field vectors; frequency dispersion (normal and anomalous); characteristics of dielectrics, conductors and plasmas.

(5)

U-4. (a) Simple radiating systems

Gauge invariance; Green's functions for the wave equation; concept of retarded potential; radiation from an oscillating dipole and its polarization. Electric dipole fields, magnetic dipole and electric quadrupole fields; center fed linear antenna. Scattering at long wave lengths- viz. by (1) dipoles induced in a small scatterer, Scattering by a small dielectric sphere.

(10)

(b) Diffraction

Scalar diffraction theory; vectorial diffraction theory; scattering in a short wave length limit

(4)

U-5. Radiation from accelerated charge

Lienard -Wiechart potentials; radiated power from accelerated charge at low velocities. Larmor's power formula. The fields of a point charge in arbitrary and uniform motion. Radiation from an ultra-relativistic particle; angular and frequency distribution of radiation from moving charges.

(10)

5:2:7(11)

U-6. Special theory of relativity

Matrix representation of Lorentz transformations; infinitesimal generators; Thomas precession; invariance of electric charge; covariance of electrodynamics; transformation of electromagnetic fields.

(7)

Text Books:

1. J. D. Jackson, **Classical Electrodynamics** (John Wiley and Sons, 1998)
2. S. P. Puri, **Classical Electrodynamics** (Tata McGraw Hill Publishing Company Ltd., 1994)
3. S. L. Gupta, V. Kumar and S. P. Singh, **Electrodynamics** (Pragati Prakashan, 1999)
4. D. J. Griffiths, **Introduction to Electrodynamics** (Prentice Hall of India, 2000)

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II Semester M.Sc.(Physics)

Phys/422 Electronics

U-1. Amplifiers and oscillators

Analysis of transistor amplifier in CB and CE configurations in terms of h-parameters, two stage cascaded amplifier, low frequency gain, High frequency gain, Miller effect, transformer coupling, Push-Pull amplifier, Op-AMP – its basic characteristics, inverting and non-inverting Op-amplifiers. Application of Op-AMPs as adder, differentiator, integrator and comparator, Phase shift oscillator, Wien Bridge oscillator, unijunction relaxation oscillator, multivibrators: astable, monostable and bistable, Schmitt trigger. (17)

U-2. Negative conductance microwave devices:

The IMPATT diode, Read diode, the TRAPATT diode, Gunn effect, Ridley-Watkins-Hilsum (RWH) mechanism, modes of operation of Gunn oscillator. (10)

U-3. Digital electronics and measurements:

Logic gates, Boolean algebra, De Morgan's theorem, DTL, TTL logics, flip-flops, RSFF, JKFF counters, shift register, A-D and D-A conversion, D-A ladder networks, essential components of a computer system, semiconductor memory. (10)

U-4. Analog measurements:

Voltage regulators, regulated power supply, photomultiplier tube, oscilloscope, Lissajous figures. (4)

U-5. Semiconductor lasers:

Population inversion at a junction, the basic semiconductor laser, heterojunction lasers. (4)

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Text Books:

1. B.G. Streetman, Solid State Electronic Devices, Prentice Hall of India, New Delhi (1996)
2. A.J. Diefenderfer, Principles of Electronic Instrumentation, Holt-Saunders (1991)
3. H.V. Malmstadt, C.G. Enki and S.R. Crouch, Electronics Instrumentation of Scientists, Benjamin (1981)
4. J.J. Brophy, Basic Electronics for Scientists, McGraw Hill Kogakusha (1991)
5. K.C. Gupta, Microwaves, Wiley Eastern (1983)
6. A.P. Malvino, Electronics Principles, Tata McGraw Hill Publishing Co. Ltd., New Delhi (1983)
7. J.D. Ryder, Electronics Fundamentals and applications, Prentice Hall of India, New Delhi (1987)
8. D.C. Tayal, Basic Electronics, Himalaya Publishing House, Mumbai (1998)

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II Semester M.Sc.(Physics)

Phys/423: Quantum Mechanics II

- U-1. Variational methods for bound states; lower and upper limits in simple cases. WKB approximation; connection with classical limits, validity of WKB approximation. Connection formulae; application to bound states, tunneling in one dimension. Application to radial Schrodinger equation. (9)
- U-2. Stationary perturbation theory: Nondegenerate case; first order and second orders for energy and wave functions, perturbation of one dimensional harmonic oscillator by potentials of the type bx^2 and cx^3 , degenerate case; first order Stark effect in hydrogen; Zeeman effect without electron spin. (8)
- U-3. Time dependent perturbation theory; first order transition probabilities; constant perturbation. Transition to continuum. Harmonic perturbation. Fermi's golden rule. Sudden and adiabatic approximations. (8)
- U-4. Scattering Theory: Asymptotic behaviour of scattering wave function; relation to cross sections. Green's function for scattering problem; Green's functions with different boundary conditions; Scattering integral equations; Born approximation and its validity criteria; Scattering by screened Coulomb potential; Born series. Partial waves and phase shifts. Scattering amplitude; optical theorem; Low energy scattering. Effective range; scattering length; resonances. (10)
- U-5. Relativistic wave equations: Klein-Gordon equation. Difficulty with probability interpretation. Dirac equation; four component solutions for free particle; negative energy solutions - particles and antiparticles. Covariant form of Dirac equation; 4-current density. Properties of γ -matrices. Dirac equation in the presence of electromagnetic field; non-relativistic reduction; spin and magnetic moment. (10)

Text Books:

1. E. Merzbacher, Quantum Mechanics, John Wiley (1999)
2. G. Aruldas, Quantum Mechanics, Prentice Hall (1998)
3. V.K. Thankappan, Quantum Mechanics, New Age Int. Pub. (1996)
4. B. Craseman and J.D. Powell, Quantum Mechanics, Addison Wesley (1998)
5. L.I. Schiff, Quantum Mechanics, McGraw Hill (1968)
6. P.T. Mathews and S. Venkatesan, Quantum Mechanics, Tata McGraw Hill (2001)

5:2:7(15)

Reference Books:

1. W. Greiner, **Quantum Mechanics, Springer (2002)**
2. J. D.Bjorken and S. D. Drell, **Relativistic Quantum Mechanics, McGraw Hill, New York (1970)**
3. A. Messiah, **Quantum Mechanics, Interscience (1961)**
4. K. Gottfried, **Quantum Mechanics, Benjamin (1986)**
5. S. Gasiorowicz, **Quantum Mechanics, Wiley (1999)**

5:2:7(16)

II Semester M.Sc.(Physics)

Phys/424: Laboratory II

List of experiments for M.Sc. semester II

1. To measure reflectivity curves of glass sheet for parallel, perpendicular and un-polarised light.
2. To verify Fresnel's formula
3. To measure attenuation and bending losses of an optical fiber.
4. To measure lines near 633 nm light of He-Ne laser.
5. To study temporal and spatial coherence of a light source.
6. To study relationship between wavelengths of microwaves in vacuum and microwave cavity using Gunn diode source.
7. To determine Lande g-factor by ESR study.
8. To study attenuation of beta-rays using GM counter.
9. To study analogue to digital and digital to analogue conversion.
10. To verify Bragg's law using x-ray diffraction unit.
11. To study acousto-optic effect .
12. To study OP-amp characteristics.
13. To study OP-amp as adder, differentiator and integrator.
14. γ - spectrometry using solid state detectors.
15. To determine the activity of a γ -emitter (relative method).

Note: Students should perform at least 10 experiments from this list.

5:2:7(17)

II Semester M.Sc.(Physics)

Phys/424: Laboratory II

List of experiments for M.Sc. semester II

1. To measure reflectivity curves of glass sheet for parallel, perpendicular and un-polarised light.
2. To verify Fresnel's formula
3. To measure attenuation and bending losses of an optical fiber.
4. To measure lines near 633 nm light of He-Ne laser.
5. To study temporal and spatial coherence of a light source.
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12. To study OP-amp characteristics.
13. To study OP-amp as adder, differentiator and integrater.
14. γ - spectrometry using solid state detectors.
15. To determine the activity of a γ -emitter (relative method).

Note: Students should perform at least 10 experiments from this list.

Recommended Reading:

1. W. T. Eadie et al.: **Statistical Methods in Experimental Physics** (North-Holland Publishing Company, 1971).
2. M. Nelkon and J. M. Osborn: **Advanced Level Practical Physics** (ELBS, 1983).
3. L. K. Maheswari and M. S. Anand: **Laboratory Manual for Introductory Electronic Experiments** (New Age International Publishers, Wiley Eastern Ltd, 1995).
4. **Nuffield Guide to Apparatus** (Western Printing Services, 1968)
5. B. Saraf et al.: **Physics Through Experiments** (Vikas Publishing House, 1979).
6. **Nuffield Physics through Experiments, Vols. III, V** (Western Printing Services, 1968).
7. L. R. Ingersoll et al.: **A Laboratory Manual of Experiments in Physics** (McGraw Hill Book Company, 1953).
8. J. R. Taylor: **An Introduction to Error Analysis** (Oxford University Press, 1982).
9. M. Sayer and A. Mansingh: **Measurement, Instrumentation and Experimental Design in Physics and Engineering** (Prentice Hall of India, 2000).
10. B. Jyrwa: **Laboratory Manual for M.Sc. (Physics) Vol. I (Electronics)** (Alpha-Plus Publishing House, 2002).
11. A. J. Diefenderfer and B. E. Hölten: **Principles of Electronic Instrumentation** (Saunders College Publication, 1994).
12. J. Christos and C. Halkias, **Electronics**, (Tata McGraw Hill, 1991)

III Semester M.Sc.(Physics)

Phya/531: Nuclear Physics**Unit-1. Conventional units used in nuclear physics**

Properties of nucleons and pions, elements of nucleon and pion structure in terms of quark model. Basic properties of nuclei-charge, mass, binding energy, size, spin and statistics, parity, magnetic dipole moment, electric quadrupole moment with illustration examples.

(6)

Unit-2. Nuclear two body problem and nuclear force

Properties of deuteron, deuteron bound state and low energy n-p scattering in terms of scattering length and effective range, spin dependence, charge independence of nucleon force. Non-central part of nucleon force, isospin concept, exchange forces, magnetic moment and electric quadrupole moment of deuteron. Yukawa theory of nuclear force.

(10)

Unit-3. Nuclear models

Magic numbers and single particle shell model using oscillator well, and l.s. interaction, Schmidt lines, spin parity assignment, rotational model, vibrational model with examples.

(6)

Unit-4. Nuclear reactions

Conservation laws, kinematics governing nuclear reactions, Q-value, cross section of nuclear reactions, neutron reactions at low energies, Coulomb effects in nuclear reactions, neutron reactions, compound nucleus hypothesis, Breit Wigner one level formula for resonance reactions. Elements of direct reactions (qualitative), energetics of fission and fusion, neutron induced fission, chain reaction, hydrogen burning in the sun.

(10)

Unit-5. Nuclear Decay

Fermi theory of decay, selection rules, non-conservation of parity. γ decay, electric and magnetic multipole transitions, selection rules, examples of β and γ decay.

(6)

Unit-6. Interaction of charged particles and γ -radiation with matter

Linear attenuation coeffs, Compton scattering, photo electric absorption, and pair production. Stopping power and range energy relations.

Semiconductor detectors for charged particles, and scintillation detectors.

(7)

Text Books:

1. S.N. Ghosal, Atomic and Nuclear Physics Vol-II, S. Chand and Company Ltd. (1998)
2. S.M. Wong, Introductory Nuclear Physics, Prentice Hall Inc. (1990)
3. B.L. Cohen, Concepts of Nuclear Physics, Tata McGraw Hill Publishing Company Ltd. (1973)
4. R.D. Evans, The Atomic Nucleus, Tata Mc Graw Hill Publishing Company Ltd. (1955)
5. S.S. Kapoor and V.S. Ramamurthy, Nuclear Radiation Detectors, Wiley Eastern Ltd. (2001)
6. B.V.N. Rao, Modern Physics Through Problems, New Age International Press (1998)
7. W.N. Cottingham and D.A. Greenwood, An Introduction to Nuclear Physics, Cambridge University Press (1986)

III Semester M.Sc.(Physics)

Phys/532: Solid State Physics

U-1. Phonons

Quantization of lattice vibrations, dispersion relations for acoustic and optical phonons, energy gaps, density of states, heat capacity, thermal conductivity, and thermal expansion. (9)

U-2. Free electron Fermi gas

Fermi energy, density of states, heat capacity, thermal conductivity, and electrical conductivity. Wiedemann-Franz law. (9)

U-3. Nearly free electron gas

Schrodinger equation of an electron in a periodic potential, Bloch theorem, energy gaps at the zone boundary, approximate solution near a zone boundary, energy bands and their role in properties of metals, insulators, and semiconductors. Holes in energy bands. Hall effect. (9)

U-4. Fermi surfaces of metals

Shape of Fermi surfaces in the free electron and nearly free electron models. Tight binding approximations. Electron orbits, hole orbits, and open orbits. Quantization of orbits in a magnetic field. De Haas-van Alphen effect and its role in experimental determination of Fermi surfaces. (9)

U-5. Plasmons, Polaritons, and Polarons

Dielectric function of the electron gas, plasmons, electrostatic screening. Mott metal-insulator transition, polaritons, polarons. Pears instability of linear metals. (9)

Text Books:

1. Charles Kittel, Introduction to Solid State Physics, John Wiley & Sons, Inc., Singapore (2001)
2. Charles Kittel, Quantum Theory of Solids, John Wiley & Sons, Inc., New York (1987)
3. J. Callaway, Quantum Theory of the Solid State, Academic Press, New York (1991)
4. H. Ibach and H. Luth, Solid State Physics, Narosa Pub. House, New Delhi (2001)

III Semester M.Sc.(Physics)

Phys/533: Atomic and Molecular Physics

- U-1 Introduction to atomic spectrum; fine structure and hyperfine structure of energy levels. Angular momentum and magnetic moment. Doublet structure of energy levels of single electron atom. Term symbols and fine structure of energy levels of two electron atoms using L-S coupling and j-j coupling schemes; identification of ground state. Interaction of nuclear and electronic magnetic moments and hyperfine structure. (14)
- U-2 Interaction of radiation with atoms; spontaneous and stimulated emission; absorption; transition. Einstein's A and B coefficients. Working principle of a He-Ne laser. (10)
- U-3 Theories of molecular bond formation; van der Waals bonding, ionic bonding, valence bond and molecular orbital models of covalent bonding. Homonuclear diatomic molecules and the term symbols for their ground states. (6)
- U-4 Vibronic states of molecules and nature of vibronic spectra; harmonic and anharmonic vibrations and potential constants; rotational spectrum and moment of inertia of molecules. (5)
- U-5 Symmetry of molecules; symmetry elements and points group; proper and improper rotations and their matrix representation. Introduction to character table of point group (no derivation of character table); reducible and irreducible representation for simple molecules such as H_2O , NH_3 , etc. Normal coordinates and normal modes of vibrations. Infrared absorption and Raman scattering from molecular vibrations and rotations, and selection rules. (10)

Text Books

1. H.E. White, **Introduction to Atomic Spectra**, Mc-Graw Hill (1993)
2. Martin Karplus and Richard N. Porter, **Atoms and Molecules**, W.A. Benjamin (1970)
3. G. Herzberg, **Spectra of Diatomic Molecules**, Van Nostrand (1950)
4. O. Svelto, **Principles of Lasers**, 4th Edition, Plenum Press (1998)

Reference Books:

1. G. Herzberg, **Atomic Spectra and Atomic Structure**, Dover Publications (1944)
2. E.B. Wilson, Jr. J.C. Decius and P.C. Cross, **Molecular Vibrations**, Mc-Graw Hill, New York (1955)
3. P.M.A. Scherwood, **Vibrational spectroscopy of solids**, Cambridge University Press, Cambridge (1972)

III Semester M.Sc.(Physics)

Phys/534: Laboratory III

1. To study Barkhausen noise in ferromagnetic material.
2. To study acoustic emission from a solid.
3. To study resistivity of a semiconductor by probe method.
4. To measure gamma-ray spectrum of Cs-137 source and determine the resolution of a gamma-ray spectrometer.
5. To calibrate the scintillation spectrometer and determine the energy of gamma-rays from an unknown source.
6. To study attenuation of gamma-rays from Cs-137 source by using different absorbers.
7. To study decay curve for half life components of irradiated In by a neutron source.
8. To study ultrasound attenuation in water solution.
9. To study phonon dispersion of a monoatomic chain of atoms using electronic analogue of the chain.
10. Fast neutron reaction studies for bulk elemental analysis.
11. γ - spectrum with MCA-statistical studies.

Note: Students should perform a minimum of 7 experiments from this list.

Recommended Reading:

1. W. T. Eadie et al.: **Statistical Methods in Experimental Physics** (North-Holland Publishing Company, 1971).
2. M. Nelkon and J. M. Osborn: **Advanced Level Practical Physics** (ELBS, 1983).
3. L. K. Maheswari and M. S. Anand: **Laboratory Manual for Introductory Electronic Experiments** (New Age International Publishers, Wiley Eastern Ltd, 1995).
4. **Nuffield Guide to Apparatus** (Western Printing Services, 1968)
5. B. Saraf et al.: **Physics Through Experiments** (Vikas Publishing House, 1979).
6. **Nuffield Physics through Experiments, Vols. III, V** (Western Printing Services, 1968).
7. L. R. Ingersoll et al.: **A Laboratory Manual of Experiments in Physics** (McGraw Hill Book Company, 1953).
8. J. R. Taylor: **An Introduction to Error Analysis** (Oxford University Press, 1982).
9. M. Sayer and A. Mansingh: **Measurement, Instrumentation and Experimental Design in Physics and Engineering** (Prentice Hall of India, 2000).
10. B. Jyrwa: **Laboratory Manual for M.Sc. (Physics) Vol. I (Electronics)** (Alpha-Plus Publishing House, 2002).
11. A. J. Diefenderfer and B. E. Holten: **Principles of Electronic Instrumentation** (Saunders College Publication, 1994).
12. J. Christos and C. Halkias, **Electronics**, (Tata McGraw Hill, 1991)

III Semester M.Sc.(Physics)

Phys/535: Environment

1. **Fossil Fuels**
Coal mining, safety and environmental problems associated with coal, oil and natural gas. (2)
2. **Global atmospheric changes**
Electric currents in the atmosphere, thunderstorms, acid deposition and its effects, controlling acid deposition. Cause and effects of global warming. (2)
3. **Water pollution**
List types of water pollution, radioactive substances, thermal pollution. (2)
4. **Noise pollution**
Measuring noise, effects of noise, controlling noise. (2)
5. **Electromagnetism & Human Health**
Cancer incidence and residential exposure, occupational exposure, MW health effects. (3)
6. **Air pollution**
Types, sources and effects of air pollution, controlling air pollutants. (2)
7. **Effects of radiation on living organisms**
Detection and measurement, shielding, maximum permissible levels for safety, precaution against radiation hazards. Elementary idea of dosimetry. (5)
8. **Trace Elements**
Role in living organisms. Detection techniques-nuclear and non-nuclear.
Nuclear techniques: X-Ray fluorescence (XRF), proton induced X-ray emission (PIXE); neutron activation analysis (NAA).
Non-nuclear techniques: Atomic absorption spectroscopy (AAS); inductively coupled plasma, optical emission spectroscopy (ICP). (5)

Text Books:

1. Peter H. Raven & Lind R. Berg, Environment, Saunder College Publishing Co. (1993)
2. Feynman Lectures on Physics Vol 2, Narosa Publishing House 1989
3. T.A. Littlefield & N. Thornley, Atomic and Nuclear Physics, T.A. Littlefield & N. Thornley, Van Nostrand Reinhold Company Ltd. (1979)
4. G. Friedlander et al Nuclear and Radio Chemistry, John Wiley & Sons (1976)
5. Attilio Bisio & Boots, Encyclopedia of Energy and the Environment Vol I, John Wiley and Sons (1997)
6. A.K. De, Environmental Chemistry, New Age International(P) Limited, Publishers (1996)
7. H.A. Strobel, Chemical Instrumentation, Addison Wesley Publishing Company, INC, Phillipines (1973)
8. M. Sankar Das, Trace Analysis and Technological Development, Wiley Eastern Ltd. (1981)

IV Semester M.Sc. (Physics)

Phys/541: Thermal Physics

U-1. Essentials

Probability theory: The random walk problem; Binomial, Poisson, and Gaussian distributions; Central Limit theorem.

Classical equilibrium statistical mechanics: Concept of equilibrium; ergodic hypothesis; Microcanonical, Canonical, and Grand Canonical ensembles. Partition functions and their relation to thermodynamics.

Classical non-equilibrium statistical mechanics: Approach to equilibrium; Liouville's theorem; Boltzmann's H-theorem.

(13)

U-2. Quantum statistics

Quantum statistical mechanics: Schrodinger and Heisenberg pictures, pure and mixed states; the density matrix; quantum mechanical Liouville's theorem; the fundamental postulates.

Quantum Statistics: Quantum gases of independent particles; partition functions; Bose-Einstein and Fermi-Dirac distributions; electrons in metals; black-body radiation; Bose-Einstein condensation.

(11)

U-3. Phase Transitions

Phenomenology: First and second order phase transitions; elementary ideas of critical phenomena; universality of critical exponents; scaling of thermodynamic functions.

Theory: The Landau theory of phase transitions; with examples.

Exact Solutions: Ising model in one dimension.

(11)

5:2:7(30)

U-4. Phase Transitions

Nonequilibrium Phenomena: Transport theory; Boltzmann equation; Maxwell-Boltzmann distribution.

Irreversible Processes: Fluctuations; Brownian motion; Langevin equation; Weiner Khintchine relations; Nyquist theorem; Fluctuation-Dissipation theorem; Fokker-Planck equation.

(10)

Text Books:

1. **Federick Reif, Fundamentals of Statistical and Thermal Physics, McGraw Hill, Singapore (1985)**
2. **Shang-Keng Ma, Statistical Mechanics, World Scientific, Singapore, (1985)**
3. **Richard E. Wilde and Surjit Singh, Statistical Mechanics: Fundamentals and Modern Applications, Wiley-Interscience, John Wiley & Sons Inc., New York, (1985)**
4. **Leo P Kadanoff, Statistical Physics: Statics, Dynamics, and Renormalization, World Scientific, River Edge, New Jersey, (2000)**
5. **K. Huang, Statistical Mechanics, John Wiley & Sons, New York (2000)**
6. **D.J. Amit and J. Verbin, Statistical Physics, World Scientific, Singapore (1999)**

Phys/542: Computational Techniques and Numerical Methods

U-1. FORTRAN LANGUAGE COURSE

INTRODUCTION:- computers, generations, mainframe, PC, software, hardware, peripherals – Files on PC, Languages.

Numerical constants, Variable Names, Types of statements – Integer, Real, Arithmetic Expressions, Mixed mode of operations, Built-in Mathematical Functions, Arithmetic assignment statement, DIMENSION statement – Matrix storage.

Writing format, Field specification, Slash, Records, multiple; IF statement, IF-THEN-ELSE, ELSE-IF-THEN, GO TO statement, CONTINUE statement, DO loop, Nested DO loops, Exit from a DO loop. FUNCTION subprograms, Calling FUNCTION subprograms, Array 1-D & multidimensional and FUNCTION subprograms, Variable Dimension, Arithmetic statement function, Subroutines. (11)

- U-2. Double precision, complex, IMPLICIT statement, ASSIGN statement, Multiple Entries and Returns to a subprogram, Unlabeled COMMON statements, Labeled COMMON statements, EQUIVALENCE statements, BLOCK DATA, Open files, READ from a file, WRITE into a file, File creation programs. (5)

NUMERICAL ANALYSIS

- U-3 INTRODUCTION TO NUMERICAL METHODS: Approximate numbers and significant figures, Absolute, relative and errors, General formula for errors, Application of the error formula to the fundamental operations of arithmetic and to logarithms, The error of a sum. The Error of a difference. The error of a product and number of correct digits, The error of Quotient and number of correct digits, The relative error of a power, The relative error of a root, Successive approximation, Taylor's series, Principle of least square. LAW OF error for residuals.

MATRICES and LINEAR EQUATIONS: Addition, subtraction, and multiplication of matrices, Inversion of matrices, Jacobi transformations of a symmetric motion, Determinant of a matrix, Transpose of a matrix, Solution of equations by matrix methods, Gauss Jordan Elimination Method, Eigenvalues and eigen vectors.

THE SOLUTION OF NUMERICAL, ALGEBRAIC AND TRANSCENDENTAL EQUATIONS:

EQUATIONS IN ONE UNKNOWN: Finding approximate values of the roots, Finding roots by repeated application of location theorem, The Newton-Raphson method its convergence and its geometric significance

(12)

U-4 SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS:

- (a) **EQUATIONS OF THE FIRST ORDER:** Euler's method and its modifications, The Runge-Kutta method, Checks, Errors and Accuracy
- (b) **EQUATIONS OF THE SECOND ORDER AND SYSTEMS OF SIMULTANEOUS EQUATIONS:** Milne's-predictor and corrector methods, Boundary value problems, Conditions for Convergence
- (c) **MINIMIZATION OR MAXIMIZATION OF FUNCTIONS:** Golden section search in 1-D, Parabolic Interpolation and Brent's method in 1-D, 1-D search with 1 derivatives, Downhill simplex method in Multidimensions, Direction set (Powell's methods in Multidimensions)

(10)

U-5 NUMERICAL SOLUTION OF INTEGRAL EQUATIONS:

- (a) Classical formulas for equally spaced abscissas: Simpson's Rule, Trapezoidal Rule, Gaussian quadrature formula.
- (b) Computation of factorials, computation of square roots, recurrence relations.

(7)

Text Books:

1. Seymour Lipschutz and Arthur Poe, Theory and problems of programming with FORTRAN, McGraw Hill (1978)
2. C. Xavier and R. Rajaraman, FORTRAN 77 and numerical methods, New Age International Publishers (2000)
3. V. Rajaraman, FORTRAN 77 Programming, Prentice Hall of India (2001)
4. V. Rajaraman, Numerical Analysis, Wiley Eastern (1990)
5. W.H. Press, S.S. Tenkolsky, W.T. Wattering and B.P. Flannery, Numerical Recipes in FORTRAN, Cambridge University Press (1992).
6. S. Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India (2002)
7. M.K. Jain et al., Numerical Methods for Scientific and Engineering Computation, New Age International Publishers (2002)

IV Semester M.Sc. (Physics)

Phys/543: Computational Techniques - Laboratory

All experiments are to be done using the Fortran Language

1. To read and write the supplied two matrices A & B.

- (a) To find the transpose of A & B
- (b) To find the inverse of A & B
- (c) To verify the accuracy of $AA^{-1} = 1$ or $BB^{-1} = 1$
- (d) To diagonalise two given matrices
- (e) To find the eigenvalues and eigenvectors.

2. Numerical differentiation

- (a) To find the derivative of a given function $f(x)$ using the formula

$$f'(x) = [f(x+h) - f(x)] / h$$

where h is the step size

- (b) To determine the second derivative of a given function $f(x)$ using the formula

$$f''(x) = [f(x+h) + f(x-h) - 2f(x)] / h^2$$

- (c) Plot the case (a) as a function of x .
- (d) Plot the case (b) as a function of x .
- (e) Compare the above cases (a) and (b) with the results obtained analytically in specific cases.

3. Numerical method of solving Schrodinger equation

- (a) Obtain numerical solution for the time independent Schrodinger Equation in one dimension for a given potential using Runge-Kutta Method or Fox Godwin method.
- (b) To plot the wave function obtained from above versus x .
- (c) Obtain numerical solution for the time independent Schrodinger equation in three dimension for a given potential using Runge-Kutta Method or Fox Godwin method.
- (d) To plot the wave function obtained from above versus r .
- (e) To evaluate the eigenvalues and eigenvectors for case (a)
- (f) To evaluate the eigenvalues and eigenvectors for case (b)

- (g) To count the number of nodes of the wave function determined in (a) above and see if it is consistent with the theoretical expectation.
 - (h) To determine the boundary value problems for cases (a) and (c)
4. Spherical harmonics
- (a) To compute the Legendre polynomials
 - (b) To plot the spherical harmonics as a function of polar angles.
 - (c) To compute the spherical Bessel function (regular and irregular).
 - (d) To plot the case (c)
5. Numerical integration
- (a) To integrate a given function numerically by Simpson's rule
 - (b) To compare the results obtained from (a) with those obtained analytically.
 - (c) To integrate a given function numerically by Trapezoidal Rule.
 - (d) To compare the results obtained from (b) with those obtained analytically.
 - (e) To integrate a given function numerically by Gauss-Legendre Integration.
 - (f) To compare the results obtained from (e) with those obtained analytically.
6. Solution of Algebraic Equations.
- (a) Solve a given equation numerically using Newton Raphson method.
 - (b) To solve a given equation using Bisection method.
 - (c) Comparative study of (a) and (b).
7. Solving of simultaneous equations.
- (a) Using Gauss-Elimination method, and Newton Raphson method.
 - (b) Compare (a) with solutions obtained analytically or algebraically.
8. Logistic systems
- To explore the regions of (a) stable fixed points (b) periodic and (c) chaotic solutions.
9. Radioactivity
- (a) Use Monte-Carlo method to simulate radioactive decay.
 - (b) Write a program for a radioactive series, when the daughter is also radioactive and so on.
 - (c) Plot N (numbers of nuclei) vs time t .
 - (d) From the slope calculate the activity at different times.

10. LCR circuits

- (a) To compute the charge and discharge of RC circuit using DC source
- (b) To compute the charge and discharge of RC circuit using AC source.
- (c) Analyse the energy in RL circuit using Runge-Kutta method.
- (d) Study the energy dissipated in a series LCR circuit. Plot it versus time t .

11. Minimization or maximization of functions

- (a) To compute the minimum of a given function using Golden Section Search in 1 dimension.
- (b) To compute the minimum having provided the function and its derivative by isolating the minimum to a fractional precision.

12. Modelling of data

- (a) To compute χ^2 for a given sample of data
- (b) To fit a given sample of data by least square method by a straight line
- (c) To fit by minimizing χ^2 by straight line
- (d) To make a polynomial fit by least square method
- (e) To make a polynomial fit by minimizing χ^2

13. Special functions

- (a) To compute Γ and β functions (integer and fractional orders), factorials and Binomial coefficients
- (b) To compute error function, probability function, cumulative Poisson Function

14. Fourier transform spectral methods

- (a) To compute Fourier transform of discretely sampled data
- (b) To compute fast Fourier transform of real functions and sine and cosine transforms
- (c) To compute Fourier transform of a given function in two or more dimensions

Note: Students should perform a minimum of 10 experiments from this list.

Text Books:

1. R.C. Verma et al., **Computational Physics An Introduction**, New Age International (1999)
2. C. Xavier, **Fortran 77 and Numerical Methods**, New Age International (1996)
3. E.W. Schmid, G. Spitz and W. Losch, **Theoretical Physics on the personal Computer**, Springer-Verlag (1990)
4. W.H. Press, S.S. Teukolsky, W.T. Vetterling and B.P. Flannery, **Numerical Recipes in FORTRAN**, Cambridge Univ. Press (1992)
5. M.K. Jain et al., **"Numerical Methods for Scientific and Engineering Computation,"** New Age Int. Pub. (2002)

IV Semester M.Sc. (Physics)

Phys/544(a) Advanced Solid State Physics

- U-1. **Optical properties and excitons:** Optical reflectance, Kramers-Kronig relations, Excitons in crystals.
Dielectrics and ferroelectrics: Macroscopic electric field and the local electric field at an atom, Dielectric constant and polarizability, Structural phase transitions, ferroelectric crystals, Displacive transitions, Landau theory of phase transitions. (12)
- U-2. **Diamagnetism and paramagnetism:** Langevin diamagnetism, Quantum theory of paramagnetism, Application to rare earth and iron group ions, Paramagnetic susceptibility of conduction electrons.
Ferromagnetism and anti-ferromagnetism: Mean field theory, Heisenberg model, Magnons, Dispersion relation for one dimensional ferromagnetic and anti-ferromagnetic models, heat capacity at low temperatures, ferromagnetic domains. (12)
- U-3. **Magnetic resonance:** Nuclear magnetic resonance, line width, motional narrowing.
Noncrystalline solids: Diffraction pattern, viscosity and hopping rates in glasses, amorphous semiconductors, low energy excitations in amorphous solids, colour centres and dislocation in crystals. (6)
- U-4. **Superconductivity:**
- (a) **Phenomenology and electrodynamics**
 Experimental survey of type-I and type-II superconductors, London penetration depth and coherence length, Cooper pairs, Flux quantization in a superconducting ring, Vortex state, Estimation of two critical fields in type-II superconductors, Josephson effect. (8)
- (b) **BCS theory**
 Electron-phonon-electron interaction, superconducting ground state, Elementary concept of energy gap, critical temperature. (7)

Text Books:

1. Charles Kittel, Introduction to Solid State Physics, John Wiley & Sons Inc., Singapore(1999)
2. Charles Kittel, Quantum Theory of Solids, John Wiley & Sons Inc., New York (1987)
3. J. Callaway, Quantum Theory of the Solid State, Academic Press, New York (1991)
4. H. Ibach and H. Luth, Solid State Physics, Narosa Publishing House, New Delhi (2001)

Reference Books:

1. P. W. Anderson, **Concepts in Solids**, Westview Press (2003)
2. P. M. Chaikin and T. C. Lubensky, **Principles of Condensed Matter Physics**, Cambridge University Press (1995)
3. J. P. Srivastava, **Solid State Physics**, Prentice Hall of India (2002)

IV Semester M.Sc. (Physics)

Phys/544(b): High Energy Physics

U-1. The Dirac equation

The Dirac equation; covariant form of Dirac equation; proof of Covariance; space reflection; bilinear covariants; nonrelativistic reduction and the magnetic of Electron.

(6)

U-2. Hole theory

Negative energy solutions; charge conjugation and positrons; vacuum polarization; time reversal; CPT transformation

(6)

U-3. Propagator theory

The nonrelativistic propagator; definitions and properties of Green's functions; the propagator in positron theory

(8)

U-4. Applications of propagator theory

Coulomb scattering of electrons and positrons; spin averaged cross sections; electron scattering from a Dirac proton; trace theorems

(9)

U-5. Feynman rules and applications

Higher order correction to electron-proton scattering and Feynman rules; bremsstrahlung and infrared catastrophe; Compton scattering and Klein-Nishina formula; crossing symmetry; pair annihilation into gamma rays; electron-electron and electron-positron scattering; the Bhabha cross section; polarization in electron scattering

(16)

Text Books:

1. J.D. Bjorken and S.D. Drell, Relativistic Quantum Mechanics, Mc Graw Hill (1970)
2. D.H. Perkins, Introduction to High Energy Physics, Addison Wesley (2000)
3. M. Leon, Particle Physics An Introduction, Academic Press N.Y.(1973)
4. David Griffith, Introduction to Elementary Particles, John Wiley (2000)
5. J. Emonerson, Symmetry Principle in Particle Physics, Clarendon Press, Oxford (1972)

Reference Books:

1. S. Weinberg, Quantum Theory of Fields, Vol. I, Cambridge University Press (2000)

IV Semester M.Sc.(Physics)

Phys/544(c): Laser Physics

- U-1 Laser idea, characteristic properties of lasers, idea of negative temperature and population inversion, amplification in the medium Line broadening mechanism, homogeneous and in-homogeneous line broadening and inhomogeneously broadened transitions, hole burning optical pumping, pumping efficiency, pumping rate, electrical pumping, electron impact excitation, excitation by near resonant energy transfer. (8)
- U-2 Mode discrimination with Fabry-Perot cavities, the Fox and Li modes, Fresnel-Kirchhoff's integral formula, form for plane parallel resonator, confocal resonators, generalized confocal resonators and regions of high loss, optical pumping, mode selection, importance of unstable resonators. (8)
- U-3 Laser threshold conditions, rate equations for three level lasers and four level lasers, continuous wave laser behavior, pumping power requirements and output power from three level and four level lasers for steady state operation, Ruby laser, Argon ion laser Nd-YAG laser, Semi-conductor lasers. Excimer and dye lasers. (8)
- U-4 Monochromaticity and frequency pulling, transient laser behavior, step pump excitation, single mode oscillation, Q switching, pulse shapes, mode locking of lasers, active and passive mode locking. Monochromaticity, degree of spatial and temporal coherence and their measurements, Relation between temporal coherence and monochromaticity, directionality and brightness of light beams. (11)
- U-5 Second harmonic generation, Stimulated Raman emission, selffocussing, optical communication, information carrying capacity, amplitude modulation, pulse code modulation, modulators and demodulators, optical fibres, homogeneous core optical fibre, graded index optical fibre, laser isotope separation, laser speckling and holography. (10)

Text Books:

1. O. Svelto, Principles of Lasers, Plenum Press, 4th Edition (1998)
2. K. Thyagrajan and A.K. Ghatak: Theory and Applications of Lasers, Macmillan India Ltd.,(1999)

Reference Books:

1. R. Loudon: The Quantum Theory of Light, Clarendon Press (1983)
2. A. Yariv: Quantum Electronics, John Wiley and Sons (1989)
3. W.T. Silfvast: Laser Fundamentals, Cambridge University Press (1996)
4. H.G. Unger: Introduction to Quantum Electronics, Pergamon (1970)
5. A.E. Siegman, Lasers, University Science Books, Mill Valley, CA 1986
6. J.T. Verdeyen, Laser Electronics, Prentice-Hall Englewood Cliffs, NJ, 2nd Edition 1989
7. B.B. Laud, Lasers and nonlinear Optics, Wiley, Newyork 1986
8. Matt Young, Optics and Lasers, Springer-Verlag, Berlin, 4th Edition 1993

IV Semester M.Sc. (Physics)

Phys/544(d): Nuclear Physics

- U-1. Shell model: Angular momentum theory; coupling of 3 & 4 angular momenta (Racah & LS-JJ transformation coefficients).
Deviations from extreme single particle shell model and simple explanations. Nordheim rules for odd Z-odd N nuclei with simple delta function interactions, configuration mixing with example of O^{13} , F^{13} . (8)
- U-2. Collective nuclear motion: Quadrupole vibrations in a spherical nuclei. Vibrational two and three phonon states. Rotations of an axially symmetric deformed rotor (only even-even nuclei) (5)
- U-3. Elementary scattering theory: Collisions with spin: general theory --- spins & channel spin, collision channels with spins, the scattering wave function and the scattering matrix, cross-sections and inverse reactions (3)
- U-4(a) Models of nuclear reactions: The optical model for elastic scattering. Average interaction potential for nucleons; energy dependence of the potential; spin-orbit coupling; average potential for complex projectiles; imaginary potentials and absorption; analysis of scattering experiments. (6)
- (b) Compound nucleus resonances: Basic concepts; resonances with charged particles; angular momentum and spin; limits on the cross-sections; R-matrix theory of nuclear reactions for description of resonances. (4)
- (c) Direct reactions: Kinematics of stripping and pick up reactions. Plane wave and distorted Born Approximation; inelastic scattering; stripping and pick-up reactions. Deuteron stripping and pick-up. (4)
- U-5. Classical and semiclassical descriptions of heavy ion scattering: Deflection function; orbits and cross-sections; rainbows and glories; WKB approximation. Eikonal approximation, diffraction and the effects of strong absorption (3)

U-6. Nuclear techniques:

(a) Formula for cross-section of charged particle induced reactions; experimental determination of charged particle cross-section (3)

(b) Detection of radiation - positron sensitive counter; semiconductor detector (Ge(Li) and HPGe); silicon drift detectors for charged particle identification; δE -E time of flight and δE -E telescope methods; scintillation detector (NaI(Tl)); gamma-gamma coincidence (fast-slow and medium coincidence); Compton suppression (Anti-Compton spectrometer). (6)

(c) Production and detection of neutrons (^3He , BF_3 counters and plastic scintillator); neutron activation technique for trace element analysis (basic idea). (3)

Text Books :

1. S.S. Kapoor and V.S. Ramamurthy, Nuclear Radiation Detectors, Wiley Eastern Limited (1993)
2. S.N. Ghosal, Atomic and Nuclear Physics Vol. II, S. Chand & Co. Ltd. (1994)
3. G.F. Knoll, Radiation Detection and Measurement, John Wiley & Sons (1989)
4. R.M. Singru, Introduction to Experimental Nuclear Physics, Wiley Eastern Ltd. (1980)
5. Structure of the Nucleus, A. Preston & R.K. Bhaduri, Addison-Wesley Publishing Company (1975)
6. G.R. Satchler, Introduction to Nuclear Reactions Macmillan Press Ltd. (2001)
7. S.M. Wong, Introductory Nuclear Physics, Prentice Hall of India Pvt. Ltd. (1993)

Reference Books:

1. A. B. Cohen, Concept of Nuclear Physics, McGraw Hill (1971)
2. R.R. Roy and B.P. Nigam, Nuclear Physics Theory and Experiment, Wiley Eastern Ltd. (1979)

5:2:8(1)

viii) Revision of Curriculum of Mass Communication and video production.

The Head Department of St. Anthony's College placed a propose draft of the syllabus before the member of the BUGS of Mass Communication and Video Production. The said BUGS in its meeting held on 25th October'02 recommended the proposed revision of Curriculum of Mass Communication and Video Production along with the recommended reading list.

The revised Curriculum of Mass Communication and Video Production is at Annexure-'A' and the reading list as Annexure-'B'.

