UNIVERSITY OF KOTA

SCHEME OF EXAMINATION

AND

COURSES OF STUDY

Department of Pure & Applied Physics
Faculty of Science

Five year Integrated B.Sc.-M.Sc. (Physics)

First Semester (July-December, 2015)
Second Semester (January-May, 2016)

UNIVERSITY OF KOTA
MBS Marg, Near Kabir Circle, KOTA (Rajasthan)-324 005
INDIA

Edition: 2015

Course Structure with Distribution of Marks

Year / Semester	Serial Number, Code & Nomenclature of Paper			Duration of Exam.	Teaching Hrs/Week & Credit			Distribution of Marks			Min. Pass Marks	
	Number	Code	Nomenclature		L	P	C	Conti. Assess.	Sem. Assess.	Total Marks	Conti. Assess.	Sem. Assess.
I Year I Semester	1.1	MAT01	Calculus	3 Hrs	4		4	30	70	100	12	28
	1.2	PHY01	Mechanics	3 Hrs	4		4	30	70	100	12	28
	1.3	PHY 02	Physics & Chemistry of Materials	3 Hrs	4		4	30	70	100	12	28
	1.4	PHY03	Computer Programming	3 Hrs	4		4	30	70	100	12	28
	1.5	GEN01	General Hindi	3 Hrs	2				100			36
	1.6	GEN02	Elementary Computer Applications	3 Hrs	2				100			36
	1.7	LAB01	Laboratory Practices	6 Hrs		16	8		100	100		50
	Total				**20**	**16**	**24**	**120**		**500**		
I Year II Semester	2.1	MAT02	Differential Equations	3 Hrs	4		4	30	70	100	12	28
	2.2	MAT03	Computer Oriented Numerical and Statistical Methods	3 Hrs	4		4	30	70	100	12	28
	2.3	PHY04	Material Physics & Engineering	3 Hrs	4		4	30	70	100	12	28
	2.4	PHY05	Waves and Oscillations	3 Hrs	4		4	30	70	100	12	28
	2.5	GEN03	Environment Studies	3 Hrs	2				100			36
	2.6	GEN04	General English	3 Hrs	2				100			36
	2.7	LAB02	Laboratory Practices	6 Hrs		16	8		100	100		50
					20	**16**	**24**	**120**		**500**		

Objectives of the Course:

Innovation and Employability-Physics is concerned with the study of the universe from the smallest to the largest scale, why it is the way it is and how it works. Such knowledge is basic to scientific progress. Although physics is a fundamental science it is a very practical subject. Physicists have to be able to design and build new instruments, from satellites to measure the properties of planetary atmospheres to record-breaking intense magnetic fields for the study of condensed matter. Many of the conveniences of modern life are based very directly on the understanding provided by physics. Many techniques used in medical imaging are derived directly from physics instrumentation. Even the internet was a spin-off from the information processing and communications requirement of high-energy particle physics.

The Department of Pure and Applied Physics has been started the integrated course from July, 2013. Our five year Integrated Master's programme involves the students in a holistic experience of Physics education and instills the spirit of research in the formative years of their careers. This flagship programme of University is a pioneering model in Indian science and education, imparting education in Physics while simultaneously encouraging a participation in research. This course shall provide the thorough knowledge of Pure and Applied branches of Physics with extensive theoretical and experimental knowledge in major areas of Physics such as Material science, Plasma science, Advanced Electronics, Energy Studies etc. at Masters' level. This course also emphasizes on the Communication & Presentation skills of the students. The students after completing the course shall be placed in premier research institutes and companies in India and abroad, qualify NET/GATE/JEST examinations and eligible for M.Tech., PhD and teaching.

Duration of the Course:

The course Integrated B.Sc.-M.Sc. in Physics shall consist of five academic years divided in to ten semesters. The important feature of the course is that if the student desires to leave the course after three years, he/she shall get degree of B.Sc. (Hons).

Eligibility for Admission:

The basic eligibility for admission to the course is XII with Physics, Chemistry and Mathematics with minimum marks for GEN category candidates of Rajasthan-60%; Other state-65%; SC/STOBC/SOBC- Minimum Pass Marks. The admission in the course is based on merit of XII class.

Structure of the Programme:

The Integrated B.Sc.-M.Sc. programme consists of:

(i) Core and applied courses of theory as well as practical papers which are compulsory for all students.

(ii) Dissertation / Project Work / Practical training / Field work, which can be done in an organization (Government, Industry, Firm, Public Enterprise, *etc.*) approved by the Department.

Attendance:

Every teaching faculty handling a course shall be responsible for the maintenance of attendance Register for candidates who have registered for the course. The teacher of the course must intimate the Head of the Department at least seven calendar days before the last instruction day in the semester about the attendance particulars of all students. Each student should earn 75% attendance in the courses of a particular semester failing which he or she will not be permitted to appear in the End-Semester Examinations. However, it shall be open

to the authorities to grant exemption to a candidate who has failed to obtain the prescribed 75% attendance for valid reasons and such exemptions should not under any circumstance be granted for attendance below 65%.

Teaching Methodologies:

The classroom teaching would be through conventional lectures or power point presentations (PPT). The lecture would be such that the student should participate actively in the discussion. Student seminars would be conducted and scientific discussions would be arranged to improve their communicative skills. In the laboratory, instructions would be given for the experiments followed by demonstration and finally the students have to do the experiments individually.

Maximum Marks:

Maximum marks of a theory and practical paper shall be decided on the basis of their contact hours/credit per week. One teaching hour per week shall equal to one credit and carry 25 maximum marks and therefore, four teaching hours/credit per week shall carry 100 maximum marks for each theory paper/course. Each four contact hours per week for laboratory or practical work shall be equal to two credits per week and carry 25 maximum marks and therefore, sixteen teaching hours per week shall carry 100 maximum marks for laboratory or practical work.

Scheme of Examinations:

The examination shall be divided into two parts in which first part is continuous assessment or internal assessment and second part is semester assessment or external assessment. The schemes for the internal and external examinations shall be as under:

a) The assessment of the student for theory paper shall be divided into two parts in which first part is continuous assessment or internal assessment (30% of maximum marks) and second part is semester assessment or external assessment (70% of maximum marks). For practical papers there will be only one external assessment (100% of maximum marks).

b) The internal assessment for each theory paper shall be taken by the teacher concerned in the Department during each semester. There will be two internal assessment tests each of 15% weightage, for theory papers in each semester. Each internal assessment test shall be of one hour duration for each paper and shall be taken according to academic calendar notified by the University. There will be no internal examination in the practical paper.

c) A student who remains absent (defaulter) or fails or wants to improve the marks in the internal assessment may be permitted to appear in the desired paper(s) (only one time) in the same semester with the permission of the concerned Head of the Department. A defaulter / improvement fee of Rupees 250/- per paper shall be charged from such candidates. Duly forwarded application of such candidates by the teacher concerned shall be submitted to HOD who may permit the candidate to appear in the internal assessment after depositing the defaulter/ improvement fee. A record of such candidates shall be kept in the Department.

d) The external assessment shall be of three hours duration for each theory paper and six hours duration for practical paper. The practical examination shall be taken by the panel of at least one external and one internal examiner at the end of each semester.

e) The syllabus for each theory paper is divided into five independent units and each theory question paper will be divided into three sections as mentioned below:

- ***Section-A*** *shall have 01 compulsory question comprising 10 questions (maximum 20 words answer) taking two questions from each unit. Each question shall be of one mark and total marks of this section will be 10. This section will be compulsory in the paper.*
- ***Section-B*** *will carry 25 marks with equally divided into five long answer type questions (answer about in 250 words) and examiners are advised to set two questions from each unit and students are instructed to attempt five questions by selecting one question from each unit.*
- ***Section-C*** *will contain five long answer type questions. One compulsory question of 15 marks and four questions of 10 marks each. Students are instructed to attempt total three questions with one compulsory question (answer about in 500 words) of and any two more questions (answer about in 400 words) out of remaining four questions. Paper setter shall be instructed to design question paper covering from all five units.*

f) The pattern of question paper of internal and external shall be as follows:

(A) Continuous or Internal Assessment:

30% weightage of Maximum Marks (30 Marks out of 100 Maximum Marks)

DEPARTMENT OF PURE & APPLIED PHYSICS
UNIVERSITY OF KOTA, KOTA
First/Second Internal Test 20…….