SG

5:2:8(2)

SUMMARY OF THE PROPOSALS FOR REVISION OF THE SYLLABUS OF MASS COMMUNICATION AND VIDEO PRODUCTION

BUGS of Mass Communication and Video Production considered the matter of revision of curriculum in its meeting held on 25th October 2002. The Head, Department of MCVP, St Anthony's College placed the proposed draft of the syllabus before the members of BUGS which was attended by the following members:

- | | |
|---------------------------|-----------------------|
| 1. Prof.(Mrs) Tapati Basu | Member |
| 2. Fr. John D. Jayakumar | Member |
| 3. Prof. Arabind Mazumdar | Member |
| 4. Mrs. M.A.Lyngdoh | Member |
| 5. Prof A.S.Chandel | Chairman of the Board |

The Board in view of the recent developments in the subject considered the need for revision of curriculum in the light of the following documents:

1. Model Curriculum developed by UGC in Mass communication and Production
2. Guidelines for course in Electronic Media in Universities/Institutions and Media center AVRC and EMRC (Feb. 2002) at B.Sc level.
3. Expert comments collected from eminent professionals.

The Board, after considerable deliberation and comparing the above documents with the existing curriculum felt that the Model Syllabus and guidelines cannot be adopted as such which have more orientation towards the print media where as this revision of BA/MCVP syllabus must cover the latest developments in electronic media. Board also noted that the course contents outlined in B.Sc *Electronic Media Syllabus* are already in the present curriculum of BA/MCVP except one paper – *Electronics and Instrumentations*. Summary of the resolutions arrived at the meeting are reproduced as under:

1. Papers Nos. 1,2 and 4 viz., *Introduction to Mass Communication, Visual Thinking and Script Writing* be made three hours papers with 60 marks for theory, 20 marks for practical and 20 for Internals, thereby increasing total marks of 50 to 100.
2. The additional 50 marks could be arrived at by:
 - i) Removing Paper 3, viz., *Mass Media Scene in India* from the Honours curriculum and making it an elective in lieu of ELECTIVE ENGLISH
 - ii) Reducing the marks of Paper 8, viz., *Video: Electronic Field Production* from 250 to 150

The paper setters and examiners were in the opinions that it is not possible to test the proficiency of the students in these concept papers with the present one hr. duration of examination and total marks of 25. In view of this Board Resolved to make these papers of 100 marks each with 3hrs duration of examination.

The new curriculum of *Communicative English* which is being offered to Media Technology students as of now, is proposed to take the place of *General* as well as *Alternate English*. The 8 classes /week that would be available could be used for *Media Appreciation* part of Paper 3, which at present can not be covered due to less number of teaching hours.

5:2:8(3)

3. The course contents of COMMUNICATIVE ENGLISH would be as under:

Unit 1: Grammar, Phraseology, idioms and punctuation for effective spoken and written English Communication.

Unit 2: Excerpts from best of Prose, Poetry, Essay and Drama

Unit 3: Writings: Students exercises in Prose, poetry, Essay and Drama writing and articulation-Language Lab.

**Change in Nomenclature for MASS MEDIA and Video Production
BA(MCVF)**

It was brought to the notice of the Board that BUGS had proposed in its meeting held on June 1, 1998 to change the name of the course. The following nomenclature were suggested

BVP- Bachelor in Video Production

BEC - Bachelor in electronic communication

BEM - Bachelor in electronic Media

BBM- Bachelor in Broadcast media

However, the present Board resolved that the course be renamed as **(BEMC) Bachelor in Electronic Media and Communication**. The proposed revision is given in the enclosed format showing the existing as well as proposed curriculum to be implemented in the forthcoming session of 2003-2004.

5:2:8(4)

Proposal for revision of Curriculum of Mass Communication & Video Production											
Paper No-Name	Existing Marking Total Marks:50				Proposed marking Total marks:100				Existing Curriculum	Proposed Curriculum	Justification
	Theory	Prac.	Inter	Time	Theory	Prac.	Inter	Time			
1. Intro to Mass communication	25	15	10	1H	60	20	20	3H	Unit 1- Mass communication concepts, definitions, elements, processes, models Unit 2- Functions, Impact and Importance of mass communication Unit 3- Communication Skills- Reading writing, speaking, Interpreting Unit 4- Media Studies - Language, Narrative, Media Institution, Audience, representation- Production process	To be added: Unit 1-Evolution of mass Communication Mass Media, Mass communication and means of social communication Unit 4- Convergence media (ICE)- Organization of modern media Issues of communication- Ethics responsibility	Paper setters and examiners had given their comments that it is not possible to test the proficiency of the students with the present One hour examination with the total marks of 25. The questions are almost always objective types and there is very little scope or time for descriptive analysis. These papers cover concepts, principles and theories which need essay type of answers. The 25 marks also mean that the duration of the paper cannot exceed one hour. This is too little a time for answering the essay type of questions dealing with fundamental principles. Therefore, present evaluation needs change a proposed.

5:2:8(5)

2. Visual thinking	25	1 5	1 0	1H	60	2 0	2 0	3H	<p>Unit 1- Seeing- The Visual process – theories of visual communication – Brain sees colour, form, depth and movement - Visual persuasion: Advertising and PR</p> <p>Unit 2- Principles of composition: Balance, dominance, line, perspective, rhythm</p> <p>Unit 3- Story Telling through images – cave paintings- comics and cartoons- posters and hoardings-moving images</p> <p>Unit 4- Image Issues: Pictorial stereotypes- ad images- children & images- women's Images- Imagination and Image</p>	<p>To be added</p> <p>Unit 1- Perspectives for analysing images</p> <p>Unit 2- Application of the perspectives to Typography, Graphic design, cartoons, Photography, Motion picture- TV and Video – computer images- WWW web images</p> <p>Unit-3 Designing Newspaper-Magazine, brochures, Ads, Poster – Design psychology- Tools of Design</p> <p>Unit-4 As unit-3 of present unit</p> <p>Unit-5 As unit 4 of present Unit</p>	<p>This paper is descriptive in its contents so requires in-depth understanding and longer time for exercises as well as for writing comprehensive answers.</p>
3. Media scene in India	25	1 5	1 0	1H	60	2 0	2 0	3H	<p>Unit 1 History and development of various media in India: Print, cinema, radio, TV, Ads,</p> <p>Unit 2- Indian Media policy statements- laws</p> <p>Unit 3- Organisation and management of Indian Media Industry</p> <p>Unit 4- The IT&</p>	<p>To be offered as an Elective in the place of Elective English.</p>	<p>Electronic convergence is fuelling many more changes. Students need more time for analyses and research into the ever-growing and changing media scenario in India. It is proposed that this paper could be removed from the present curriculum and</p>

									Communication revolution in India Unit 5- Media Appreciation- Film, TV, Ads- Print media analysis		Offered as an ELECTIVE with more time and marks.
<p>Paper 3 MEDIA SCENE IN INDIA AND MEDIA APPRECIATION is of very different in nature. The first part of the paper is an historical survey of the various Indian media over the years and the second part is an effort to understand the economic, aesthetic and moral values underlying the various media texts.</p> <p><u>It is proposed that it could be removed from the honours curriculum of Mass media and video production and offered as an elective in lieu of ELECTIVE ENGLISH.</u> It is strongly believed that professional course students do not need Three English papers (GENERAL ENGLISH, ALTERNATE ENGLISH AND ELECTIVE ENGLISH).</p> <p>The MEDIA APPRECIATION section needs viewing of films and videos for 60+ hours. At the moment we are not able to do justice to this. Adding of the analysis of print materials, Ad Images etc task becomes next to impossible with the present timeframe allotted to the paper.</p>											
4. Script writing	25	1 5	1 3	1H	60	2 0	2 0	3H	<p>Unit 1- Introduction- role of the Writer- Law and the writer - Budget and the writer- Elaborative Efforts.</p> <p>Unit 2- Production process – requirements – stages in planning, pre writing and writing</p> <p>Unit 3- Structure of the Script – Style- Genre- Characterization – Dramatic Arc- Action Line – Plot Twist- Climax Transition</p> <p>Unit 4- Different scripts for different media-</p>	<p>No change in contents of paper. The paper is to be changed into a full paper of 100 marks with examination duration of 3 hours.</p> <p>More exercises in TV spot writing is proposed to be introduced.</p>	<p>Good scripting is the basis of good AVV production. The present examination pattern does not allow evaluation of the Four stages of script writing viz, plan, pre-write, write and post write.</p> <p>A three hour paper is essential to do justice to the subject matter that forms the backbone to all the studio and out-door productions in the 2nd and 3rd year.</p>

									Knowledge of media- its grammar and language- scripting the unscriptable – narrative styles, dialogue Unit 5- Credibility – Accuracy- point of view- Ethic- Editing		
<p>It is suggested that papers 1,2 &4 be made full three hour papers with 60 marks for theory and 20+20 marks for the practical and internal.</p> <p>The required marks could be obtained by removing the Paper 3 Media Scene in India from the honours curriculum and reducing the marks of paper 8 EFP theory & Project from 250 to 150. The 50 marks gained from paper 3 and the 100 gained from paper 8 could be added to the 150 which the paper 1,2 &4 have at present, thus they could each have total marks of 100.</p>											
	Total Marks :100										
5. Sound for Media	50	30	20	3H	50	30	20	3H	Unit 1- Sound its characteristics, quality, propagation, possible modifications, Measurement, distortion Unit 2- Mechanisms of Human Hearing – sound Production crew Unit 3- Microphones: characteristics- responses –build types –selection- methods of usage- cables and connectors- Storage devices Unit 4- Magnetic recording	To be added: Unit 1- Acoustics, Reverberation Time Unit 2- Sound perspective ex. Unit 3 Sound Studio – Temporary as well professional studio building- treatment for Music and speech	

									principles – Multi track sound recording procedures – Post production editing- dubbing, laying tracks MIX DOWN – audio sweetening Sound manipulation/devices- Monitoring- Cue sheets - SFX		
6. VDC for communication	50	3 0	2 0	3H	50	3 0	2 0	3H	Unit 1- Video: basic principles – usages, comparisons, competencies Unit 2- Video Camera: history and development – types – designs – imaging devices Unit 3- VTR/VCR History and development Head, Scan, accessories – Video Tape formats – history and development-connections and connectors- Acquisition and transmission process in CCTV and Broadcast-TV- Wrap and Scan formats Broadcast standards Unit 4- Basic shot sizes – lights for video- Editing offline/Online-editing	To be added: Unit 2- New types of cameras Unit 3 New tape formats – Digital- non tape storage- Video streaming	

	Total Marks :250										
8:EFP Production	50	16	4	3H	50	6	4	3H	<p>Unit 1-EFP vs ENG- preliminaries – Idea- Proposal (research RECCE) –synopsis- Treatment- Draft Scripts- Shooting script- Story board – Camera Shot list</p> <p>Unit 2- EFP equipment and personnel: studio and location personnel- Talent- casting- Equipment hiring, buying- Production design- set costume- makeup</p> <p>Unit 3-EFP Production practices – Planning and production meetings</p> <p>Unit 4- Post Production – Editing- Linear and non- linear editing – Procedures and practices – methods of putting together telling visuals, voice, music and sound effects- Graphics planning execution</p> <p>Unit 5- Production book – The PROSPECTUS and the Production book- Forms and contracts,</p>	<p>More Emphasis to be given on Non –Linear editing- terms, concepts of digital video capturing and editing – Logging and organizing the footage, trimming, keying motion effects, compositing, titling, generating EDL – Adding sound - Outputting to different media.</p>	

									permissions and releases —copyright materials- presentation and marketing.		
		Total Marks : 50									
9: Media Entrepreneurship	35		1 5	3H	35		1 5	3H	Unit 1- Entrepreneurships – the concept and principles of – Factors that affect Entrepreneurial Dev.- Entrepreneurship and management- the role of entrepreneurship in society Unit 2- Entrepreneurship in North East- Problems and possibilities – support systems Unit 3- Media Entrepreneurship- Media buying and selling Unit 4- Management of various media in India	To be added: Unit 3 Media marketing strategies in the light of globalization and technology, orientation of the media industries. The importance of Customers relation management and Customer Satisfaction management in media industries. People metering, Audience Mapping- Television Rating Points.	Another paper that cannot depend on text books solely. Needs hands on experience in media selling and buying as well in media events management.

Recommended books for MCVP (Mass Communication & Video production)

Paper I

Communication –general

1. Botef Dawkins, *Communicating*, D.C.Heath, Lexington, 1973
2. Dowden, Hutchinson, Ross, *Instructional media and Technology*, Halstead Press, Stroudsburg, 1976
3. C.R.David(Ed), *Communication in theological Education*, BTESSC, Serampore, 1986
4. *Communication socialis Year books 1*, Satprakashan, Indore 1981-1988
5. Pearsley Hunter & Furlong, *We teach with Technology*, Franklin & Beeble, Wilsonville, 1992
6. Gaston Roberge, *Mediation –the action of media in our society*, Manohar, New Delhi, 1978
7. Thakur, B.S. & Agrawal Binod C., *Media Utilisation for the Dev. of women and children*, Concept, New Delhi 1988
18. Agrawal, Jooni, Sinha, *Communication Research for Development*, Concept, New Delhi, 1986
19. Desmond D'Abro, *Mass Media and You*, BYB, Mumbai, 1994
20. Franz Eilers, *Communication within cultures*, Satprakashan, Indore, 1993
21. Culture & Communication, *An Introduction to Mass media*, YCS/YSM Chennai, 1990
22. K.E.Eapen, *Communication – a Discipline in distress*, Gurukul, Chennai, 1995
23. Myron J.Pereira, *Our Second Skin and other essays on communication and culture*, Satprakashan, Indore, 1994
24. Myron J.Pereira, *Development communication Handbook*, Satprakashan, Indore, 1994
25. Stewart marshal & Noel Williams, *Exercises in teaching communication*, Kogen Page, London, 1986
26. Marlin Tierney *The Media and how to use it*, Varitas, Dublin, 1988
27. Desmond D'Abro, *Group discussion and Team Building*, BYB, Bombay, 1993
28. Kewal Kumar, *Mass communication – A critical Analysis*, Vipul Prakshan, Bombay, 1994
29. Tan Kwang, *How Supervision and managing people*, Sterling, New Delhi, 1994
30. Gerald I. Nierenberg & Henry Calero, *How to read a person like a book*, Gerald & Henry Pub, New York, 1971
31. J. Maurus, *Its human relations that count*, BYB, Allahabad, 1979
32. Julius Fast, *Body language*, Pocket BOOKS, New York, 1971
33. Marshall McLuhan, *Understanding Media*, Mentor, London, 1980
34. Elizabeth Carnegie, *Training methods*, Girl Guides, London, 1972
35. Samuel L. Becker *Discovering Mass Communications*, Scott Foresman, Glenview, 1987
36. Doris A. Graber, *Media Power in Politics*, Macmillan, New Delhi, 1990
37. Philip Lee (ed), *Communication for All*, Satprakashan, Indore, 1990
38. *Mass media and leadership* –LTS –Kolkata, 1997
39. Wimala Dissanayaka, *Asian Approaches to communication* AMIC, Singapore, 1990
40. *Pop Music in Media Development*, WACC, London, 1982
41. *Clothes and Communication in Media Development*, WACC, London, 1984
42. *Information Technology in Media Development*, WACC, London, 1983
43. *The right to communicate in Media Development*, WACC, London, 1988
44. *Communication for peace in Media Development*, WACC, London, 1983
45. *Children and communication in Media Development*, WACC, London, 1994
46. *Silence in Communication in Media Development*, WACC, London, 1982
47. *Gulf War in Media Development*, WACC, London, 1991
48. *Group communication in Media Development*, WACC, London, 1981
49. *Popular communication – Group Media in Media Development*, WACC, London, 1980
50. *New International INFO order in Media Development*, WACC, London, 1980
51. *Women and media in Media Development*, WACC, London, 1984
52. *Introduction to Communication – Part 1* IGNOU, New Delhi
53. *Elements in mass Media* – IGNOU, New Delhi
54. *Global Communication in Media Development*, WACC, London, 1993
55. Mary Helen Richards, *Language Arts through Music*, Richards Instn, Portola, 1971
56. *Communication Issues for 1990s in Media Development*, WACC, Apr 1990
57. Gladys deSouza & Gabriel J. Gonsalves, *Education to reality*, Net work, New Delhi, 1984
58. Ian Stewart, *The business Writing Work book*, Yogen Page, London, 1987
59. Charles R. Wright, *Mass Communication & Sociological perspective*, Random House, New York, 1986
60. Alan Wells, *Mass Media and society*, Mayfield, Palo Alto, 1979
61. Dennis Mcquail, *Communication Models*, Longman, Burnt Mill, 1984
62. Samuel L. Becker, *Discovering Mass Communications*, Scott Foresman, Glenview, 1987
63. Graeme Burton, *More than meets the eye*, Edward Arnold, London, 1990
64. *Mass media and society (1-10)*, Madurai Kamaraj Univ, Madurai
65. *Information & Information Technology (1-8)* Madurai Kamaraj Univ, Madurai
66. *Mass Media (practical 1-3)* Madurai Kamaraj Univ, Madurai
67. *Concepts of Mass communication 1-11)* Madurai Kamaraj Univ, Madurai
68. *Media Across the Century- the Media Education Journal*, AMES, Glasgow, Winter 1993
69. Andrew Hart, *Understanding Media*, Routledge, London, 1991
70. David Lusted, *Media studies Book*, Routledge, London, 1991
71. Samuel L. Becker, *Discovering Mass Communications*, Scott Foresman, Glenview, 1987
72. Fredrick Williams *The New Communication*, Wadsworth, Belmont, 1989

73. John C. Merrill, John Lee, Edward Jay Friedlander, *Modern Mass Media*. Harper & Collins, New York, 1990
74. *Media Culture & Society/Making politics popular*, Sage, London, 1998
75. *Media Culture & Society/Media Industries as economic institutions*, Sage, London, 1998
76. *Media Culture & Society 20/4/1998*, Sage, London, 1998
77. Siddon Suzi, *Presentation Skills*, Universities Press, Hyderabad, 2000
78. Hardingham Alison, *Working in teams*, Universities Press, Hyderabad, 2000
79. Ian Mackay, *Listening Skills*, Universities Press, Hyderabad, 2000
80. Eric Parsloe & Caroline Allen, *Learning for learning*, Universities Press, Hyderabad, 2000
81. Hackett Penny, *The Selection Interview*, Universities Press, Hyderabad, 2000
82. Villanilam J.V, *More Effective communication*, Response Books, New Delhi, 2000.
83. Edward S. Harman, Robert Mochesney, *The Global media*, Madhyam books, New Delhi, 1998
84. Robert McChesney (ed), et al., *Capitalism and the Information Age*, Corener stone, Kharagpur, 2001
85. Pavate K.D., *Information Highways*, CSIR, New Delhi, 199.
86. *The Hindu speaks on Information Technology*, Kasturi, Chennai, 1993
87. *MEP-Managerial Communication - IIM*, Ahmedabad, 1991
88. *Building Effective Partnership*, APPLE 1992
89. Neepa Mehta, *Communication - Plugging the Basics*, Ext. Communication, Vadodra, 1997
90. *Perspectives in Development Communication*- Caritas, New Delhi, 1997
91. Wright Chrissie, *Handbook of Practical Communication Skills*, Jico, 2001
92. Mohan Krishna, Banerjo Meera, *Developing Communication Skills*, MacMillan, 1999
93. Wimmer Roger D., & Dominick Joseph R., *Mass Media Research: An Introduction*, Wadsworth, Belmont, 2000
94. Blaji Shirley, *Media/Impact- An Introduction to Mass Media*, Wadsworth, Belmont, 2001
95. Gaston Roberge, *Introduction to Mass Communication*, Xavier's, Kolkata, 2001
96. Arthur Asa Berger, *Essentials of Mass Communication Theory*, Sage, New Delhi, 1995
97. *Mass Communication: A to Z - A dictionary of terms*, sage, New Delhi, 1999
98. John Townsend, *The Business Presenter's Pocket Book*, Research Press, New Delhi, 1995
99. John Townsend, *The Instructor's Pocket Book*, Research Press, New Delhi, 1995

Paper II

Visual Thinking

1. *The Lighter side of Campus Life* (cartoons), Campus Life Books, Wheaton, 1986
2. Patrick White, *A Tale of Two Mothers in law* (cartoon story), Heinemann, London, 1983
3. Rex Davis (ed), *Be Thou my Vision*, Risk Books, Geneva, 1976
4. Brian & Patricia Eales, *Pin & Thread*, Search Press, London, 1973
5. RichHall & Friends, *Sniglets*, Ebury Press, London, 1987
6. Janet Rogers, *Crazy Graffiti*, Beaver Press, London, 1982
7. Jeavan Darshan A/V Service, *Chalk Talk*, Gujarat Sahitya Prakash, Anand, 1986
8. Alexyz, *Spittoons*, IBH, Bombay, 1982
9. Barbara Dorf, *Beginner's guide to Painting in Dits Sphere*, London, 1973
10. M.Miri, Sen, Rao, *Art and its appreciation*, NEHU, Shillong, 1983
11. Abu Abraham (ed), *Indian Cartoons* Penguin, New Delhi, 1988
12. Kiku Adatto, *Picture Perfect-Basic Books*, New York, 1993
13. F.V.Sathyamoorthy, *How to Draw Cartoons*, Pustak Mahal, New Delhi, 1996
14. William Meyers, *The Image Makers*, Macmillan, London, 1981
15. K.S.Singh(ed), *Visual Anthropology and India*, ASI, Calcutta, 1992
16. *Tante Idee per... LDC*, Turin, 1985
17. *2001 idee per... LDC*, Turin, 1988
18. William M. Lessel, *Creating Graphics that Communicate*, Moody Press, Chicago, 1987
19. *May I help You*, Graphics, DBVC, Chennai, 1980
20. Tapan Bhattacharjya, *The Illusive World of Virtual Reality*, NBT, New Delhi, 1997
21. Design Digest Dec 1995, Spectrum, New Delhi
22. Design Digest Aug 1996, Spectrum, New Delhi
23. Design Digest Jan 1996, Spectrum, New Delhi
24. Design Digest Feb 1996, Spectrum, New Delhi
25. Design Digest Apr 1996, Spectrum, New Delhi
26. Design Digest May 1996, Spectrum, New Delhi
27. Design Digest, Jun 1996, Spectrum, New Delhi
28. Design Digest, Nov 1995, Spectrum, New Delhi
29. Design Digest, Mar 1997, Spectrum, New Delhi
30. Design Digest, Jul 1997, Spectrum, New Delhi
31. Akira Yoshizawa, *Origami Vol 1-2*, Froebel-kan, Tokyo, 1969
32. Times, *30 Years in Pictures 1960-1990*, Custom, New York, 1990
33. *Don Bosco - Magazine Design*
34. Design Digest Aug 1997, Spectrum, New Delhi
35. *Discover India 1/96, 9/95, 11/95*
36. Timothy, R. Botts, *Door posts*, Tyndale Publ, wheaton, 1987
37. Australian Design, *Corporate and Office Design*, ACP, Sydney, 1990
38. David M. Considine & Gail E. Hsley, *Visual messages* Teacher Ideas Press, Englewood, 1992
39. *Time Collection of Photographs: Best of 1996*, Time-Life, New York, 1996
40. Design Digest Sep 1997, Oct 1997, Jan 1998, Feb 1998, Spectrum, New Delhi

41. *Evergreen fun time folding time*, Evergreen, New Delhi, 1999
42. *The Creative Black Book*, Black Book, New York, 1993
43. John Berger, *Ways of Seeing*, BBC, London, 1980
44. Donald D. Hoffman, *Visual Intelligence*, Norton, New York, 1998
45. *Immersion*, Dept of Visual Communication, Chennai, 1997
46. *Images and disappearance of the Word in Media Development*, WACC, London, 1991
47. Mark Linley, *How to draw anything*, Clarion, Tadworth, 1999
48. Mark Linley, *How to Cartoon or Caricature any one*, Clarion, Tadworth, 1999
49. *India today Book of Cartoon*, Books Today, New Delhi, 2001
50. Paul Martin Lester, *Visual communication*, Wadsworth, Belmont, 2000
51. *Impact of Images in Media & Values*, Centre for Media & Values, South Shenandoah, 1992
52. MEGHALYA- *Land and the People- Illustrated brochure*, DIPR, Shillong, 1992
53. MEGHALYA- *Flora & Fauna, Illustrated brochure*, DIPR, Shillong, 1992
54. MEGHALYA *Places of Interest, Illustrated brochure*, DIPR, Shillong, 1992
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Revised Under-Graduate Syllabus in Anthropology.

The Chairman,BUGS in Anthropolpology , vide letter No. Anth.2/UL-CPU/2003-559,dt. 9/6/03, placed at Annexure -'A' has submitted The Minutes and the Syllabus in Anthropology duly approvedn by the Board of Under-Graduate Studies meeting held on 23/5/03, placed as Annexure -'B' & 'C' respectively.

The matter is placed before the Council for consideration.

5:2:9(2)

ANNEXURE - 'A'

North-Eastern Hill University
OFFICE OF THE HEAD DEPARTMENT OF ANTHROPOLOGY
MAYURBHANJN COMPLEX, SHILLONG 793014
Tel.255171(R) 2231653(O) 98630-60674(Mobile) 2550076(fax)
E.Mail-tbsbba@sancharnet.in;tbs34@hotmail.com

No.Anth.2/42-CPU/2003-559

Dr TB Subba
Professor of Anthropology & Head

Date as signed

The Deputy Registrar(Conference)
NEHU, Shillong.

Sub: Undergraduate Syllabus in Anthropology.

Dear Sir,

I am sending herewith a hard copy of the undergraduate syllabus in Anthropology along with a floppy for your kind and necessary action towards placing the same in the forthcoming Academic Council meeting.

Thanking you

Sincerely,
Sd/
(9/6/03)

Encl: as above.

Minutes of the Board of Under-Graduate Studies in Anthropology meeting held in the Department of Anthropology on 23.5.2003 at 11 am.

Member present :

1. T.B.Subba	in the chair
2. Jan Brouwer	member
3. Henry Lamin	member
4. Lucy Zehol	member
5. R. Khongsdier	invitee
6. D.K.Limbu	invitee
7. V.Pakyntein	invitee
8. B.Langstien	invitee
9. JW Dkhar	invitee
10.Nandita Mukharjee	invitee
11.Chandana Bhattacharjee	member
12.Sharmila Das Talukdar	member

1. The chairman called the meeting to order and informed the members and invitees present that the only agenda of the meeting was to finalize the undergraduate syllabus in Anthropology. He also stated that this was necessary before taking up the revision of the postgraduate syllabus on 29.5.2003 to maintain continuity as well as avoid duplication between the undergraduate and postgraduate syllabi.
2. The Board discussed the structure of the syllabus till the lunch time and discussed the contents after lunch time.
3. The members unanimously agreed on the structure as well as contents of the undergraduate syllabus in Anthropology and decided to recommend the same for consideration of the Academic Council.
4. The Chairman of the BUGS in Anthropology was authorized to look into minor details of the syllabus, should such a necessity arise.

The meeting ended with a vote of thanks to the chair.

Sd/-

(2/6/03)

T.B.Subba

Chairman,BUGS(Anthropology)

REVISED UNDERGRADUATE SYLLABUS IN ANTHROPOLOGY (2003)

YEAR	PAPER	TITLE OF THE PAPER	MARKS
I	I (Pass)	Social and Cultural Anthropology	100
	IV (Hons)	Tools & Techniques in Anthropology	100
II	II (Pass)	Physical Anthropology	100
	V (Hons)	Tribes in India	100
	VI (Hons)	Human Genetics	100
III	III (Pass)	Prehistoric Anthropology	100
	VII (Hons)	Indian Anthropology	100
	VIII (Hons)	Practical in Physical Anthropology/ Project Work in Social and Cultural Anthropology	100

Preface

The Anthropology undergraduate syllabus was last revised in 1998. Between 1998 and 2003 the only change that was brought about, on the request of the Controller of Examinations, was in the 3rd Paper (Pass) for the 3rd Year students. The Examination Department had to face difficulty due to two papers with the same title "Man and Environment", one specifically meant for Anthropology students and the other a compulsory paper for undergraduate students of all streams. Hence the Board of Undergraduate Studies in Anthropology replaced the former with a paper titled "Prehistoric Archaeology", which has now, in the proposed revision, been titled as "Prehistoric Anthropology".

The BUGS in Anthropology has once again recommended this syllabus for consideration of the Academic Council after revising the same thoroughly. The proposed syllabus has not only been updated content wise but also reading list wise. Of the several changes in this the following are significant. One, the paper titled "Tools & Techniques in Anthropology" has been shifted from the 2nd to the 1st year in view of the fact that this paper is relatively easier to understand than the paper "Tribes in India" which has been brought to the 2nd year. Two, "Anthropological Theories" has been replaced with a paper titled "Indian Anthropology" in view of the relative importance of the latter for various competitive examinations. And, finally, the students have now a choice in VIIIth Paper (Hons). Earlier, "Practical in Physical Anthropology" was compulsory for Honours students, who can now opt for "Project work in Social and Cultural Anthropology". This is also expected to facilitate opening of Anthropology in colleges without necessarily having to establish laboratory for Practical in Physical Anthropology.

Year 1, Paper I (Pass)
Social and Cultural Anthropology

1. Development and scope of social and cultural anthropology: its relationship with other sub-disciplines of anthropology and with other social sciences and humanities.
2. Basic concepts in social anthropology: society, community, group, social structure, and social function.
3. Basic concepts in cultural anthropology: material & non-material culture, culture traits and elements, assimilation, and acculturation.
4. Family & marriage: definitions, forms, types, and functions.
5. Kinship: descent, clan, phratry, moiety, and kinship terminologies.
6. Basic ideas of evolutionary and diffusion theories.

Suggested reading:

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- Ember, C. R. and M. Ember. 1981. *Cultural Anthropology*. New Jersey: Prentice-Hall.
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Year I, Paper IV (Hons)
Tools & Techniques in Anthropology

1. Basics of anthropological research: data collection, review of literature, statement of problem, formulation of hypothesis, and research design.
2. Fieldwork: acquaintance and rapport building, importance of learning native language, key informants, field diary, reporting, and ethics of fieldwork.
3. Sampling: sampling procedures and sampling design.
4. Techniques of data collection: interview, observation, case study, and genealogy.
5. Basic statistics: mean, mode, median, standard deviation, standard error.
6. Processing, analysis and presentation of data: classification, tabulation, diagrams, pie chart, and histogram.

Suggested reading:

- Bernard, H.R. 1988. *Research Method in Cultural Anthropology*. Florida: Univ. Press.
- Epstein, A.L. 1978. *Crafts in Social Anthropology*. New Delhi: Hindustan Publishing Corporation.
- Flower, J.F. 1993. *Survey Research Methods*. New Delhi: Sage.
- Madrigal, L. 1996. *Statistics for Anthropology*. Cambridge: Univ. Press.
- Puto, P.J. 1970. *Anthropological Research: The Structure of Enquiry*. London: Harper & Collins.
- Sarana, Gopala. 1975. *The Methodology of Anthropology*. New York: The University of Arizona Press.
- Tennekes, J. 1971. *Anthropology: Relations and Method*. Assen: Van Goroum.
- Wilkinson, T.S. 1982. *Methodology and Techniques of Social Sciences*. Bombay: Himalaya.

Year 2, Paper V (Hons)
Tribes in India

1. Concepts of tribe: typologies and locations of tribes in India.
2. Colonial and post-colonial policies towards the tribes: constitutional safeguards for the Scheduled Tribes in Vth and VIth Schedule areas.
3. Economic aspects of the tribes: hunting & gathering, shifting cultivation, pastoralism, and settled agriculture.
4. Strategies for tribal development: ITDP, SMPT, TDB, TSP.
5. Problems of tribes: land alienation, displacement and rehabilitation, health and communication.
6. Tribal movements: Nerbada Bachao Andolan, Jharkhand, Bodoland, and Naga movement.

Suggested reading:

- Ao, S. 1967. Report of the Study Team on Tribal Development Programme. New Delhi: Govt. of India.
- Chaudhuri, B. 1990. Tribal Transformation in India. New Delhi: Inter-India.
- Danda, A. K. 1990. Tribal Economy in India. New Delhi: Inter-India.
- Dhebar, U.N. 1961. Report of the Scheduled Tribe Commission. New Delhi: Govt. of India.
- Elwin, V. 1960. Report of the Committee on Special and Multipurpose Tribal Blocks. New Delhi: Govt. of India.
- Mishra, S.N. 1998. Ownership and Control of Resources among Indian tribes. New Delhi: Inter-India.
- Nair, M.K.S. 1986. Tribal Economy in Transition. New Delhi: Inter-India.
- RoyBurman, B.K. 1994. Tribes in Perspective. New Delhi: Mittal Publications.
- Singh, K.S. ed. 1969. Tribal Situation in India. Shimla: Indian Institute of Advanced Study.
- Singh, K.S. ed. 1998. Tribal Movements in India. New Delhi: Inter-India.
- Subba, T. B. and G.C. Ghosh. 2003. The Anthropology of Northeast India. New Delhi: Orient Longman.

Year 2, Paper II (Pass)
Physical Anthropology

1. Aim and scope of Physical Anthropology, its relationship with other branches of anthropology.
2. Theories of organic evolution: Lamarckism, Darwinism and Neo-Darwinism.
3. Man's place in the animal kingdom: Order Primates and their chief characteristics, the great apes and man.
4. Fossil evidence on the emergence of man: Australopithecus, Pithecanthropus and Homo-Neanderthalensis.
5. Concept of race: UNESCO statement on race, racial criteria and major races of the world.
6. Morphological variation in human population.

Suggested reading:

- Ashley-Montague, M.F. 1961. *An Introduction to Physical Anthropology*. Illinois: Charles C. Thomas
- Basu, A. et al. 1973. *Physical Anthropology and its Extending Horizons*. New Delhi: Orient Longman.
- Buttner, J.J. 1966. *Origins of Man*. New York: John Wiley and Sons.
- Clark, W.E. LeGros. 1964. *The Fossil Evidence for Human Evolution*. Chicago: University Press.
- Das, B.M. 1997. *Outlines of Physical Anthropology*. Allahabad: Kitab Mahal.
- Hammond, P.B. 1976. *Physical Anthropology and Archaeology*. New York: Macmillan.
- Hooton, F.A. 1965. *Up from the Ape*. New York: Macmillan
- Laskar, G.W. 1976. *Physical Anthropology*. New York: Holt, Rinehart and Wilson.
- Rami Reddy, V. 1992. *Physical Anthropology, Evolution and Genetics in Man*. Tirupati: V. Indira.
- Subba, T. B. and G.C. Ghosh. 2003. *The Anthropology of Northeast India*. New Delhi: Orient Longman.
- Volpe, Peter E. 1989. *Understanding Evolution*. New Delhi: Universal Book Stall.

Year 2, Paper VI (Hons)
Human Genetics

1. Definition, aim and scope of human genetics and its significance in anthropology.
2. Cell division, Mendel's Law of Inheritance.
3. Patterns of inheritance for recessive and dominant traits.
4. Multiple allelism: inheritance of ABO blood types, MN grouping and Rh types.
5. Population genetics: Hardy-Weinberg Law –its assumptions, deviations: mutation, selection and genetic drift, their role in regulating the genetic composition of population.
6. Concept of polymorphism: types of polymorphism, differences between transient and balanced polymorphism.

Suggested reading:

- Buttner, J.J. 1966. *Origins of Man*. New York: John Wiley and Sons.
- Das, B.M. 1997. *Outlines of Physical Anthropology*. Allahabad: Kitab Mahal.
- Hartl, D.L. 1983. *Human Genetics*. New York: Harper Row.
- Jha, A.P. 1993. *Genes and Evolution*. Delhi: Macmillan
- Kroon, A.M. 1983. *Genes Structure and Expression*. Chichester: John Wiley.
- Lewin, B. 2000. *Genes VII*. New York: Oxford University Press.
- Marrel, D.J. 1975. *An Introduction to Genetics*. New York: W.W. Norton.
- Mekusick, V.A. 1978. *Human Genetics*. New Jersey: Prentice Hall.
- Motulsky, V. 1986. *Human Genetics*. Berlin, Heidelberg: Springer-Verlag
- Rothwell, N.V. 1978. *Human Genetics*. New Delhi: Prentice Hall of India
- Stern, C. 1973. *Principle of Human Genetics*. San Francisco: Freeman.
- Subba, T. B. and G.C. Ghosh. 2003. *The Anthropology of Northeast India*. New Delhi: Orient Longman.

Year 3, Paper III (Pass)
Prehistoric Anthropology

1. **Introduction: Meaning, scope and aims, Prehistory, Protohistory and Prehistory; Relationship with other branches of Anthropology and other sciences; Utilities of studying Prehistory.**
2. **Methods of study: Geological time scale, Glaciation; Pluviation; Stratigraphy, C 14; Flourine test; Dendrochronology; Pollen Analysis; Varve clay analysis; Potassium Argon Method.**
3. **Stone Age Tools: Techniques of manufacture; Types of tools; Probable functions.**
4. **Palaeolithic cultures and Industries: Abbevillian; Acheulian; Clactonian; Levalloisian; Mousterian; Aurignacian; Solutrean; Magdalian; Kitchen Midden; Palaeolithic art.**
5. **Mesolithic cultures and Industries: Azilian; Tardenoisian; Maglemosian; Asturian; Campignian.**
6. **Neolithic culture: chief features; Neolithic Revolution and Impact.**

Suggested reading:

- Bhattacharya, D.K. 1990. *Prehistoric Archaeology*. Delhi: Hindustan Publishing Corporation
- Childe, V.C. 1936. *Man Makes Himself*. New York: Weidenfeld and Nicholson.
- Childe, V.C. 1964. *What happened in History*. Harmondsworth: Penguin Books.
- Oakley, K.P. 1950. *Man the Tool-Maker*. London: British Museum.
- Ramireddy, V. 1987. *Elements of Prehistory*. Delhi: Mittal Publications.
- Sankalia, H.D. 1964. *Stone Age Tools: Their Techniques, Names and Probable Functions*. Poona: Deccan College.
- Sankalia, H.D. 1965. *Introduction to Archaeology*. Poona: Deccan College.
- Subba, T. B. and G.C. Ghosh. 2003. *The Anthropology of Northeast India*. New Delhi: Orient Longman.

Year 3, Paper VII (Hons)
Indian Anthropology

1. Racial, religious, and linguistic elements in Indian population.
2. Caste: definition, characteristics, dominant caste.
3. Indian village: jajmani system, universalisation-parochialisation, great-little tradition.
4. Social change in India: indigenous process, sanskritization, exogenous process, westernization, industrialization and urbanization, globalization.
5. Pioneers in Indian Anthropology I: Hutton, Furer-Haimendorf, Elwin.
6. Pioneers in Indian Anthropology II: S.S.Sarkar, I.Karve, L.P.Viyarhi, H.D.Sankalia.

Suggested reading:

Annual Review of Anthropology, Vol. 17.

Bansal, I.J.S. 1984. Anthropology in Indian Context. New Delhi: Today & Tomorrow.

Beteille, A. 1969. Caste, Class and Power. New Delhi: OUP.

Bose, N.K. 1975. The Structure of Hindu Society. New Delhi: Sangam Books.

Danda, A. K. 1996. Foundations of Anthropology in India. New Delhi: Inter-India.

Dube, S.C. 1962. India's Changing Villages. Bombay: Allied.

Dube, S.C. 1974. Contemporary India and its Modernization. New Delhi: Vikas.

Kuppuswamy, B. 1987. Social Change in India. New Delhi: Vikas.

Mandelbaum, D.G. 1972. Society in India. 2 vols. Bombay: Popular.

Srinivas, M.N. 1972. Social Change in Modern India. New Delhi: Orient Longman.

Subba, T. B. and G. C. Ghosh. 2003. The Anthropology of Northeast India. New Delhi: Orient Longman.

Year 3, Paper VIII (Hons)
Practical in Physical Anthropology

1. Human osteology: identification, description and drawing of major human bones: skull, pelvis, long bones.
2. Somatometric measurements: Height vertex, sitting height vertex, height acromion, height tragus, height sternale, height iliospinale, height fibiale, height spherion, height dactylion, minimum frontal diameter, facial height, superior facial height, mouth breadth, horizontal circumference of head, head breadth, head length, bizygomatic breadth, bigonial breadth, nasal length, nasal breadth, biacromial diameter, chest breadth, chest circumference and body weight.
3. Somatoscopic observation: hair (texture, colour and form), Skin (colour), nose (form), eye (form and colour), chin (form) and face (form).
4. Craniometric linear measurements: max. cranial length, max. cranial breadth, greatest breadth, nasion-inion length, biauricular length, min. frontal breadth, bizygomatic breadth, nasal length, nasal breadth, frontal chord, occipital chord, frontal arc, parietal arc and occipital arc.
5. Angular measurements: facial profile angle, nasal profile angle, metopic angle, frontal angle of schwalbe, bregma angle of schwalbe.
6. Human Genetics: (a) Blood groups: ABO, Rh.
(b) Dermatoglyphics (finger ball patterns)

Suggested reading:

- Das, B.M. and R. Deka. 1993. Physical Anthropology Practical. Allahabad: Kitab Mahal.
- Poddar, S. and A. Bhagat. 1987. Handbook of Osteology. Patna: Scientific Book Co.
- Sarkar, S.S. 1957. A laboratory manual of Somatology. Calcutta: Scientific Book Agency.
- Singh, T.P. and M.K. Bhasin. 1968. Anthropometry. New Delhi: Bharati Bhawan.