Duration of Exam: 1.00 Hr **Max. Marks: 15**
Class: Integrated B.Sc.-M.Sc. (Physics) **Semester:**
Subject: **Paper:**
No. of Students: **Teacher:**

Note: The question paper contains three sections as under:
Section-A : One compulsory question with 04 parts. Please give short answers in 20 words for each part.
Section-B : 02 questions to be attempted having answers approximately in 250 words.
Section-C : 01 question to be attempted having answer in about 500 words.

SECTION A

Q.1(a)		1
(b)		1
(c)		1
(d)		1
	SECTION B	
Q.2		3
Q.3		3
Q.4		3
Q.5		3
	SECTION C	
Q.6		5
Q.7		5

(B) Semester or External Assessment:

70% weightage of Max. Marks (70 Marks out of 100 Max. Marks)

Duration of Examination: 3 Hours **Max. Marks: 70**

SECTION-A: 10x1=10
(Answer all questions)
(Two question from each unit with no internal choice)
Q. No. 1
(i) ……..…… **1 Mark**
(ii) ……..…… **1 Mark**
(iii) ……..…… **1 Mark**
(iv)……..…… **1 Mark**
(v)……..…… **1 Mark**
(vi)……..…… **1 Mark**
(vii)……..…… **1 Mark**
(viii)……..…… **1 Mark**
(ix)……..…… **1 Mark**
(x)……..…… **1 Mark**

SECTION-B: 5x5=25
(Answer all questions)
(One question from each unit with internal choice)
(Maximum two sub-divisions only)
Q. No. 2. . ……..……
Or
……..…….
5 Marks
Q. No. 3. ……..……
Or
……..……...
5 Marks
Q. No. 4. ……..……
Or
……..……
5 Marks
Q. No. 5. ……..……
Or
……..……...
5 Marks
Q. No. 6. ……..
Or
……..
5 Marks

SECTION-C: 1x15 + 2x10=35
(Answer any three questions including compulsory Q.No. 7)
(Maximum four sub-divisions only)
Q. No. 7. …… **15 Marks**

Q. No. 8. …… **10 Marks**

Q. No. 9. …… 1**0 Marks**
Q. No. 10. …… **10 Marks**

Q. No. 11. …… **10 Marks**

Distribution of Marks for Practical Examinations:

Duration of Exam: 06 Hours **Maximum Marks: 100**

S. No.	Name of Exercise	Marks
1.	Exercise No. 1	35
2.	Exercise No. 2	35
3.	Viva-voce	15
4.	Practical Record	15
	Total Marks	**100**

Rules regarding determination of results:

Each semester shall be regarded as a unit for working out the result of the candidates. The result of the each semester examination shall be worked out separately (even if he/she has appeared at the paper of the lower semester along with the papers of higher semester) in accordance with the following conditions:

a) The candidate shall be declared as pass in a semester examination, if he/she secures at least 40% marks in each theory paper separately in external & internal examination and 50% marks in each practical paper and at least 50 % marks in project/dissertation with 50% aggregate marks in that semester.

b) A candidate declared as fail/absent in one or more papers at any odd semester examination shall be permitted to take admission in the next higher semester (even semester) of the same academic session.

c) A candidate may be promoted in the next academic session (odd semester) if he/she has cleared collectively at least 50% of the papers of both semesters of previous academic session with 50% of the aggregate marks. The candidate who does not fulfill the above condition will remain as an ex-student and will reappear in the due papers along with next odd/even semester exams.

d) If any student who is provisionally admitted in higher odd semester but could not secure prescribed minimum marks in previous semesters will be treated as ex-student and his/her admission fee will be carry forwarded to the next odd semester of forthcoming academic session.

e) If a candidate, who is declared as pass, wishes to improve his/her performance in the theory papers of previous semester, he/she may re-appear only one time in these papers in next odd/even semester examinations.

f) Candidate shall not be permitted to re-appear or improve the marks obtained in the external examination of practical / dissertation in any condition.

g) If the number of papers prescribed in a semester examination is an odd number, it shall be increased by one for the purpose of reckoning 50% of the papers for considering the student pass/fail.

h) A candidate may be given only two additional chances for passing the semester thus maximum tenure for completing the two years' postgraduate course will be limited to four years, for three years postgraduate programme up to five years and so on.

i) The marks secured in the Gen Hindi, Gen English, Elementary Computer applications and Environment studies shall not be counted in awarding the division to a candidate. The candidate shall have to clear the compulsory subjects in the additional three chances and non-appearance or absence in the examination of compulsory subjects shall be counted as chance and shall be declared fail in that examination.

j) The grace marks scheme shall be applicable as per University norms.