Year 3, Paper VIII (Hons)

Project Work in Social and Cultural Anthropology

I. Research project on the tribes of Northeast India: Total Marks = 50

1. Each student is required to prepare a report based on secondary data on a topic allotted by her/his supervisor.
2. The report should contain at least 30 typed pages or 6000 words. All reports are to be submitted to the department one month before the commencement of the final university examination, which will be examined by two subject experts (external and internal), appointed by the university for this purpose.

II. Prehistoric Anthropology: Total Marks = 50

1. Typology and Techniques in prehistoric tools.
2. Measurement, drawing and description of chopper and chopping tools, hand axe, cleaver, scraper, double sided, end, round, nose, points. Bone tools: harpoons, points, needle, baton-de-commandment.
3. Measurement, drawing and description of the Mesolithic blades, scrapers, fluted cores. Neolithic celts; axe, adze and chisel.

Suggested reading:

- Bernard, H.R. 1988. Research Method in Cultural Anthropology. Florida: Univ. Press.
- Bhattacharya, D.K. 1990. Prehistoric Archaeology. Delhi: Hindustan Publishing Corporation
- Burkitt, M.C. 1933. Old Stone Age. Cambridge: Univ. Press.
- Oakley, K.P. 1950. Man the Tool-Maker. London: British Museum.
- Rami Reddy, V. 1987. Elements of Prehistory. Delhi: Mittal Publications.
- Sankalia, H.D. 1964. Stone Age Tools: Their Techniques, Names and Probable Functions. Poona: Deccan College.
- Wilkinson, T.S. 1982. Methodology and Techniques of Social Sciences. Bombay: Himalaya.

5:2:10(1)

x) Revised syllabus for B Sc (Physics) Pass and Hons.

The Board of Under-Graduate Studies in Physics had its meeting held on 9th May '03 recommended and approved the syllabus for B Sc(Physics) Pass and Hons. Courses which is placed as Annexure-'A'.

The matter is placed before the Council for consideration.

SG

NORTH-EASTERN HILL UNIVERSITY
PHYSICS DEPARTMENT
Shillong - 793 022

B.Sc. (Physics) Pass and Honours Syllabus

1. B.Sc. Pass

1st Year

Phys 111	Paper I	(PH)	Theory	46 marks
Phys 112	Paper II	(P)	Theory	46 marks
Phys 113	Paper III	(PH)	Practical	40 marks

2nd Year

Phys 211	Paper IV	(P)	Theory	48 marks
Phys 212	Paper V	(P)	Theory	48 marks
Phys 213	Paper VI	(P)	Practical	40 marks

3rd Year

Phys 311	Paper VII	(P)	Theory	46 marks
Phys 312	Paper VIII	(P)	Theory	46 marks
Phys 313	Paper IX	(P)	Practical	40 marks

P - Pass, PH - Common for both Pass and Honours

2. B.Sc. Honours**1st Year**

Phys 111	Paper I	(PH)	Theory	46 marks
Phys 122	Paper II	(H)	Theory	70 marks
Phys 113	Paper III	(PH)	Practical	40 marks
Phys 124	Paper IV	(H)	Theory	70 marks

2nd Year

Phys 221	Paper V	(H)	Theory	70 marks
Phys 222	Paper VI	(H)	Theory	70 marks
Phys 223	Paper VII	(H)	Theory	70 marks
Phys 224	Paper VIII	(H)	Practical	74 marks

3rd Year

Phys 321	Paper IX	(H)	Theory	70 marks
Phys 322	Paper X	(H)	Theory	70 marks

Elective Phys. 323 (a) to Phys 323 (e)

Phys 323 (a)	Paper XI	(H)		
	Computer Applications -		Theory	45 marks
	Computer Applications -		Practical	25 marks
Phys 323 (b)	Paper XI	(H)		
	Advanced Electronics		Theory	70 marks
Phys 323 (c)	Paper XI	(H)		
	Advanced Solid State Physics		Theory	70 marks
Phys 323 (d)	Paper XI	(H)		
	Astrophysics		Theory	70 marks
Phys 323 (e)	Paper XI	(H)		
	Environmental Physics		Theory	70 marks
Phys 324	Paper XII	(H)	Practical	80 marks

P – Pass, H – Honours, PH – Common for both Pass and Honours

B.Sc. (Physics) Pass & Hons.

Full marks 46

PHYS 111 Paper I (PH)

Mechanics of particles, Rigid bodies, Continuous media and Oscillations (90 lectures)

Unit I (13 lectures)

Laws of motion, components of velocity and acceleration in different coordinate systems. Uniformly rotating frame, centripetal acceleration, coriolis force and applications, conservation of energy and momentum, applications to rotating frames.

Unit II (15 lectures)

Motion under a central force: conservation of angular momentum, Kepler's laws, gravitational field and potential due to spherical body, Gauss and Poisson equations, gravitational self-energy.

System of particles: Centre of mass, angular momentum, equations of motion, conservation theorems for energy momentum and angular momentum, elastic and inelastic collisions.

Unit III (15 lectures)

Rigid body motion: Degrees of freedom, angular velocity, angular momentum, moments of inertia and products of inertia, theorems of parallel and perpendicular axes, moments of inertia of shell, sphere, disc, cylinder, Euler's equations.

Elasticity: Elastic constants for an isotropic solid, their inter-relation, torsion of a cylinder, bending of beams, cantilever and beam supported at both ends.

Unit IV (15 lectures)

Kinematics of moving fluids: Equation of continuity, Euler's equation, Bernoulli's theorem, viscous fluid, streamline and turbulent flow, flow through a capillary tube, Poiseuille's law, Reynold's number, Stoke's law and terminal velocity.

Surface tension and surface energy, molecular interpretation of surface tension, pressure on a curved liquid surface, wetting.

Unit V (16 lectures)

Differential equation of a SHM and its solution: Bar pendulum, Kater's pendulum, time period.

Free oscillations of simple system: equilibrium, concept of potential well, small oscillation approximation solutions, linear and transverse oscillations of two masses connected by a spring.

Damped and forced oscillations: critical damping, Q of an oscillator, forced oscillator with one degrees of freedom, transient and steady state oscillations, resonant energy absorption, low and high frequency responses.

Unit VI (16 lectures)

Free oscillations of system with two degrees of freedom, two-dimensional oscillator, normal modes, longitudinal and transverse oscillation of coupled masses, energy transfer between normal modes, coupled pendulum, theories of plucked string and struck string, energy of vibrating strings.

Fourier analysis: Fourier series and Fourier coefficients, simple examples, use of exponential expression for Fourier coefficients, non-periodic disturbance, representation of Fourier integral, Fourier transform. Case of wave train of finite length.

Books recommended:

1. E.M. Purcell, Berkeley Physics Course, Vol. 1, McGraw Hill International, 1965.
2. F.H. Newman and V.H.L. Searle, Properties of matter, Radha Publication, Delhi 5th Edn., 1985.
3. R. Sengupta and H. Chatterjee, Treatise in general properties of matter, New Central Book Agency, 2nd Edn., 1991.
4. D.S. Mathur Elements of Properties of Matter, S. Chand & Co., 1987.
5. H.J. Pain, The Physics of Vibrations and waves, 4th Edition, John Wiley & Sons, 1998.

B.Sc. (Physics) Pass
 Full Marks 46
 PHYS 112 Paper II (P)

Electricity and Magnetism (90 lectures)

Unit I (15 lectures)

Scalars and vectors, dot product, cross-product, scalar triple product, vector triple product, gradient of a scalar field, divergence and curl of a vector field, line, surface and volume integrals, flux of a vector field, Gauss' divergence theorem, Green's theorem and Stokes theorem.

Functions of two and three variables, partial derivatives. Total differential of a function of two and three variables.

Coulomb's law expressed in vector form, calculation of E for simple distribution of charge at rest (line, surface and volume), dipole and quadrupole fields.

Unit II (15 lectures)

Work done on a charge in an electrostatic field expressed as a line integral, conservative nature of the electrostatic field. Electric potential due to an arbitrary charge distribution application to: line charge, disc, shell and sphere. Torque on a dipole in a uniform field. Potential energy of a system of charges, energy density of an electrostatic field, potential energy of a charged sphere.

Flux of the electric field, Gauss' law and its application for finding E for symmetric charge distributions, Gaussian pill box, field at the surface of a conductor.

Unit III (15 lectures)

Electric field around conductors: Induced charges, field and potential inside a conductor, field near the surface of an earthed plane sheet of conductor by the method of images.

Electric field inside matter: Polarization and polarization vector, potential and field due to a polarized matter, applied to a sphere. Gauss' law in dielectric and the displacement field, electric susceptibility and dielectric constant, boundary conditions satisfied by E and D at the interface between two homogeneous dielectrics, capacitor filled with dielectrics. Polar and non-polar molecules.

Unit IV (15 lectures)

Steady current, current density J, non-steady currents and continuity equation, Kirchoff's law and analysis of multi-loop circuits, rise and decay of current in LR and CR circuits, decay constants, transients in LCR circuit, integrating and differentiating circuits.

Alternating currents: Skin effect for resistance at high frequencies, complex impedance, reactance, impedances of LCR series and parallel circuits, resonance, Q-factor, power dissipation and power factor. AC- bridges, Anderson's and Owens bridges.

Unit V (14 lectures)

Generators and rectifiers: Three-phase electric power supply, delta and star connections, rectifiers, voltage regulation, method for high DC voltage generation.

Force on a moving charge, Lorentz force equation and definition of B, force on a straight conductor carrying current in a uniform magnetic field, torque on a current loop, magnetic dipole moment angular momentum and gyromagnetic ratio.

Unit VI (16 lectures)

Biot and Savart law, calculation of B in simple geometrical situations, Ampere's law. Field due to magnetic dipole, magnetization current, magnetization vector, magnetic permeability (linear cases).

Electromagnetic induction, Faraday's law, electromotive force, integral and differential forms of Faraday's law, mutual and self-inductance, transformers, energy in a static magnetic field. Maxwell's displacement current, Maxwell's equations, electromagnetic field energy density.

Books recommended:

1. D.J. Griffith, Introduction to Electrodynamics, Prentice Hall of India Prentice Hall of India 3rd Edn., 1998.
2. J.R. Reitz, F.J. Milford and R.W. Christy, Foundations of Electromagnetic theory, Narosa Publishing House, 3rd Edition, 1993.
3. E.M. Purcell, Berkeley Physics Course: Electricity and magnetism, McGraw Hill, 1965.
4. R.K. Wangsness, Electromagnetic fields, 2nd Edn., John-Wiley & Sons, 1986.
5. K.K. Tiwari, Electricity & Magnetism with Electronics, S. Chand & Co, 3rd Edn., 2001.

B.Sc. (Physics) Pass & Hons.
Full Marks 40
PHYS 113 Paper III (PH)

Practical

1. To determine the value of g by Bar/Kater pendulum.
2. To determine the moment of inertia of an unknown body by torsion pendulum.
3. To determine the rigidity modulus of a cylindrical body.
4. To determine Y of a wire by Searle method.
5. To determine the coefficient of viscosity of a liquid by Capillary method.
6. To determine the surface tension of water by Jeager method.
7. To determine the angle of dip at a place by dip circle.
8. To determine H and M of a bar magnet by deflection and vibration magnetometers.
9. To determine the resistance of a lamp in candescent and at room temperature.
10. Verification of Kirchhoff's voltage and current laws.
11. To determine the resistance per unit length by Carey-Foster method.
12. To determine the reduction factor of a tangent galvanometer and hence the value of H .
13. Verification of inverse square law in magnetism.

Books recommended:

1. S.K. Ghosh, A Text Book of Practical Physics, New Central book, 1997.
2. H. Singh, B.Sc. Practical Physics, S. Chand, 1992.
3. K.G. Mazumdar, A Text Book of Practical Physics, Modern Book Agency, 1978.

B.Sc. (Physics) Pass
Full Marks 48
PHYS 211 Paper IV (P)

Kinetic theory, Thermal Physics and Statistical Physics (90 lectures)

Unit I (15 lectures)

Definition of $\beta(m,n)$, and $\Gamma(n)$ and their relation, recursion and duplication formula of $\Gamma(n)$, evaluation of $\Gamma(1/2)$, evaluation of some integrals using β & Γ functions.

Review of kinetic theory of gases, interpretation of temperature, equipartition of energy, specific heat of gases.

Unit II (15 lectures)

Real gas: Van der Waal's model, equation of state, nature of Van der Waal forces, critical constants.

Transport phenomena: Molecular collision, mean freepath and collision cross-section, estimate of molecular diameter and mean freepath, transport of momentum (viscosity), energy (thermal conductivity) and matter (diffusion), Brownian motion.

Unit III (15 lectures)

Laws of Thermodynamics: The zeroth law, indicator diagrams, work done, the first law, internal energy, reversible and irreversible changes, Carnot cycle, Carnot's theorem, second law of thermodynamics, entropy as thermodynamic variable, principle of increase of entropy, entropy of perfect gas, entropy and unavailable energy, thermodynamic scale of temperature, identity with perfect gas scale, impossibility of attaining absolute zero, third law of thermodynamics.

Unit IV (15 lectures)

Thermodynamic relations: Thermodynamic variables, extensive and intensive, Maxwell's relations and applications, TdS equations, heat capacity equations, internal energy equations.

Joule-Thomson cooling, thermodynamic potentials, Clausius-Clapeyron equation, equilibrium of thermodynamical variables.

Unit V (15 lectures)

Liquefaction of gases, Boyle temperature and inversion temperature, principle of regenerative cooling and cascade cooling, liquefaction of gases like He and hydrogen, refrigeration cycles.

Black body radiation, pure temperature dependence, Stefan-Boltzmann law, pressure of radiation, spectral distribution of black body radiation, Wein displacement law, Rayleigh-Jeans law, Planck's quantum postulates, Planck's law.

Unit VI (15 lectures)

Phase space representation, the μ -space, its division into sheets of energy phase cells of arbitrary size, distribution function, ensembles- microcanonical, canonical and grand canonical, microstates and macrostates, principle of a priori probability distribution, its narrowing with increasing 'n', average properties, fluctuation, accessible and inaccessible states, distribution of particles with a given total energy into a discrete set of energy states.

Books recommended:

1. M.W. Zemansky & R.H. Dittman, Heat and Thermodynamics, McGraw Hill Singapore 7th Edition, 1997.
2. F. Reif, Fundamentals of Statistical and Thermal Physics, McGraw Hill Singapore, 1985.
3. B.B. Laud, Fundamentals of Statistical Mechanics, New Age International Publishers, 1994.
4. B.K. Agarwal and M. Eisner, Statistical Mechanics, New Age International Publishers, 2nd Edition, 1998.

B.Sc. (Physics) Pass
Full Marks 48
PHYS 212 Paper V (P)

Waves and Acoustics, Optics (90 lectures)

Unit I (15 lectures)

General solutions of second order differential equations. Solutions of partial differential equations by the method of separation of variables.

Waves in one dimensional chain of particles, classical wave equations, wave velocity, boundary conditions and normal modes, dispersion relations.

Waves in continuous media: Speed of transverse waves on a uniform string, speed of longitudinal waves in a fluid, energy density and energy transmission in waves, dispersion in waves, group velocity and phase velocity.

Unit II (14 lectures)

Superposition of waves: Linear homogeneous equations and the superposition principle, interference in space and energy distribution, beats and combination tones.

Ultrasonics: Production, detection and applications of ultrasonic waves.

Noise and music: Limit of human audibility, intensity and loudness, bel and decibel, musical scale, temperament and music instruments.

Acoustics: The acoustics of halls, reverberation period, Sabine's formula, live and dead room.

Unit III (15 lectures)

Fermat's principle, principle of extremum path, aplanatic points of a sphere and other applications.

General theory of image formation, cardinal points of an optical system, general relationships, thick lens, combination of thin lenses and eyepieces.

Aberration in images: Chromatic aberration, achromatic combination of lenses in contact and separated lenses. Monochromatic aberrations and their reductions, aspherical mirrors, aplanatic points, oil immersion objectives, meniscus lens.

Unit IV (15 lectures)

Interference of light: Principle of superposition, two-slit interference, coherence requirement for the sources, optical path retardations, lateral shift of fringes, fringes of equal thickness and equal inclination (Haidinger fringes): Theory of Newton's rings and experimental determination of wavelength of monochromatic light. Michelson interferometer its applications for the determination of wavelength, wavelength difference, standardization of the metre. Intensity distribution in multiple beam interference, Fabry-Perot interferometer construction and production of fringes.

Unit V (15 lectures)

Diffraction of light: Fresnel diffraction, Fresnel half period zones, zone plates, straight edge, rectilinear propagation. Fraunhofer diffraction: Diffraction from a single slit, double slit, N slits, theory of plane diffraction grating. Resolution of images, Rayleigh criterion, resolving power of prism and gratings.

Unit VI (16 lectures)

Polarization: Different methods of polarization, Brewster's law, double refraction in uniaxial crystals, its electromagnetic theory, phase retardation plates. Rotation of plane of polarization and optical activity.

Dispersion and scattering: Theory of dispersion of light, absorption bands and anomalous dispersion. Theory of Rayleigh scattering.

Laser: Purity of spectral line, spontaneous and induced emissions, condition for laser action, basic properties of laser, existence of metastable state, population inversion by pumping and cavity, energy level schemes for ruby.

Books recommended:

1. H.J. Pain, The Physics of Vibrations and Waves, John Wiley & Sons, 3rd Edn., 1998.
2. Chakrabarti and Chowdhury, A Text Book on Waves and Acoustics, Central 2nd Edition, 1982.
3. D.P. Raychaudhuri, Advanced Acoustics, The New Book Stall, 2nd Edition, 1987.
4. A.K. Ghatak, Physical Optics, Tata McGraw Hill of India, 2nd Edition, 1997.
5. D.P. Khandelwal, Optics and Atomic Physics, Himalaya, 1988.
- 6 D.W. Tenquist, R.M. Whittle, J. Yarwood, University Optics, Vol. I &II, Gondon and Breach Pub., 1970.

B.Sc. (Physics) Pass
Full Marks 40
PHYS 213 Paper VI (P)

Practical

1. To determine the coefficient of linear expansion of a rod.
2. To determine the specific heat of liquid by the method of cooling.
3. To determine the coefficient of apparent expansion of a liquid using specific gravity bottle and hence of a glass.
4. To determine the thermal conductivity of a conductor by Searle method.
5. To determine the value of J by an electrical method.
6. To determine the refractive index of a prism by spectrometer using monochromatic light.
7. To determine the refractive index of a liquid/solid by traveling microscope.
8. To determine the magnifying power of a telescope.
9. To determine the radius of curvature of a lens by Newton's ring method.
10. To determine the number of lines per unit length of a grating using spectrometer.
11. To determine the power of two thin lenses in contact by displacement method.
12. To determine the pressure coefficient by constant volume thermometer.
13. To determine the speed of waves on a stretched string.
14. To determine the frequency of an ac main by Melde's experiment.

Books recommended:

1. S.K. Ghosh, A Text Book of Practical Physics, New Central book, 1997.
2. H. Singh, B.Sc. Practical Physics, S. Chand, 1992.
3. K.G. Mazumdar, A Text Book of practical Physics, Modern Book Agency, 1978.

B.Sc. (Physics) Pass
 Full Marks 46
 PHYS 311 Paper VII (P)

Solid State Physics & Electronics (90 lectures)

Unit I (16 lectures)

Periodicity of crystals, lattice translation vectors, primitive axes, lattice constant, unit cell, primitive cell, typical crystal structures, coordination number, packing fraction, Miller indices.

Bragg's law diffraction of X-rays by crystal lattice, Laue's formulation of X-rays diffraction, reciprocal lattice, Brillouin zones, Laue spots, Bragg's law from Laue formulation, neutron and electron diffraction methods.

Types of binding in solids: Covalent binding, ionic binding, metallic binding, Van der Waal's binding.

Unit II (14 lectures)

Lattice vibrations: Elastic and atomic force constants, dynamics of a chain of atoms, chain of two types of atoms, optical and acoustic modes, interaction of light with ionic crystals, Einstein and Debye's theories of specific heat of solids.

Conduction electrons in metals: Concept of free electron, Drude's theory, DC conductivity, quantum mechanical treatment of free electrons in metals, concept of Fermi level.

Unit III (15 lectures)

Band theory: Nearly free electron theory, forbidden gap, concepts of energy bands, differences between conductors, semiconductors and insulators. Qualitative discussion of intrinsic and extrinsic semiconductors.

Magnetism: Diamagnetism (Langevin theory), paramagnetism (Langevin's theory) Curie-law, Weiss theory of ferromagnetism-Curie-Weiss law.

Superconductivity: Zero resistivity, critical temperature, critical magnetic field. Meissner effect, type I and type II superconductors.

Unit IV (15 lectures)

Semiconductor diodes: p-n junction, I-V characteristics, Shockley model, application in rectifiers, clippers, and limiters, zener diode and applications, opto-electronic diodes, LED, photodiodes, optocouplers.

Bipolar junction transistor (BJT), p-n-p and n-p-n structures, active and saturation regions, characteristics of BJT, common emitter configuration, input and output characteristics. Two-port analysis of a transistor, definition of h-parameters, loadline concept.

Unit V (14 lectures)

Field effect transistor (FET): Classification of various types of FETs, constructional detail of junction field effect transistor, drain characteristics of JFET, biasing of JFET, operating region, pinch-off voltage.

Small signal amplifiers: General principle of operation, classification, distortion, RC coupled amplifier, gain frequency response, band width input and output impedance, transformer coupled amplifiers, noise in electronic circuits, decibel power.

Unit VI (16 lectures)

Operational amplifiers: Principle of operational amplifiers, differential gain, CMRR, applications of operational amplifiers: adder, integrator, differentiator.

Oscillators and wave-form generators: Positive feedback, Barkhausen criterion, phase shift oscillator, Hartley oscillator.

Digital circuits: Binary system, Boolean algebra, OR, AND, NOR, NAND gates.

Books recommended:

1. C. Kittel, Introduction to Solid State Physics, John Wiley & Sons, 7th Edn., 1999.
2. A.J. Dekker, Solid State Physics, McMillan, 1969.
3. M.A. Wahab, Solid State Physics, Narosa, 1999.
4. J.D. Ryder, Electronics fundamentals and applications, Prentice Hall of India, 5th Edn., 1999.
5. Gupta & Kumar, Hand book of Electronics, Pragati Prakashan, 27th Edn., 2000.
6. B.L. Theraja, Basic Electronics, S Chand & Co., 5th Edn., 1998.
7. M.K. Bagde and S.P. Singh, Elements of Electronics, S. Chand, 2000.

B.Sc. (Physics) Pass
 Full Marks 46
 PHYS. 312 Paper VIII (P)

Relativity, Quantum Mechanics, Atomic, Molecular and Nuclear Physics (90 lectures)

Unit I (20 lectures)

Reference frames, inertial frame, Galilean transformations and conservation laws, Michelson-Morley experiment, postulates of special theory of relativity, Lorentz transformations, length contraction, synchronization and time dilation, velocity addition theorem, variation of mass with velocity, simultaneity, mass-energy equivalence.

Origin of quantum mechanics, failure of classical physics to explain the phenomenon of black body radiation, photoelectric effect and quantum effect. Ritz combination principle, Planck's radiation law, wave particle duality, de-Broglie's concept of matter waves and de-Broglie relation, simple deduction of de-Broglie's wavelength, properties of matter waves, verification by G.P. Thomson's experiment, wave velocity, group velocity.

Unit II (12 lectures)

Heisenberg's uncertainty principle and its explanation, determination of the position of a particle by a microscope, diffraction by a single slit, explanation of non-existence of electrons in the nucleus using uncertainty principle, binding energy of an electron in atom, radius of Bohr's first orbit, concept of electron microscope.

Schrodinger time-dependent and time-independent wave equation (one-dimension), physical interpretation of wave function, particle in a box.

Unit III (14 lectures)

Atoms, ions, ionisation current, excitation and ionization potential, measurement of ionization current, mobility of ions, determination of e/m of the electron by Thomson's method, determination of electronic charge by Millikan's oil-drop method, determination of mass of the electron, Avogadro's number, mass of the hydrogen atom. Principle of cathode ray oscilloscope.

Positive rays, properties, positive ray analysis – Thomson's parabola method, isotopes, isobars, Aston's mass spectrograph, Bainbridge mass spectrograph.

Bohr's theory of H-like atoms, Pauli's principle, quantum number for atomic orbitals and degeneracy.

Unit IV (12 lectures)

X-rays, absorption of X-rays, X-ray spectra, continuous spectrum and its explanation (Duane-Hunt Law), characteristic X-ray law and its importance, Compton's scattering, deduction of change in wavelength, experimental verification.

Photoelectric effect, Einstein's photoelectric equations and explanation of photoelectric effect, determination of h by Millikan's method. Photoelectric cells and their uses, photo multiplier tube.

Unit V (18 lectures)

Natural radioactivity: Law of disintegration, decay constant, half-life, mean life (deduction), basic ideas of α , β and γ decays – energetics with examples. Passage of gamma rays through matter. Uses of radioactivity.

Particle accelerators: Electrostatic accelerators, linear accelerators, cyclotron.

Particle detectors: Ionisation chamber and cloud chamber, GM counter.

Artificial transmutation: Artificial transmutation, scheme of nuclear reactions, nuclear reaction energy, discovery of neutron, properties of neutron, determination of mass of neutron, classification of neutrons according to their kinetic energy.

Unit VI (14 lectures)

Nuclear fission: Discovery, energy released in fission, secondary neutrons and their importance, multiplication factor, chain reaction, concept of critical size, nuclear reactor, types of reactors.

Nuclear fusion: Origin of stellar energy, calculation of fusion energy, nuclear structure, nuclear constituents, nuclear composition, basic ideas of nuclear models, calculation of binding energy.

Cosmic rays and elementary particles: General characteristics, latitude effect, east-west effect, altitude effect, origin of cosmic rays, primary and secondary cosmic rays, cosmic ray shower, classification of elementary particles and their properties, fundamental interactions, concept of anti-particles, universal conservation laws – statements, quarks.

Books recommended:

1. A.K. Ghatak and S. Lokanathan, Quantum Mechanics, McMillan, 1992.
2. S.L. Gupta and S. Gupta, Concepts of Modern Physics, Dhanpati Rai & Co., 1998.
3. R. Murugesan, Modern Physics, S. Chand & Co., 2000.
4. B.L. Theraja, Basic Electronics, S Chand & Co., 5th Edn., 1998.
5. M.K. Bagde and S.P. Singh, Elements of Electronics, S. Chand, 2000.

B.Sc. (Physics) Pass
Full Marks 40
PHYS 313 Paper IX (P)

Practical

1. To determine the value of Planck's constant by photo cell.
2. To determine the ratio e/m of an electron.
3. To determine the energy gap of a semiconductor diode.
4. To study the characteristics of a semiconductor diode.
5. To study the characteristics of a zener diode.
6. To study the output characteristics of a transistor in CB configuration.
7. To study the output characteristics of a transistor in CE configuration.
8. To measure the unknown capacitance by De Sauty method.
9. To determine the figure of merit of a mirror galvanometer.
10. To study the charging and discharging of a capacitor.
11. To study the frequency response of series LCR circuit.
12. To study the frequency response of parallel resonant LCR circuit.
13. To study the OR and AND gates logic circuits.

Books recommended:

1. S.K. Ghosh, A Text Book of Practical Physics, New Central book, 1997.
2. H. Singh, B.Sc. Practical Physics, S. Chand, 1992.
3. K.G. Mazumdar, A Text Book of practical Physics, Modern Book Agency, 1978.

B.Sc. (Physics) Hons.
Full Marks 70
PHYS 122 Paper II (H)

Electricity and Magnetism (90 lectures)

Unit I (11 (7 + 4) lectures)

Scalars and vectors, dot product, cross-product, scalar triple product, vector triple product, gradient of a scalar field, divergence and curl of a vector field, line, surface and volume integrals, flux of a vector field, Gauss' divergence theorem, Green's theorem and Stokes theorem.

Functions of two and three variables, partial derivatives, total differential of a function of two and three variables, definition of double and triple integrals.

Unit II (11 (4 + 7) lectures)

Coulomb's law expressed in vector form, calculation of E for simple distribution of charge at rest (line, surface and volume), dipole and quadrupole fields.

Work done on a charge in an electrostatic field expressed as a line integral, conservative nature of the electrostatic field. Electric potential due an arbitrary charge distribution application to: line charge, disc, shell and sphere. Torque on a dipole in a uniform field. Potential energy of a system of charges, energy density of an electrostatic field line charge, sheet charge, spherical shell and solid sphere.

Unit III (11 (4 + 3 + 4) lectures)

Flux of the electric field, Gauss' law and its application for finding E for symmetric charge distributions, Gaussian pill box, field at the surface of a conductor.

Differential form of Gauss's law, Poisson's and Laplace's equation boundary conditions and uniqueness theorem.

Electric field around conductors: Induced charges, field and potential inside a conductor, field near the surface of a conductor by the method of images.

Unit IV (12 lectures)

Electric field inside matter: Polarization and polarization vector, potential and field due to polarized matter, applied to a sphere. Gauss' law in dielectric and the displacement field. electric susceptibility and dielectric constant, boundary conditions satisfied by E and D at the interface between two homogeneous dielectrics, dielectric sphere in a uniform field, capacitor filled with dielectrics. Polar and non-polar molecules induced dipoles – Clausius Mossoti relation, frequency dependent, atomic polarisability.

Unit V (10 lectures)

Steady current, current density J, non-steady currents and continuity equation, Kirchoff's law and analysis of multiloop circuits, rise and decay of current in LR and CR circuits, decay constants, transients in LCR circuit, integrating and differentiating circuits.

Unit VI (13 (7 + 6) lectures)

Alternating currents: Skin effect for resistance at high frequencies, complex impedance, reactance, impedances of LCR series and parallel circuits, resonance, Q-factor, power dissipation and power factor. AC- bridges, Anderson's and Owens bridges.

Generators and rectifiers: Three-phase electric power supply, delta and star connections, rectifiers, voltage regulation, method for high DC voltage generation.

Unit VII (12 (6 + 6) lectures)

Force on a moving charge, Lorentz force equation and definition of B, force on a straight conductor carrying current in a uniform magnetic field, torque on a current loop, magnetic dipole moment angular momentum and gyromagnetic ratio.

Biot and Savart law, calculation of B in simple geometrical situations, Ampere's law. Field due to magnetic dipole, magnetization current, magnetization vector, magnetic permeability (linear cases).

Unit VIII (10 lectures)

Electromagnetic induction, Faraday's law, electromotive force, integral and differential forms of Faraday's law, mutual and self-inductance, transformers, energy in a static magnetic field. Maxwell's displacement current, Maxwell's equations, electromagnetic field energy density:

Books recommended:

1. D.J. Griffith, Introduction to Electrodynamics, Prentice Hall of India, 3rd edition, 1998.
2. J.R. Reitz, F.J. Milford and R.W. Christy, Foundations of Electromagnetic theory, Narosa Publishing House, 3rd edition, 1993.
3. E.M. Purcell, Berkeley Physics Course, Electricity and magnetism, McGraw Hill, 1965.
4. R.K. Wangsness, Electromagnetic fields, 2nd Edn., John-Wiley & Sons, 1986.
5. K.K. Tiwari, Electricity and Magnetism with electronics, S. Chand & Co, 3rd Edn., 2001.

B.Sc. (Physics) Hons.

Full Marks 70

PHYS 124 Paper IV (H)

Waves and Acoustics, Optics (90 lectures)

Unit I (10 (4 + 6) lectures)

General solutions of second order differential equations. Solutions of partial differential equations by the method of separation of variables.

Waves in one dimensional chain of particles, classical wave equations, wave velocity, boundary conditions and normal modes, dispersion relations, dispersive waves, acoustic and optical modes.

Unit II (10 (6 + 4) lectures)

Waves in continuous media: Speed of transverse waves on a uniform string, speed of longitudinal waves in a fluid, energy density and energy transmission in waves, dispersion in waves, group velocity and phase velocity and their measurement.

Superposition of waves: Linear homogeneous equations and the superposition principle, interference in space and energy distribution, beats and combination tones.

Unit III (11 (3 + 4 + 4) lectures)

Ultrasonics: Production, detection and applications of ultrasonic waves.

Noise and music: Limit of human audibility, intensity and loudness, bel and decibel, musical scale, temperament and music instruments.

Applied acoustics: The acoustics of halls, reverberation period, Sabine's formula, live and dead room.

Unit IV (12 (3 + 9) lectures)

Fermat's principle, principle of extremum path, aplanatic points of a sphere and other applications.

General theory of image formation, cardinal points of an optical system, general relationships, thick lens, combination of thin lenses, telephoto lenses and eyepieces, ideas of matrix optics, lens formula by matrix method.

Unit V (11 (7 + 4) lectures)

Aberration in images: Chromatic aberration, achromatic combination of lenses in contact and separated lenses. Monochromatic aberrations and their reductions, aspherical mirrors, aplanatic points, oil immersion objectives, meniscus lens.

Optical instruments: Entrance and exit pupils, need for multiple lens eyepieces, common type of eyepieces.

Unit VI (12 lectures)

Interference of light: Principle of superposition, two-slit interference, coherence requirement for the sources, optical path retardations, lateral shift of fringes, fringes of equal thickness and equal inclination (Haidinger fringes), theory of Newton's rings and experimental determination of wavelength of monochromatic light. Michelson interferometer its applications for the determination of wavelength, wavelength difference, standardization of the metre. Intensity distribution in multiple beam interference, Fabry-Perot interferometer construction and production of fringes, Tolansky fringes.

Unit VII (12 (7 + 5) lectures)

Diffraction of light: Fresnel diffraction, Fresnel half period zones, zone plates, straight edge, rectilinear propagation. Fraunhofer diffraction: Diffraction from a single slit, double slit, N slits, theory of plane diffraction grating. Concave grating, diffraction at a circular aperture and circular disc. Resolution of images, Rayleigh criterion, resolving power of Fabry-Perot interferometer, microscope, prism and gratings.

Polarization: Different methods of polarization, Brewster's law, double refraction in uniaxial crystals, its electromagnetic theory, phase retardation plates. Rotation of plane of polarization, origin of optical rotation in liquid and crystals.

Unit VIII (12 (5 + 7) lectures)

Dispersion and scattering: Theory of dispersion of light, absorption bands and anomalous dispersion. Theory of Rayleigh scattering.

Laser: purity of spectral line, coherent length and coherent time, spatial coherence of a source, coherence of induced emissions, condition for laser action, existence of metastable state, population inversion by pumping and cavity, energy level schemes for ruby, He-Ne and semiconductor lasers.

Books recommended:

1. H.J. Pain, The Physics of Vibrations and waves, John Wiley & Sons, 3rd Edition., 1998.
2. Chakrabarti and Chowdhury, A Text Book on Waves and Acoustics, Central 2nd Edition, 1982.
3. D.P. Raychaudhuri, Advanced Acoustics, The New Book Stall, 2nd Edition, 1987.
4. A.K. Ghatak, Physical Optics, Tata McGraw Hill of India, 2nd Edition, 1997.
5. D.P. Khandelwal, Optics and Atomic Physics, Himalaya, 1988.
- 6 D.W. Tenquist, R.M. Whittle, J. Yarwood, University Optics, Vol. I & II, Gondon and Breach Pub., 1970.

B.Sc. (Physics) Hons.
Full Marks 70
PHYS 221 Paper V (H)

Electromagnetic Theory, Relativity & Classical Mechanics (90 lectures)

Unit I (12 (5 + 7) lectures)

Tensors: Transformation of coordinates, covariant and contravariant tensors, first rank tensors (vectors), higher rank tensors, symmetric and anti-symmetric tensors, polarizability tensor, angular momentum tensor, metric tensor, epsilon tensor, Christoffel symbols.

Motion of charged particles in E and B fields: Circular motion, cycloidal motion, case of cathode ray oscillograph – determination of e/m , e for electron. Positive ray analysis by mass spectrograph, Thomson parabola method, Aston and Bainbridge mass spectrographs, velocity selector, magnetic focusing, cyclotron and betatron.

Unit II (11 (3 + 8) lectures)

Maxwell's equations: Maxwell's equations for time dependent electromagnetic field in vacuum, and in material media, boundary conditions.

Electromagnetic potentials: Magnetic vector potential A and scalar potential ϕ , Poisson's equation for A in terms of current density, solution for line and surface currents, calculation of vector potential for an infinitely long solenoid, a distant circuit, Coulomb and Lorentz gauge transformations, Lorentz law in terms of potentials.

Unit III (10 lectures)

Electromagnetic waves: The wave equation, plane-wave solution for Maxwell's equations, orthogonality of E, B and propagation vector. Poynting (theorem) vector, energy and momentum propagation, reflection and transmission at dielectric boundaries, normal incidence, oblique incidence, polarization by reflection, Brewster's angle.

Unit IV (10 (5 + 5) lectures)

Electromagnetic waves in conductors: Modified field equation, attenuation of the wave, skin-depth, reflection and transmission through a conducting surface.

Radiation from accelerated charges: Concept of retarded potentials, radiation from an oscillating dipole.

Unit V (12 lectures)

The Lorentz transformations: Galilean transformations, Newtonian relativity, instances of their failure, electromagnetism, aberration of light, Michelson-Morley experiment, Einstein basic postulates and geometric derivation of Lorentz transformation, invariance of Maxwell's equations, length contraction, simultaneity, synchronization and time dilation, Einstein's velocity addition rule, Doppler effect in light.

Unit VI (14 (4 + 4 + 6) lectures)

Relativistic dynamics: Variation of mass with velocity, mass-energy equivalence, relativistic formulae for momentum and energy.

The structure of spacetime: Four vectors, invariance of an interval, timelike, spacelike and lightlike intervals, Minkowski world.

Relativistic electrodynamics: Electric field of a point charge in uniform motion, transverse components, magnetism as a relativistic phenomenon, transformation of E and B fields. Expression for Lorentz force.

Unit VII (9 lectures)

Constraints and generalized co-ordinates, principle of virtual works, D'Alembert's principle, Lagrange's equation, Lagrangian and Lagrange's equation for simple pendulum, Hamilton's canonical equations.

Unit VIII (12 (6 + 6) lectures)

Rigid bodies: Euler angles, Molecular rotation (as rigid bodies) di and tri-atomic molecules. Moment of inertia of diatomic and triatomic molecules in specific examples, rotation about an axis of symmetry, intrinsic spin angular momentum in elementary particles, precessional motion, top, gyroscope.

Two-body problem, reduced mass, scattering and scattering cross-section, illustrations, Rutherford scattering by hard spheres, center of mass and laboratory reference frames, binary stars, single stage and multistage rocket of variable mass, trajectory of an artificial satellite.

Books recommended:

1. D.J. Griffith, Introduction to Electrodynamics, Prentice Hall of India, 3rd Edition, 1998.
2. J.R. Reitz, F.J. Milford and R.W. Christy, Foundation of Electromagnetic Theory, Narosa Publishing House, 3rd Edition, 1993.
3. R.K. Wangsness, Electromagnetic fields, John Wiley & Sons, 2nd Edition, 1986.
4. E.C. Jordan and K.G. Balmain, Electromagnetic Waves and Radiating Systems, Prentice Hall of India, 2nd Edition, 2000.
5. R. Resnick, Introduction to Special Relativity, John Wiley and Sons, 1998.
6. T.W.B. Kibble, Classical Mechanics, Longman Scientific and Technical, 3rd Edition, 1985.
7. H. Goldstein, C. Poole, J. Safko, Classical Mechanics, Pearson Publication, 3rd Edition, 2002.
8. D.T. Greenwood, Classical Dynamics, Prentice Hall of India, 1988.

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B.Sc. (Physics) Hons.

Full Marks 70

PHYS. 222 Paper VI (H)

Quantum Mechanics (90 lectures)

Unit I (9 lectures)

Matrices: Definition, addition of matrices, multiplication of matrices, different types of matrices, hermitian matrix, unitary matrix, orthogonal matrix, inverse of a matrix, eigen values and eigenvectors, diagonalisation of a matrix, normalized vectors.

Unit II (14 (9 + 5) lectures)

Special functions: Differential equations of Legendre function, Hermite and Laguerre functions and their polynomial solutions. Rodrigue formula, generating function, recurrence relations and orthogonality of the polynomials.

Complex variables: Cauchy - Riemann conditions, Cauchy's theorem, Cauchy's integral theorem, the residue theorem, evaluation of integrals using residue theorem.

Unit III (10 (5 + 5) lectures)

Rise and fall of Planck-Bohr quantum theory. Duality of radiation and matter, de-Broglie hypothesis, justification for relation $\lambda = h/p$. Experimental confirmation.

Phase and group velocities of a wave, formation of a wave packet, uncertainty principle relating to position and momentum, relating to energy and time, applications, complementary principle, photon interpretation of two-slit interference.

Unit IV (10 lectures)

Einstein-de-Broglie relations as a link between particle and wave properties, general equation of wave propagation, propagation of matter waves. Time dependent and time-independent Schrodinger equations. Physical meaning of Ψ , conditions to be satisfied by Schrodinger equation as an operator equation. Postulates of quantum mechanics, operators, observables and measurements. Normalization of wave functions.

Unit V (13 (7 + 6) lectures)

Operators: Eigenvalues and eigenfunctions, linear operators, product of two operators, commuting and non-commuting operators, simultaneous eigenfunctions, orthogonal functions, Hermitian operators, their eigenvalues, Hermitian adjoint operators, expectation values of an operator, matrix representation of an operator.

Application of Operator methods: simple harmonic oscillator, step up and step down operators, eigenfunctions and eigenvalues of the ground and excited states, zero point energy. Probability current density and its variations with degree of excitation.

Ehrenfest theorem, classical limit of quantum mechanics, orthogonality of wavefunctions. Basic ideas behind Heisenberg matrix mechanics.

Unit VI (11 lectures)

D problems: Particle in a box with rigid walls, concept of potential well, wave functions and energies for the ground and excited states. Quantization of energy, qualitative discussion of the solution for a shallow potential well. Step potential, penetration through a rectangular barrier, barrier of special shapes, quantum mechanical tunneling, particle in a 3-D cubical box, degeneracy.

Unit VII (10 lectures)

Central forces: Orbital angular momentum, operators for its Cartesian components, commutation relations, mutual as well as with L^2 , operators L_+ and L_- , their interpretation as step operators, eigenvalues of L_z , half-integral values for quantum numbers. Angular momentum operators in spherical polar co-ordinates, evaluation of their eigenfunctions explicitly in terms of the co-ordinates, their degeneracy.

Unit VIII (13 (6 + 7) lectures)

Schrodinger equation for hydrogen atom in spherical polar co-ordinates, separation into radial and angular variables, solution of radial equation for obtaining energy eigenvalues, qualitative discussion of spherical harmonics.

Angular momentum and magnetic moment of electron due to orbital motion: Bohr magneton, Stern-Gehrlich experiment, Uhlenbeck and Goudsmit's hypothesis of electron spin. Pauli's method of spin variable, along with the three co-ordinates in Schrodinger equation. Eigen values and eigenfunctions of the spin operator, Pauli's spin operators and commutation relations.

Books recommended:

1. P.T. Mathew, Quantum Mechanics, Tata McGraw Hill of India, 3rd Edn., 1990.
2. D. Park, Quantum Theory, McGraw Hill, 2nd Edn., 1999.
3. S. Gasiorowitz, Quantum Physics, John Wiley & Sons, 2nd Edn., 1995.
4. A.K. Ghatak and S. Lokanathan, Quantum Mechanics, McMillan, 1992.
5. P.M. Mathew and S. Venkatesan, Quantum Mechanics, Tata McGraw Hill, 2001.

B.Sc. (Physics) Hons.

Full Marks 70

PHYS 223 Paper VII (H)

Kinetic theory, Thermal Physics and Statistical Physics (90 lectures)

Unit I (11 (4 + 4 + 3) lectures)

Definition of $\beta(m,n)$, and $\Gamma(n)$ and their relation, recursion and duplication formula of $\Gamma(n)$, evaluation of $\Gamma(1/2)$, evaluation of some integrals using β & Γ functions.

Statistics and Probability: Binomial distribution, calculation of mean, Stirling approximation, Gaussian or normal distribution, calculation of mean and variance, Poisson's distribution.

Review of kinetic theory of gases, interpretation of temperature, equipartition of energy, specific heat of gases.

Unit II (11 (3 + 8) lectures)

Real gas: Van der Waal's model, equation of state, nature of Van der Waal forces, critical constants.

Transport phenomena: molecular collision, mean freepath and collision cross-section, estimate of molecular diameter and mean freepath, transport of momentum (viscosity), energy (thermal conductivity) and matter (diffusion), Brownian motion.

Unit III (12 lectures)

Laws of Thermodynamics: The zeroth law, indicator diagrams, work done, the first law, internal energy, reversible and irreversible changes, Carnot cycle, Carnot's theorem, second law of thermodynamics, entropy as thermodynamic variable, principle of increase of entropy, entropy of perfect gas, entropy and unavailable energy, thermodynamic scale of temperature, identity with perfect gas scale, impossibility of attaining absolute zero, third law of thermodynamics.

Unit IV (12 (6 + 6) lectures)

Thermodynamic relations: Thermodynamic variables, extensive and intensive, Maxwell's relations and applications, TdS equations, heat capacity equations, internal energy equations.

Joule-Thomson cooling, thermodynamic potentials, Clausius-Clapeyron equation, equilibrium of thermodynamical variables, cooling due to adiabatic demagnetization, production and measurement of very low temperature.

Unit V (11 (5 + 6) lectures)

Liquefaction of gases, Boyle temperature and inversion temperature, principle of regenerative cooling and cascade cooling, liquefaction of gases like He and hydrogen, refrigeration cycles.

- Black body radiation, pure temperature dependence, Stefan-Boltzmann law, pressure of radiation, spectral distribution of black body radiation, Wein displacement law, Rayleigh-Jeans law, Planck's quantum postulates, Planck's law, complete fit with experiment.
- Interpretation of behaviour of specific heats of gases at low temperature.

Unit VI (14 lectures)

Phase space representation, the μ -space, its division into sheets of energy phase cells of arbitrary size, distribution function, Liouville's theorem, ensembles microcanonical, canonical and grand canonical, microstates and macrostates, principle of a priori probability distribution, its narrowing with increasing 'n', average properties, fluctuation, accessible and inaccessible states, distribution of particles with a given total energy into a discrete set of energy states, application to 1-D harmonic oscillator and free particles, the function $\Phi(E)$ and $\Omega(E)$.

Unit VII (10 lectures)

- The bridge with thermodynamics: Thermal equilibrium between two systems, β -parameter and its identity with $1/kT$, probability and entropy, Boltzmann entropy relation, statistical interpretation of Law II of thermodynamics, Maxwell-Boltzmann distribution law, equipartition of energy. Maxwellian distribution of speeds in an ideal gas, derivation of the distribution of speeds and velocities (mean, rms and most probable), experimental verification.

Unit VIII (9 lectures)

Transition to quantum statistics: Indistinguishability of particles and its consequences, BE and FD statistics, application to liquid helium, free electrons in metals, photons in black body chamber, Fermi level and Fermi energy.

Books recommended:

1. M.W. Zemansky & R.H. Dittman, Heat and Thermodynamics, McGraw Hill, Singapore, 7th Edition, 1997.
2. F. Reif, Fundamentals of Statistical and Thermal Physics, McGraw Hill, Singapore, 1985.
3. B.B. Laud, Fundamentals of Statistical Mechanics, New Age International Publishers, 1994.
4. B.K. Agarwal and M. Eisner, Statistical Mechanics, New Age International Publishers, Second Edition, 1998.
5. D.J. Amit and Y. Verbin, Statistical Physics, An Introductory Course, World Scientific, Singapore, 1999.

B.Sc. (Physics) Hons.

Full Marks 74

PHYS 224 Paper VIII (H)

Practical

1. To determine the wavelength of sodium light using biprism.
2. To determine the wavelength of monochromatic light using Michelson interferometer.
3. To measure the width of a single slit from the study of its Fraunhofer diffraction.
4. To determine the specific rotation of a solution by polarimeter.
5. To determine the thermal conductivity of a bad conductor by Lees method.
6. To determine the velocity of ultrasonic waves in liquids.
7. To determine the frequency of ac main by Melde's experiment.
8. To determine the low resistance by potentiometer.
9. To determine the current through external circuit.
10. To study the frequency response of series and parallel resonant LCR circuits.
11. To determine the coefficient of viscosity of a liquid using rotating viscometer.
12. To determine J by Callendar and Barnes method.
13. To determine the value of Planck's constant using photo cell.

Books recommended:

1. S.P. Singh, Advanced Practical Physics, Vol. I & II, Pragati Prakashan, 1998.
2. S.K. Ghosh, A Text Book of Advanced Practical Physics, New Central Book Agency, 1997.
3. K.G. Mazumdar, Advanced Practical Physics, Modern Book Agency, 1964.
4. B.L. Worsnop and H.T. Flint, Advanced Practical Physics, Khosla Publishing House, 1991.

B. Sc. (Physics) Hons.

Full Marks 70

PHYS 321 Paper IX (H)

Solid State Physics, Solid State Devices & Electronics (90 lectures)

Unit I (12 (5 + 7) lectures)

Periodicity of crystals, lattice translation vectors, primitive axes, lattice constant, unit cell, primitive cell, symmetry in crystals, point groups and space groups, typical crystal structures, coordination number, packing fraction, Miller indices.

Bragg's law diffraction of X-rays by crystal lattice, Laue's formulation of X-rays diffraction, reciprocal lattice, Brillouin zones, Laue spots, Bragg's law from Laue formulation, geometrical structure factor, atomic form factor, neutron and electron diffraction methods.

Unit II (12 (6 + 6) lectures)

Types of binding in solids: Covalent binding and its origin, ionic binding, energy of binding (Madelung energy), covalent binding, metallic binding, Van der Waal's binding - Lennard Jones potential, hydrogen bond.

Lattice vibrations: Elastic and atomic force constants, dynamics of a chain of atoms, chain of two types of atoms, optical and acoustic modes, interaction of light with ionic crystals, Einstein and Debye's theories of specific heat of solids.

Unit III (11 (6 + 5) lectures)

Conduction electrons in metals: Concept of free electron, Drude's theory, DC conductivity, quantum mechanical treatment of free electrons in metals, concept of Fermi level. Plasma frequency, thermal conductivity in metals, Sommerfeld's theory of conduction in metals.

Band theory: Nearly free electron theory, forbidden gap, concepts of energy bands, differences between conductors, semiconductors and insulators. Electrons and holes, donor and acceptor impurities, donor impurity levels. Thermal excitation of carriers, electrical conductivity, Hall effect.

Unit IV (13 (6 + 7) lectures)

Magnetism: Diamagnetism (Langevin theory), paramagnetism (Langevin's theory), Curie-law, Weiss theory of ferromagnetism Curie-Weiss law, ferromagnetic domain, hysteresis loop, outline of anti ferro- and ferri-magnetism, ferrites.

Superconductivity: Zero resistivity, critical temperature, critical magnetic field. Meissner effect, type I and type II superconductors, specific heat, entropy, energy gap, concepts of penetration depth and coherence length. Elementary aspects of BCS theory. Ideas of high T-C superconductivity.

Unit V (10 (5 + 5) lectures)

Basic circuit analysis: Circuit models, Kirchhoff's law, single equation loops, single node pair circuit, voltage and current divider rules, principle of superposition, Thevenin and Norton's theorems, two-port analysis of an electrical network.

Semiconductor diodes: p-n junction, I-V characteristics, Shockley model, application in rectifiers, clippers, and limiters, zener diode and applications, opto-electronic diodes, LED, photodiodes, optocouplers.

Unit VI (10 (5 + 5) lectures)

Bipolar junction transistor (BJT), p-n-p and n-p-n structures, active and saturation regions, characteristics of BJT, common emitter configuration, input and output characteristics. Two-port analysis of a transistor, definition of h-parameters, loadline concept, emitter follower, biasing methods, stability factor, low frequency model.

Field effect transistor (FET): Classification of various types of FETs, constructional details of junction field effect transistor, drain characteristics of JFET, biasing of JFET, operating region, pinch-off voltage, idea of metal-oxide-semiconductor transistor (MOS transistor).

Unit VII (11 (6 + 5) lectures)

Small signal amplifiers: General principle of operation, classification, distortion, RC coupled amplifier, gain frequency response, band width input and output impedance, multistage amplifiers transformer coupled amplifiers, equivalence circuits, at low, medium and high frequencies, noise in electronic circuits, Decibel power.

Operational amplifiers: Differential amplifiers, principle of operational amplifiers, transfer characteristics, offset parameters, differential gain, CMRR, applications of operational amplifiers: Adder, integrator and differentiator.

Unit VIII (12 (6 + 6) lectures)

Oscillators and wave-form generators: Positive feedback, Barkhausen criterion, RC oscillator, Wien bridge oscillators, phase shift oscillator, Colpitts' oscillator, Hartley oscillator.

Digital circuits: Binary system, Boolean algebra, OR, AND, NOR, NAND gates, TTL logic families, NMOS and CMOS circuit, ECL gates, binary address, arithmetic function circuits, digital comparator, decoder, demultiplexer.

Books recommended:

1. C. Kittel, Introduction to Solid State Physics, John Wiley and Sons, 7th Edition, 1999.
2. A.J. Dekker, Solid State Physics, Mcmillan Student edition, 1969.
3. J.S. Blakemore, Solid State Physics, Cambridge Univ. Press, 2nd edition, 1987.
4. J.R. Christman, Fundamentals of Solid State Physics, John Wiley & Sons, 1988.
5. H.P. Myers, Introductory Solid State Physics, Viva Book Pvt. Ltd., 2nd Edition, 1998.
6. J.P. Srivastava, Elements of Solid State Physics, Prentice Hall of India, 2001.
7. J.D. Ryder, Electronics fundamentals and applications, Prentice Hall of India, 5th edition, 1999.
8. Gupta & Kumar, Hand book of Electronics, Pragati Prakashan, 27th Edition, 2001.
9. B.L. Theraja, Basic Electronics, S. Chand & Co, 5th Edition, 1998.
10. M.K. Bagde and S.P. Singh, Elements of Electronics, S. Chand, 2000.

B.Sc. (Physics) Hons.

Full Marks 70

PHYS. 322 Paper X (H)

Atomic and Molecular Physics, Nuclear and Particle Physics (90 lectures)

Unit I (12 (8 + 4) lectures)

Background from quantum theory, the four quantum numbers, the spinning electron, space quantisation, spin-orbit coupling, Spectral terms arising from L-S coupling, s,p,d,f notation, selection rules, half-life of excited states, width of spectral lines, j-j coupling, spectra of mono- and divalent atoms: Doublet fine structure of hydrogen lines, screening constants for monovalent atoms, series limits, doublet series of alkali spectrum, spectra of helium and alkaline earth's atoms, singlet and triplet series.

Effects of magnetic field on energy levels (specify): Gyromagnetic ratio for orbital and spin motions, vector model, Lande g-factor, strong and weak field effects, illustrative case of H, Na, Ca and Hg.

Unit II (10 (5 + 5) lectures)

X-ray spectra: The continuum X-ray spectrum, Duane and Hunt Law, characteristic x-rays, Moseley law, doublet fine structure, H-like character of x-ray states, x-ray absorption spectra, absorption edges, Compton Scattering, change of wavelength.

Sharing of electrons, formation of molecular orbitals, H_2^+ ion, H_2 molecule, electronic levels, singlet and triplet characteristic, rotational energy levels, inter-nuclear distance, vibrational energy levels, force constant, anharmonicity, dissociation energy, isotope effects on rotational and vibrational energies.

Unit III (13 (5 + 5 + 3) lectures)

Spectra of diatomic molecules: Pure rotational spectra, selection rules, vibrational-rotational spectra, selection rules, P, Q and R branches, electronic band systems, sequence and progressions, Frank-Condon principle.

Triatomic and complex molecules: Normal mode of a triatomic molecule, selection rules for infrared absorption, molecular orbitals in complex molecules, approximation for treating HOC vibrations relative to rest of the molecule.

Raman effect, Raman shifts, Stokes and anti-Stokes lines, selection rules in Raman versus IR spectra.

Unit IV (11 (7 + 4) lectures)

Structure of nucleus: Discovery of the nucleus, composition, basic properties, charge, mass, size, spin, magnetic moment, electric quadrupole moment, binding energy, binding energy per nucleon and its observed variation with mass number of the nucleus, Coulomb energy, volume energy, surface energy, other corrections, explanation of the binding energy curve, liquid drop model, shell model of the nucleus, Schmidt lines, collective model.

Nuclear forces: Two-nucleon system, deuteron problem, binding energy, nuclear potential well, pp and np scattering experiments, meson theory of nuclear forces, e.g., Bartlet, Heisenberg, Majorana forces and potentials, mirror nuclei, nuclear energy levels, nuclear gamma rays.

Unit V (12 (4 + 4 + 4) lectures)

Radioactivity: decay constant and half life, methods of measurement of half-life, spectra of emitters, Geiger-Nuttal law, Gamow's explanation, beta decay, Fermi's theory, neutrinos and antineutrino, nuclear radiation, energy levels, biological effects of radiation.

Detectors for charged particles: Ionization chamber, Geiger counter, resolving time, cloud chamber, photographic emulsion and bubble chamber.

Accelerators: Need for accelerators, Cockroft, Walton, Van de Graf, cyclic accelerators, cyclotron, synchrocyclotron, variable energy cyclotron, phase stability, superconducting detectors.

Unit VI (10 (3 + 7) lectures)

Nuclear reactions: Rutherford's experiments of nuclear transmutation, conservation theorems, Q-value, threshold energy, cross-section of nuclear reactions.

Artificial radioactivity: Nuclear fission, Bohr-Wheeler theory of nuclear fission, condition of spontaneous fission, the four factor formula for a nuclear multiplication factor, chain reaction, criticality, moderators, power reactors, breeder reactors, problems of nuclear safety, Fermi and transuranic elements. Nuclear fusion reaction in the plasma, condition for sustained fusion energy production in stars, Tokomak experiment.

Unit VII (10 (5 + 5) lectures)

Discovery of cosmic rays, hard and soft components, discovery of muon, pion, heavy mesons and hyperons, mass and lifetime determination for muon and pion.

Primary cosmic rays: Extensive air showers, solar modulation of primary cosmic rays, effect of earth's magnetic field on the cosmic ray trajectories.

Unit VIII (12 (6 + 6) lectures)

Elementary particles: Classification of elementary particles on the basis of spin-fermions and bosons, four types of basic interactions, leptons, baryons, mesons and hadrons, antiparticles.

Resonant particles, discovery and important properties, strangeness, conservation and violation of strangeness in particle interactions, isospin, hypercharge, quark hypothesis, high energy electron scattering from protons, families of quarks and leptons.

Books recommended:

1. G. Herzberg, Atomic spectra and atomic structure, Dover Publications, 1944.
2. H.E. White, Introduction to atomic spectra, McGraw Hill, 1934.
3. T.A. Littlefield and N. Thorley, Atomic and Nuclear Physics, E.L.B.S. Publications, 1980.
4. A. Beiser, Perspectives of Modern Physics, McGraw Hill, 1969.
5. G.M. Barrow, Molecular Spectroscopy, McGraw Hill, 1962.
6. C.N. Barnwell, E.M. McCash, Fundamental spectroscopy 4th edition – Tata McGraw Hill Ltd., India, 1995.
7. J.D. Graybeal, Molecular Spectroscopy, McGraw Hills International Edition, 1988.
8. S.N. Ghosal, Atomic and Nuclear Physics, Vol. II, S. Chand and Co. Ltd., 1994.
9. B.N. Srivastava, Basic Nuclear Physics and Cosmic Rays, Pragati Prakashan, 1993.
10. B.L. Cohen, Concepts of Nuclear Physics, Tata McGraw Hill, 1990.

B.Sc. (Physics) Hons.

Full Marks 70 (45 (Theory) + 25 (Practical))

PHYS 323 (a) Paper XI(H)

Computer Applications - Theory (60 lectures)

Full Mark 45

Unit I (12 lectures)

Classification of computers: Analog, digital and hybrid. Units of computer (broad feature): Block diagram showing the units of a computer.

Input unit and devices: Keyboard, video display unit, floppy disc, CD-ROM. Output unit and devices: Printers and their different types, video terminals. Devices used both as input and output: Terminals, interactive remote terminals, intelligent terminals. Central Processing Unit (CPU): Two parts: Control unit and Arithmetic Logic Unit (ALU) Memory units and devices: Auxiliary or peripheral memory devices, floppy disc, hard disc, magnetic tape, cartridge tape, memory cell, RAM, ROM, PROM, EPROM, cache memory, virtual memory. Data storage and representation.

Number system: Integer and floating point, modes of representation of number, external and internal representation of numbers, representation of positive and negative binary numbers, decimal, binary, hexadecimal, octal, BCD code, inter-conversion of number from one system to the other, binary arithmetic.

Unit II (7 lectures)

Flowchart and algorithm (illustration by examples), execution of flow chart and looping in a flowchart, illustration with roots of a quadratic equation and summation of arithmetic series.

Operating system basic concept of operating systems, functions of operating systems, introduction to MS-DOS, WINDOWS and services provided by these systems.

Function of CPU in program execution: Only simple description.

FORTRAN Language:**Unit III (10 lectures)**

Fortran characters: Integer constant, real constant, complex constant, hexadecimal constant, logical constant, literal constant.

Fortran variables: Real variables, double precision, logical variables, subscripted variables, arrays.

Library functions: List of library functions: algebraic, hyperbolic, logarithmic, trigonometric and other.

Fortran expression: Arithmetic expression, rules for forming arithmetic progressions, mathematical expressions, relational expressions, logical expressions (to be illustrated with examples).

Unit IV (15 lectures)

Fortran statements:

(a) Executable statements: (with illustrations)

(i) Assignment statement

(ii) Input statement: formatted/unformatted

(iii) Control statement and its classification, viz.

1. GOTO statement, unconditional GOTO statement, computed GOTO statement, assigned GO TO statement.
2. IF statement: arithmetic IF, logical IF, IF THEN, ELSE, ENDIF
3. DO statement: DO loop, ENDDO
4. CONTINUE statement
5. STOP statement
6. PAUSE

(iv) Output statement: formatted/unformatted

(v) CALL statement (related to Subprogram & Subroutine)

(vi) RETURN statement (related to Subprogram & Subroutine)

(b) Non-executable statements: (with examples and illustrations)

DIMENSION statement

DATA statement

IMPLICIT statement (Integer, real, complex or logical)

EXPLICIT statement (Integer, real, complex or logical)

FORMAT statement

NAMelist statement

COMMON statement

EQUIVALENCE statement

EXTERNAL statement

END statement

OPEN FILE statement

SUBPROGRAMS statement

(c) (i) FUNCTION SUBPROGRAM Their relation with main

(ii) SUBROUTINE SUBPROGRAM Program with illustration

Unit V (16 lectures)

Program writing (using Fortran):

(i) Solution of quadratic equation.

(ii) Evaluation of determinant.

(iii) Solution of linear equation in three variables by Cramer's rule.

(iv) Numerical integration (trapezium rule & Simpson's rule).

(v) Inversion of a matrix.

(vi) Eigen-values and eigen-vectors of a matrix.

Books recommended:

1. S. Lipschutz and A. Poe, Programming with Fortran, Mc Graw Hill, 1978.

2. V. Rajaraman, Computer programming in Fortran 77, Prentice Hall of India, 2001.

3. E.V. Krishnamurthy and S.K. Sen, Numerical Algorithms, East West Press, 2nd Edn., 2000.

4. C. Xavier and V. Rajaraman, Fortran 77 and Numerical Methods, New Age International, 2000.

5. M. Boillot, Understanding Fortran 77, Jaico, 1990.

6. V. Rajaraman, Numerical Analysis, Wiley Eastern, 1990.

7. S. Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India, 2002.

Computer Applications - Practical**Full Mark 25**

1.

- (a) To read and write two supplied 3X3 matrices, A and B.
- (b) To find the product of two supplied matrices and print the result.
- (c) To find the determinant of a supplied matrix.

2.

- (a) To find the transpose of two supplied matrices A and B.
- (b) Find the inverse of two supplied non singular matrices A and B and verify the accuracy result through $AA^{-1} = I$, $BB^{-1} = I$.

3.

- (a) To diagonalise two given matrices A and B.
- (b) To find eigen values and eigen vectors corresponding to a supplied 3X3 matrix.

4. To find out the roots (real and complex) of a quadratic equation of the form

$$ax^2 + bx + c = 0$$

for supplied values of a, b, c and print out the result.

5. Using Simpson's rule

- (a) integrate numerically a given function $f(x)$, which is analytically integrable and compare the numerical and analytical results.
- (b) study the improvement in accuracy of the result with the increase of number of steps in (a).

6.

- (a) using trapezoidal rule numerically integrate a given function $f(x)$ which is analytically integrable and compare the numerical and analytical results.
- (b) Using Simpson's rule numerically integrate the same function as in (a) and compare the two numerical results.

7. The radioactive decay formula for β -particles as a function of time is given by

$$N(t) = N_0 e^{-\lambda t}$$

Plot $N(t)$ as a function of t graphically for different values of λ and N_0 . Verify the definition of half-life from the graph.

Books recommended:

1. M.K. Jain, Numerical Methods for Scientific and engineering Computation, New Age international Publications, 2002.
2. C. Xavier, Fortran 77 and Numerical Methods, New Age International Publications, 2000.
3. V. Rajaraman, Numerical Analysis, Wiley Eastern, 1990.
4. S. Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India, 2002.
6. R.C. Verma et. Al., Computational Analysis: An Introduction, New Age International Publications, 1999.

Full Marks 70

PHYS 323 (b) Paper XI (H)

Advanced Electronics (90 lectures)

Unit I (12 lectures)

Network Theorems: Reciprocity theorem, maximum power transfer theorem.

Two-port network, z-parameters, y-parameters and h-parameters of a two-port network, analysis of transistor amplifier in CB and CE configurations in terms of h-parameters.

Unit II (8 lectures)

Multivibrators: Astable multivibrator, monostable multivibrator and bistable multivibrator, Schmitt trigger.

Unit III (15 lectures)

Methods of modulation, amplitude modulation, waveforms of amplitude-modulated voltages, amplitude modulator circuit (CM and EM circuits), limitations of amplitude modulation.

Frequency modulation, frequency modulator circuit, phase modulation, comparative merits and demerits of AM, FM and PM.

Unit IV (10 lectures)

Demodulation, amplitude demodulation, frequency demodulation.

Transmission lines, equivalent circuit for transmission lines, characteristic impedance of transmission lines, wave-guides.

Propagation of radio waves, ground wave, space wave, sky wave propagation, aerials.

Unit V (10 lectures)

OP-AMP, basic characteristics of OP-AMP (without the details of internal circuit of IC), inverting and non-inverting amplifiers.

Basic concepts of integrated circuits, advantages of integrated circuits, type of ICs, basic ideas of SSI, MSI, LSI and VLSI.

Unit VI (12 lectures)

Number systems, decimal, binary, octal and hexadecimal number systems, interconversion from one system to the other, the BCD code, the excess-3 code.

The logic circuits, AND, OR, NOT, NAND, NOR and XOR gates, truth table.

Boolean algebra, De Morgan's theorem.

Unit VII (15 lectures)

Arithmetical digital circuits, Binary addition (Half adder and Full adder), subtractors, the 2's complement and the double complement, 2's complement method for addition and subtraction.

Multiplexer and demultiplexer, encoder and decoder.

A/D conversion and D/A conversion.

Essential components of a computer system (Input devices, output devices, CPU), semiconductor memories (RAM, ROM, PROM and EPROM).

Unit VIII (8 lectures)

Simple optical processes, spontaneous and stimulated emission, optical transitions in semiconductors, coherent optical radiation in information systems, optical communication.

Books recommended:

1. A.P. Malvino, Electronics Principles, Tata McGraw Hill, 3rd Edn., 1983.
2. B.G. Streetman, Solid State Electronic Devices, Prentice Hall of India, 5th Edn., 2001.
3. K.C. Gupta, Microwaves, New Age International Publisher, 1996.
4. M.L. Sisodia & G.S. Raghuvanshi, Microwave circuit and Passive devices, New Age International Publisher, 1997.
5. Gupta & Kumar, Handbook of Electronics, Pragati Prakasan, 27th Edn., 2000.
6. J.D. Ryder, Electronics Fundamentals and Applications, Prentice Hall of India, 5th Edn., 1999.
7. M.K. Bagde & S.P. Singh, Elements of Electronics, S. Chand, 2000.
8. Viswanathan, Mehta & Rajaraman, Electronics for Scientists and Engineers, Prentice Hall of India, 1984.
9. D.C. Tayal, Basic Electronics, Himalaya, 1998.
10. J.J. Brophy, Basic Electronics for Scientists, McGraw Hill, 1991.
11. A.J. Diefenderfer, Principle of Electronics Instrumentation, Holt Sanders, 1991.

B.Sc. (Physics) Hons.

Full Marks 70

PHYS 323 (c) Paper XI (H)

Advanced Solid State Physics (90 Lectures)

Unit I (13 lectures)

Crystal Structure: Concept of primitive unit cell and conventional unit cell, Wigner-Seitz cell, lattice with basis and geometrical structure factor of bcc and fcc lattices, atomic form factor, temperature dependence of Bragg's reflection and Debye-Waller factor, point group and space group.

Unit II (13 lectures)

Elastic constants and Elastic waves: Elastic strains, dilation, stress and strain components, elastic energy density, stiffness constants of cubic crystals, bulk modulus and compressibility, elastic waves in cubic crystals, waves in [110] direction.

Unit III (13 lectures)

Thermal Properties: Phonon heat capacity, normal mode enumeration, density of states in one, two, three dimensions, equation of state of solids, Gruneisen constant, Gruneisen relation and thermal expansion of solids, thermal conductivity of solids.

Unit IV (18 lectures)

Free-electron theory of metals: Electrical conductivity at high frequencies, optical properties of metals, transparency of alkali metals to ultra-violet frequencies, skin effect, electrostatic screening, application of F-D distribution to thermoionic emission from metals, energy distribution of emitted electrons, field emission of electrons from metals, contact potential between two metals, photoelectric effect of metals.

Unit V (8 lectures)

Band theory of solids: Wave equation of electron in periodic potential, Bloch Theorem and Bloch function, effective mass and concept of a hole, tight-binding method for energy bands, idea of Fermi surface.

Unit VI (10 lectures)

Semiconductors: Recombination, diffusion and lifetime of minority carriers, thermal equilibrium of the p-n junction, photodiodes, Hall effect in semiconductors, optical excitation and infrared absorption, thermoelectric effects.

Unit VII (8 lectures)

Defects in solids: Point defects, Schottky defect and Frenkel defect, diffusion in metals, colour centres and F-centres, Trapped-hole centres, excitons (Frenkel and Mott-Wannier).

Unit VIII (7 lectures)

Magnetic resonance: Nuclear magnetic moments, nuclear magnetic resonance, conditions for resonance absorption, Bloch equations, application of magnetic resonance in (a) Structure of solids (b) molecular rotation in solids.

Books recommended:

1. C. Kittel, Introduction to Solid State Physics, 7th edition, John Wiley & sons, 1999.
2. H.P. Myers, Introductory Solid State Physics, 2nd edition, Viva Books Pvt. Ltd., 1998.
3. A.J. Dekker, Solid State Physics, Mc. Millan India Ltd., 1986.
4. J.P. Srivastava, Elements of Solid State Physics, Prentice Hall of India, 2001.
5. J.R. Christman, Fundamentals of Solid State Physics, John Wiley & sons, 1988.
6. H. Ibach and H. Luth, Solid State Physics, 2nd edition, Springer, 1996.
7. R.E. Hummel, Electronic properties of materials, 3rd edition, Springer, 2001.
8. N.W. Ashcroft & N.D. Mermin, Solid State Physics, Hault & Saunders, 1981.
9. M.S. Rogalski & S.B. Palmer, Solid State Physics, 1st edition, Gordon and Breach, 2001.
10. J.M. Ziman, Principles of the Theory of Solids, 2nd edition, Cambridge University Press, 1984.

B.Sc. (Physics) Hons.
Full Marks 70
PHYS 323 (d) Paper XI (H)

Astrophysics (90 lectures)

Unit I (12 lectures)

Introduction, transmission of radiation through earth's atmosphere, brief ideas of IR, UV, X-ray and γ -ray astronomy.

Optical telescopes (reflecting and refracting telescopes, their relative advantage), radio telescopes, astronomical spectographs, slit spectograph, objective prism, photographic photometry, detectors.

Unit II (10 lectures)

Review of Planck's theory of black-body radiation, photo-electric effect, Kirchoff's law, Doppler effect and Doppler shift, Compton effect and inverse Compton effect, Saha's equation of thermal ionization and its significance in astrophysics.

Stellar magnitude sequence, apparent and absolute magnitude, bolometric magnitude, the UBV magnitude system, the radiometric magnitude and the heat index.

Unit III (12 lectures)

The celestial coordinate systems, the horizontal coordinate system, the equatorial coordinate system and the ecliptic system.

Distance measurements in astronomy, stellar parallax method and the unit of stellar distances (pc), spectroscopic parallax method and distance modulus, Cepheid variables as distance indicators, distances from Doppler's shift measurements.

Spectral classification of stars, Harvard system of spectral classification (Henry-Draper catalogue), Hertzsprung-Russell diagram.

Unit IV (14 lectures)

Sun as a typical star, solar photosphere (limb darkening, temperature variation with geometrical depth), opacity of solar atmosphere, Fraunhofer lines of solar spectra and relative abundance of elements, the chromosphere, solar corona (K-corona, F-corona and E-corona), solar prominences (the quiescent, active, eruptive and sunspot-type prominences), solar cycle and sunspots, Babcock's theory of solar cycle, solar magnetic field and solar flares.

Unit V (11 lectures)

Basic theory of stellar atmosphere, condition of radiative equilibrium, equation of transfer, solution of the equation of transfer, processes of absorption in stellar atmosphere, continuous absorption by the H⁻ ions in cooler stars, analysis of spectral-line broadening (natural, Doppler and collisional broadening).

Unit VI (10 lectures)

Binary and multiple stars, visual binary, spectroscopic binary, eclipsing binary, origin of binary stars, mass-luminosity relation.

Variable stars, classification of variable stars, the Cepheid group of variables (type I & type II), analysis of Cepheid spectrum.

Unit VII (10 lectures)

Novae and supernovae, light variation of novae, spectra of novae, cause of novae outburst, supernovae, supernovae 1987A.

Discovery of Pulsars, rotating neutron star, model of pulsars, period distribution and loss of rotational energy, test of rotating neutron star model of pulsars, Gold's model of pulsars, binary pulsars, black holes.

Unit VIII (11 lectures)

Discovery of quasars, radio properties and optical properties of quasars, redshift of quasars.

Redshift and expansion of the universe, the deceleration parameter, the cosmological principle, fundamental equation of cosmology, Einstein's static model of the universe, steady-state model of the universe.

Books recommended:

1. Frank H. Shu, *The Physical Universe: An introduction to Astronomy*, University Science Books, 1982.
2. Frank H. Shu, *The Physics of Astrophysics*, Vol. I & II, University Science Books, 1982.
3. T. Padmanavan, *Theoretical Astrophysics*, Vol. I, II & III, Cambridge University Press, 2000.
4. J.V. Narlikar, *Structure of the Universe*, Oxford University Press, 1977.
5. J.V. Narlikar, *Introduction to Cosmology*, Oxford University Press, 1993.
6. H. Bondi, *Cosmology*, Cambridge University Press, 1999.
7. J.B. Kaler, *Stars and their Spectra*, Cambridge University Press, 2001.
8. S. Chandrasekhar, *An introduction to the study of stellar structure*, Dover, 1967.

B.Sc. (Physics) Hons.

Full Marks 70

PHYS 323 (e) Paper XI (H)

Environmental Physics (90 lectures)

Unit I (13 lectures)

Essentials of environmental physics: Structure and thermodynamics of the atmosphere, composition of air, greenhouse effect, transport of matter, energy and momentum in nature, stratification and stability of atmosphere, laws of motion, hydrostatic equilibrium, general circulation of the tropics, elements of weather and climate of India.

Unit II (13 lectures)

Solar and terrestrial radiation: Physics of radiation, interaction of light with matter, Rayleigh and Mie scattering, laws of radiation (Kirchoff, Planck, Beer, Wien, etc), solar and terrestrial spectra, UV radiation, ozone depletion problem, IR absorption, energy balance of the earth atmosphere system.

Unit III (10 lectures)

Environmental pollution and degradation: Elementary fluid dynamics, diffusion, turbulence and turbulent diffusion, factors governing air, water, and noise pollution, air and water quality standards, waste disposal, heat island effect, land and sea breeze, puffs and plum

Unit IV (12 lectures)

Gaseous and particulate matter, wet and dry deposition, dispersal mechanism of air and water pollutants, mixing height and turbulence, Gaussian plume models, dispersion models, environmental degradation, thermal and radioactive pollution, nuclear radiation, health hazards and safety.

Unit V (10 lectures)

Environmental changes and remote sensing: Energy sources and combustion processes, renewable sources of energy, solar energy, wind energy, bioenergy, hydropower, fuel cells, and nuclear energy.

Unit VI (10 lectures)

Forestry and bioenergy, deforestation, U-G degradation of soils, agriculture and land use changes, changing composition of local, regional and global environment, remote sensing techniques.

Unit VII (12 lectures)

Global and regional climate: Elements of weather and climate, stability and vertical motion of air, horizontal motion of air and water, pressure gradient forces, viscous forces, and inertia forces, Reynold's number, enhanced greenhouse effect, energy balance - a zero-dimensional greenhouse mode.

Unit VIII (10 lectures)

Global climate models, cloud radiative feedback and ice albedo feedback processes, projections of global climate changes, downscaling techniques, future scenarios of Indian climate, introductory modeling, elements of chaos, Lorenz model.

Books recommended:

1. J. T. Houghton, **The Physics of Atmosphere**, Cambridge Univ. Press, 1977.
2. J. Twidell and J Weir, **Renewal Energy Resources**, ELBS, 19880.
3. Sol Wieder, **An Introduction to Solar Energy for Scientists and Engineers**, John Wiley, 1982.
4. R. N. Keshavamurthy and M. Shanker Rao, **The Physics of Monsoons**, Allied Publishers, 1992.
5. G. J. Haltiner and R. T. Williams, **Numerical Weather Prediction**, John Wiley, 1980.

B.Sc. (Physics) Hons.
Full Marks 80
PHYS 324 Paper XII (H)

Practical

1. To study the Hall effect and determine the Hall coefficient and voltage.
2. To draw/trace the BH curve of a ferromagnetic sample.
3. To determine the band gap in semiconductor diode.
4. To study a simple power supply with filter circuit.
5. To study the static characteristics of a transistor in CB configuration and the value of α .
6. To study the static characteristics of a transistor in CE configuration and the value of β .
7. To study the frequency response of RC-coupled amplifier.
8. Study of logic gates : OR, AND and NOT gates.
9. Study of integrating and differentiating circuits.
10. To draw the plateau of a GM counter and determine the percentage of plateau slope.
11. To determine the ratio e/m for electron.
12. Study of Lissajours figures using CRO.

Books recommended:

1. S.P. Singh, Advanced Practical Physics, Vol. I & II, Pragati Prakashan, 1998.
2. S.K. Ghosh, A Text Book of Advanced Practical Physics, New Central Book Agency, 1997.
3. K.G. Mazumdar, Advanced Practical Physics, Modern Book Agency, 1964.
4. B.L. Worsnop and H.T. Flint, Advanced Practical Physics, Khosla Publishing House, 1991.
5. B.L. Theraja, Basic Electronics, S Chand & Co., 5th Edn., 1998.
6. M.K. Bagde and S.P. Singh, Elements of Electronics, S. Chand, 2000.

GENERAL NOTES ON THE SYLLABUS

1. Out of five elective papers in B.Sc. Physics (Hons.), the Phys. 323 (a) – 323 (e), the student is allowed to exercise his option for one only.
2. Duration of every theory paper in Pass or Hon., except for “Computer Applications – Theory” in the elective Paper XI (H), Phys. 323 (a) of B.Sc. (Hons.), will be three hours. The duration of the paper ‘Computer Applications – Theory’ will be two hours.
3. The duration of Practical Examinations in Phys. 113, 213, 313 and Phys. 323 (a) (Paper XI (H), Computer Applications – Practical) will be four hours and the student will be asked to do one experiment in the examination.
4. The duration of Practical Examination in B.Sc. (Hons.) for Phys. 224 and Phys. 324 will be six hours except in ‘Computer Applications – Practical’ the duration for which will be four hours. The student will be asked to perform one experiment during the examination.
5. In each of the theory papers Phys. 111, 112, 311 and 312 there shall be objective type questions carrying 18 marks out of total 46 marks. In addition to objective type questions, the question paper shall contain six other questions each carrying 7 marks out of which the student has to answer four questions:

$$18 \text{ (objective)} + 28 \text{ (others)} = 46 \text{ (total)}.$$

6. In each of the papers Phys. 211 and 212 there shall be objective type questions carrying 20 marks out of total 48 marks. In addition to objective type questions, the question paper shall contain six other questions each carrying 7 marks out of which the student has to answer four questions:

$$20 \text{ (objective)} + 28 \text{ (others)} = 48 \text{ (total)}.$$

7. In every paper in B.Sc. (Hons.) there shall be 20% weightage on problem oriented questions.
8. In each of the theory papers Phys. 122, 124, 221, 222, 223, 321, 322, 323 (b), 323 (c), 323 (d), 323 (e), the student should be asked to answer five questions out of eight questions each carrying 14 marks.

In the theory paper “Computer Applications – Theory” under elective paper of Phys. 323 (a), the student should be asked to answer three out of five questions each carrying 15 marks.

5:2:11(1)

xi) Draft Syllabi for B.E. in Electronics & Communication Engineering (Four year Degree Course).

The Board of under graduate studies in Electronics and communication engineering in its meeting held on 23rd May '03' discussed the draft syllabus for Bachelor of engineering and communication engineering for V-VI semesters presented by the Principal, engineering. Management College, Shillong and the Board resolved to recommend and finalize the syllabus for V -VI semesters only.