Classification of Successful Candidates:

The classification of successful candidates after last semester examination shall be as under:

Description of Marks Obtained	**Division / Result**
• 80% and above marks in a paper.	Distinction in that paper.
• A candidate who has secured aggregate 60% and above marks	First Division
• A candidate who has secured aggregate 50% and above but less than 60% marks	Second Division

I Semester

1.1– Calculus

Unit 1
Polar coordinates, angle between radius vector and tangent, angle between curves in polar form, length of polar sub tangent and polar sub normal, derivative of length of an arc, Pedal equation of a curve, curvature, centre of curvature, chord of curvature.

Unit 2
Partial differentiation with Euler's theorem and its applications, Total derivative, Change of variables (Polar to Cartesian and Cartesian to Polar), Concept of Tangent plane and Normal to a surface. Maxima and Minima of two variables including Legrange's method of undetermined multipliers.

Unit 3
Asymptotes, Multiple points, Curve tracing (Cartesian, Parametric and Polar), Envelops & Evolutes, concavity and convexity, Double point.

Unit 4
Beta and gamma function, Reduction Formulae, Double and Triple Integrals, Change of order of integration in double integrals, Change of variables in multiple integration, triple integrals, Drichlet's integral.

Unit 5
Quadrature, Rectification, Intrinsic equation, Volume and Surface of solids formed by revolution, line integral, surface integral, volume integral, Gauss divergence theorem, Stokes theorem, Green's theorem.

Text/Reference Books:
1. Advanced Engineering Mathematics: E. Kreiszyg, New Age International, New Delhi, 1997.
2. Differential Calculus:Shanti Narayan, Shyam Lal Charitable Trust, Delhi, 1981.
3. Integral Calculus: Shanti Narayan, S. Chand, Delhi, 1982.

1.2-Mechanics

Unit 1
Inertial frame of references, Motion and rest, Galilean transformations, transformation of displacement, velocity and acceleration, Special theory of relativity, Lorentz transformation and rotation in space-time, time like and space like vector, world line macro-causality. Energy-mass relation, energy momentum relation.

Unit 2
Rotating frame of references, transformation of velocity and acceleration between rotating frames, Fictitious forces-Coriolis and centrifugal forces, effects of coriolis and centrifugal forces due to Earth's rotation, Foucault's pendulum-demonstration of earth's rotation.

Unit 3
Conservation Laws: Conservative forces, potential energy, Gravitational Potential, electric potential, center of mass and motion of center of mass of a system of particles, two particle

system and reduced mass, conservation of linear momentum in Lab and CM system, collision of two bodies in one and two dimensions (elastic and inelastic), slowing down of neutrons in a moderator, motion of a system with varying mass, conservation of angular momentum.

Unit 4

Dynamics of rigid body and motion under central forces: Rotational motion of a body, Moment of inertia, inertial coefficients, kinetic energy of rotation and concept of principal axes, Precessional motion of a spinning top and spin precession in constant magnetic field, motion under central forces, general solution under gravitational interaction, cases of elliptical and circular orbits, scattering of charged particles by heavy nucleus, planetary motion, Kepler's Laws.

Unit 5

Hooke's law, three moduli of elasticity, Young's modulus, Bulk modulus and modulus of rigidity, Poison's ratio, Relation between various elastic constants, torsion of a Cylinder, bending of beam, experimental determination of elastic constants by bending of beam and Searle's method, Modulus of rigidity by static and dynamic method and Poisson's ratio for rubber.