The minutes of the Boards meeting is placed as Annexure-'A' and the draft syllabus as Annexure 'B'.

The matter is placed before the Council for consideration.

5:2:11(2)

Annexure - 'A'

**NORTH EASTERN HILL UNIVERSITY
DEPARTMENT OF LIBRARY & INFORMATION SCIENCE
MAYURBIHANJ COMPLEX: NONGTHYMMAI: SHILLONG: 14**

Minutes of BUGS of Electronic & Communication Engineering which was held on May 23rd 2003 in VC's Conference room at 11.00.a.m. The following members participated in the proceedings:-

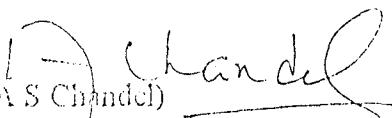
1. Prof R P Bajpai, NEIU
2. Fr. Joseph Nellanatt, St. Anthony's College, Shillong
3. Mr. P K Baruah, Principal, Shillong Engineering and Management College, Shillong.
4. Dr A K Sinha, REC Silchar
5. Mr. T D Singh, St. Anthony's College, Shillong.
6. Prof A S Chandel, NEIU(Chairman)

Item: 1 Draft Syllabus

Board discussed the draft syllabus for Bachelor of Engineering & Communication Engineering (ECE) for V-VI semesters presented by the Principal, Engineering and Management College, Shillong and resolved to recommend and finalise the syllabus for V and VI semesters only. Board further resolved to discuss the course contents for VII & VIII semesters in its forthcoming meeting. The Principal of the College was requested to send the proposed draft of these semesters to all the members of BUGS well in advance of the meeting.

Item: 2 Panel of Examiners/Paper setters.

BUGS (ECE) recommended the panel of examiners/paper setters and moderators for V and VI semesters.


(A S Chandel)
Chairman

Department of Library & Information Science, NEHU

Dated 23.05.03

5:2:11 (3)

Answer - 'B'

NORTH-EASTERN HILL UNIVERSITY (N.E.H.U.) : SHILLONG
(A Central University)

DRAFT
SYLLABI

for

BACHELOR OF ENGINEERING in ELECTRONICS & COMMUNICATION ENGINEERING
(A FOUR YEAR DEGREE COURSE)

For FIFTH SEMESTER & SIXTH SEMESTER

Course : Bachelor of Engineering (Electronics & Communication Engineering)

DETAILED SYLLABUS

Fifth Semester

ECE 3101/CSE 3101 NUMERICAL ANALYSIS AND ALGORITHMS (Common Paper for Computer Science & Engineering)

Unit-I

Idea of Computational Algorithms.

Error in numbers. Absolute, Relative and Percentage errors. Approximation by Digital Computer and sources of errors. Significant figures of a number. Rounding of a number. Errors in sum, product, quotient.

Unit-II

Numerical solution of transcendental and algebraic equation – Method of iteration with convergence criterion, Newton-Raphson Method with convergence criterion. Multiple roots and complex roots. Numerical solution of a system of linear algebraic equations – Gaussian Elimination Method, Gauss-Jordan Method, Gauss-Siedel Method.

Unit-III

Matrix Inversion by Gauss-Jordan Method.

Finite difference, interpolation and extrapolation. Newton's forward and backward formulae. Gauss's forward and backward formulae. Stirling's and Bessel's interpolation formulae. Lagrange's interpolation formula for unequal intervals. Divided difference. Newton's divided difference formula. Numerical differentiation.

Unit-IV

Numerical integration – Newton-Cotes quadrature formula. Trapezoidal Rule, Simpson's 1/3 rd and 3/8 th rules with error estimation. Romberg's Method. Gaussian quadrature formula.

Unit-V

Numerical solution of ordinary differential equations with initial value – Taylor's Series Method, Euler's and modified Euler's Methods. Runge-Kutta Method of 4th order. Milne's Predictor-Corrector Method. An introduction to linear differential equation with constant coefficient.

*** All methods should be associated with corresponding numerical algorithms and programming in FORTRAN or C language.*

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional	: 25 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Books for reference :

- 1) Numerical Methods in Engineering and Sciences by Dr. B.S. Grewal, 4th Edition, Khanna Publishers, 2001.
- 2) Introductory Methods for Numerical Analysis by S.S. Sastry, 5th Edition, Prentice-Hall, 2002.
- 3) Computational Mathematics by Demidovich & Maron, 2nd Edition, Mir Publishers, 2001.
- 4) Applied Numerical Analysis by Gerald & Wheatley, 3rd Edition, Addison Wesley Longman, 2000.
- 5) Numerical Methods in Engineering and Sciences – A Practical Approach by S. Rajasekaran, 2nd Edition, Wheeler Publishing, 2001.
- 6) Numerical Method by E. Balagurusamy, 4th Edition, , Tata McGraw Hill, 2000.

ECE 3102/CSE 3102 CONTROL SYSTEM ENGINEERING (Common Paper for Computer Science & Engineering)

Unit-I

Introduction :

The control problem and solution possibilities. The notion of objective/specifications, Feedback as natural strategy. Regulation and tracking problems.

Models of physical systems :

Definition of transfer function. Examples of transfer function : Mechanical, Electrical (lag networks, lead networks, lag-lead networks) and Hydraulic. Examples of transfer function : Systems with dead zone.

Unit-II

Servo Components (Deduction of transfer function only) :

Potentiometers, Synchros, DC and AC Servometers, Techogenerators, Gyroscope, Amplidyne, Hydraulic actuators.

Mathematical Tools :

Differential equation, Forced response, Laplace transforms, Transfer functions of components and block diagram, State transition matrix, Signal flow graphs.

Unit-III

Stability analysis in time domain :

Steady state and transient response (Time domain and state variable approach), Root locus technique.

Unit-IV

Stability analysis in frequency domain :

Bode plot, Nyquist plot.

Case Studies :

Hydraulic control system, Instrument servomechanism, Gyro control system.

Unit-V

Introduction to non linear control :

Describing function technique.

Specific topics : Optimal Control Theorem, Controllability and observability.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional	: 25 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Books for reference :

- 1) Modern Control Engineering by K. Ogata, 3rd Edition, Prentice-Hall India, 2002.
- 2) Control Systems Engineering by I.J. Nagrath & M. Gopal, 2nd Edition, New Age International, 2001.
- 3) Control Systems by M. Gopal, 2nd Edition, Tata McGraw-Hill, 2001.
- 4) Modern Control Engineering by R.C. Dorf & R.H. Bishop, 3rd Edition, Addison Wesley Longman, 2002.
- 5) Feedback and Control Systems, Schaum's Outline Series, McGraw-Hill, 2001.

ECE 3103 ANALOG COMMUNICATION

Unit-I

Spectral Analysis :

Classification of signals, Bandwidth and noise limitations, Fourier series and Fourier transform Normalized power, Power spectral density, Parseval's theorem, Dirac delta function, Transmission of signals through linear systems, Correlation between waveforms, Pre-envelope.

Amplitude Modulation :

Principles and definitions, Spectrum and power considerations, DSB, SSB and VSB principles, Methods of generation and detection, Multiplexing, Mixing, Demodulation : coherent, square law and envelope.

Unit-II

Amplitude modulators and demodulators :

Square law modulator, Balance modulator, Practical analog multipliers and demodulators, Practical average envelope and peak envelope detectors.

Mixers, RF and IF amplifiers :

Superheterodyne concept, Mixer techniques, Practical mixer circuits, Tuned RF amplifiers, Double tuned circuits, Noise, distortion and cross modulation.

Unit-III

Frequency and phase modulation :

Principles and definitions, Relationship between phase frequency and phase modulation, Phase, frequency deviation, Spectrum of FM signal, Bandwidth consideration, Effect of modulation index on bandwidth, Pulse Modulation (PM) : Sampling theorem, Practical aspects of sampling, PAM, PPM and PWM, Narrow band and wide band FM and PM principles, stereophonic FM principles, FM demodulating principles, Limiting.

Unit-IV

FM modulators and demodulators : Direct and indirect FM generation, Frequency stabilization of modulators, Demodulation techniques, Frequency domain differentiation : slope demodulator, Time delay Differentiation, Foster Seely discriminator, Ratio detector, The phased locked loop, Frequency locked loop and frequency demodulation with feedback.

Unit-V

Noise in communication systems :

Sources of noise, Frequency domain representation of noise, Noise bandwidth, Noise temperature, signal to noise ratio, Noise in AM systems : SNR for coherent reception with DSBSC and SSBSC, noise in AM receiver using envelop detector, Noise in FM systems : Threshold effects, pre-emphasis and de-emphasis in FM.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional	: 25 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Books for reference :

- 1) Principles of Communication Systems by Herbert Taub & Donald L. Schilling, 3rd Edition, McGraw-Hill International Edition, 2002.
- 2) Communication Systems by Simon Haykin, 5th Edition, John Wiley & Sons, 2001.
- 3) Communication Systems : An Introduction to Signals and Noise in Electrical Communication by A. Bruce Carlson, 4th Edition, McGraw-Hill International Edition, 2002.
- 4) Electronic Communication Systems by G. Kennedy, 5th Edition, Tata McGraw-Hill, 2001.
- 5) Modern Analog and Digital Communication Systems by B.P. Lathi, 4th Edition, Oxford University Press, 2002.

ECE 3104 ELECTRONIC CIRCUIT - II

Unit-I

Stability and Response of Feedback Amplifiers :

Effect of feedback on stability, Stability, Frequency response of 2-pole/3-pole feedback amplifiers, Closed loop stability, Bode plot, Gain margin, Phase margin, Compensation.

Unit-II

Tuned Amplifiers :

Bandwidth consideration of tuned amplifier, Analysis of single and double tuned amplifiers, Stagger Tuning, Butterworth and Chebyshev response.

Unit-III

Operational Amplifiers : Operational amplifier architecture, Gain stage with active load, Differential stage : common mode and differential mode signals, Q-point analysis, CMMR; DC level shifting, Output stage, Offset voltages and currents. Slew rate, Applications of operational amplifier : Summing amplifier, difference amplifier, integrator and differentiator.

Unit-IV

Wave generators, wave shaping :

Sinusoidal Oscillators, Phase-shift oscillator, The Wein bridge oscillator, Square wave generation from sinusoid, Square wave and triangular wave generator, Voltage time base generator, Step generator, Modulation of square wave.

Unit-V

Filters :

Active RC filters, Butterworth and Chebyshev filter function, Switched capacitor filter.

Voltage regulators :

Discrete voltage regulators, Monolithic voltage regulators, Switching regulators.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional	: 25 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Books for reference :

- 1) Integrated Electronics by J. Millman & Halkias, 3rd Edition, Tata McGraw-Hill, 2001.
- 2) Microelectronics by J. Millman & A. Grabel, 4th Edition, Prentice-Hall of India, 2002.
- 3) Electronic Circuits, Discrete and Integrated by Schilling & Belove, McGraw-Hill International, 2002.
- 4) Electronic Devices and Circuit Theory by Boylestad & Nashelsky, 6th Edition, Prentice-Hall of India, 2002.
- 5) Microelectronics by R.T. Howe & C.G. Sodini, 5th Edition, Prentice-Hall of India, 2002.

ECE 3105 SOLID STATE DEVICES

Unit-I

The p-n junction :

Junction formation, Physical Description of the p-n junction, Step p-n junction at equilibrium, Depletion approximation, Biasing of p-n junction, Transition capacitance and varacter, Breakdown in p-n junction.

The p-n junction under forward bias :

Minority carrier injection, Space charge effect and diffusion approximation, DC current voltage characteristics, Tunneling current and tunnel diode, Charge storage and reverse transient.

Unit-II

Bipolar transistor fundamentals :

The transistor action, Current gains and current voltage characteristics, Derivation of current components and gain expressions, The Ebers-Moll model, Hybrid equivalent circuit, Transistor as switch, *pnpn* diode & Silicon controlled rectifier.

Unit-III

Metal Semiconductor Junctions :

Ideal Schottky barrier, Current-Voltage characteristics of Schottky barrier diode, Image force lowering of barrier height, Comparison between Schottky barrier and a p-n junction diode.

Unit-IV

JFET and MOSFET :

Physical description of FET, Theory of JFET, Static characteristics, Small signal parameters and equivalent circuits, Cut-off frequency, MOSFET.

MOSFET fundamentals :

Surface space charge regions of an Ideal MOS structure, The MOS capacitor, Flat band and threshold voltage, Static characteristics of MOSFET, Effect of substrate (body) bias, Short channel effects.

Unit-V

CCD Characteristics & Principles :

Solar Cells and Photo Detectors :

Optical absorption, Photo voltaic effect and solar cell, Light generated current and collection efficiency.

Light emitting and LASER diode :

Generation of light with p-n junction : the LED, Minority carrier injection and injection efficiency, Internal and external quantum efficiency.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional	: 25 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Books for reference :

- 1) Microelectronic Devices by Edward S. Yang, McGraw-Hill International Edition, 2002.
- 2) Solid State Electronic Devices by Ben G. Streetman, 4th Edition, Prentice-Hall of India, 2001.
- 3) Semiconductor Devices by D. Nagchoudhuri, 5th Edition, Tata McGraw-Hill, 2002.
- 4) Semiconductor Devices : Physics and Technology by S.M. Sze, 4th Edition, John Wiley & Sons, 2002.

ECE 3106 DIGITAL COMPUTER ORGANISATION AND ARCHITECTURE

Unit-I

The Evolution of Computers :

Computers and computations, Limitations of computers; First, second and third generation of computer families.

The VLSI era : Integrated circuits, Microprocessors and Microcomputers, recent developments.

Design methodology :

System modelling, design levels; The gate level: Combinatorial circuits, sequential circuits; The register level :

Processor level components, design techniques and queuing models.

Unit-II

Processor Design :

Processor organization, information representation, number formats; Instruction sets: instruction formats: instruction types, execution of instructions; fixed -point arithmetic: addition and subtraction, multiplication, division; ALU design: basic ALU organization, Floating point arithmetic, arithmetic processors.

Unit-III

Controller Design :

Instruction sequencing and instruction interpretation; Hardware control: design methods, multiplier control unit; Microprogrammed control: basic concepts, control-memory optimization, multiplier control unit; Microprogrammed computers: CPU control units, a conventional computer, nanoprogrammed computers.

Unit-IV

Memory organization :

CPU – memory interaction, Memory array organization and technology, Multiple module memory; Virtual memory: Memory hierarchies, main-memory allocation, segment, pages and files; High speed memories: Interleaved memories, caches and associative memories.

Unit-V

Input-output processing :

Data transfer technique, Bus interface, IO accessing and data transfer, IO interrupts, IO Channel/ Processor.

Peripheral systems :

Principles of DOT matrix, inkjet and laser printers, magnetic memory systems, Video display unit and interface.

Introduction to parallel processing :

Concepts of pipelining and parallel processing, Applications of parallel processing.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional	: 25 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Books for reference :

- 1) Computer Architecture and Organization by John P. Hayes, McGraw-Hill international Edition, 2002.
- 2) Computer Organization and Design by P. Pal Chaudhuri, 3rd Edition, Prentice-Hall of India, 2002.
- 3) Computer System Design and Architecture by V.P. Heuring & H.F. Jordan, 4th Edition, Addison Wesley Longman, 2001.
- 4) Computer Architecture and Parallel Processing by Kai Hwang & F.A. Briggs, McGraw-Hill international Edition, 2002.

ECE 3107 ELECTRONICS LABORATORY - III

Distribution of Marks:

Practical Examination	: 100 marks	Exam 4 hrs. Duration
Sessional	: 25 marks	

FOLLOWING EXPERIMENTS TO BE CONDUCTED IN THE LABORATORY :

1. **Distance/Velocity Lag :**
To observe and measure the distance/velocity lag of a process caused due to an alteration to the condition of a process after a time interval.
2. **Transfer Lag :**
To observe and measure the transfer lag of a process when a step change is applied at the input.
3. **Calibration :**
To obtain the relationship between set value and heater power & between air temperature rise and heater power.
4. **Two Step Control :**
To observe the effect of overlap on the frequency of the controller output signal in case of two step control.
5. **Proportional Control :**
To observe the effect of change in proportional band on the deviation or offset and heater power.
6. **Disturbance and System Response :**
To observe the effect of change in proportional band on the response of the system due to different forms of disturbance.
7. **Proportional & Derivative Control of an Inertia Load :**
To observe the action of derivative controller along with proportional controller over the control of an inertia load and to control the undamped oscillation with the help of PD controller.
8. **Frequency Response :**
To assess the closed loop stability of the system by applying a sine-wave to the input in open-loop and measuring the amplitude and phase of the output signal and to plot the results on a Nyquist or Bode diagram.
9. **Amplitude Modulation :**
To observe & assess the Amplitude Modulator using transistor and demodulation of AM signal using Diode detector.
10. **Frequency Modulation :**
To demonstrate the Voltage Controlled Oscillator (VCO) based Frequency modulator and Phased locked loop (PLL) based FM demodulator and to observe FM wave forms and to calculate the frequency deviation.
11. **Phased Lock Loop :**
To study the operation of Phased locked loop (PLL) and to calculate the capture range, lock range and free running frequencies and verify them with theoretical values.
12. **Balanced Modulator :**
To verify the Double Side Band Suppressed Carrier (DSB-SC) modulator with the help of dedicated Balanced Modulator.
13. **Pulse Amplitude modulation & demodulation :**
To study the Pulse Amplitude Modulation (PAM) and Demodulation of PAM signal.
14. **Pulse Width Modulation & Pulse Position Modulation:**
To generate PWM & PPM signals with Op-Amp based timer circuits and to observe PWM & PPM signals for various levels of DC input signals, AF signals and demodulation of PWM and PPM signals.
15. **Integrator & Differentiator using Op-Amp :**
To observe differentiator, integrator output at different RC time constants and to plot the output wave forms for square wave input of different frequencies.

Instruction for Paper Setter:

All the experiments listed above to be included in the question paper. The candidate shall be asked to draw any three of the experiments from the lot and to carry out the experiments in the laboratory.

ECE 3108 ELECTRONICS LABORATORY - IV

Distribution of Marks:

Practical Examination
Sessional

: 100 marks

: 25 marks

Exam 4 hrs. Duration

FOLLOWING EXPERIMENTS TO BE CONDUCTED IN THE LABORATORY :

- 1) Characteristics of Zener Diode, Zener Voltage Regulator.
- 2) Design and performance characteristics of Halfwave, Fullwave and bridge rectifiers without filter and with capacitor filter.
- 3) Determination of h-parameters using static characteristics of a transistor in CE and CB mode.
- 4) Static characteristics of FET, parameter calculation.
- 5) Characteristics of UJT, intrinsic stand off ratio.
- 6) Static characteristics of MOSFET, parameter calculations.
- 7) Characteristics of photo diodes and photo transistors.
- 8) Verification of Thevenin's, Norton's and maximum power transfer theorem.
- 9) Characteristics of series and parallel resonance circuits.
- 10) Design, fixation of operating point and performance characteristics of (i) R-C coupled amplifier, (ii) Transformer coupled amplifier and (iii) Emitter follower.
- 11) Design, fixation of operating point and performance characteristics of (i) FET Darlington Emitter follower, (ii) FET Voltage series feed back amplifier and (iii) Single tuned amplifier.
- 12) Class B and Class AB push-pull amplifier design, characteristics and efficiency calculation.
- 13) Design and study of (i) Crystal oscillator using FET, (ii) Hartley/Colpitt's oscillator using FET.
- 14) Diode clipping/clamping circuits using diodes (single/double).
- 15) Analysis and Design of (i) Astable multivibrator using OP-amp, (ii) Monostable multivibrator using Op-amp and (iii) Schmitt Trigger.

Instruction for Paper Setter:

All the experiments listed above to be included in the question paper. The candidate shall be asked to draw any three of the experiments from the lot and to carry out the experiments in the laboratory.

**Branch : Electronics & Communication Engineering
Sixth Semester**

Subject Code	Subject	Number of hours Per week			Duration of Examination in hours		Marks		
		L	T	P	Theory	Practical	Examination	Sessional *	Total
ECE 3201	Principles of Management and Project Appraisal	3	1	-	3	-	100	25	125
ECE 3202	Advanced Microprocessor	3	1	-	3	-	100	25	125
ECE 3203	Digital Communications	3	1	-	3	-	100	25	125
ECE 3204	System Programming	3	1	-	3	-	100	25	125
ECE 3205	Electromagnetic Wave Theory	3	1	-	3	-	100	25	125
ECE 3206	Instrumentation Engineering	3	1	-	3	-	100	25	125
ECE 3207	Laboratory - V	-	-	4	-	4	100	25	125
ECE 3208	Laboratory - VI	-	-	4	-	4	100	25	125
	Total	18	6	8	Total Marks			1000	

Course : Bachelor of Engineering (Electronics & Communication Engineering)

DETAILED SYLLABUS

Sixth Semester

ECE 3201/CSE 3201 PRINCIPLES OF MANAGEMENT AND PROJECT APPRAISAL (Common Paper for Computer Science & Engineering)

Unit-I

Management :

Definition of management. Functions of management.

Functional areas of management : Financial Management, Marketing management, Personnel management, Production management (Concepts).

Social responsibility of Business Management.

Organisation and Management : Organisational Structure, Delegation of Authority, Centralisation and Decentralisation, Line and Staff Organisation, Span of Control.

Unit-II

Entrepreneurship:

Entrepreneurship – Role for Industrial Development. Steps to be taken for establishing the small scale unit.

Managerial Economics :

Definition and its scope; Law of Demand; Law of Diminishing Marginal Utility; Law of Elasticity of Demand; Types of Business Organizations; Sources of finance (at national level); Indian Government Policy for Industrial Development and current developments in trade and industry.

Unit-III

Labour Legislations in India :

Provisions and definition; Factories Act, 1948; Industrial disputes Act, 1947; Workmen Compensation Act, 1923.

Unit-IV

Cost Accounting :

Meaning, cost classification, objectives; Elements of cost and cost determination – Material Cost, Methods of Labour cost and Recovery of overheads, Preparation of Cost Sheet and estimate (Problems).

Unit-V

Project Appraisal :

Broad criteria for pre-investment decisions, Different types of appraisal – Financial techniques for project appraisal and feasibility, Discounted Cash flow and non discounted cash flow methods (Payback period, net present value, internal rate of return, annual cost method etc.), Non-financial justification of Projects.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional	: 25 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Books for reference :

- 1) Industrial Engineering and Management by O.P. Khanna, 3rd Edition, Dhanpat Rai & Sons, New Delhi, 2001.
- 2) Essentials of Management by H. Koontz & H. Weirich, 5th Edition, Tata McGraw-Hill, 2001.
- 3) Cost Accounting by S.P. Jain & K.L. Narang, 6th Edition, S. Chand & Co., 2002.
- 4) Elementary Economic Theory by K.K. Dewatt & J.D. Verma, 4th Edition, S. Chand & Co., 2001.
- 5) Elements of Mercantile Law by N.D. Kapoor, 3rd Edition, S. Chand & Co., 2001.
- 6) Preparation, Appraisal, Budgeting and Implementation by Prasanna Chandra, 3rd Edition, Tata McGraw-Hill, 2001.
- 7) Project Management by S. Choudhury, 3rd Edition, Tata McGraw-Hill, 2002.
- 8) Industrial Engineering and Management by Banga, Sharma & Agrawal, S. Chand & Co., 2001.

ECE 3202 ADVANCED MICROPROCESSORS

Unit-I

Introduction :

Important features, Educational need, Applications.

Microprocessor architecture :

Arithmetic Logic Unit (ALU), Timing and control unit, Registers, Data and Address bus, Interface unit, Intel 8085 instructions, Instruction word size: one byte, two byte and three byte instructions, Timing and control signals, Fetch operations, Machine cycle and state, Instruction and data flow, System timing diagram.

Unit-II

Programming microprocessors :

Data representation, Instruction formats, Addressing modes, Instruction set, Assembly language programming, Program looping, Subroutine linkage.

Unit-III

Memory interfacing :

Types of main memories, Compatibility between memory and system bus, Address space, Partitioning of address space, Special chips for address decoding, ROM and RAM interfacing.

Unit-IV

Data transfer techniques and their implementation :

Programmed data transfer, DMA mode of transfer, I/O port, Device polling in interrupt driven mode of data transfer, DMA controller and data transfer in DMA mode, Serial mode of data transfer, Introduction to Standard interface chips : 8155, 8255, 8259, 8253, 8279, 8272 and 8251.

Common peripherals and their interfacing :

Keyboard, LEDs, Common display and keyboard scanning.

Unit-V

Important features of some advanced microprocessors :

16 bit microprocessor families : MOTOROLA 68000: The CPU components, Instruction sets, addressing modes etc, Intel 8086/8088: The CPU components, Instruction sets, addressing modes etc.; 32 bit microprocessor families : MOTOROLA 68020, Intel 80386, 486, Pentium Pro; RISC microprocessors : SUN SPARC, HP precision architecture.

Applications of Microprocessors :

Temperature monitoring and control system, Stepper motor control and applications, d.c. motor control, airport conveyor belt control, digital clocks for railway station, automatic airport night landing system, automatic traffic lights.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional	: 25 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Books for reference :

- 1) Digital Systems and Microprocessors by John P. Hayes, McGraw-Hill International Edition, 2002.
- 2) Microprocessor Architecture, Programming and Applications by R.S. Gaonkar, 4th Edition, John Wiley & Sons, 2001.
- 3) Microprocessor and Interfacing : Programming and Hardware by D.V. Hall, McGraw-Hill International Edition, 2002.
- 4) Advanced Microprocessor by Daniel Tabak, McGraw-Hill International Edition, 2002.

ECE 3203 DIGITAL COMMUNICATIONS

Unit-I

Introduction : Source, Encoding.

Pulse Code Modulation (PCM) :

Linear and nonlinear quantisation, Calculation of quantisation errors, Intersymbol interference, Eye pattern and equalization, Multiplexing of PCM signals.

Unit-II

Delta Modulation :

Quantisation error in Delta Modulation, Limitations of Delta Modulation, Slope over load, Adaptive Delta Modulation, Differential PCM, Linear predictive encoding.

Digital Modulation techniques :

Concepts of phase, amplitude and frequency shift keying, BPSK, DPSK, DEPSK, QPSK, M-ary PSK, QASK, BFSK, M-ary FSK, QAM.

Unit-III

Data transmission and reception :

Probability of error, Coherent detection of signals in presence of noise, Correlation receiver. Matched filter, Coherent detection of BPSK and BFSK signals, Noncoherent detection of FSK signals, Effects of inter symbol interference.

Unit-IV

Synchronization :

Need for Synchronization, Bit Synchronizer, In phase and mid phase Synchronizer, Early-late Synchronizer, Frame Synchronization.

Information Theory and Coding :

Unit-V

Discrete messages, Concept of information, Entropy, Information rate, Mutual information, Coding to increase average information per bit, Shannon's theorem, Channel capacity, Capacity of Gaussian channel, Bandwidth and S/N trade off, Orthogonal signals to attain Shannon's limit, Introductory ideas of different types of coding.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional	: 25 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Books for reference :

- 1) Digital Communication by John Proakis, 4th Edition, Tata McGraw-Hill, 2002.
- 2) Digital Communications by Simon Haykin, 3rd Edition, John Wiley & Sons, 2002.
- 3) Principles of Communication Systems by Herbert Taub & Donald L. Schilling, 3rd Edition, McGraw-Hill International Edition, 2002.
- 4) Digital Communications by P. Chakraborty

ECE 3204 SYSTEM PROGRAMMING

Unit-I

Machine Structure, Machine Language and Assembly language :

General approach to a new Machine, Machine Structure : Memory, Registers, Data, Instructions, Special features; Machine Language program without looping, Different Addressing Modes, Programs with looping ; Assembly Language : Introduction, Examples of Assembly Language Programming, Assembly Language programming using literal.

Unit-II

Assemblers :

General design procedure, Design of assembler : Statement of problem, Data structure, Format of databases, Algorithm.

Unit-III

Macro Language and the Macro Processor :

Macro instructions, Features of a Macro facility : Macro instruction arguments, Conditional Macro expansion, Macro calls within Macros, Macro instructions defining macros; Implementation : Implementation of a restricted facility : A Two-pass algorithm, A single-pass algorithm, Implementation of Macro Calls within Macros, Implementation within an assembler.

Unit-IV

Loaders :

Loader schemes : General Loader scheme, Absolute Loaders, Subroutine linkages, Relocating Loaders, Direct linking Loaders, Other Loader schemes; Design of a direct linking Loader : Specification of the problem, Specification of data structures, Format of databases, Algorithm.

Unit-V

Introduction to Operating Systems :

Basic operating system functions : Types of operating systems, User interface, Runtime environment; Machine dependent operating system features : Interrupt processing, Process scheduling, I/O supervision, Management of virtual memory; Machine-Independent operating system features, File processing, Job scheduling, Resource allocation, Protection.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional	: 25 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Books for reference :

- 1) System Programming by J.J. Donovan, 4th Edition, Tata McGraw-Hill, 2001.
- 2) System Software by L.L. Beck, 3rd Edition, Addison Wesley Longman, 2002.
- 3) System Programming and Operating Systems by D.M. Dhamdhare, 2nd Revised Edition, Tata McGraw-Hill, 2002.

ECE 3205 ELECTROMAGNETIC WAVE THEORY

Unit-I**Electrostatic :**

Concept of electric field, Electric flux, Flux density, Gauss's Law, Conservation property of electrostatic fields, Electrostatic fields, Electrostatic potential, Capacitance, Laplace and Poisson's equation, Boundary conditions in electrostatics, Use of image method, Numerical solution to Laplace and Poisson's equations, Electrostatic Energy, Uniqueness theorem.

Unit-II**Stationary magnetic field :**

Concept of magnetic field, Magnetic flux, Flux density, Ampere's Law, Vector magnetic potential, Boundary condition, Energy stored in steady magnetic fields.

Unit-III**Electromagnetic Theory :**

Voltage induced by changing magnetic fields : Faraday's law, Conservation of charge and concept of displacement current, Maxwell's equation for time periodic case, Wave equations, Power flow in EM fields : Poynting's theorem, Boundary conditions, Penetration of EM in good conductors, Skin effect, Surface impedance.

Unit-IV**Electromagnetic Waves :**

Uniform plane wave in dielectric media, Reflection of waves, Brewster angles, Critical angle, SWR, Basic concept of transmission lines and wave guide, Radiation of EM waves.

Unit-V

Introduction to Computational Methods in Electromagnetics: Application of numerical methods in electromagnetics.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional	: 25 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Books for reference :

- 1) Electromagnetic Waves and Radiating Systems by E.C. Jordan & K.G. Balmain, 4th Edition, John Wiley & Sons, 2001.
- 2) Fields and Waves in Communications Electronics by S.Ramo, J.R. Whinnery & T.Van Suzer, 3rd Edition, John Wiley & Sons, 2002.
- 3) Applied Electromagnetic by Martin A. Plonus, 3RD EDITION, Prentice-Hall of India, 2002.
- 4) Engineering Electromagnetic by William H. Hayt Jr., 4th Edition, Tata McGraw-Hill, 2001.

ECE 3206 INSTRUMENTATION ENGINEERING

Unit-I**Introduction :**

Generalized instrumentation system (Functional description), Role of transducers, amplifiers, filters, display devices, etc., Review of idea on transducers.

Unit-II**Transducers :**

Active electric transducers : Piezoelectric, Thermoelectric, Magnetolectric, Photoelectric transducers, Tachometer, Electromagnetic flowmeters; Feedback transducers : Inverse transducers, temperature balance system and Feed back accelerometer; Nuclear radiation transducers.

Unit-III

Actuators :

Solenoid valve, Stepper motor, Relays.

Amplifiers and Filters :

Basic characteristics of amplifiers, DC amplifiers, OPAMPs, Instrumentation amplifiers, Isolation amplifiers, Signal conditioning, Types of filters, Active and passive filters, Frequency transformation, Realization of practical filters.

Unit-IV

Data acquisition and conversion :

Instrumentation systems, Interfacing transducers to electronic control and measuring systems, DA and AD converters, Multiplexers, Sample and Hold circuits.

Unit-V

Data Transmission and telemetry :

Definition of telemetry, Classification, Description of current, voltage, position telemetering systems, R.F. telemetry, Data transmission systems and modulation techniques for digital data transmission.

Data Display and Recording Systems :

Data loggers, Analog indicators, Digital read out systems, Analog recorders (CRO), Magnetic tape recorders (types of recording and description), Digital input-output devices.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 25 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Books for reference :

- 1) Modern Electronic Instrumentation and Measuring Techniques by A.D. Helfrick & W.D. Cooper, 3rd Edition, Prentice-Hall of India, 2002.
- 2) Electronic Measurement and Instrumentation by B.M. Oliver & J.M. Cage, McGraw-Hill International Edition, 2001.
- 3) Transducers and Instrumentation by D.V.S. Murty, 3rd Edition, Prentice-hall of India, 2002.
- 4) Sensors and Transducers by D. Patranabis, 2nd Edition, Wheeler Publishing Co., 2002.

ECE 3207 ELECTRONICS LABORATORY - V

Distribution of Marks:

Practical Examination	: 100 marks	Exam 4 hrs. Duration
Sessional	: 25 marks	

FOLLOWING EXPERIMENTS TO BE CONDUCTED IN THE LABORATORY :

- (1) Data transfer Instructions in 8085 : Byte and Double Byte transfer between memory and registers in different addressing modes and Block data transfer.
- (2) Logic Instructions in 8085 : Comparison of contents of two registers and decision making depending on whether the content of a register is equal to, less than or more than the content of the other.
- (3) Looping instructions in 8085 : Counting, Software delays of microsecond and millisecond durations.
- (4) Arithmetic and Boolean instructions in 8085 : Addition, Subtraction, Multiplication and Division of 8 and 16 bit unsigned hexadecimal numbers – 2's compliment subtraction, Boolean operations and Shift & Rotate operations.
- (5) Conditional and unconditional Subroutine Calls in 8085 : Conditional CALL and RETURN, Parameter passing techniques.
- (6) Waveform Generation Using ADC, DAC.
- (7) Use of 8255 in handshake mode.
- (8) Programming 8279.
- (9) Interfacing 8253/8254 to generate timing signals.
- (10) Verification of sampling theorem using Flat top samples.
- (11) TDM and recovery of two band limited signals of PAM signals.
- (12) ASK generation & detection (binary)
- (13) FSK generation & detection (binary)
- (14) DPSK generation & detection (binary)
- (15) QPSK modulator.

Instruction for Paper Setter:

All the experiments listed above to be included in the question paper. The candidate shall be asked to draw any three of the experiments from the lot and to carry out the experiments in the laboratory.

ECE 3208 ELECTRONICS LABORATORY - VI**Distribution of Marks:**

Practical Examination
Sessional

: 100 marks
: 25 marks

Exam 4 hrs. Duration

Following experiments to be conducted on IBM compatible Personal Computers using suitable software tools like Assemblers, Linkers and Debuggers :

- (1) Data Transfer Instructions in 8086 : Byte and word data transfer in different addressing modes; String transfers in both directions.
- (2) Arithmetic and Boolean Operations in 8086 : Addition, Subtraction, Multiplication and Division of signed and unsigned hexadecimal numbers; ASCH adjustment instructions.
- (3) Boolean Instructions in 8086 : Bit manipulation instructions.
- (4) Processor control instructions in 8086 : Instructions to set and reset various control flags in 8086.
- (5) Branch Instructions in 8086 : Near and Far calls and returns; Conditional and unconditional jumps of both types.
- (6) Software and Conditional Interrupts to 8086 : Int n. Divide Error; Overflow interrupts; break point and single step interrupts; vector table handling.
- (7) Interfacing 8255 to 8086 Input/Output of byte/word : Microcontrollers.
- (8) To design a digital clock using only a single microcomputer.
- (9) To design a traffic light control system of a two way crossing using 8085 & 8255.
- (10) Design and implementation of digital clock in hardware using 8085 & its peripherals.
- (11) Driving of stepper motor using 8085.

Following experiments are to be conducted in the laboratory :

- (12) Determination of modes, transit time, electronic tuning range and sensitivity of a Reflex Klystron.
- (13) Determination of coupling coefficient and insertion loss of Directional coupler and Magic Tee.
- (14) Measurement of Directivity Beam width & Gain of any two types of Antennas.

Instruction for Paper Setter:

All the experiments listed above to be included in the question paper. The candidate shall be asked to draw any three of the experiments from the lot and to carry out the experiments in the laboratory.

5:2:12(1)

xii) Draft Syllabi for B.E.in Computer Science and Engineering.

The Board of Under-Graduate Studies in Bachelor of Engineering in Computer Science and Engineering in its meeting held on 19th May'03 approved the draft syllabi after correcting and incorporating the Modifications by the Principal, Shillong Engineering and Management College for 5th and 8th semesters.

The minutes of the meeting is placed as Annexure-'A' and the draft Syllabi as Annexure-'B'

The matter is placed before the Council for consideration.

SG

North-Eastern Hill University
Shillong

Minutes of the meeting of the Board for Under-Graduate Studies in Bachelor of Engineering in Computer Science & Engineering (C.S.E.) held at 11.00 a.m. on May 19, 2003 at the Computer Centre, N.E.H.U., Shillong – 793 003

1. Dr. S.N. Rai, Chairman, Professor R.N. Sharan, Professor Malay Dutta, Fr. J. Nellanatt, Mr. S. Nagi, Mr. B. Roy Choudhury, Dr. Padmini Bhattacharjee and Mr. P.K. Baruah were present at the meeting.
2. The draft syllabi for 5th to 8th Semesters were taken up for discussion.
3. Mr. P.K. Baruah, Principal, Shillong Engineering & Management College was entrusted to make the corrections and incorporate the modifications suggested by the members in the draft syllabi and pass it on to the Chairman, Board of Under-Graduate Studies for onward submission to the Academic Council.
4. Subject to item 3 above, the syllabi was approved.
5. The meeting ended at 1.00 p.m. with thanks to the members from the Chair.

S. N. Rai
19-05-2003

S.N. Rai, Chairman
19-05-2003

NORTH-EASTERN HILL UNIVERSITY (N.E.H.U.) : SHILLONG
(A Central University)

DRAFT
SYLLABI

for

BACHELOR OF ENGINEERING in COMPUTER SCIENCE & ENGINEERING
(A FOUR YEAR DEGREE COURSE)

From FIFTH SEMESTER to EIGHT SEMESTER

**Branch : Computer Science & Engineering
Fifth Semester**

Subject Code	Subject	Number of hours Per week			Duration of Examination in hours		Marks					
		L	T	P	Theory	Practical	Theory		Practical		Total	
							Examination	Sessional	Examination	Sessional		
CSE 3101	Numerical Analysis & Algorithms	3	-	2(P/T)	3	-	100	25	-	25	150	
CSE 3102	Control System Engineering	3	1	-	3	-	100	50	-	-	150	
CSE 3103	Data Communications	3	1	2	3	-	100	25	-	25	150	
CSE 3104	Computer Organisation and Architecture - I	3	1	-	3	-	100	50	-	-	150	
CSE 3105	Computer Graphics	3	1	-	3	-	100	50	-	-	150	
CSE 3106	Microprocessors and Peripherals	3	1	-	3	-	100	50	-	-	150	
CSE 3107	Control System Laboratory	-	-	3	-	3	-	-	25	25	50	
CSE 3108	Computer Graphics Laboratory	-	-	2	-	3	-	-	25	25	50	
	Total	18	5	9							Total Marks	1000

Course : Bachelor of Engineering (Computer Science & Engineering)

DETAILED SYLLABUS

Fifth Semester

CSE 3101/ECE 3101 NUMERICAL ANALYSIS AND ALGORITHMS (Common Paper for Electronics & Communication Engineering)

Unit-I

Idea of Computational Algorithms.

Error in numbers. Absolute, Relative and Percentage errors. Approximation by Digital Computer and sources of errors. Significant figures of a number. Rounding of a number. Errors in sum, product, quotient.

Unit-II

Numerical solution of transcendental and algebraic equation – Method of iteration with convergence criterion, Newton-Raphson Method with convergence criterion. Multiple roots and complex roots.

Numerical solution of a system of linear algebraic equations – Gaussian Elimination Method, Gauss-Jordan Method, Gauss-Siedel Method.

Unit-III

Matrix Inversion by Gauss-Jordan Method.

Finite difference, interpolation and extrapolation. Newton's forward and backward formulae. Gauss's forward and backward formulae. Stirling's and Bessel's interpolation formulae. Lagrange's interpolation formula for unequal intervals. Divided difference. Newton's divided difference formula. Numerical differentiation.

Unit-IV

Numerical integration – Newton-Cotes quadrature formula. Trapezoidal Rule, Simpson's 1/3 rd and 3/8 th rules with error estimation. Romberg's Method. Gaussian quadrature formula.

Unit-V

Numerical solution of ordinary differential equations with initial value – Taylor's Series Method, Euler's and modified Euler's Methods. Runge-Kutta Method of 4th order. Milne's Predictor-Corrector Method.

An introduction to linear differential equation with constant coefficient.

** All methods should be associated with corresponding numerical algorithms and programming in FORTRAN or C language.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 25 marks	
Sessional (practical)	: 25 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Book for study :

- 1) Numerical Methods in Engineering and Sciences by Dr. B.S. Grewal, 4th Edition, Khanna Publishers, 2001.
- 2) Introductory Methods for Numerical Analysis by S.S. Sastry, 5th Edition, Prentice-Hall, 2002.

Suggested Reading :

- 3) Computational Mathematics by Demidovich & Maron, 2nd Edition, Mir Publishers, 2001.
- 4) Applied Numerical Analysis by Gerald & Wheatley, 3rd Edition, Addison Wesley Longman, 2000.
- 5) Numerical Methods in Engineering and Sciences – A Practical Approach by S. Rajasekaran, 2nd Edition, Wheeler Publishing, 2001.
- 6) Numerical Method by E. Balagurusamy, 4th Edition, , Tata McGraw-Hill, 2000.

CSE 3102/ECE 3102 CONTROL SYSTEM ENGINEERING (Common Paper for Electronics & Communication Engineering)

Unit-I

Introduction :

The control problem and solution possibilities. The notion of objective/specifications, Feedback as natural strategy, Regulation and tracking problems.

Models of physical systems :

Definition of transfer function. Examples of transfer function : Mechanical, Electrical (lag networks, lead networks, lag-lead networks) and Hydraulic. Examples of transfer function : Systems with dead zone.

Unit-II

Servo Components (Deduction of transfer function only) :

Potentiometers, Synchros, DC and AC Servometers, Techogenerators, Gyroscope, Amplidyne, Hydraulic actuators.

Mathematical Tools :

Differential equation, Forced response, Laplace transforms, Transfer functions of components and block diagram, State transition matrix, Signal flow graphs.

Unit-III

Stability analysis in time domain :

Steady state and transient response (Time domain and state variable approach), Root locus technique.

Unit-IV

Stability analysis in frequency domain :

Bode plot, Nyquist plot.

Case Studies :

Hydraulic control system, Instrument servomechanism, Gyro control system.

Unit-V

Introduction to non linear control :

Describing function technique.

Specific topics : Optimal Control Theorem, Controllability and observability.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Books for study:

- 1) Modern Control Engineering by K. Ogata, 3rd Edition, Prentice-Hall India, 2002.
- 2) Control Systems Engineering by I.J. Nagrath & M. Gopal, 2nd Edition, New Age International, 2001.

Suggested Reading :

- 3) Control Systems by M. Gopal, 2nd Edition, Tata McGraw-Hill, 2001.
- 4) Modern Control Engineering by R.C. Dorf & R.H. Bishop, 3rd Edition, Addison Wesley Longman, 2002.
- 5) Feedback and Control Systems, Schaum's Outline Series, McGraw-Hill, 2001.

CSE 3103 DATA COMMUNICATIONS

Unit-I

Spectral Analysis :

Classification of signals, Bandwidth and noise limitations, Fourier series and Fourier transform Normalized power, Power spectral density, Parseval's theorem, Dirac delta function, Transmission of signals through linear systems, Correlation between waveforms, Pre-envelope.

Unit-II

Analog Modulation technique :

Amplitude modulation (AM), Single Side Band (SSB), Frequency Modulation (FM), Quantization of signals, Pulse Modulation (PM) : sample theorem, FDM and TDM, PAM, PCM, DM and ADM.

Unit-III

Data Communication Systems :

Concept of phase, amplitude and frequency shift keying, BPSK, DPSK, DEPSK, QPSK, M-ary PSK.

Unit-IV

Elementary noise studies :

Sources of noise, Frequency domain representation of noise, Noise in AM system, Noise in FM system.

Unit-V

Introduction to information theory and coding :

Discrete messages, Concept of information, Entropy, Discrete noiseless channel, Error control coding : linear block codes and cyclic codes.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 25 marks	
Sessional (Practical)	: 25 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Books for study :

- 1) Communication Systems : An Introduction to Signals and Noise in Electrical Communication by A. Bruce Carlson, 2nd Edition, McGraw-Hill International Edition, 2002.
- 2) Communication Systems by Simon Haykin, 4th Edition, John Wiley, 2001.

Suggested Reading :

- 3) Principles of Communication Systems by H. Taub & D.L. Schilling, McGraw-Hill International Edition, 2000.
- 4) Information Transmission, Modulation and Noise by Mischa Schwartz, 4th Edition, Addison Wesley Longman, 2001.
- 5) Analog Communication by P. Chakraborty, 3rd Edition, Prentice-Hall of India, 2001.

CSE 3104 COMPUTER ORGANISATION AND ARCHITECTURE - I**Unit-I****Evolution of Computers :**

Computers and computations, Limitations of computers; First, second and third generation of computer families. The VLSI era : Integrated circuits, Microprocessors and Microcomputers, recent developments.

Design methodology :

System modelling, design levels; The gate level: Combinatorial circuits, sequential circuits; The register level : Processor level components, design techniques and queuing models.

Unit-II**Processor Design :**

Processor organization, information representation, number formats; Instruction sets: instruction formats: instruction types, execution of instructions; fixed –point arithmetic: addition and subtraction, multiplication, division; ALU design: basic ALU organization, Floating point arithmetic, arithmetic processors.

Unit-III**Controller Design :**

Instruction sequencing and instruction interpretation; Hardware control: design methods, multiplier control unit; Microprogrammed control: basic concepts, control-memory optimization, multiplier control unit; Microprogrammed computers: CPU control units, a conventional computer, nanoprogrammed computers.

Unit-IV**Memory organization :**

CPU – memory interaction, Memory array organization and technology, Multiple module memory; Virtual memory: Memory hierarchies, main-memory allocation, segment, pages and files; High speed memories: Interleaved memories, caches and associative memories.

Unit-V**Input-output processing :**

Data transfer technique, Bus interface, IO accessing and data transfer, IO interrupts, IO Channel/ Processor.

Peripheral systems :

Principles of DOT matrix, inkjet and laser printers, magnetic memory systems, Video display unit and interface.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Books for study :

- 1) Computer Architecture and Organization by John P. Hayes, 3rd Edition, McGraw-Hill International Edition, 2001.

2) Computer Organization by Andrew S. Tanenbaum, 4th Edition, Prentice-Hall India, 2000.

Suggested Reading :

3) Computer Organization and Design by P. Pal Chaudhuri, 2nd Edition, Prentice-Hall India, 2002.

4) Computer Systems Design and Architecture V.P. Heuring & H.F. Jordan, 2nd Edition, Addison Wesley Longman, 2001.

5) Computer Organization by V.C. Hamacher *et.al.*, 4th Edition, McGraw-Hill International Edition, 1999.

CSE 3105 COMPUTER GRAPHICS

Unit-I

Development of computer graphics :

Basic graphic systems and standards, Raster scan and random scan graphics, Continual refresh and storage displays, Display processors, Colour display techniques, Frame buffer and bit operations, Concepts in Raster graphics.

Output primitives :

Points and lines, Line drawing algorithms, Circle and ellipse generating algorithms, Conic sections, Polynomials and Spline curve, Polygon filling, Antialiasing.

Unit-II

Two dimensional geometric transformation :

Basic transformation, Matrix representations and homogeneous coordinates, Composite transformations, Transformation between coordinate systems, Transformation functions, Raster methods for transformations.

Unit-III

Two dimensional viewing :

The viewing pipeline, Viewing coordinate reference frame, Window to viewport coordinate transformation, Two dimensional viewing functions, Clipping operations, Points, line, polygon and character clipping.

Unit-IV

Three dimensional concepts :

3-D representations and transformations, 3-D viewing, Algorithm for 3-D volumes, Spline curves and surfaces, Fractal geometric method, Quadtree, Octrees.

Unit-V

Rendering :

A simple illumination model, Determining surface normal, Determining the reflection vector, Gouraud shading, Phong shading, Transparency.

Introduction to Graphical input device handling algorithms; data structures for computer graphics; Brief introduction to graphic processors.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Books for study :

1) Principles of Interactive Computer Graphics by W.M. Newman & R.F. Sproull, 3rd Edition, McGraw- Hill International Edition, 2001.

2) Computer Graphics by D. Hearn & M.P. Baker, 3rd Edition, EEE Edition, Prentice-Hall India, 2002.

Suggested Reading :

3) Procedural Elements for Computer Graphics by D.F. Rogers, 3rd Edition, McGraw-Hill International Edition, 2002.

4) Computer Graphics for Scientists and Engineers by Asthana & N.K. Sinha, 2nd Edition, New Age International Publishers, 2001.

CSE 3106 MICROPROCESSORS AND PERIPHERALS

Unit-I

Introduction :

Important features, Educational need, Applications.

Microprocessor architecture :

Arithmetic Logic Unit (ALU), Timing and control unit, Registers, Data and Address bus, Interface unit, Intel 8085 instructions, Instruction word size: one byte, two byte and three byte instructions, Timing and control signals, Fetch operations, Machine cycle and state, Instruction and data flow, System timing diagram.

Unit-II

Programming microprocessors :

Data representation, Instruction formats, Addressing modes, Instruction set, Assembly language programming, Program looping, Subroutine linkage.

Unit-III

Memory interfacing :

Types of main memories, Compatibility between memory and system bus, Address space, Partitioning of address space, Special chips for address decoding, ROM and RAM interfacing.

Unit-IV

Data transfer techniques and their implementation :

Programmed data transfer, DMA mode of transfer, I/O port, Device polling in interrupt driven mode of data transfer, DMA controller and data transfer in DMA mode, Serial mode of data transfer, Introduction to Standard interface chips : 8155, 8255, 8259, 8253, 8279, 8272 and 8251.

Common peripherals and their interfacing :

Keyboard, LEDs, Common display and keyboard scanning.

Unit-V

Important features of some advanced microprocessors :

16 bit microprocessor families : MOTOROLA 68000: The CPU components, Instruction sets, addressing modes etc, Intel 8086/8088: The CPU components, Instruction sets, addressing modes etc.; 32 bit microprocessor families : MOTOROLA 68020, Intel 80386, 486, Pentium Pro; RISC microprocessors : SUN SPARC, HP precision architecture.

Applications of Microprocessors :

Temperature monitoring and control system,

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Book for study:

- 1) Digital Systems and Microprocessor by John P. Hayes, 3rd Edition, McGraw-Hill International, 2001.

Suggested Readings :

- 2) Microprocessor Architecture, Programming and Applications with 8085 by R.S. Gaonkar, 4th Edition, New Age International, 2002.
- 3) Microprocessors and Interfacing : Programming and Hardware by D.V. Hall, 2nd Edition, McGraw-Hill International, 2001.
- 4) Advanced Microprocessor by Daniel Tabak, 3rd Edition, McGraw-Hill International, 2001.

CSE 3107 CONTROL SYSTEM LABORATORY

Laboratory corresponding to Control System Engineering Paper CSE 3102

Distribution of Marks:

Practical	: 25 marks	Exam 3 hrs. Duration
Sessional (Practical)	: 25 marks	

FOLLOWING EXPERIMENTS TO BE CONDUCTED IN PROCES TRAINER IN LAB :

1. Distance/Velocity Lag :

To observe and measure the distance/velocity lag of a process caused due to an alteration to the condition of a process after a time interval.

2. **Transfer Lag :**
To observe and measure the transfer lag of a process when a step change is applied at the input.
3. **Calibration :**
To obtain the relationship between set value and heater power & between air temperature rise and heater power.
4. **Two Step Control :**
To observe the effect of overlap on the frequency of the controller output signal in case of two step control.
5. **Proportional Control :**
To observe the effect of change in proportional band on the deviation or offset and heater power.
6. **Disturbance and System Response :**
To observe the effect of change in proportional band on the response of the system due to different forms of disturbance.
7. **Frequency Response :**
To assess the closed loop stability of the system by applying a sine-wave to the input in open-loop and measuring the amplitude and phase of the output signal and to plot the results on a Nyquist or Bode diagram.

Instruction for Paper Setter:

All the experiments listed above to be included in the question paper. The candidate shall be asked to draw any one of the experiments from the lot and to carry out the experiment in the laboratory.

CSE 3108 COMPUTER GRAPHICS LABORATORY

Laboratory corresponding to Computer Graphics Theory paper CSE 3105

1. Implementation of graphics algorithms such as the following using C/C++:
Generation of Lines
Circles & Figures
Clipping
Transformations, etc.
2. Development of a graphic package.

Distribution of Marks:

Practical	: 25 marks	Exam 3 hrs. Duration
Sessional (Practical)	: 25 marks	

Instruction for Paper Setter:

There shall be five questions from Unit 1 to 5 of Theory paper and two questions are to be answered.

**Branch : Computer Science & Engineering
Sixth Semester**

Subject Code	Subject	Number of hours Per week			Duration of Examination in hours		Marks					
		L	T	P	Theory	Practical	Theory		Practical		Total	
							Examination	Sessional	Examination	Sessional		
CSE 3201	Principles of Management and Project Appraisal	3	1	-	3	-	100	50	-	25	150	
CSE 3202	Computer Organisation and Architecture - II	3	1	-	3	-	100	50	-	-	150	
CSE 3203	Operating Systems	3	1	-	3	-	100	50	-	-	150	
CSE 3204	Mathematics - V	3	1	-	3	-	100	50	-	-	150	
CSE 3205	Design & Analysis of Algorithms	3	1	-	3	-	100	50	-	-	150	
CSE 3206	Automata Theory & Theoretical Computer Science	3	1	-	3	-	100	50	-	-	150	
CSE 3207	Operating Systems Laboratory	-	-	3	-	3	-	-	25	25	50	
CSE 3208	Design & Analysis of Algorithms Laboratory	-	-	3	-	3	-	-	25	25	50	
	Total	18	6	6							Total Marks	1000

Course : Bachelor of Engineering (Computer Science & Engineering)

DETAILED SYLLABUS

Sixth Semester

**CSE 3201/ECE 3201 PRINCIPLES OF MANAGEMENT AND PROJECT APPRAISAL
(Common Paper for Electronics & Communication Engineering)**

Unit-I

Management :

Definition of management. Functions of management.

Functional areas of management : Financial Management, Marketing management, Personnel management, Production management (Concepts).

Social responsibility of Business Management.

Organisation and Management : Organisational Structure, Delegation of Authority, Centralisation and Decentralisation, Line and Staff Organisation, Span of Control.

Unit-II

Entrepreneurship:

Entrepreneurship – Role for Industrial Development. Steps to be taken for establishing the small scale unit.

Managerial Economics :

Definition and its scope; Law of Demand; Law of Diminishing Marginal Utility; Law of Elasticity of Demand; Types of Business Organizations; Sources of finance (at national level); Indian Government Policy for Industrial Development and current developments in trade and industry.

Unit-III

Labour Legislations in India :

Provisions and definition; Factories Act, 1948; Industrial disputes Act, 1947; Workmen Compensation Act, 1923.

Unit-IV

Cost Accounting :

Meaning, cost classification, objectives; Elements of cost and cost determination – Material Cost, Methods of Labour cost and Recovery of overheads, Preparation of Cost Sheet and estimate (Problems).

Unit-V

Project Appraisal :

Broad criteria for pre-investment decisions, Different types of appraisal – Financial techniques for project appraisal and feasibility, Discounted Cash flow and non discounted cash flow methods (Payback period, net present value, internal rate of return, annual cost method etc.), Non-financial justification of Projects.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Books for study :

- 1) Industrial Engineering and Management by O.P. Khanna, 3rd Edition, Dhanpat Rai & Sons, New Delhi, 2001.
- 2) Cost Accounting by S.P. Jain & K.L. Narang, 6th Edition, S. Chand & Co., 2002.
- 3) Project Management by S. Choudhury, 3rd Edition, Tata McGraw-Hill, 2002.

Suggested Readings :

- 4) Essentials of Management by H. Koontz & H. Weirich, 5th Edition, Tata McGraw-Hill, 2001.
- 5) Elementary Economic Theory by K.K. Dewatt & J.D. Verma, 4th Edition, S. Chand & Co., 2001.
- 6) Elements of Mercantile Law by N.D. Kapoor, 3rd Edition, S. Chand & Co., 2001.
- 7) Preparation, Appraisal, Budgeting and Implementation by Prasanna Chandra, 3rd Edition, Tata McGraw-Hill, 2001.
- 8) Industrial Engineering and Management by Banga, Sharma & Agrawal, S. Chand & Co., 2001.

CSE 3202 COMPUTER ORGANISATION AND ARCHITECTURE - II

Unit-I

Recent Developments in sequential architecture :

CISC, RISC, Linearly interconnected networks.

Pipelining and Vector processing :

Scalar and vector pipelining, Instruction and execution pipelining, Control strategy for pipeline scheduling, Performance analysis of pipelined units, Characteristics of vector processing, Multiple vector task dispatching, Pipelined Vector processing methods.

Unit-II

Flynn's classification – SISD, SIMD and MIMD machines :

Basic structure, Interconnection structure : Mesh, Cube, Hypercube, Pyramids, Butterfly network, Example of SIMD algorithms, Comparison with SISD algorithm, MIMD machine : basic structure, Representative MIMD machine (both loosely coupled and tightly coupled), Examples of MIMD algorithm.

Unit-III

Associative memory :

General idea, A typical implementation. Example algorithms to run on associative memory machines, Case study of representative machines, Block oriented CAM.

Unit-IV

Data flow architecture :

Basic concepts, Differences with control flow architecture, Data flow graphs and languages, Advantages and potential problems, Static data flow computer, Dynamic data flow computer, Data flow design alternatives.

Unit-V

VLSI Computing :

The Systolic Array Architecture, Mapping algorithm into Systolic Arrays, Reconfigurable Processor Arrays, VLSI arithmetic modules, Partitioned Matrix algorithm, Matrix Arithmetic Pipelines.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Books for study :

- 1) Computer Architecture and Parallel Processing by Kai Hwang & F.A. Briggs, 2nd Edition, McGraw-Hill International, 2001.
- 2) VLSI Array Processors by S.Y. Kung, 3rd Edition, Addison Wesley Longman, 2000.

Suggested Readings :

- 3) Advanced Computer Architecture : Parallelism, Scalability, Programmability by Kai Hwang, 3rd Edition, McGraw-Hill International, 2001.
- 4) Designing Efficient Algorithms for Parallel Computer by M.J. Quinn, 3rd Edition, McGraw-Hill International, 2002.
- 5) The Architecture of Pipelined Computers by P.M. Kogge, 4th Edition, Prentice-Hall India, 2001.
- 6) Computer Architecture – A Quantitative Approach by Menessey & Patterson, 3rd Edition, Morgan Kaufmann, 2001.

CSE 3203 OPERATING SYSTEMS

Unit-I

Introduction to System Programming :

Assembler : Introduction, Data structures and algorithms for a two pass assembler, Macros and Macroprocessor. Loader and Linker : General loader schemes, Introduction to different types of loaders, Data structures and algorithms for a direct linking loader.

Introduction to Operating System :

Processor management, Memory management, I/O management, File system management, System calls.

Unit-II

Memory Management :

Single user contiguous : Protection; Fixed partition multiprogramming : Protection, Fragmentation, Relocation; Variable partition multiprogramming : Compaction, Storage placement strategies; Multiprogramming with storage swapping : Paging; Segmentation; Paging and Segmentation together; Virtual memory : Page replacement and strategies, locality, Working sets, Page fault frequency, Demand paging, Optimization technique.

Unit-III

Processor Management :

Scheduling levels, Quantities to be optimized, Pre-emptive/Non Pre-emptive, Interrupting clock. FIFO, Shortest job first, Shortest remaining job first, Round robin, Priority; Multilevel queues, Multilevel feedback queues.

Unit-IV

File Systems :

Directory organization, Functions, Data hierarchy, Blocking and buffering, File organization, Free space management, Allocation techniques : Contiguous, Non contiguous; Sector oriented linked; Block : block chaining, Index block chaining, Block oriented file mapping.

Device Management :

Types : Block, Character,; PIO, DMA, I/O channels, Virtual devices.

Deadlocks :

Resource concepts, Necessary conditions, Resource allocation graph, Deadlock prevention : Three strategies of Havender, Deadlock avoidance : Bankers algorithm, Deadlock detection : Reduction of resource allocation. Graph, Deadlock recovery.

Unit-V

Concurrent Processes :

Mutual exclusion and Barnstein's conditions, Fork/Join construct, PARBEGIN/PAREND construct; Semaphores :

Use of semaphores to complement PARBEGIN/PAREND; Critical section problem : 2 process critical section problem and solution, both H/W and S/W; Monitors; Message passing; Case studies : Dinning philosophers problem, Reader Writer problem and Disk head scheduler problem.

Disk Scheduling :

Operation of Disks, Quantities to be optimized, Seek optimization : FCFS, SSTF, SCAN, C-SCAN, M-Step SCAN, Eschenbach; Rotation optimization, System consideration, Disk caching and other optimizations.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Book for study :

- 1) Operating System Concepts by Abraham Silberschatz & Peter Baer Galvin, 5th Edition, Addison Wesley Longman, 2001.

Suggested Readings :

- 2) Modern Operating Systems by Andrew S. Tanenbaum, 4th Edition, Prentice-Hall India, 2002.
- 3) Operating Systems Concepts by H.M. Deitel, 3rd Edition, Addison Wesley Longman, 2002.
- 4) Operating Systems by William Stallings, 3rd Edition, Prentice-Hall India, 2001.

CSE 3204 MATHEMATICS - V

Unit-I

Algebra

Cartesian product of sets, Relation, equivalence relations, equivalence class, Partitions, Pigeonhole Principle, Functions, Posets, Lattices.

Recurrence equations and Generating Functions.

Unit-II

Binary operation, Semigroup, Group Subgroup, Normal subgroups, Lagrange's Theorem, Order of an element of a group, Cyclic group, Definition, examples and simple properties of ring, Field, Integral domain and vector spaces.

Unit-III

Integral Transforms

Fourier transform, Fourier Sine and Cosine transforms, Convolution theorem. Definition and simple properties of Z-transform.

Unit-IV

Probability and Statistics (Part I)

Probability density function; distribution function; joint distribution; moment generating and characteristic functions, Mathematical expectation.

Correlations and Regressions – determination of correlation and regression coefficients, determination of lines of regression, multiple and partial correlation.

Unit-V

Probability and Statistics (Part II)

Estimation and Testing of Hypotheses : concept of sampling, sampling distributions and standard errors, confidence interval, estimation of mean, proportion and variance. Maximum likelihood method of estimation for parameters of distribution/function, Testing of Hypotheses (Simple problems) and cases of z, t, tests.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Books for study :

- 1) Discrete Mathematics by Seymour Lipschutz & Marc Lipson, 9th Edition, Tata McGraw-Hill, 2001.
- 2) Advanced Engineering Mathematics by Ervin Kreysiz, 9th Edition, Wiley Eastern, 2002.

Suggested Readings :

- 3) Abstract Algebra by I.N. Hesstain, 5th Edition, Wiley Eastern, 2000.
- 4) Modern Algebra by Surjeet Singh & Qazi Zameeruddin, 6th Edition, Vikas Publishing House, 2001.
- 5) Elements of Discrete Mathematics by C.L. Liu, 4th Edition, Tata McGraw-Hill, 2002.
- 6) Probability & Statistics by M.R. Spiegel, 4th Edition, Tata McGraw-Hill, 2002.
- 7) Higher Engineering Mathematics by Dr. B.S. Grewal, 35th Edition, Khanna Publishers, 2001.
- 8) Probability and Statistics for Engineers by Miller, Freund & Johnson, 5th Edition, Prentice-Hall of India, 2002.

CSE 3205 DESIGN AND ANALYSIS OF ALGORITHMS**Unit-I****Introduction :**

What is an Algorithm? Algorithm Specification; Performance Analysis : Space Complexity, Time Complexity, Asymptotic Notations, Recurrence Relations.

Design of Efficient Algorithms :

Graphs, Trees, Recursion, Divide-and-Conquer, Balancing, Dynamic Programming.

Sorting and Order Statistics :

Merge Sort, heap Sort : Heaps and maintaining the heap properties, Building a Heap, The Heap Sort Algorithm, Priority Queues, Quick sort : Description of Quick Sort, Performance of Quick Sort, Analysis of Quick Sort; Sorting in Linear Time : Lower bounds for sorting, Counting Sort, Radix Sort, Bucket Sort; Medians and Order Statistics : Minimum and Maximum, Selection in worst-case linear time.

Unit-II**Some Data Structures :**

Hash Tables : Direct-address Tables, hash Tables, Hash functions, Open Addressing.

Binary Search trees : What is a Binary search tree? Querying a binary search tree, Insertion and Deletion, Optimal binary search tree, 2-3 Tree, AVL Tree.

Red-Black Trees : Properties of Red-Black trees, Rotations, Insertions, Deletions, Interval trees.

B-Trees : Definition of B-Trees, Basic operations on B-Tree, Deleting a key from a B-Tree.

Binomial Heaps : Binomial Trees and Binomial Heaps, Operations on Binomial heaps.

Fibonacci Heaps : Structure of Fibonacci Heaps, Mergeable-Heap operations, Decreasing a key and deleting nodes, Bounding the maximum degree.

Unit-III**Advanced Design and Analysis Techniques :**

Dynamic programming : Matrix-chain multiplication, Elements of Dynamic Programming, Longest common subsequence, Optimal polygon triangulation.

Greedy Algorithms : An activity selection problem, Elements of Greedy strategy, Huffman Codes, Theoretical foundations for Greedy methods, A Task-Scheduling problem.

Amortized Analysis :

The aggregate method, The Accounting method, The potential method, Dynamic tables.

Graph Algorithm :

Elementary graph Algorithms, Breadth-First Search, Depth-First Search, Topological Sort, Strongly connected components.

Minimum Spanning Trees ; Growing a Minimum Spanning Tree, The algorithms of Kruskal and Prim.

Unit-IV**Single-Source Shortest Paths :**

Shortest paths and relaxation, Dijkstra's Algorithm, The Bellman-Ford Algorithm, Single-Source Shortest Paths in Directed Acyclic Graphs, Difference constraints and shortest paths.

All-Pairs Shortest paths : Shortest Paths and Matrix Multiplication, The Floyd-Warshall Algorithm, Johnson's Algorithm for Sparse Graphs.

Matrix Multiplication and Related Operations :

Basics, Strassen's Matrix multiplication Algorithm, Inversion of matrices, LUP decomposition of matrices, Application of LUP decomposition, Boolean matrix multiplication.

Unit-V

Fourier Transform :

The Discrete Fourier Transform and its Inverse, The Fast Fourier Transform Algorithm.

Integer and Polynomial Arithmetic :

The similarity between Integers and Polynomials, Integer multiplication and division, Polynomial multiplication and division, Modular Arithmetic : Modular polynomial arithmetic and polynomial evaluation, Chinese remaindering and interpolation of polynomials, Greatest Common Divisor and Euclid's algorithm, An Asymptotically fast algorithm for polynomial GCD, Sparse Polynomials.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Books for study :

- 1) Introduction to Algorithms by Thomas H. Cormen & Charles E. Leiserson & Ronald L. Rivest, 3rd Edition, Prentice-Hall of India, 2001.
- 2) The Design and Analysis of Computer Algorithms by Alfred V. Aho, John E. Hopcroft & J.D. Ullman, 3rd Edition, Addison Wesley Longman, 2000.

Suggested Readings :

- 3) Computer Algorithms by E. Horowitz, S. Sahni & S. Rajasekaran, 2nd Edition, Goltotia Publications (P) Ltd., 2002.
- 4) Computer Algorithms : Introduction to Design and Analysis by Sara Ben-Dor & Allen Wan Gelder, 4th Edition, Addison Wesley Longman, 2001.
- 5) Fundamentals of Algorithms by Gilles Brassard & Paul Bratley, 3rd Edition, Prentice-Hall of India, 2001.

CSE 3206 AUTOMATA THEORY AND THEORETICAL COMPUTER SCIENCE

Unit-I

Introduction to Sequential Circuits.

Capabilities, Limitations and Transformation of Sequential Circuits :

The Finite State Model : Definition, Capabilities and Limitations of Finite-State Machines, state Equivalence and Machine Minimization, Simplification of Incompletely Specified Machines.

Unit-II

Structure of Sequential Machines :

Problem Statement, State Assignments using Partitions, The Lattice of Closed partitions, Reduction of the Output Dependency, Covers and Generation of Closed Partitions by State Splitting, Information Flow in Sequential Machines.

State Identification and Fault Detection Experiments :

Homing Experiments, Distinguishing Experiments, Fault Detection Experiments. Information Losslessness of Finite Automata.

Unit-III

Theory of Computation:

Introduction to Strings, Alphabets and Language.

Finite Automata and Regular Expressions :

Non-deterministic Finite Automata with ϵ -moves, Regular Expressions, Two-way Finite Automata.

Properties of Regular Sets :

The Pumping Lemma for regular Sets, Closure properties of Regular Sets, Decision Algorithm for Regular Sets.

Unit-IV

Context-Free Grammars :

Introduction to Context-free Grammar, Derivation Trees, Simplification of Context-free Grammars, Chomsky Normal form, existence of Inherently ambiguous Context-free Grammar.

Pushdown Automata (PDA) :

Description and Definition of PDA, PDA and Context-free Grammar.

Unit-V

Properties of Context-Free Languages (CFL) :

The Pumping Lemma for CFL, Closure properties of CFL, Decision Algorithms for CFL.

Turing Machines :

Introduction, Description of the model, Computable languages and functions, Introduction to Undecidability and Intractable Problems.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Books for study :

- 1) Switching and Finite Automata Theory by Z.V.I. Kohavi, 2nd Edition, Tata McGraw-Hill, 2002.
- 2) Introduction to Automata Theory : Language and Computation by John E. Hopcroft & Jeffrey D. Ullman, 4th Edition, Narosa Publishing House, 2001.

Suggested Readings :

- 3) Introduction to Languages and the Theory of Computation by John C. Martin, 3rd Edition, Tata McGraw-Hill, 2002.
- 4) An Introduction to Formal Languages and Automata by Peter Linz, 4th Edition, Narosa Publishing House, 2001.
- 5) Theory of Computer Science (Automata, Languages and Computation) by K.L.P. Mishra & N. Chandrasekaran, 2nd Edition, Prentice-Hall of India, 2002.

CSE 3207 OPERATING SYSTEMS LABORATORY

Laboratory corresponding to Operating Systems Theory paper CSE 3203

Programming assignments to build parts of an OS Kernel.

Use of a teaching package such as Nachos.

Distribution of Marks:

Practical	: 25 marks	Exam 3 hrs. Duration
Sessional (Practical)	: 25 marks	

Instruction for Paper Setter:

There shall be four questions in the Practical paper and two questions are to be answered.

CSE 3108 DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY

Laboratory corresponding to Design and Analysis Theory paper CSE 3205

Problems such as the following using C or C++ :

1. Kruskal's algorithm
2. Prim's algorithm
3. Shortest path, Scheduling
4. Time and space complexity of binary search
5. Quicksort
6. Dynamic Programming
7. Knapsack Problem
8. Floyd's algorithm
9. DFS & BFS searches
10. Queen Problem
11. Travelling sales person problem.

Distribution of Marks:

Practical	: 25 marks	Exam 3 hrs. Duration
Sessional (Practical)	: 25 marks	

Instruction for Paper Setter:

There shall be four questions in the Practical paper and two questions are to be answered.

**Branch : Computer Science & Engineering
Seventh Semester**

Subject Code	Subject	Number of hours Per week			Duration of Examination in hours		Marks				
		L	T	P	Theory	Practical	Theory		Practical		Total
							Examination	Sessional	Examination	Sessional	
CSE 4101	Database Management System	3	1	-	3	-	100	50	-	-	150
CSE 4102	Computer Networking and Communication	3	1	-	3	-	100	50	-	-	150
CSE 4103	Software Engineering	3	1	-	3	-	100	50	-	-	150
CSE 4104	Digital Signal Processing	3	1	-	3	-	100	50	-	-	150
CSE 4105	Elective - I	3	1	-	3	-	100	50	-	-	150
CSE 4106	Project - I	-	4	-	-	-	75(50+25) *	75	-	-	150
CSE 4107	Industrial Training	-	-	-	-	-	-	-	-	50(25+25) **	50
CSE 4108	Database Management System Laboratory	-	-	3	-	3	-	-	25	25	50
	Total	15	9	3						Total Marks	1000

* 50 from Viva and 25 from dissertation ** 25 from the organization in which student goes for training and 25 from presentation on training given by the student at the college

DETAILED SYLLABUS

Seventh Semester

CSE 4101 DATA BASE MANAGEMENT SYSTEM

Unit-I

Introduction :

What is DBMS : File systems versus a DBMS, Introduction to various data models, Levels of Data Abstraction : Conceptual, Physical and External Schema, Advantages of a DBMS.

Conceptual Design & Entity Relationship Model : Entities, Attributes and Entity Sets.

Features of ER Model : Key Constraints, Participation Constraints Weak Entities, Class Hierarchies, Aggregation.

Conceptual Design using ER Model : Entity versus Attributes, Entity versus Relationship, Binary versus Ternary Relationships, Aggregation versus Ternary Relationships, Constraints not implementable by ER Model.

Unit-II

Relational Data Model : Relational Algebra, Relational Calculus, SQL.

Design Theory for Relational Databases : Reasons behind a bad database design, Functional Dependencies, Decomposition of Relational Schemas : Dependency Preservation and Lossless Join, Normal forms for Relational Schemas : 1 NF, 2 NF, 3 NF and Boyce-Codd NF.

Other kinds of Dependencies : Multivalued Dependencies, 4 NF, Join Dependencies, 5 NF, Inclusion Dependencies.

Unit-III

File Organizations, Indexes and Sorting :

File Organizations : Heap files, Sorted Files, Hashed Files, Comparisons of these three organizations.

Properties of Indexes :

Clustered versus Unclustered Indexes, Dense versus Sparse Indexes, Primary versus Secondary Indexes, Indexes using Composite Keys, Indexed Sequential Access Method.

B+ Trees and its Associated Algorithms : Search, Insert, Delete, Duplicates.

Some Pragmatic Issues : Key Compression, Bulk-Loading a B+ Tree, The Order Concept.

Hashing : Static Hashing, Extendible Hashing, Linear Hashing, Extendible Hashing versus Linear Hashing.

Sorting : External merge Sort : Minimizing the Number of Runs, Minimization of I/O cost vs. Number of I/Os, Blocked I/O, Double Buffering, B+ Trees for Sorting : Clustered Index and Unclustered Index.

Unit-IV

Relational Query Optimization : Introduction : Query Evaluation Plans, Pipelined Evaluation, Iterator Interface for Operators and Access Methods.

Alternative Plans : Pushing Selections using Indexes.

Estimating the Cost of a Plan : Statistics maintained by a DBMS, Estimating Result Sizes.

Enumeration of Alternative Plans : Single-Relation Queries, Multiple-Relation Queries, Nested Subqueries.

Concurrency Control : The Concept of a Transaction : Concurrent Execution and Database Consistency, Incomplete Transaction and Crash recovery, Transactions and Schedules.

Notions of Consistency : Serializability, Some anomalies associated with Interleaved Execution, Schedules in involving Aborted Transactions.

Unit-V

Lock-Based Concurrency Control : Strict Two-Phase Locking (Strict 2PL), 2PL, Serializability and Recoverability, Conflict Serializability and View Serializability.

Lock Management : Implementing Lock and Unlock Requests, Deadlocks, Performance of Lock-Based Concurrency Control.

Specialized Locking Techniques : Dynamic Databases and Phantom Problem, Concurrency Control in Tree Indexes, Multiple-Granularity Locking.

Concurrency Control without Locking : Optimistic Concurrency Control, Timestamp-Based Concurrency Control, Multiversion Concurrency Control.

Crash Recovery ; Recovery and Atomicity, Log-Based Recovery, Shadow Paging, Recovery with Concurrent Transactions, Buffer Management.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Books for study :

- 1) Principles of Database Management by Jeffrey D. Ullman, 3rd Edition, Golgotia Publications (P) Ltd., 2001.
- 2) Database Management Concepts by Abraham Silberschatz, Henry F. Korth & S. Sudarshan, 4th Edition, McGraw Hill Book Co.

Suggested Readings :

- 3) Database Management Systems by Raghu Ramakrishnan & Johannes Gehrke, 2nd Edition, Tata McGraw-Hill, 2001.
- 4) Fundamentals of Database Systems by R. Elmasri & S.B. Navathe, 3rd Edition, Addison Wesley Longman, 2002.
- 5) Introduction to Database Management Systems by A.K. Majumdar & P. Bhattacharya, 2nd Edition, Tata McGraw-Hill, 2002.

CSE 4102/ECE 4102 COMPUTER NETWORKING AND COMMUNICATIONS
(Common Paper for Electronics & Communication Engineering)

Unit-I

Introduction :

Network Hardware : Local Area Network (LAN), Metropolitan Area Network (MAN), Wide Area Network (WAN), Wireless Networks, Internetworks.

Network Software: Protocol Hierarchies, Design Issues for Layers, Interfaces and Services, Connection Oriented versus Connectless Services, Service Primitives, Relationships of Services to Protocols.

Reference Models: The ISO-OSI reference model, The TCP/IP reference model, Comparisons of OSI and TCP reference model.

Medium Access Sublayer :

Channel Allocation : Static versus Dynamic Channel Allocation.

Unit-II

LAN Protocols : Persistent and Nonpersistent CSMA, CSMA/CD, Collision-free Protocols, Broadcast Recognition with Alternating Priorities (BRAP), Multi-Level with Multi-Access Protocol, Limited Contention Protocols, The Adaptive Tree Walk Protocol, The Um Protocol, IEEE standard 802 for LAN : 802.3, 802.4, 802.5; Fibre Optic Networks, Satellite Networks, Packet Radio Networks.

Data link Layer :

Design Issues : Service provided to Network Layer, Framing, Error Control, Flow Control, Link Management, Error detection and Correction.

Elementary Protocols : unrestricted Simplex Protocol, Simplex Stop-and-Wait Protocol, Simplex Protocol for Noisy Channel.

Sliding Window Protocol : One-Bit Sliding Window Protocol, Go Back *n* Protocol, Protocol with Selective Repeat, Protocol Performance.

Network Layer :

Design Issues : Service provided to , Internal Organization, Routing, Congestion, Internetworking.

Routing Algorithms : Shortest Path Routing, Multi-Path Routing, Centralized Routing, Isolated Routing, Flooding, Distributed Routing, Optimal Routing, Hierarchical Routing, Broadcast Routing.

Unit-III

Congestion Control Algorithms : Preallocation of Buffers, Packet Discarding, Isarithmic Congestion Control, Flow Control, Choke Packets, Deadlocks.

Internetworking : Internetwork Architectures, Internetworking Issues, Bridges, Gateways, Tunneling, Internetwork Routing, Fragmentation, Firewalls.

Network Layer for Internet : The IP Protocols, IP Addresses, Subnet, Internet Control Protocols : ICMP, ARP, RARP, OSPF, BGP, Internet Multicasting, CIDR, Ipv6.

Unit-IV

Transport Layer :

Design Issues : Services provided to Session Layer, Quality of Service, Service Primitives, Berkeley Sockets.

Connection Management : Addressing, Establishing a Connection, Releasing a Connection, Timer-Based Connection Management, Flow Control and Buffering, Multiplexing, Crash Recovery.

Unit-V

Internet Transport Protocols : TCP Protocols, TCP Segment Header, TCP Connection Management, TCP Transmission Policy, TCP Congestion Control, TCP Timer Management, UDP.

Session layer and Presentation Layer : Issues and Solutions.

Application Layer :

TCP/IP Application Protocols : TELNET, FTP and TFTP, SMTP, SNMP.

ISO Application Protocols : VT, File Transfer Access and Management (FTAM).

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Books for study :

- 1) Computer Networks by Andrew S. Tanenbaum, 4th Edition, Prentice-Hall of India, 2002.
- 2) An Engineering Approach to Computer Networking by S. Keshav, 3rd Edition, Addison Wesley Longman, 2001.

Suggested Readings ;

- 3) Data and Computer Communications by W. Stallings, 5th Edition, Prentice-Hall of India, 2001.
- 4) Computer Networks and Distributed Processing : Software, Techniques and Architecture by James Martin, 3rd Edition, Prentice-Hall of India, 2002.
- 5) Data Communications and Distributed Networks by U.D. Black, 3rd Edition, Prentice-Hall of India, 2002.

CSE 4103 SOFTWARE ENGINEERING

Unit-I**Introduction :**

The role of Software Engineering in System Design, The Software Life cycle.

Relationship of Software Engineering to Other : Programming Languages, Operating System, Databases, Artificial Intelligence, Theoretical models.

Software : Nature and Qualities : Classification of Software Qualities : External versus Internal Qualities, Product versus Process Qualities. **Representative Qualities :** Correctness, Reliability and Robustness, Performance, User Friendliness, Verifiability, Maintainability, Reusability, Portability, Understandability, Interoperability, Productivity, Timeliness, Visibility, Measurement of Quality.

Unit-II**Software Engineering Principles :**

Rigour and Formality, Separation of Concerns, Modularity, Abstraction, Anticipation of change, Generality, Incrementality.

Requirements Engineering : Requirements Analysis – Including Prototyping, Formal Specification – Including Prototyping.

Software Specification : the uses of Specifications, Specification Qualities, Classification of Specification Styles, Verification of Specifications.

Unit-III

Operational Specification : Entity-Relationship Diagrams, Logic Data Flow Diagrams : Functions of Information Systems, Finite State Machines : Control Flow, Petri Nets : Asynchronous System.