Text/Reference Books:

1. Mechanics by M P Saxena, P R Singh, S S Rawat and N S Saxena (4^{th} ed., College Book House, 1999)
2. Mechanics by D S Mathur (S. Chand & Co., 2001)
3. Berkley Physics Course Vol. I, Mc Graw Hill International, New York.
4. Mechanics by P. K. Srivasatava, New Age International Publisher, Delhi

1.3- Physics & Chemistry of Materials

Unit 1

Atomic Structure-Schrodinger wave equation, significance of Ψ, $\Psi^*\Psi$, quantum numbers, shapes of s, p, d orbitals, Aufbau and Pauli principles, Hund's multiplicity rule, exchange energy, pairing energy, symmetrical distribution of charge, extra stability of half-filled and completely-field orbitals, electronic configurations of elements up to atomic No. 71, effective nuclear charge, shielding effect, Slater's rules for evaluation of shielding constant.

Unit 2

Covalent bond:- resonance, valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions, valence shell electron pair repulsion (VSEPR) theory with reference to BF_3, BF_4^-, NH_3, H_2O, H_3O^+, PCl_5, SF_4, CIF_3, I_3^-, SF_6, IF_7, ICI_2^-, and $POCl_3$; MO theory, simple LCAO theory, sigma and pi molecular orbitals, homonuclear and heteronuclear (CO and NO) diatomic molecules and their ions, multicenter bonding in electron deficient molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.

Unit 3

Introduction to chemical kinetics, measurement of reaction rate, integration and determination of rate laws, rate constant, unit of rate constant for zero order, first order and

second order reactions, order of reaction, molecularity of reaction, difference between order and molecularity of reaction, chemical kinetics and its scope, factors influencing the rate of a reaction-concentration, temperature, pressure, solvent, light, catalyst; concentration dependence of rates, mathematical characteristics of simple chemical reactions-zero order, first order, second order, pseudo order; half-life and mean life; determination of the order of reaction-differential method, graphical method, method of integration, method of half-life period and isolation method, radioactive decay as a first order phenomenon, applications

Unit 4

Phase Equilibrium-Introduction, terminology: - phase, component, degree of freedom or variance; phase diagram of one-component system: -water system, sulphur system, CO_2 system, phase rule for two-components system: - Pb-Ag system and its applications, reduced phase rule, eutectic point.

Unit 5

Electric transport in electrolytic solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution, migration of ions and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its uses and limitations, Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only), applications of conductivity measurement: determination of degree of dissociation, determination of K_a of acids, determination of solubility product of sparingly soluble salt, conductometric titrations.

Text/Reference Books:

1. Lee, J. D. "Concise Inorganic Chemistry", Blackwell Publication.
2. Atkins, P. W. "Physical Chemistry", ELBS.
3. Material Science & Engineering, A first course, V Raghavan, PHI, New Delhi.
4. Material Science & Engineering an introduction, William D Callister Jr., John Wiley & Sons.

1.4- Computer Programming

Unit 1

C programming: structure of C program, A Simple C program, identifiers, basic data types and sizes, Constants, Operators, variables, expressions, type conversions, conditional expressions, precedence and order of evaluation. Input-output statements, if and switch statements, loops- while, do-while and for statements, break, continue, goto and labels.

Unit 2

Designing structured programs, Functions, basics, parameter passing, storage classes- extern, auto, register, static, scope rules, block structure, user defined functions, standard library functions, recursive functions, header files, C preprocessor.

Unit 3

Arrays-concepts, declaration, definition, accessing elements, storing elements, arrays and functions, two-dimensional and multi-dimensional arrays, applications of arrays, pointers-concepts, initialization of pointer variables, pointers and function arguments, address arithmetic, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays, dynamic memory managements functions.

Unit 4

Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bitfields, Input and output - concept of a file, text files and binary files, streams, ,standard I/o, Formatted I/o, file I/o operations, command line arguments.

Unit 5

FORTRAN programming: Variables, expressions, jumping, branching and looping statements, input/output statement, special statements: COMMON, ENTRY, FORMAT, PAUSE, EQUIVALENCE, programming of simple problems involving use of interpolation differentiation, integration, matrix inversion and least square analysis.