Descriptive Specification : Entity-Relationship Diagrams, Logic Specifications, Algebraic Specifications, Building and Using Specifications in Practice : Requirements for Specification Notations, Building Modular Specifications, Specifications for the End User.

Software Verification : goals and Requirements of Verification, Approaches to Verification.

Testing : Goals for testing, Theoretical foundations of testing, empirical testing principles, testing in the small and in the large, Separate concerns in the testing activity, Testing concurrent and real-time systems.

Analysis : Informal analysis techniques, Correctness proofs.

Unit-IV

Symbolic Execution : Basic concepts, Programs with arrays, Use of symbolic execution in testing, Debugging.

Verification to other Software properties : Verifying performance, Verifying Reliability, Source-Code Metrics.

Software Production Process :

Process Models : Waterfall Model, Evolutionary Model, Transformation Model, Spiral Model, Assessment of the models.

Unit-V

Organizing the Process ; Software Methodologies, Configuration Management, Software Standards.

Project Management :

Project Planning : Software Productivity, People and Productivity, Cost Estimation.

Project Control : Work Breakdown Structures, Gantt Charts, PERT Charts, Dealing with deviations from the plan.

Organization :

Centralized-control Team Organization, Decentralized-control Team Organization, Mixed -control Team Organization, Assessment of Team Organization, Risk Management.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Books for study :

- 1) Software Engineering – A Practitioner’s Approach by Roger. S. Pressman, 5th Edition, McGraw-Hill, 2001.
- 2) Software Engineering : A Programming Approach by Douglas Bell, 3rd Edition, Addison Wesley Longman, 2002.

Suggested Readings :

- 3) Software Engineering by Ian Sommerville, 5th Edition, Addison Wesley Longman, 2002.
- 4) An Integrated Approach to Software Engineering by P. Jalote, 3rd Edition, Narosa Publishing House, 2002.
- 5) Fundamentals of Software Engineering by Carlo Ghezzi, Mehdi Jazayeri & Dind Mandrioli, Prentice-Hall of India, 2001.

CSE 4104/ECE 4104 DIGITAL SIGNAL PROCESSING
(Common Paper for Electronics & Communication Engineering)

Unit-I**Discreet Time Signals & Systems :**

Advantages of digital over analog signal processing ; discreet-time signals and sequences : representation of sequences and elementary operations; classifications of discreet-time signals. Resolution of discreet-time signals into impulses; Analysis of discreet-time LTI systems: Response to arbitrary inputs, the convolution sum, properties of LTI systems and their interconnections, causality and stability. Linear constant coefficient difference equations and their solutions; Impulse response of LTI recursive system. Response to complex exponential and sinusoidal signals- the frequency response function.

Unit-II**Transforms :**

Representation of sequences by Fourier-transforms – symmetry properties and theorems. Z-transforms – two-sided and one-sided Z-transforms; properties of ROC; the inverse Z-transforms; Z-transform properties; analysis of LTI system in the Z-domain: Sampling of continuous-time signals-periodic sampling; frequency domain representation of sampling.

Transform Analysis of LTI Systems :

System functions-linear constant coefficient difference equations: poles and zeros, rational system function, causality and stability; frequency response of LTI systems-phase distortion and delay; frequency response for rational system functions and for single zero or pole systems.

Unit-III**Structures for Discreet-time Systems :**

Block diagram representation of linear constant coefficient difference equations- their interconnection schemes; direct form-I, direct form-II, cascade form and parallel form structures. Finite precision word-length effect-number representation, analysis of effect of coefficient quantization and rounding of noise; zero input limit cycles in fixed-point realizations of IIR digital filters.

Unit-IV**Filter Design Techniques :**

Characteristics of practical frequency selective filter; design of FIR filters by windowing. Characteristics of Butterworth & Chebyshev filters; design of IIR filters from continuous-time filters- Impulse invariance & bilinear transformation methods.

Unit-V**Discreet Fourier Transforms :**

Frequency domain sampling; The DFT and properties of DFT; circular convolution; linear convolution using DFT.

Applications :

Dual-tone multifrequency signal detection, spectral analysis using DFT, musical sound processing, digital FM stereo generation, Digital audio sampling rate conversion.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Books for study :

- 1) Discrete-Time Signal Processing by Alan V. Oppenheim & Ronald W. Schaffer, 3rd Edition, Prentice-Hall of India, 2001.
- 2) Signal and Linear Systems by R.A. Gabel and R.A. Roberts, 5th Edition, John Wiley & Sons Inc., 2001.

Suggested Readings :

- 3) Digital Signal Processing : Principles, Algorithm and Applications by John G. Proakis & Dimitris G. Manolakis, 3rd Edition, Prentice-Hall of India, 2002.
- 4) Digital Signal Processing : A Computer Based Approach by Sanjit K. Mitra, 2nd Edition, Tata McGraw-Hill, 2001.
- 5) Understanding Digital Signal Processing by Richard G. Lyons, 4th Edition, Addison Wesley Longman, 2001.
- 6) Computer Exploration in Signals and Systems using MATLAB by J. R. Buck *et. al.*, Prentice-Hall of India, 2001.
- 7) Digital Signal Processing – a laboratory approach using PC-DSP by O. Alkin, Prentice-Hall, 2002.

ELECTIVE - I**CSE 4105A IMAGE PROCESSING****Unit-I****Introduction :**

Digital image Representation, Fundamental Steps in Image processing, Elements of Digital Image processing, Image Acquisition, Storage. Processing Communication, Display.

Unit-II**Fundamentals of Image Processing :**

Visual Perception – Structure of human eye, Image formation in the eye, Discrimination of brightness and adaptation, Sampling and quantization uniform and non-uniform, Relationship between pixels, Neighbourhood of pixels, connectivity, Stereo Imaging.

Unit-III**Image Transforms :**

Introduction to the Fourier Transform, The discrete Fourier transform, Some properties of Fourier Transform, Separability, Translation, Periodicity and conjugate symmetry, rotation, Distributivity and Scaling Average Value, Laplacian Convolution and correlation and Sampling, The Fast Fourier Transform, FFT, Number of operations, Inverse FFT, Other Separable Image Transforms, Walse, Hadamard Transforms.

Unit-IV**Image Enhancement :**

Fundamentals, Spatial and Frequency domain methods, Enhancement by point processing, Some simple Intensity Transforms, Histogram processing, Spatial filtering : Smoothing filters : Median filtering, Sharpening filters : Derivative filters. Enhancement in frequency domain : Low pass and high pass filtering.

Unit-V**Image Restoration :**

Degradation model, Inverse filtering, Formulation, Removal of blur caused by uniform linear motion.

Image Segmentation :

Detection of discontinuities : point detection, Line detection, Edge detection, Thresholding.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Books for study :

- 1) Digital Image Processing by Rafael C. Gonzalez & Rich E. Woods, 3rd Edition, Addison Wesley Longman, 2001.
- 2) Digital Image Processing and Analysis by B. Chanda & D. Dutta Majumder, 2nd Edition, Prentice-Hall of India, 2002.

Suggested Readings :

- 3) Digital Image Processing by G.A. Baxes, 3rd Edition, John Wiley International Edition, 2001.
- 4) Image Processing by Sid Ahmed, 4th Edition, Tata McGraw-Hill, 2001.
- 5) Fundamentals of Digital Signal Processing by A.K. Jain, 4th Edition, Prentice-Hall of India, 2001.

Unit-I

Introduction :

Issues in Real-Time Computing, Structure of a Real-Time System, Performance Measures for Real-Time Systems, Estimating Program Run Times, Introduction to Hardware Components of Real-Time Systems (microcontroller, sensor, actuator, interrupts).

Unit-II

Task Assignment and Scheduling :

Pre-emptive, Non-preemptive scheduling, Classical Uniprocessor Scheduling Algorithms, Rate-Monotonic Scheduling Algorithms, Preemptive Earliest Deadline First(EDF) Algorithm, Allowing for Precedence and Exclusion Conditions, Using Primary and Alternative Tasks, Introduction to IRIS tasks, Task Assignment and allocation algorithms, Utilization-Balancing Algorithm, A Next-Fit Algorithm for RM Scheduling, A Bin-Packing assignment Algorithm for EDF, A Myopic Offline Scheduling(MOS) Algorithm, Fault-Tolerant Scheduling.

Unit-III

Programming Languages for Real-Time Applications :

Desired Languages, Characteristics, Data Typing, Control Structures, Hierarchical Decomposition, exception Handling, Overloading, Multitasking, Low-Level Programming, Task Scheduling, Timing Specifications, Programming Environments, Run-Time Support.

Unit-IV

Real-Time Databases :

Real-Time Vs. Relative Databases, Main Memory Databases, Transaction Priorities, Transaction Aborts, Concurrency Control Issues, Disk Scheduling Algorithms, databases for Hard Real-Time Systems.

Unit-V

Real-Time Communication :

Network Topologies, Protocols (Contention-based Protocols, Token-based Protocols, Stop and Go Multihop Protocol, The Polled Bus Protocol, Hierarchical Round-Robin Protocol, Deadline-based Protocols, Fault-Tolerant Routing.

Fault-Tolerant Techniques :

Introduction to fault types, Fault detection; Hardware, Software Information and Time Redundancy, Introduction to reliability evaluation and clock synchronization for hardware and Software redundancy.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit I to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Book for study :

1. Real-Time Systems by C.M. Krishnan & K.G. Shin, McGraw-Hill International Edition, Computer Science Series, 2001.

Suggested Readings :

2. Software Design for Real Time Systems by J.E. Cooling, 2nd Edition, Chapman & Hall Publishing, 2001.
3. Real-Time Systems Design and Analysis : An Engineer's Handbook by Phillip A. Laplante, 3rd Edition, Prentice-Hall of India, 2002.

CSE 4105C MODELLING AND SIMULATION

Unit-I

System Models and Role of Simulation :

Basic concepts and nomenclature, Types of system – Deterministic, Stochastic, Continuous and Discrete Systems, System Simulation – Uses of simulation and its limitations, Steps in simulation studies.

Statistical Tool :

Generation and testing of pseudorandom numbers, Random variate generation for Uniform, Exponential, Normal and Poisson distributions, Sampling and Estimation, Maximum likelihood estimation, Confidence interval estimation.

Unit-II

Discrete Event Simulation :

Representation of time, Approach to discrete event simulation, Queuing models – Single and multiserver queues, Steady state behaviour of queues, Network of queues, Inventory System simulation, Programming languages for discrete system simulation – GPSS, SIMSCRIPT (Brief Overview).

Unit-III

Modelling and Performance Evaluation of Component Systems :

Behavioural, Data flow and structural modeling, Overview of Hardware, Modelling and Simulation, Simulation for behavioural model, Evaluation of multiprocessor systems, workload characterization and Benchmarks.

Unit-IV

Continuous System Simulation :

Continuous System Models – Open and closed loop systems, Models described by differential equations, Systems Dynamics, Growth and decay models, Systems dynamics diagram, Simulations of aircraft models, Biological and sociological systems simulation, Simulation Languages Overview – CSMP.

Unit-V

Virtual reality Modelling :

Overview of Virtual Reality Modelling Language VRML 2.0, Creating dynamic worlds, Integrating JavaScript's with VRML.

Verification and Validation of Simulation Models :

Goals of Model Verification and Validation, Input Data Analysis, Output Analysis, Sensitivity Analysis, Hypothesis testing, Performance measures and their estimation.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Book for study :

- 1) Discrete-Event System Simulation by Jerry Banks, John S. Carson & Barry L. Nelson, 3rd Edition, Prentice-Hall of India, 2001.

Suggested Readings :

- 2) System Simulation by Geoffrey Gordon, 3rd Edition, Prentice-Hall India, 2001.
- 3) Computer Systems Performance Evaluation by D. Ferrari, 4th Edition, Prentice-Hall of India, 2002.
- 4) A VHDL Primer by J. Bhastav, 2nd Edition, Prentice-Hall of India, 2001.
- 5) System Simulation with Digital Computer by Narsingh Deo, 2nd Edition, Prentice-Hall of India, 2001.

CSE 4105D / ECE 4105D **ADVANCED CONTROL SYSTEM** (Common Paper for Electronics & Communication Engineering)

Unit-I

State space description : Some basic concepts; Some canonical realizations, parallel and cascade realization, matrix rotations and state space equation.

Unit-II

Controllability and observability of continuous realization, determining the initial conditions; state observability, setting up initial conditions; state controllability, joint observability and controllability; the uses of diagonal form, standard form for uncontrollable and/or nonobservable systems. Test for controllability and observability.

Unit-III

Review of stability theory, external and internal stability, the Lyapunov criterion, stability results for linearized systems.

Unit-IV

Linear state variable feedback :

Analysis of stabilization by output feedback, state variable feedback and model controllability, formulae for the feedback gain, a transfer function approach, aspects of state variable feedback.

Unit-V

A symptotic observers and compensator design : A symptotic observers for state measurement, combined observer-controller compensators, reduced order onserver, transfer function reformulation of the observer-controller design some variants of the observer-controller design.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Book for study :

- 1) Linear Systems by Thomas Kailath, 4th Edition, Prentice-Hall of India, 2001.
- 2) Modern Control Engineering by R.C. Dorf & R.H. Bishop, 3rd Edition, Addison Wesley Longman, 2001.

Suggested Readings :

- 3) Feedback and Control Systems : Schaum's Outline Series, 5th Edition, Tata McGraw-Hill, 2002.
- 4) Modern Control Engineering by K. Ogata, 3rd Edition, Prentice-Hall of India, 2002.
- 5) Control Systems Engineering by I.J. Nagrath & M. Gopal, 2nd Edition, New Age International, 2001.
- 6) Control System Design – An Optimal Approach by B. Sarkar, 2nd Edition, Wheeler Publishing, 2002.

CSE 4105E / ECE 4105E BIOMEDICAL INSTRUMENTATION
(Common Paper for Electronics & Communication Engineering)

Unit-I**Introduction to Biomedical Instrumentation :**

Introduction, Biometrics, physiological systems of the body, Biomedical Transducer, Sources of bio-electric signals, propagation of action potential, Electrodes : theory, physical sensors, chemical transducers.

Cardio-Vascular System and Electrocardiography :

The heart and cardiovascular system, Blood pressure, The heart sound, The Electrocardiography.

Unit-II**Biomedical Recorders :**

Electrocardiograph (ECG), Phonocardiograph, Electroencephalograph (EEG), Electromyograph(EMG).

Implantable Bio-Electric Devices :

Introduction, function of implantable electronic device, Implantable electrodes and leads, Cardiac pacemaker – types, working principle and performances, Implantable electrodes and leads.

Unit-III**Patient care and Monitoring :**

System concept and requirement, Measurement of blood : pressure, heart beat rate, temperature and respiration, The organisation of the hospital for patient care monitoring., Defibrillators.

Related Topics :

Hearing Aids – Hearing fundamentals, disorders.

Unit-IV**Biotelemetry :**

Introduction, Classification and principles of biotelemetry, Ultrasound and light telemetry, Telephonic telemetry, Implantable units, Application of telemetry in patient care.

Medical Imaging :

Instrumentation of diagnostic X-rays, X-ray computed tomography, medical imaging- MRI, Basic NMR and its components, Ultrasonic imaging systems – Medical ultrasound, A-SCAN, Echocardiograph (M-mode), B-SCANNER, Biological effect of ultrasound.

Unit-V**Computers in Biomedical Instrumentation :**

Database management : Introduction, in-house and commercially available systems, desirable features, specific medical application, Computerized critical care areas : Planning and designing a computerised critical care unit, selection of monitoring equipment, The computer in clinical laboratories, Computer in medical research : Introduction, interacting with experimental preparations, Artificial intelligence : Introduction, medical applications of artificial intelligence, developing a medical expert system.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Book for study :

- 1) Biomedical Instrumentation and Measurements by L. Cromwell *et al*, 4th Edition, Prentice-Hall of India, 2002.

Suggested Readings :

- 2) Handbook of Biomedical Instrumentation by R.S. Khandpur, 3rd Edition, Tata McGraw-Hill, 2001.
- 3) Handbook of Biomedical Engineering by Jacob Kline, 2nd Edition, Academic Press, 2001.
- 4) Medical Instrumentation : Application and Design by J.G. Webster, 4th Edition, John Wiley, 2002.

CSE 4106 PROJECT – I

A mini-project implemented in an RDBMS environment like INGRES, ORACLE, Sybase etc.
(Chosen by the institution)

The mini-project may be carried out individually or by a batch of not more than two students.
The students will pick a topic in consultation with a local faculty.
The mini-project must be carried out in the College only
The faculty is expected to guide the students

The mini-project tasks would involve:

Understanding the mini-world description and the application specification of the mini-project.
Bringing out the conceptual design(Entity-relationship representation) of the mini-project.
Converting the conceptual design to the relational design.
Normalization of the relational design up-to 3NF (desirable 5NF).
Documentation and Submission of Report
Each student in a team should equally participate in the tasks mentioned above.

Typical mini-projects:

1. Room reservation and front office needs of a luxury hotel
2. Railway reservation for Indian Railways
3. Airline reservation for Indian Airlines
4. Sales management of consumer products company
5. Library management
6. A city tourist assistance service
7. Bus reservation for a state transport corporation
8. Front office management for a large bank
9. Patient and services management for a large hospital
10. Admissions management for a large University
11. Managing of placement centre
12. Sports databases
13. Examination system management
14. Online enquiry service for products and services in a city like Yellow pages.

Distribution of Marks:

Viva-voce	: 50 marks
Dissertation	: 25 marks
Sessional (Theory)	: 75 marks

CSE 4107 INDUSTRIAL TRAINING

An eight week industrial training after the sixth semester in an industry having large computer application.

Distribution of Marks:

Sessional (Practical)	: 50 marks (25 marks from the organization in which the student goes for training and 25 marks from presentation on training given by the student at the college)
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CSE 4108 DATABASE MANAGEMENT SYSTEM LABORATORY

Laboratory corresponding to Database Management System Theory paper CSE 4101

Familiarization with various database packages like MS Access, Foxpro, INGRESS, ORACLE etc.
Design and implementation of a Database using a multi-user DBMS.

Laboratory exercise in use of SQL for

- a) Defining schema for applicant
- b) For populating sample database
- c) For making SQL query for information retrieval
- d) Use of host language interface with embedded SQL. Use forms and report writer packages.

Distribution of Marks:

Practical	: 25 marks	Exam 3 hrs. Duration
Sessional (Practical)	: 25 marks	

Instruction for Examiner :

There shall be four questions in the Practical paper and two questions are to be answered.

**Branch : Computer Science & Engineering
Eighth Semester**

Subject Code	Subject	Number of hours Per week			Duration of Examination in hours		Marks				
		L	T	P	Theory	Practical	Theory		Practical		Total
							Examination	Sessional	Examination	Sessional	
CSE 4201	Distributed Computing	3	1	-	3	-	100	50	-	\$\$\$\$\$	150
CSE 4202	VLSI System Design	3	-	2	3	-	100	25	-	25	150
CSE 4203	Compiler Design	3	1	-	3	-	100	50	-	-	150
CSE 4204	Elective - II	3	1	-	3	-	100	50	-	-	150
CSE 4205	Elective - III (Open)	3	1	-	3	-	100	50	-	-	150
CSE 4206	Project - II	-	4	-	-	-	75(50+25) *	75	-	-	150
CSE 4207	Seminar	-	-	3	-	-	-	-	-	50	50
CSE 4208	Compiler Design Laboratory	-	-	3	-	3	-	-	25	25	50
	Total	15	8	8	Total Marks						1000

* 50 from Viva and 25 from dissertation

Course : Bachelor of Engineering (Computer Science & Engineering)

DETAILED SYLLABUS

Eighth Semester

CSE 4201 DISTRIBUTED COMPUTING

Unit-I

Introduction :

System architecture Types, Distributed Operating Systems;

Issues in Distributed Operating Systems : Global knowledge, Naming, Scalability, Compatibility, Process Synchronization, Resource Management, Client-server Computing Model.

Communication Primitive : The message Passing Model, Remote Procedure Calls, Design Issues in RPC.

Theoretical Foundations :

Inherent Limitations of a Distributed System : Absence of a Global Clock, Absence of Shared Memory, Lamport's Logical Clocks, Vector Clocks, Causal Ordering of Messages, Global State : Chandy-Lamport's Global State Recording Algorithm, Cuts of a Distributed Computation, Termination Detection.

Mutual Exclusion :

The Classification of Mutual exclusion Algorithms, Requirements of Mutual Exclusion Algorithms, How to measure performance? A simple solution to Distributed Mutual Exclusion, Lamport's Algorithm, The Ricart-Agrawala Algorithm, Maekawa's Algorithm.

Unit-II

A generalized Non-Token-Based Algorithm : Information Structure, The Generalized Algorithm, Static versus Dynamic Information Structure, Token-Based Algorithms, Suzuki-Kasami's Broadcast Algorithm, Singhal's Heuristic Algorithm, Raymond's Tree-Based Algorithm.

A comparative Performance Analysis : Response Time, Synchronization Delay, Message Traffic, Universal Performance Bounds.

Deadlock Detection :

Preliminaries ; The System model, Resource versus Communication Deadlocks, A Graph-Theoretic Model.

Strategies ; Deadlock Prevention, Deadlock Avoidance, Issues in Deadlock Detection and Resolution.

Centralized Deadlock Detection Algorithms : Completely Centralized Deadlock Algorithm, The Ho-Ramamoorthy Algorithm.

Distributed Deadlock Detection Algorithms : A Path-Pushing Algorithm, An Edge-Chasing Algorithm, A Diffusion Computation Based Algorithm, a Global State Detection Based Algorithm.

Hierarchical Deadlock Detection Algorithms : The Menceg-Muntz Algorithm, The Ho-Ramamoorthy Algorithm.

Unit-III

Agreement Protocols :

The System Model : Synchronous versus Asynchronous Computation, Model of Processor failures, Authenticated versus Non- Authenticated Messages.

A Classification of Agreement Problems : The Byzantine Agreement Problem, The Consensus Problem, The Interactive Consistency Problem, Relation among the Agreement Problems.

Solutions to the Byzantine Agreement Problem : The Upper bound on the number of Faulty Processors, An Impossibility Result, Lamport-Shostak-Pease Algorithm, Dolev *et al*'s Algorithm.

Applications of Agreement Protocols : Fault-Tolerant Clock Synchronization, Atomic Commit in DDDBS.

File Systems :

Architecture.

Mechanisms for Distributed File Systems : Mounting, Caching, Hints, Bulk Data Transfer, Encryption, design Issues, Log-Structured File Systems, Case Studies.

Distributed Shared Memory :

Architecture and Motivation.

Unit-IV

Algorithms for Implementing DSM : The Central-Server Algorithm, The Migration Algorithm, The Read-Replication Algorithm.

Memory Coherence.

Coherence Protocols : Cache Coherence in the PLUS System, Unifying Synchronization and Data Transfer in Cloud, Type-Specific Memory Coherence in Munin System, Design Issues.

Distributed Scheduling :

Issues in Load Distributing : Load, Classification of Load Distributing Algorithms, Load Balancing versus Load Sharing, Preemptive versus Non-preemptive Transfers.

Components of a Load Distributing Algorithm : Transfer Policy, Selection Policy, Location Policy, Information Policy.

Stability : The Queuing-Theoretic Perspective, The Algorithm Perspective

Load Distributing Algorithms : Sender-Initiated Algorithms, Receiver-Initiated Algorithms, Symmetrically-Initiated Algorithms, Adaptive Algorithms, Performance Comparisons, Requirements for Load Distributing, Task Migration.

Issues in Task Migration : State Transfer, Location Transparency, Structure of a Migration Mechanism, Performance.

Unit-V

Fault Tolerance :

Atomic Actions and Committing, Commit Protocol : 2 PL.

Non-blocking Commit Protocols : Basic Idea, The Non-blocking Commit Protocol for Single Site Failure, Multiple Site Failure and Network Partitioning, Voting Protocols, Dynamic Voting Protocols, The Majority based Dynamic Voting Protocols.

Dynamic Vote Reassignment Protocols : Autonomous Vote Reassignment, Vote Increasing Policies, Balance of Voting Power.

Failure Resilient Processes : Backup Processes, Replicated Execution, reliable Communication : Atomic Broadcast.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Books for study :

- 1) Advanced Concepts in Operating Systems by Mukesh Singhal & N. Shivratni, 2nd Edition, Tata McGraw-Hill, 2002.
- 2) Principles of Distributed Systems by Vijay K. Garg, 4th Edition, Kluwer Academic Publishers, 2002.

Suggested Readings :

- 3) An Introduction to Distributed and Parallel Computing by Joel M. Crichlow, 3rd Edition, Prentice-Hall of India, 2002.
- 4) Distributed Operating Systems : Concepts and Design by Pradeep K. Sinha, 2nd Edition, Prentice-Hall of India, 2002.
- 5) Modern Operating Systems by Andrew S. Tanenbaum, 4th Edition, Prentice-Hall India, 2002.

CSE 4202 VLSI SYSTEM DESIGN

Unit-I

Introduction : N-MOS enhancement transistor, P-MOS enhancement transistor, Threshold voltage, Threshold voltage equation, Body effect, Basic DC equation.

CMOS Inverters : DC Characteristics, n/p ratio, noise margin.

CMOS Processing Technology : Wafer processing, oxidation, epitaxi, deposition, Ion implantation, diffusion, Polysilicon gate process, Basic CMOS n-well. P-well, twin tub, SOI.

Unit-II

CMOS Process Enhancement : Interconnect : Metal interconnect, Polysilicon interconnect, Local interconnect.

Circuit elements : resistors, capacitors.

Layout Design Rules : Layer representations, CMOS n-well Rules, Latchup.

Unit-III

Basic physical design of simple logic gates : Inverter, NAND & NOR gates, Complex logic gate layout, General CMOS logic gate guidelines. CMOS design methods.

Design Strategies : structured design strategies, hierarchy, regularity, modularity, locality.

CMOS chip design options : Programmable logic, programmable logic structures, programmable interconnect, field programmable gate arrays, Sea-of-gate and gate array design, standard cell design, full custom design, symbolic layout.

Unit-IV

Design Methods : Behavioural Synthesis, RTL Synthesis, Logic optimization, structural to layout synthesis (placement, routing).

Design Capture Tools : HDL Design, Schematic design, layout design, floor planning, chip composition.

Design Verification Tools : Simulation : circuit level simulation, timing simulation, logic level simulation, switch level simulation, mixed mode simulators, Timing verifier, Network isomorphism, Netlist compaction. "Nc {ovv extraction, Back-annotation, Design rule verification, Pattern generation, Design economy.

Top-down Design Approach : Placement, Partitioning, Floor planning, Placement, Routing : Fundamentals, Global routing, Detailed routing, Routing in field programmable gate arrays, Performance issues in circuit layout.

Unit-V

Delay Models : Gate delay models, Models for interconnect delay, Timing driven placement, Timing driven routing, Via minimization, Power minimization.

Compaction :

ID Compaction : Compression ridge techniques, Graph based techniques, wire length minimization, compaction with automatic jog, grid constraints. 2D compaction.

CMOS Testing : The need for testing : Functionality test, manufacturing test, Manufacturing test principles, Design strategies for test, Chip level test techniques, System level test techniques.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 25 marks	
Sessional (Practical)	: 25 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Book for study :

- 1) Principles of CMOS VLSI Design : A Systems Perspective by N.H.E. Weste & K. Eshraghian, 5th Edition, Addison Wesley Longman, 2001.

Suggested Readings :

- 2) An Introduction to VLSI Physical Design by M. Sarrafzadeh & C.K. Wong, 4th Edition, McGraw-Hill International Edition, 2001.
- 3) Modern VLSI Design : A Systems Approach by Warne Wolf, 4th Edition, Prentice-Hall of India, 2002.
- 4) Application of Specific Integrated Circuits by Michael John & Sebastian Smith, 2nd Edition, Addison Wesley Longman, 2001.
- 5) Basic VLSI Design by D.A. Pucknell & K. Eshraghian, 3rd Edition, Prentice-Hall of India, 2002.

CSE 4203 COMPILER DESIGN

Unit-I

Introduction :

Issues related to Programming Language Design, Issues related to Finite-State Machines, Phases of Compiler Design, Lexical Analysis.

Basic Parsing Techniques :

Parsers, Shift-Reducing Parsers, Operator-Precedence Parsing, Predictive Parsers.

Top-down Parsing :

Brute-Force Approach, Recursive-Descent Parsers, Top-Down Parsing with Limited Backup, Top-Down Parsing with no Backup : Simple LL(1) Grammars, LL(1) grammars without - Rules, LL(1) grammars with - Rules.

Bottom-up Parsing :

LR Grammars – Concepts and Terminology, LR(0) Parsers, Canonical LR(1) Parsers, LALR(1) Parsers using ambiguous grammar.

Unit-II

Syntax-Directed Translation (SDT) :

SDT Schemes, Implementation of SDT's, Intermediate Code, Postfix Notations, Parse Trees and Syntax Trees, Three-Address Code, Quadruples and Triples, Translation of Assignment Statements, Translation of Boolean Expressions, Translation of Statements that alter flow of control, Postfix Translation, Translation with top-down parsers, Translation of Array references in Arithmetic Expressions, Translation of Procedure Calls, Translation of Declarations, Translation of Case Statements, Translation of Record Structures.

Semantic Analysis :

Implicit-Stacking in Recursive-Descent Compilation, Semantic Stacks in Bottom-up Compilation, Action-Symbols in Top-down Compilation.

Attributed Translation : Attributed Translation Grammar, L- Attributed Translation Grammar.

Example Language Constructs : Declarations, Expressions, Assignment Statements, Control Statements, Procedure Calls and Returns, Input and Output Statements.

Unit-III

Symbol Table Handling Techniques :

When to construct and interact with the Symbol Table, Symbol-Table Contents, Operations on Symbol Table.

Symbol Table organizations for Non-Block-Structured Languages : Unordered Symbol Tables, Ordered Symbol Tables, Tree-Structured Symbol Tables, Hash Symbol Tables.

Symbol Table organizations for Block-Structured Languages : Block-Structured Language Concepts, Stack Symbol Tables, Stack-Implemented Tree-Structured Symbol Tables, Stack-Implemented Hash-Structured Symbol Tables.

Unit-IV

Run-Time Storage Organization and Management : Static Storage Allocation.

Dynamic Storage Allocation : Activation Records, Parameter Area, Display Area, Run-Time Address Calculation, Handling Recursive Procedures.

Heap Storage Allocation : Implicit Storage Requests, Explicit Storage Requests, Management of Fixed-Length Blocks, Management of Variable-Length Blocks, Garbage Collection and Compaction.

Error Detection and Recovery : Description of possible errors, Lexical-phase Errors.

Syntactic-phase Errors : Error handling in LL(1) parsers, Error handling in LR parsers, Semantic Errors.

Code Optimization : Principal Sources of Optimization.

Unit-V

Loop Optimization : Dominators, Reducible Flow Graphs, Depth-First Search, loop-Invariant Computation, Induction variable elimination, Other Loop Optimization.

The DAG representation of Basic Blocks.

Global Data-Flow Analysis : Reaching definition again, Available Expressions, Copy Propagation, Backward Flow problem, Handling pointers, Inter-procedural Data-Flow Analysis.

Code Generation : Object programs, Problems in Code Generation, A machine model, A simple Code Generator.

Register Allocation and Optimization : Register Allocation in Single register Machine, Register Allocation in Multi-Register Machine, Code Generation from DAG.

Peephole Optimization.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Books for study :

- 1) Compilers : Principles, Techniques and Tools by Alfred V. Aho, Ravi Sethi & Jeffrey D. Ullman, 4th Edition, Addison Wesley Longman, 2001.
- 2) The Theory and Practice of Compiler Writing by Jean P. Tremblay & Paul G. Sorenson, McGraw-Hill International Edition, 2001.

Suggested Readings :

- 3) Compiler Design in C by Allen I. Holub, 3rd Edition, Prentice-Hall of India, 2002.
- 4) Practice and Principles of Compiler Building with C by Henk Alblas & Albert Nymeyer, 2nd Edition, Prentice-Hall of India, 2002.

ELECTIVE - II

CSE 4204A / ECE 4204A ARTIFICIAL INTELLIGENCE (Common Paper for Electronics & Communication Engineering)

Unit-I

Scope of Artificial Intelligence :

Games, theorem proving, Natural language processing, Vision & speech processing, Robotics, Expert systems, Artificial Intelligence techniques – Search, Knowledge, Abstraction.

Problem Solving

State space search

Control Strategies

Depth-first search, Breadth-first search, Production System.

Problem characteristics

Decomposable, ignorable, recoverable, predictable.

Unit-II

Use of Heuristics

Hill climbing, Best first search, A*algorithm : Admissibility, AND/OR graph – AO*, Constraint satisfaction,

Crypto arithmetic, Waltz Line Labelling,

Game Playing

Minimax search, Alpha-Beta pruning.

Knowledge representation

Predicate Logic, Well formed formulae, quantifiers, Prenex Normal Form, Skolemization

Unification, modes ponens, Resolution refutation-various strategies, Rule Based Systems, Forward reasoning :

Conflict resolution, Backward reasoning : Use of No backtrack, Structured Knowledge Representations, Semantic Net : slots, inheritance, frames – exceptions and defaults – attached predicates, Conceptual Dependency formalism, Object Oriented Representations.

Unit-III

Artificial Intelligence Programming Languages

PROLOG : Syntax, Procedural and Declarative meaning, Prolog unification mechanism, Anonymous variable, Lists, Use of fail, Cut, not.

LISP : Basic Concepts, Eval Function, Functions and Variables, Scooping of LISP variables, Iteration and recursion.

Unit-IV

Handling uncertainty

Probabilistic reasoning, Bays Net, Dumpster Shafer Theory, Use of certainty factors, Fuzzy Logic, Non-monotonic reasoning : Dependency directed backtracking, Truth maintenance systems.

Learning :

Concept of learning, learning automation, The Genetic Algorithm, Learning by induction, Neural Networks : Hop field Networks, Perceptions – Learning algorithm, Back propagation Network, Boltzman Machine. Recurrent Network

Planning :

Components of Planning System, Plan Generation Algorithm, Forward State Propagation, Backward State Propagation, Nonlinear Planning using constraint posting

Unit-V

Expert Systems

Need and justification for expert systems – cognitive problem

Expert System Architectures : Rule Based System, Non Production System

Knowledge acquisition, Case studies : MYCIN, R1

Natural Language Processing

Syntactic Analysis, Top down and bottom up parsing, Augmented Transition Networks, Semantic Analysis, Case grammar.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Books for study :

- 1) Artificial Intelligence by E. Rich & K. Knight, 5th Edition, Tata McGraw-Hill, 2001.
- 2) Introduction to Artificial Intelligence and Expert Systems by Dan W. Patterson, 3rd Edition, Tata McGraw-Hill, 2002.

Suggested Readings :

- 3) Introduction to Expert Systems by P. Jacson, 4th Edition, Addison Wesley Longman, 2001.
- 4) Principles of Artificial Intelligence : A New Synthesis by Nils J. Nilsson, 2nd Edition, Morgan Kaufmann, 2001.
- 5) Programming on PROLOG by Clocksm & Mellish, 2nd Edition, Narosa Publishing House, 2000.

CSE 4204B / ECE 4204B PATTERN RECOGNITION (Common Paper for Electronics & Communication Engineering)

Unit-I

Introduction : Machine perceptions, pattern representation, segmentation, feature extraction, learning and adaptations, scene analysis, shape determinations. Baye's decision theory – Minimum error rate classification, discriminant functions and decision surfaces for two category and multi-category cases, univariate and multivariate normal density, Baye's theory for discrete features, error probability and error bounds, Hidden Markov model. Parameter estimation.

Unit-II

Non-parametric techniques – Parzen indows, -nearest neighbour rule. Linear discriminant function and decision surface-minimising the perceptron criterion functions, relaxation procedure, minimum squared error procedure, Ho-Kashyap procedure, linear programming techniques, multi category cases.

Unit-III

Unsupervised learning and clustering : Various clustering strategies based on minimisation of objective functions, tree based techniques, cluster validation issues. Neural network based learning - Back propagation algorithm, relating back propagation with Baye's theory, practical techniques for improving performance, training methods.

Unit-IV

Non-metric methods in pattern classification : decision trees, classification and regressions trees. Structural pattern recognition – recognition with strings, concepts of formal language theory and automata theory, high-dimensional grammars, grammatical inference. Fuzzy sets theoretic pattern classification strategies ; Applications of Pattern Recognition.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 4	: 25 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Book for study :

- 1) Pattern Recognition (Pattern Classification and Scene Analysis) by Richard O. Duda & Peter E. Hart, 2nd Edition, Addison Wesley Longman, 2001.

Suggested Readings :

- 2) Pattern Recognition by Tou & Gonzalez, 2nd Edition, Addison Wesley Longman, 2001.
- 3) Pattern Recognition : Statistical, Structural and Neural Approaches by Robber J. Schalkoff, 3rd Edition, John Wiley & Sons Inc., New York, 2001.
- 4) Pattern Recognition and Image Analysis by Earl Gose, Johnsonbaugh & Jost, 3rd Edition, Prentice-Hall of India, 2002.

CSE 4205C ADVANCED DATABASE MANAGEMENT SYSTEM

Unit-I

The Basics of Transaction Processing

Introduction :

Transaction Models

Atomic Actions and Flat Transaction, Spheres of Control, A Notation for Explaining Transaction Models, Flat Transactions with Savepoints, Chained Transactions, Nested Transactions, Distributed Transactions, Multi-Level Transactions, Open Nested Transactions, Long-Lived Transactions.

Unit-II

Transaction Processing Communications

The Remote Procedure Call Model, An RPC Walkthrough, Peer-to-Peer Programming, Comparing RPC and Peer-to-Peer.

Queued Transaction Processing

Why use Queues ? The Queued Transaction Processing Model, Client Recovery, Handling Non-Undoable Operations, The Queue Manager, Multi-transaction Workflow, Multi-transaction Requests without Queues.

Unit-III

Introduction to Advanced Transaction Models

Introduction, Advanced Transaction Models, Cooperative Transaction Hierarchy, Cooperative SEE Transactions, DOM Transactions, A Transaction Model for an Open.

A Cooperative Transaction Model for Design Databases

Characteristics of the Transaction Model, The Model Correctness, Synchronization, Recovery.

Unit-IV

Introduction to Relational Query Processing

Query processing In Object-Oriented Database Systems, Query Processing in Distributed Relational Database Systems, Query Processing in Multi-database Systems, Parallel Processing of Relational Queries.

Multidimensional Search Structures

G-Tree, Quadtree, R*-Tree.

Unit-V

Text Retrieval

An Overview of Text Retrieval and Classification, Retrieval Effectiveness, Relevance Feed-back, Specialized Hardware, Other Retrieval Methods.

Text Clustering and Clustered Search

Text Clustering, Clustered Search.

Image and Video Retrieval

Picture Retrieval, Video Retrieval.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Book for study :

- 1) Principles of Database Query Processing for Advanced Application Element by T. Yu & Weiyi Meng, The Morgan Kaufmann Series in Data Management Systems, 2000.

Suggested Readings :

- 2) Database Transaction Models for Advanced Applications edited by Ahmed K. Elmagarmid, The Morgan Kaufmann Series in Data Management Systems, 2000.
- 3) Principles of Transaction Processing for the Systems Professional by Philip A. Bernstein & Eric Newcomer, The Morgan Kaufmann Series in Data Management Systems, 2000.
- 4) Transaction Processing : Concepts and Techniques by Jim Gray & Andreas Reuter, The Morgan Kaufmann Series in Data Management Systems, 2000.
- 5) Advanced Database Systems by Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, Richard T. Snodgrass, V.S. Subrahmanian & Robert Zioni, 3rd Edition, Tata McGraw-Hill, 2001.

CSE 4204D ADVANCED COMPUTER NETWORKS

Unit-I

Introduction

Overview of Computer Networks, Seven layer architecture, TCP/IP suite of protocols etc.

MAC protocols for high-speed LANs, MANs and Wireless LANs

FDDI, DQDB, HPPI, Gigabit Ethernet, Wireless Ethernet etc.

Fast Access Technologies

ADSL, Cable Modem etc.

Unit-II

ATM Networks

ATM Layer; ATM Adaptation Layers; Congestion control; Signalling, Routing, QoS support, Neighbour-discovery, Auto-Configuration; Changes to other protocols; Application Programming Interface for Ipv6; 6bone.

Unit-III

Mobility in Networks

Mobile IP; Security related issues.

Unit-IV

IP Multicasting

Multicast routing protocols, address assignments, session discovery etc.

TCP extensions for high-speed networks

Transaction-oriented applications.; Other new options in TCP.

Unit-V

Network security at various layers

Secure-HTTP, SSL, ESP, Authentication header, Key distribution protocols; Digital signatures, digital certificates.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Books for study :

- 1) TCP/IP Illustrated, Volume 1 : The Protocols by W.R. Stevens, Reading, MA : Addison Wesley Longman, 2000.
- 2) TCP/IP Illustrated, Volume 2 : The Implementation by W.R. Stevens & Gary R. Wright, Reading, MA : Addison Wesley Longman, 2000.
- 3) TCP/IP Illustrated, Volume 3 : TCP for Transactions, HTTP, NNTP and the Unix Domain ProtocolsI by W.R. Stevens, Reading, MA : Addison Wesley Longman, 2000.

Suggested Readings :

- 4) Cryptography and Network Security : Principles and Practice by W. Stallings, 3rd Edition, Prentice-Hall of India, 2002.
- 5) Mobile IP : Design Principles and Practices by C.E. Perkins, B. Woolf & S.R. Alpert, 4th edition, Addison Wesley Longman, 2001.
- 6) Ipv6 Clearly Explained by Peter Loshin, 2nd Edition, Morgan Kaufmann, 2001.
- 7) Ipv6 Networks by M. Gonsalves & N. Niles, 4th Edition, Tata McGraw Hill, 2002.

CSE 4204E MULTIMEDIA AND APPLICATIONS

Unit-I

Introduction TO Multimedia System

Architecture and components, Multimedia distributed processing model, Synchronization, Orchestration and Quality of Service (QoS) architecture.

Unit-II

Audio and Speech

Data acquisition, Sampling and Quantization, Human Speech production mechanism, Digital model of speech production, Analysis and synthesis, Psycho-acoustics, low bit rate speech compression, MPEG audio compression.

Unit-III

Images and Video

Image acquisition and representation, Composite video signal; NTSC, PAL and SECAM video standards, Bi-level Image Compression standards : ITU (formerly CCITT) Group III and IV standards, JPEG image compression standards, MPEG video compression standards.

Unit-IV

Multimedia Communication

Fundamentals of data communication and networking, Bandwidth requirements of different media, Real time constraints : Audio latency, Video data rate, multimedia over LAN and WAN, Multimedia conferencing. Hypermedia presentation : Authoring and Publishing, Linear and non-linear presentation, Structuring Information, Different approaches of authoring hypermedia documents, Hypermedia data models and standards.

Unit-V

Multimedia Information Systems

Operating system support for continuous media applications : limitations in usual OS, New OS support, Media stream protocol, file system support for continuous media, data models for multimedia and hypermedia information, content based retrieval of unstructured data.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Books for study :

- 1) Multimedia Systems by John F. Koegel Buford, 4th Edition, Addison Wesley Longman, 2001.
- 2) Multimedia : Making It Work by Tay Vaughan, 7th Edition, Tata McGraw-Hill, 2002.

Suggested Readings :

- 3) Multimedia System Design by P.K. Andleigh & K. Thakrar, 4th Edition, Prentice-Hall of India, 2002.
- 4) Multimedia : Computing, Communications and Applications by Ralf Stein Metz & Klara Nahrstedt, 3rd Edition, Addison Wesley Longman, 2001.
- 5) Multimedia Literacy by Fred T. Hofstetter, 2nd Edition, McGraw-Hill, 2000.

ELECTIVE (OPEN)

CSE 4205A MANAGEMENT INFORMATION SYSTEM

Unit-I

Introduction

Data, information and knowledge : flow of data amongst individuals and organization importance of information in today's world : representation of information : file records and fields.

Unit-II

Data Manager

Basic tasks of data capture, validation classification, storage retrieval and maintenance; modeling using data flow diagrams : problem areas in manual systems including those in information dissemination, delays in movement, lack of consolidated metadata metainformation.

Unit-III

Information Resources

Computer networks and communications, application software, database system, Enterprise wide computing.

Unit-IV

Building Information System

Life cycle, feasibility and cost/benefit analysis, requirements specification, design and implementation, user acceptance, CASE tools.

Unit-V

Applications

The Internet and Electronic Commerce, Intranets, Extranets and Enterprise Collaboration, Information Systems for Business Operations, Information Systems for Managerial Decision Support, Information Systems for Strategic Advantage.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Books for study :

- 1) Management Information Systems by S. Sadagopan, 3rd Edition, Prentice-Hall India, 2002.
- 2) Management Information Systems : Organization and Technology by Kenneth C. Laudon & Jane P. Laudon, 4th Edition, Prentice Hall India, 2002.

Suggested Readings :

- 3) Information Systems for Modern Management by Robert G. Murdick, Joel E. Ross & James R. Claggett, 3rd Edition, Prentice-Hall of India, 2002.
- 4) Management Information Systems by Gordon B. Davis, 2nd Edition, Tata McGraw-Hill, 2001.
- 5) Management Information Systems by Gerald V. Post, 4th Edition, Tata McGraw-Hill, 2002.

CSE 4205B OBJECT ORIENTED SYSTEMS

Unit-I

Fundamental concepts of Object Oriented Programming.

Introduction to the principles of Object Oriented Programming

Classes, Objects, Messages, Encapsulation, inheritance, polymorphism, exception handling and Object Oriented containers. Object design implementation in programming languages e.g., C++ or Java. Object Oriented analysis, modeling and design.

Introduction to UML. Use case driven analysis.

Unit-II

Structural Modelling

Classes, Relationships, Interfaces, Class Diagrams and Object Diagrams in UML, Links and association between two objects. Advanced link and association concepts : Link attributes, modeling and association as a class, Roll names, ordering, qualification, Aggregation.

Generalization & Inheritance – basic concepts only.

Difference between Aggregation & Generalization, Types of Aggregation.

Unit-III

Behavioural/Functional Modelling

Use of case diagrams, sequence diagrams in UML. Dynamic Modelling : Statecharts Architectural Modelling
Analysis patterns, Design patterns.

Unit-IV

Distributed Object Model

Object oriented language features – multiple inheritance, class library, efficiency, strong typing versus weak typing, memory management, encapsulation, packaging, development environment, metadata, data persistence, assertions and constraints.

Basic concepts of CORBA and COM/DCOM.

Unit-V

Object Oriented Database Systems

Object Oriented Data Model, query languages, Storage Organization and Indexing Techniques; Object Relational Databases.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Books for study :

- 1) Object Oriented Programming in C++ by Barkakati, 6th Edition, Prentice-Hall of India, 2001.
- 2) Object-Oriented Modeling and Design by James Rumbaugh *et al*, 3rd Edition, Prentice-Hall of India, 2001.

Suggested Readings :

- 3) Object Oriented Design and Applications by Grady Booch, 4th Edition, Benjamin/Cummings Publishing, 2001.
- 4) Object Oriented Programming in C++ by E. Balagurusamy, 4th Edition, Tata McGraw-Hill, 2002.
- 5) C++ Program Design : An Introduction to Programming and Object-Oriented Design by James Cohoon & Jack Davidson, 4th Edition, Tata McGraw-Hill, 2002.

CSE 4205C FUZZY LOGIC AND NEURAL NETWORK

Unit-I

Overview of Crisp Sets and Fuzzy Sets

Basic Concepts of Crisp Sets and Fuzzy Sets, Basic Types of Fuzzy Sets, Fuzzy sets versus Crisp sets, Representation and Extension Principle for Fuzzy Sets, Operation of Fuzzy sets.

Unit-II

Fuzzy Relations and Fuzzy Logic

Crisp Vs. Fuzzy Relations, Binary Relations on Fuzzy Sets, Equivalence, Compatibility of Relations, Morphisms and Composition of Relations, Fuzzy Relations Equations, Fuzzy Measure and Possibility Theory, Classical Logic and Multi-valued Logics, Fuzzy Propositions and Approximate Reasoning.

Unit-III

Introduction to Neural Networks

Biological and Artificial Neurons, Perceptions – Classification and Linear Separability X-OR Problem, Hopfield Network, Overview of Neural network Architecture : Multi-layered Feed Forward and Recurrent Network, Learning : Supervised, Unsupervised and Reinforcement, Generalized Delta Rule.

Unit-IV

Multiplayer Networks

Back Propagation (BP) Network, BP Training Algorithm and Derivation for Adaptation of Weights, Variations in BP and Alternative Cost, Functions; Improvements in BP Network, Radial Basis Function (RBF) Network, Applications of BP and RBF Networks.

Recurrent Networks and Unsupervised Learning : Counter Back Propagation Networks, Boltzman Machine, Unsupervised Learning Methods, Hebbian Learning, Kohonen's Self Organizing Feature Maps, Adaptive Resonance Theory.

Associative Memories

Matrix Associative Memories, Auto Associative Memories, Hetero Associative Memories, Bi-directional Associative Memories, Applications of Associative Memories.

Unit-V

Fuzzy Systems and Neuro Fuzzy Systems :

Relevance of Integration Between Fuzzy Sets and Neural Network – Pros and Cons, Fuzzy Neural Network, Neuro Fuzzy Systems, Fuzzy Associative Memories.

Applications of Fuzzy Sets and Neural Networks in the following areas :

Applications in Pattern Recognition, Image Processing and Computer Vision, Applications in Controls : Fuzzy controllers, Neuro controllers and Fuzzy Neuro controllers, Applications in Expert Systems and Decision Making Systems, Applications in Real World Computing.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Book for study :

- 1) Fuzzy Sets and Fuzzy Logic : Theory and Applications by George J. Klir & Bo Yuan, 5th Edition, Prentice-Hall of India, 2002.

Suggested Readings :

- 2) Fuzzy Logic with Engineering Applications by Timothy Ross, 4th Edition, Tata McGraw-Hill, 2002.
- 3) Neural Networks and Fuzzy Systems : A Dynamical Systems Approach to Machine Intelligence by Bart Kosko, 3rd Edition, Prentice-Hall of India, 2001.
- 4) Artificial Neural Networks Robert J. Schalkoff, 3rd Edition, McGraw-Hill International Edition, 2001.
- 5) Introduction to Artificial Neural Systems by J.M. Zurada, 3rd Edition, Jaico Publishers, 2002.
- 6) Artificial Neural networks by B. Yegnanarayan, 3rd Edition, Prentice-Hall of India, 2002.

CSE 4205D SYSTEM ANALYSIS AND DESIGN

Unit-I

Information Systems

Systems Development Life Cycle. Structured Systems Analysis and Design – Physical and Logical Data Flow Diagrams, Requirements Analysis.

Unit-II

Design of New System Data Modelling – Data Dictionary, Entity-Relationship Diagrams.

Structure Charts – Transform and Transaction Analysis. Coupling and Cohesion.

Unit-III

Process Specification – Structured English, Decision Tables, CASE tools, Structured Programming.

System Implementation – Chief Programmer terms, Planning for Coding and Testing, Verification and Validation, Changeover Phase, Project Review and Walkthrough.

Unit-IV

Alternate Life Cycles – Evolutionary Design and Prototyping. Feasibility Study – Cost Estimation, Cost-Benefit Analysis.

Unit-V

Input-Output Design – Forms Design, Dialogue Design, File Design, Security and Control, Codification and Classification, Documentation.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Books for study :

- 1) System Analysis and Design by Elias M. Awad , 5th Edition, Galgotia Publication Ltd., 2002., 2001
- 2) Introduction to System Analysis and Design, by Igor Hawryszkiewicz, 4th Edition, Prentice-Hall of India, 2002.

Suggested Readings :

- 3) System Analysis and Design Methods by Whitten, Bentley & Barlow, 3rd Edition, Galgotia Publication Ltd., 2001.
- 4) Analysis and Design of Information Systems by A.S. James, 2nd Edition, Tata McGraw-Hill, 2001.

CSE 4205E INFORMATION THEORY AND CODING

Unit-I

Concept of mutual information, Entropy and their properties.
Entropy based techniques of feature extraction in pattern recognition and image enhancements.

Unit-II

Noiseless coding, Huffman coding and its optimality, Kraft and McMillan's inequality, Shannon-Fano code, Elias code, Arithmetic coding and universal coding.

Unit-III

Ergodic and Markov sources and their entropy.

Unit-IV

Algebraic codes – Linear Block codes, Cyclic codes – BCH codes, perfect code, Galley code, Finite geometry codes, Hadamard codes, Maximal distance separable codes, sphere packing and singleton bounds.

Unit-V

Codes for random access memories, tapes and disc, fault tolerant computation with arithmetic codes and redundant number systems. Exact techniques of decoding, relationship between complexity of algorithm in poly-digital circuits and VLSI with algebraic coding.

Cryptographic codes – Random number generation, DES scheme, RSA scheme and Diffie & Hellman's Public Key Crypto systems.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Books for study :

- 1) Theory and Practice of Error Correcting Codes by R.E. Blahut, 3rd Edition, Addison Wesley Longman, 2001.
- 2) Principles of Transmission of Digital Information by R.E. Blahut, 2nd Edition, Addison Wesley Longman, 2002.

Suggested Readings :

- 3) Digital and Analog Communications Systems by K. Sam Shanmugam, 3rd Edition, John Wiley, 2002.
- 4) Digital Communications by Simon Haykin, 4th Edition, John Wiley, 2002.
- 5) Modern Communication Systems : Principles and Applications by Leon W. Couch II, 6th Edition, Prentice-Hall of India, 2002

CSE 4205F / ECE 4205F OPERATIONS RESEARCH (Common Paper for Electronics & Communication Engineering)

Unit-I

Introduction to Operations Research (O.R.)

The historical development of O.R., Principles of Modelling. Features and phases of O.R.

Unit-II

Linear Programming :

Introduction, Formulation of Linear Programming Problems (L.P.P.), Graphical solution procedure. Idea of Convex set, Convex combination of two points, Boundary point, Extreme point. Fundamental Theorem of L.P.P. (proof not required). Feasible, Basic, Basic Feasible solutions of L.P.P. Simplex Method. Big-M methods.

Unit-III

Transportation Problems (T.P.)

Introduction. Mathematical formulation. Tabular representation. Definitions of Balanced, Unbalanced T.P. Rules to find initial Basic Feasible Solution (B.F.S) of T.P. – North West Corner Rule, Lowest Cost Entry (Matrix-minima) method, Vogel's Approximation Method. Solution algorithm of T.P. Solution technique for unbalanced T.P. Degeneracy in T.P. Resolution of degeneracy. Examples.

Assignment Problems (A.P.)

Introduction. Mathematical formulation. Reduction theorem (proof not required). Definitions of Balanced and Unbalanced A.P. Hungarian Algorithm for solving A.P. Solution technique for unbalanced (A.P.) Examples.

Unit-IV

Sequencing Problems :

Introduction. Definition. Solution of Sequencing problems, Processing n jobs through two machines, two jobs through m machines (Graphical method), Processing n jobs through m machines.

Integer Programming Problems (I.P.P.) :

Introduction. Pure and mixed integer programming problems. Gomory's Cutting Plane technique for solving I.P.P. Examples.

Unit-V

Dynamic Programming Problems (D.P.P.)

Introduction. Multistage process. What is D.P. ? Advantage of D.P. Characteristics of D.P.P. Bellman's Principle of Optimality, Use of D.P. to solve some standard optimizing problems (Single additive constraint with multiplicatively separable return, Single additive constraint with additively separable return, Single multiplicative constraint with additively separable return).

Queuing Theory :

Introduction. Characteristics of queuing systems. Pure birth and death process. Queuing models. Kendall's notation (M/M/1;a, FCFS) models.

Distribution of Marks:

Theory	: 100 marks	Exam 3 hrs. Duration
Unit 1 to 5	: 20 marks each	
Sessional (Theory)	: 50 marks	

Instruction for Paper Setter:

There shall be two questions from Unit 1 to 5 and one question from each Unit is to be answered.

Core Books for study :

- 1) Operations Research by Kanti Swarup Manmohan & Gupta, 4th Edition, S. Chand & Co. Ltd., 2002.
- 2) Operations Research by Panneerselvam, 4th Edition, Prentice-Hall of India, 2002.

Suggested Readings :

- 3) Operations Research by S. D. Sharma, 14th Edition, Kedarnath Ram Nath & Co., 2002.
- 4) Operations Research by J. K. Sharma, 6th Edition, MacMillan India Ltd., 2001.
- 5) Operations Research by P.K. Gupta & D.S. Hira, 3rd Edition, S. Chand & Co. Ltd., 2001.
- 6) Introduction to Operations Research by Frederick Hillier & Gerald Lieberman, 4th Edition, Tata McGraw-Hill, 2002.

CSE 4206 PROJECT – II

Objective:

The purpose behind the inclusion of this is to consolidate the concepts and practices that were imparted during the course and to serve as record of competence. It should enable the student to apply concretely in a small package the concepts gained from system analysis and design.

Guidelines :

This project will be carried out over a duration of three months, involving about 100 hours. Every student should do a project individually and not in a group, under the guidance of at least one of the faculty members and / or expert / professional from an organization outside of the College. The selected project can be either of type Model 1 or Model 2. The Project Report should be submitted covering the aspects specified under Project Profile below. The Project Report should have a certificate from the College stating it to be a bonafide work of the student that has not been submitted for any other examination.

Project Profile :

Model 1

1. The topic for the project can be any sub-system of a system software or tool or any scientific or a fairly complex algorithmic situation.
2. The aim of this type is to highlight the abilities of algorithmic formulation, program and data flow representation, modular programming, optimized code preparation, systematic documentation and other associated aspects of software engineering.
3. The assessment would be through the Project Report and Viva. The former should portray the following :
Programming style, structured design, minimum coupling and high cohesion
Good commenting and annotating of the code and flow of representation, such that meaningful code, with good readability and ease of maintenance, results.
Design specifications, depicting the method adopted and giving a simple data dictionary, for each data, to cover name, type and validity aspects.
Test case samples, enough in number, to adequately cover the possible chances of common errors
User manual.

Model 2

1. This model can be of a typical business application. The aim of this type is to highlight the stages involved in a typical business oriented project development, though on a miniature scale and simulated environment. The appropriate use of DBMS/RDBMS towards any business application, along with adequate level system analysis and structured design and development of specific tools /products would be the underlying activity, in preparing this project.
2. The emphasis should be on selecting a system/ sub system which shows the DBMS and System Analysis aspects to a greater degree. Any small and simple business system may be selected, although candidates are advised to use their knowledge and creativity, to select typical and intelligent applications, rather than run- of - the - mill themes, such as simple Pay Roll calculation or Issue Return portion on an inventory scheme. The Evaluation stage would give due weightage for theme selection, problem analysis, fact finding techniques and initial design, which is as close to real life business situations as possible.
3. The assessment would be through the Project Report and Viva. The former should portray the following-
 - Requirements leading to the project, those which were the result of System Analysis.
 - The design aspect of DBMS oriented documentation which describes the structure and organization of the database well annotated source code, supplemental documentation, which can serve as a Data Analysis and Data Flow description.
 - A simple Data Dictionary of the elements, which form the structure. the number of tables/files which make up the DBMS, should not be less than three.
 - Details about I/O screens and facilities, for on screen query, printed oriented Reports and built in house keeping routines, which helps disk management and file integrity, are to be included to a limited extent.
 - Details of Acceptance Tests which , should be in adequate number and should include error messages.
 - User manual

Viva-Voce :

The viva-voce will be conducted by an external examiner appointed by the University and an internal examiner from the College. Other members of the faculty and students may be present. It will be of a duration of about 15 to 20 minutes. The logic, analysis and design aspects relevant to the project mentioned under assessment would be the main subject matter for the viva. However the general proficiency of the candidate should also be tested.

Documentation:

System Overview will have the following sections:

1. Application area : e.g., Production/ Inventory/Finance/Marketing/Human Resource Management/ Library/Training/Service sector/System Level Programming, etc.
2. System/Subsystem: e.g., Invoicing and Accounts Receivables, Purchase and Accounts Payables, Budget and Accounts Variance analysis, Production and Sales Monitoring, Material Requirement Planning, Hotel Management/ Hospital Management/ Specific Software utility.
3. End user (s); Finance Controller, Marketing Manager, Production Manager, Personnel Department, School or College or Hospital administrative staff, etc.
4. Analysis and description of the system, and the specific gains from computerization.
5. Description of the various modules.
6. Performance criteria for the proposed system: e.g., volume of transactions (Data handling), control aspects , timeliness, archival.
7. Need for the review : Deficiencies and future enhancements.

Data Dictionary :

1. This should give catalogue of the data elements used in the system/subsystem developed.
2. The following are the details required: Write NA where Not Applicable.
 - Data name
 - Aliases, if any.
 - Length (size)
 - Type(numeric, alpha, binary, etc.)
 - Validity criterion (minima, maxima, etc.)
 - Default value, if any.
 - Whether related to other data items.
 - Where used in the program; reference to data structure / file/ procedure/modules.

User Manual:

It may include chapters like the ones suggested below :

1. Installation
2. Hardware requirements
3. System requirements
4. Installation procedure, including security aspects like passwords, protection, backups, controls, etc.
5. Menu choices and their actions- screen formats
6. Error Messages

7. Output
8. A sample test case

Distribution of Marks :

Practical (Dissertation) : 25 marks
Viva-voce : 50 marks
Sessional : 75 marks

CSE 4207 SEMINAR

Presentation of talk and discussion on practical training/topics of current interest in computer field.

Distribution of Marks:

Practical : 25 marks Exam 3 hrs. Duration
Sessional (Practical) : 25 marks

CSE 4208 COMPILER DESIGN LABORATORY**Laboratory corresponding to Compiler Design Theory paper CSE 4203**

Programming assignments to build a compiler for a subset of a C-like programming language, using tools such as Lex and Yacc.

Distribution of Marks:

Practical : 25 marks Exam 3 hrs. Duration
Sessional (Practical) : 25 marks

Instruction for Paper Setter:

There shall be four questions in the practical paper and two questions are to be answered.

i) To reorganise academic calendar of the University.

In response to the Govt. of Meghalaya, Education Department letter vide No.EDN.255/2001/22, dt. 23/1/03 relating to number of working days in Higher Secondary School and Colleges, which is placed as Annexure 'A'. In this regard the Vice-Chancellor constitute a Committee to examine the matter and to submit report which is placed as Annexure 'B'

The matter is placed before the Council for consideration.

GOVERNMENT OF MEGHALAYA
EDUCATION : : DEPARTMENT

No:EDN:255/2001/22

Dated Shillong, the 23rd January'03

From :- Smti B G Momin,
Under Secretary to the Govt. of Meghalaya

To, 1. The Vice-Chancellor,
NEHU, . . . Campus, Maw'ynroh,
Shillong - 793022
2. The Secretary,
Meghalaya Board of School Education, (MBOSE)
Tura.

Subject :- Matters relating to number of working days in
Higher Secondary Schools and Colleges.

Sir,

With reference to the subject mentioned above, I am directed to say that the subject matter was discussed in the meeting of Education Officers on 3rd February, 01 at SIRD, Nongsder and has been highlighted in the prospective Plan for Development and Education in Meghalaya, 01 for the period from 2002 to 2020 as follows :-

" It has been noted that Colleges do not and cannot fulfil the 180 working days as specified by the UGC and NEHU. They have only about 150 working days in a year, the reasons being that the Winter, Pujas and Pre and Post Exam Holidays are too long (Sundays + Holidays + Winter + Pujas + Pre + Post Exams = 52 + 20 + 60 + 10 + 70 = 212 days. Total Working days = 365 - 212 = 153 days).

The problem will be solved if HSLC, HSSLC Exams are held in December as was done in the early 80's . The attention of NEHU may be drawn to this fact and urge that academic terms for Under-Graduate courses start from March to December with exams in December to give more teaching days in these hills which have long cold winters".

In connection with the above, you are requested to examine the proposal in depth and submit your views within two months' time.

Yours faithfully,

Sd/-

(B G Momin)

Under Secretary to the Govt. of Meghalaya,
Education Department.

**NORTH EASTERN HILL UNIVERSITY
DEPARTMENT OF SOCIOLOGY
UMSHING-MAWKYNROH, SHILLONG-793 022**

Prof.M.N.Karna

Gram:NEHU
(O)(0364) 551551
(0364) 551689

Dated 11th June, 2003.

To

The Vice-Chancellor
NEHU
Shillong-793022

Sir,

I am enclosing herewith the Report of the Committee
Constituted by you to reorganize the academic calendar of the
University.

Yours faithfully -

Sd/

(M.N.Karna)

Chairman of the Committee

A meeting of the Committee constituted by the Vice-Chancellor to reorganise academic calendar of the University was held on 7 April 2003 in the Seminar Room of the Department of Sociology at 11.00 am. The following members were present:

1. Prof. M.N Karna - Chairman
2. Prof. A.N.Rai - Member
3. Dr. A.Patton (COE) - Member

The issue of re-organization of academic has emerged in the context of number of working days in Higher Secondary Schools and Colleges in the State of Meghalaya. Colleges do not fulfil the stipulation of 130 working days in a year as specified by the UGC and NEHU. In view of this it has been proposed by the Govt. of Meghalaya that HSLC and HSSLC examinations be held in the month of December. Accordingly, the Government has drawn the attention of NEHU to re-organise its academic calendar.

Against this background the committee decided the following :

(i) The letter of the Education Deptt. of the Government of Meghalaya indicates that HSLC and HSSLC examinations be held in December. However, it does not provide any information about the duration of the examinations and the time schedule for the declaration of final results.

(ii) We suggest that let the MBOSE conduct its examinations in the month of December 2003 and come out with its results.

(iii) Reducing the examination time by restricting the combinations of subjects available, as agreed upon in the Principals' meeting, will provide at least few more teaching days.

(iv) Some curtailment in number of days which are lost in pre- and post-examinations (70 days) and Puja holidays will also help in getting some more teaching days.

(v) Another suggestion is that the Practical examinations for UG may be conducted in December and Theory examinations from the first week of February till the second week of March and results should be out by 30th April. This would give extra teaching days for almost a month.

(vi) The University should not go for a change in its academic calendar at this stage.

(vii) Since the current academic calendar of the University was evolved after long deliberations and several experiments with different systems, it would be advisable that the matter is discussed in the Academic Council particularly keeping in mind the fact that the system is working smoothly.

It has to be kept in view that a change in the academic calendar for UG will eventually have an impact on PG Programme also.

(viii) In addition to the above points we are annexing here a response note from the Controller of Examinations that is based on discussions in earlier AC meeting from time to time.

Sd/-
(M.N.Karna)

Sd/-
(A.N.Rai)

(A.Patton)

The V.C may like to note that the University had earlier conducted its under-graduate examinations in the month of November/December. However, subsequently the the university opted for February/March examinations for the following reasons :-

- a. During winter vacations most of the teachers are out of station. As a result, many of the teachers are not available in Shillong for doing the evaluation works of the university. Thus, even if the examination are over by December, the scripts in actual effect can be distributed for evaluation only in the month of March thus the confidential papers are required to be in the custody of the office of the Controller of Examinations for 2(two) months without any work done on them, to the jeopardy of great risk of keeping them.
- b. November/December are very cold months and various students' groups have expressed their harrowing experiences of going through the examinations in such cold months as November/December. They have expressed their difficulties and unwillingness through the media to sit for any university examinations in the cold months of November/December.

One may not lose sight that the climatic conditions and the environmental hazards has dictated the vacation period in most of the educational institutions of the country, as much as in "summer vacation" are regulated in the hot plains and "winter vacations" are regulated in the cold regions like in our state...

In addition to what have been stated above, it is worthwhile and expedient to mention herein that whereas MBOSE requires only about three weeks for its theory and practical examinations due to limited subject combinations, the university requires about 60 days for its theory and practical examinations for reasons of varied subject combinations.

Thus the working days available in the month of November/December will not suffice the conduct other examinations like (PG twice in a year) LLB(twice in a year), Engineering (twice in a year) and B.Ed (once in a year). The said examinations are phased out through out the year for technical reasons.

Inspit of the aforesaid difficulties, if rescheduling of under-graduate examination is effected, it will necessitate the bifurcation of the Confidential Section into UG and other Courses and which will entail appointment of additional manpower to cope up with the work.

Sd/-

Controller of Examinations

OTHERS

5:8:5(1)

(v) Restructuring of the Centres of Studies

The University had constituted a Committee under the Chairmanship of Prof J B Bhattacharjee vide notification No:Con/99-1/Regn/98(Vol.II)part 936 dated 18.11.02 to suggest restructuring of the Centres of Studies.

The Committee held four meetings on 21.3.03, 25.4.03, 15.5.03 and 11.6.03 and submitted its report, which is placed at Annexure-'A'

The matter is placed before the Council for consideration.

SG

5:8:5(2)

Annexure-'A'

DEPARTMENT OF HISTORY
NORTH-EASTERN HILL UNIVERSITY
SHILLONG-793022

Professor JB Bhattacharjee

June 11, 2003

To
The Deputy Registrar(Conference)
NEHU, Shillong.

Subject : Item for AC

Sir,

I am forwarding herewith the Report of the Committee constituted by the University vide Notification No:Conf/99-1/Regn/98 (Vol.II)part-036 dated 18th November'02 "to suggest restructuring of the Centres of Studies" for consideration of the Academic Council.

Yours faithfully,

Sd/-

(JB Bhattacharjee)

SG

Report of the Committee
On Restructuring of the Centres of Studies

The University constituted the Committee vide Notification No: Conf/99-1/Regn/98(Vol.II)part-936 dated 18th November'02 "To suggest restructuring of the Centres of Studies."

The Committee held four meetings, on 21.3.03, 25.4.03, 15.5.03 and 11.6.03. As decided in the first meeting, suggestions were invited from the colleagues in the Centres on the subject and they were also requested to inform the Committee about the academic thrusts and programmes of the respective Centres to enable the Committee to better appreciate the need for restructuring. The Committee was happy to note in the next meeting that almost all the colleagues in the Centres had either individually or collectively responded to the request. They had also frankly given their views on some matters which are not exactly within the scope of the Committee but are important for the academic development and better functioning of the Centres as well as the individual colleagues.

The Committee found that there are, as on date, four Centres of Studies in the University, viz. 1 Centre for Environmental Studies, 2 Centre for Applied Statistics, 3 Centre for Cultural and Creative Studies, and 4 Centre for Supportive Learning Systems. Whereas the Centre for Environmental Studies and the Centre for Applied Statistics are unitary in nature, the two other Centres, viz Centre for Creative and Cultural Studies and the Centre for Supportive Learning System have Units within the Centres and those Units are identical with the Centres as they were before the restructuring which was effected a few years ago. Not only have the Units retained the old identities and infrastructure, they are also spread over separate premises/campuses. In the opinion of the Committee, this unit system is bound to create administrative problems, require additional infrastructure (including supporting staff) and affect the academic functioning of the Centres of Studies. There is no provision for Unit or Unit-in-charge in the Ordinance. The Committee, therefore, decided to recommend that the Units should be abolished immediately.

Each of the above mentioned four Centres, should have one Head, one Office and should be located at one place for convenience and more effective functioning. The Headship should rotate within the Centre, like the Departments, as per provisions of the Statute and Ordinance.

Contd.....P.....2/-

6:1:2(1)

Item No.6. ADMINISTRATIVE MATTERS

6:1 - Selection Committee

(ii) ITEM FROM THE CHAIR :

Panel of Names of Expert for Selection
Committee for Faculty Selection in
various Departments/Centres.

Clause (2) of Statute 20 provides for panel of Experts for consideration of Selection Committee for recruitment to the post of Professors, Readers and Lecturers as well as for cases under Career Advancement Scheme. The experts are to be nominated by the Executive Council out of the panel of names recommended by the Academic Council for their special knowledge of or interest in the subject with which a Professors, Readers and Lecturers is concerned. The Council is required to recommend a panel of names of expert for the following Deptts./Centres.

1. Geography
2. Zoology
3. Applied Statistics
4. Mathematics
5. Centre for Adult & Continuing Education.

6:2 - Appointment/Creation of Post/Termination of Service etc.

Step d). Re-employment of teachers

The Council may like to apprise that in the last (115th) meeting of the Executive Council, held on 5.5.2003, some cases of re-employment were placed for consideration.

The Executive Council considered the provision for re-employment and its need for review and resolved that it be referred to the Academic Council.

The Executive Council further resolved to refer the matter of re-employment of teachers attached to Centres/Units where only one faculty may exist, and from where the comments of the 'Department' would need to be sought.

The amendments to Rules RU-2 are enclosed at ANNEXURE-I & II.

The matters are placed before the Council for policy decisions.

....

6:2:1(2)

(COPY)

ANNEXURE-I

NORTH-EASTERN HILL UNIVERSITY
SHILLONG

No. Conf/22-3/Rules/2000-695 Dated 30th July, 02

NOTIFICATION

In pursuance of the Academic Council's resolution No. AC:66:2001:6:2(i) & 4:(i) and the Executive Council's resolution No. EC:111:2001:6:2(i) as adopted in their 66th and 111th meetings respectively and in partial modification of Notification No. Conf/22-3/Reg/2000-1785 of 21st August 2000, the Vice-Chancellor, NEHU, is pleased to notify the amendments to RU-2 on Rules for Re-Employment of Teachers with immediate effect as per Annexure-A appended herewith.

Sd/-
JMS Khongwir
Deputy Registrar

Copy to :

1. Pro-Vice-Chancellor, NEHU, Shillong/Tura
2. Registrar/Finance Officer/Controller of Examinations, NEHU, Shillong.
3. All Deans of School, NEHU, Shillong.
4. All Heads of Departments/Centres, NEHU/Tura.
5. All Officers, NEHU, Shillong/Tura.
6. Publication Officer, Publication Cell, NEHU, Shillong.
7. P.S. to the Vice-Chancellor, NEHU, Shillong.

Sd/-
Deputy Registrar

AMENDMENTS TO RULES RU-2 ON RULES FOR RE-EMPLOYMENT
OF TEACHERS

EXISTING PROVISIONS	PROVISIONS AFTER AMENDMENT
---------------------	----------------------------

NEHU extends the benefit of re-employment to its superannuated teachers on the following conditions:

No Change

1. The teachers on retirement may be re-employed for a period of three years from the date of retirement against the post vacated by him/her subject to the condition that such teachers shall not hold any administrative post.

No Change

Eligibility 1. A superannuated teacher will be eligible for re-employment provided he has served NEHU, its constituent Colleges and institutions for a minimum period of 10 years.

No Change

2. He/She should be physically fit and certified as such by NEHU C.M.O.

No Change

3. He/She should be academically active with a good record of service.

No Change

4. Teachers of all categories of the University as well as constituent Colleges fulfilling the above conditions will be eligible for consideration.

No Change

Procedure 1. Application for re-employment should be made by the teacher concerned to the Vice-Chancellor through the Deptt. approximately one year prior to the date of retirement. The Head of the Deptt. shall forward the application to the Vice-Chancellor within a period of one month of the receipt of the application along with the comments and resolution of the Department.

The Registrar shall ask the teacher if she/he is interested in re-employment and the Application thereof, if any shall be made by the teacher concerned to the Vice-Chancellor through the Deptt. approximately one year prior to the date of retirement. The Head of the Deptt. shall forward the application to the Vice-Chancellor within a period of one month of the receipt of the application along with the comments and resolution of the Deptt.

2. The vice-Chancellor will place the application for the consideration and approval of the Executive Council and its decision shall be final.

No change

EXISTING PROVISIONSPROVISIONS AFTER AMENDMENT

- | | |
|---|--------------|
| 3. The University shall intimate its decision to the concerned teacher and the Deptt. atleast three monts before the date of retirement of the teacher. | No Change |
| Remuna- 1. A re-employed teacher will be entitled to pay as per other Rules governing fixation of pay of re-employed facilities. persons. | 1.No Change. |
| 2. Physical facilities and other Departmental/University's amenities enjoyed by the teacher prior to his/her retirement will continue to be available to him/her. | 2.No Change |
| 3. The payment of retirement TA and moving expenses shall be deferred till he/she finally relinquishes his/her position as a teacher in the University after the period of re-employment. | 3.No Change |
| 4. The re-employed teacher shall be entitled to the benefit of CPF, Annual increments, LTC, etc. during the period of re-employment as per Govt. of India rules. | 4.No Change |

Notwithstanding anything contained in the rules, any difficulty in operating any of its clauses, or interpretation thereof, the matter shall be referred to the Executive Council, whose interpretation/decision shall be treated as final.

6:2:1(5)

NORTH-EASTERN HILL UNIVERSITY

SHILLONG

ANNEXURE-II

No:Conf./22-3/Reg./2000-1785 Dated Shillong the 21st August, 2000.

N O T I F I C A T I O N

In pursuance of the Academic Council's resolution No:AC:63:2000:5:1:(i) and the Executive Council's resolution No:EC:107:2000:5:1:(i) as adopted in their 63rd and 107th meetings respectively, the Vice-Chancellor, North-Eastern Hill University, Shillong is pleased to notify the AMENDMENTS TO RULE RU-2 ON RULES FOR RE-EMPLOYMENT OF TEACHERS as per ANNEXURE-'A', appended herewith with immediate effect.

Sd/- J.M.S.Khongwir
Deputy Registrar

Copy to:

1. Pro Vice-Chancellor's, NEHU, Shillong/Tura/Aizawl.
2. Registrar/Finance Officer/Controller of Examinations, NEHU, Shillong.
3. All Deans of Schools, NEHU, Shillong.
4. All Heads of Departments/Centres, NEHU, Shillong/Tura/Aizawl.
5. All Officers, NEHU, Shillong/Tura/Aizawl.
6. Director, Publication Cell, NEHU, Shillong.
7. P.S to the Vice-Chancellor, NEHU, Shillong.

Sd/-Deputy Registrar

AMENDMENTS TO RULE RU-2 ON RULES FOR RE-EMPLOYMENT
OF TEACHERS

EXISTING PROVISIONS	PROVISIONS AFTER AMENDMENT
NEHU extends the benefit of re-employment to its superannuated teachers on the following conditions:-	No change
1. The teacher on retirement may be re-employed for a period of two years from the date of retirement against the post vacated by him/her subject to the fulfilment of the following conditions:-	1. The teachers on retirement may be re-employed for a period of three years from the date of retirement against the post vacated by him/her subject to the condition that such teachers shall not hold any administrative post.
Such teachers shall not hold any administrative position.	
<u>Eligibility</u> 1. A superannuated teacher will be eligible for re-employment provided he has served NEHU, its constituent Colleges and Institutions for a minimum period of 10 years.	No change
2. He/She should be academically active with a good record of service.	No change
3. He/She should be physically fit and certified as such by NEHU C.M.O.	No change
4. Teachers of all categories of the University as well as constituent Colleges fulfilling the above conditions will be eligible for consideration.	No change
<u>Procedure</u> 1. Application for re-employment should be made by the teacher concerned to the Vice-Chancellor approximately one year prior to the date of retirement.	Application for re-employment should be made by the teacher concerned to the Vice-Chancellor or through the Department approximately one year prior to the date of retirement. The Head of the Department shall forward the application to the Vice-Chancellor within a period of one month of the receipt of the application alongwith the comments and resolution of the Department.
2. The Vice-Chancellor will place the application for the consideration and approval of the Executive Council and its decision shall be final.	No change

EXISTING PROVISIONS

PROVISIONS AFTER AMENDMENT

- | | |
|--|--|
| <p>3. The University shall intimate its decision to the concerned teacher within one month before retirement.</p> <p><u>Remu</u> 1. A re-employed teacher will be entitled to pay as per rules governing fixation of pay of other re-employed persons.</p> <p>2. Physical facilities and other departmental/University's amenities enjoyed by the teacher prior to his/her retirement will continue to be available to him/her</p> | <p>3. The University shall intimate its decision to the concerned teachers and the Department atleast three months before the date of retirement of the teacher.</p> <p>1. No change</p> <p>2.No change</p> <p>3. The payment of retirement T.A and moving expenses shall be deferred till he/she finally relinquishes his/her position as a teacher in the University after the period of re-employment.</p> <p>4. The re-employed teacher shall be entitled to the benefit of CPF, annual increments, LTC, etc. during the period of re-employment as per Government of India rules.</p> |
|--|--|

Notwithstanding anything contained in the rules, any difficulty in operating any of its clauses, or interpretation thereof, the matter shall be referred to the Executive Council, whose interpretation/ decision shall be treated as final.

6:3:2:(1)

6+
6:3 - LEAVE / DEPUTATION ETC.

ii) **Study leave provisions in OE-6**

Prof. M.N. Karna, Department of Sociology, NEHU, Shillong has submitted a proposal Vide letter dated 12.6.03 at Annexure -A to replace some old provisions contained under Clause (vii)(a) of OE-6 on study leave to the teachers of the University by the Provision as notified by the UGC on Revision of Pay Scale as per Appendix-VI, 10(i) & 10(vi)(a) for the benefit of the teachers community of the University.

The matter is placed before the Council for deliberation and decision.

6:3:2:(2)
NORTH-EASTERN HILL UNIVERSITY
DEPARTMENT OF SOCIOLOGY
UMSHING MAWKYNROH, SHILLONG-22 ANNEXURE-'A'

Prof M N Karna

Phone No: (0364)2551551(0)
(0364)2551689

Date: 12th June, 03

To

The Chairman,
Academic Council,
NEHU, Shillong-22

Ref : Study Leave provisions in OE-6

Sir,

While revising OE-6 in the light of the revision of pay scales under the UGC recommendations in 1998 certain important provisions concerning study leave were left out inadvertently. Certain clauses in the UGC recommendations are more advantageous in the larger interest of teachers. It would therefore be appropriate to replace some old provisions in OE-6 by new ones as provided in these recommendations.

An illustrative chart is furnished below to drive the fact home:

NEHU OE-6
(VII)(a)

Subject O...Study leave may be granted in full pay for the first year and on half pay for the second year and no pay shall be admissible thereafter.

UGC Notification
Appendix-VI

10(i)...The paid period of study leave should be for 3 years, but 2 years may be given in the first instance, extendable by one more year.

10(vi)(a)

Study leave may be granted on full pay up to two years extendable by one year at the discretion of the University.

Besides, there are some other provisions also which will be helpful to the teachers. It is therefore, requested that the matter may be placed before the ensuing meeting of the Academic Council for deliberations and early decisions.

Yours faithfully,

Sd/-
(MN Karna)

SG