Text/Reference Books:

1. Kochan Stephen G., Programming in C, Pearson Eductaion
2. Wirth N., Algorithms & Data Structures, Prentice Hall

1.5-General Hindi

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vof/k 3 ?k.Vs

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2- ,d iz'u & 10 vad

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3- tkxks fQj ,d ckj ¼Hkkx nks½	fujkyk
4- fnYyh	fnudj
5- ge vfudsru	ckyd`".k 'kekZ uohu
6- >kalh dh jkuh	lqHknzk dqekjh pkSgku
7- xhr Qjks's'k	Hkokuh izlkn feJ
8- ckny dks f?kjr s ns[kk gS	ukxktqZu
9- HkVdk es?k	JhdkUr oekZ
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5- cMs+ ?kj dh csVh izsepUn
6- vnE; thou jkaxs; jk?ko
7- ckck vkEVs clar iksrnkj
8- mRlxZ jke dqekj oekZ
9- xka/kh th ls HksaV ¼vkRe dFkk ls½ jktsUnz izlkn
10- egkjktiqj ls Xokjh ?kkV ¼lkSan;Z dh unh ueZnk ls½ ve`r yky csxM+
11- HkfDru egknsoh oekZ
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Hkkx & x % O;kdj.k [k.M 50 vad

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3- izk:i 5 v ad
4- dgkorsa vkSj eqgkojsa 5 v ad
5- ikfjHkkf"kd 'kCnkoyh 5 v ad
6- 'kqf)dj.k ¼'kCn okD;½ 5 v ad
7- fucU/k 10 v ad
8- milxZ izR;; 5 v ad
9- okD;ka'k ds fy, ,d 'kCn 5 v ad

Hkkx ;% lwpuk dk vf/kdkj vf/kfu;e 2005
10 vad

1- y?kqmÙkjkRed iz'u 5 v ad
2- cgqfodYikRed iz'u 5 v ad

1.6-Elementary Computer Applications

Duration : 3 Hrs. M.M.Pass Marks:22 Theory :60
Duration : 2 Hrs. M.M.Pass Marks:14
Practical:40

Multiple Questions-120 and O.P.of four series for theory. Each question shall carry 1/2 mark, with no negative marking. As such, 1/2 mark shall be awarded for the correct answer in each question.

Note:

1. The marks secured in this paper shall not be counted in awarding the division to a candidate.
2. The candidate has to clear compulsory paper in three chances.

3. Non appearing or absent in the examination of compulsory paper will be counted a chance.

Model syllabus for compulsory paper of "Elementary Computer Applications"
in the first year of B.A./B.Sc./B.Com. Courses:

1. **Introduction to Information Technology**, evolution and generation of computers, type of computers, micro, mini, mainframe and super computer. Architecture of a computer system: CPU, ALU, Memory (RAM, ROM families) cache memory, input/output devices, pointing devices.
2. **Number system** (Binary, octal, decimal and hexadecimal) and their interconversions, character codes (ASCII, EBCDIC and Unicode). Logic gates. Boolean Algebra, machine, assembly and high level language including 3 GL and 4 Gl.
3. **Concept of Operating system**, need types of operating systems, batch, single user, multi-processing, distributed and time shared operating systems. Process and memory management concept. Introduction to Unix, Linux, Windows, Windows NT systems and their simple commands.
4. **Internet:** Concepts, email services, world wide web, web browsers, search engines, simple programs in HTML. Type of HTML documents. Document structure element. Type and character formation. Tables. Frames and forms.
5. **Word processing packages**, standard features like tool bar word wrap, text formatting, paragraph formatting. Effect to text. Mail-merge.
6. **Presentation packages**: Slide creation, slide shows, adding graphics, formatting, customizing and printing.
7. **Computer networking**: Type of networks. LAN, MAN and Wan concept of technology, bridges and routers, gateways and modems. ISDN and leased. Lines. Teleconferencing and videoconferencing.
8. **Multimedia Technology**: Introduction, framework for multimedia devices, image compression standards, JPEG, MPEG and MIDI formats.
9. **Database Management Systems:** Data, field and records, information database, creation of a database file, insertion, deletion and updating of records, modifying structure, editing and browsing of records, searching, sorting and indexing of records, retrieving of records and report generation. Data processing in government organizations.
10. **E-commerce**: Concept of e-commerce, benefits and growth of ecommerce, security considerations and hazards of virus and other security risks, anti-virus software, electronic payment system.

LABORATORY: The laboratory exercises will be designed to help in the understanding of concepts of computer and the utilization in the areas outlined in the theory syllabus. The emphasis should be on practical usage rather than on theoretical concepts only. In addition, MS-Office package is to be practiced in the lab.

Note:

1. Passing in Theory and Practical examinations separately shall be necessary by securing at least 36% marks. Maximum marks for theory will be 60 and maximum marks for practical paper will be 40. Minimum passing marks for theory and practical shall be 22 and 14 respectively.

2. The theory Q. P. will carry 120 multiple choice question of 1/2 marks each. Question paper of four series shall be printed.

3. The practical examination scheme should be as follows.

1. The practical examination scheme should be as follows:

a. Record/sessionals	6 marks
b. Viva-voce	6 marks
c. practical Exercise (DOS)	7 marks
d. practical Exercise (Window 98)	7 marks
e. practical Exercise (MS-Word)	7 marks
f. practical Exercise (MS-Excel)	7 marks

2. Duration for practical examination shall be of 2 hours and not more than 2 batches of 20 students each should be examined in a day by Single examiner.

1.7 Laboratory Practices

1. Determine the Young's modulus of the material, by bending of beam.
2. Determine the modulus of rigidity using Maxwell's needle.
3. Determine Poisson's ratio of rubber.
4. Determine Young modulus, Modulus of rigidity and Poisson ratio by searl's method.
5. Study the damping of a compound pendulum and determine the damping coefficient and quality factor.
6. Conversion of a galvanometer in to an ammeter and to calibrate it.
7. Conversion of a galvanometer in to a voltmeter and to calibrate it.
8. Study of charging and discharging of a capacitor through a resistance.
9. Simple Problems Using scanf and printf functions, Formula Based Problems using Constants, Variables and use of operators, Library Functions.
10. Loop Statement using for, while, do –while statement.
11. Conditional checking using if statement, Nested if statement, switch statement and Unconditional goto.
12. Problems based on array data types. Problems on One Dimensional Array-Searching (Linear, Binary), Sorting (Bubble, Selection, Insertion), Merging.
13. Problems on two Dimensional Array-Matrix Operation: Addition, Subtraction, Multiplication etc.
14. Problems based on pointers, Parameter passing in functions, Recursion.
15. Declaration, Reading, Writing and manipulation on struct and union data type.
16. File handling, Command Line Arguments.

II Semester

2.1-Differential Equations

Unit 1

Solution of differential equations of first order and first degree, Solution of differential equations of first order and any degrees, Applications, Linear differential equations with constant coefficients, Homogeneous linear differential equations.

Linear differential equations of second order: The complete solution in terms of known integral, Method of removal of first derivative (or Reduction to normal form or Change of dependent variable), Transformation of equations by changing the independent variable, Method of variation of parameters.

Unit 2

Singular solutions & Extraneous loci, Trajectories of a family of curves, Orthogonal trajectories, Simultaneous Differential Equations: Methods of solving simultaneous differential equations, Simultaneous equations of the first order.

Unit 3

Exact Linear Differential Equations of nth order, Condition of exactness for a linear equation of order n, Integrating factors; Non-linear differential equation of particular forms, Exact non-linear differential equations, Riccati's Equation.

Unit 4

Total Differential Equation-Necessary & Sufficient condition for the total differential equations, Solutions of a total differential equation involving four variables.

Unit 5

Series solutions of second order linear differential equations: Method of differentiation Cauchy- Euler equation, Method of Frobenius, The Hyper Geometric Series, Solution of Gauss-Hypergeometric Equation.

Text/Reference Books:

1. Differential Equations Vol I: J.L. Bansal and H.S. Dhami, JPH, 2004.
2. Ordinary and Partial Differential Equations: M.D. Raisinghania and R.S. Aggarwal, S. Chand & Company, New Delhi, 2nd edition 1983.
3. Theory and problems of Differential equations: Frank Ayres, McGraw-Hill Book Company, Singapore, 1st edition 1972.
4. The Use of Integral transforms: I. N. Sneddon, New Delhi, 1974.
5. Integral Transforms: S. P. Goyal and A. K. Goyal, JPH, 1st edition 2005.

2.2-Computer Oriented Numerical and Statistical Methods

Unit 1

Computer arithmetic and errors, Floating point arithmetic and error estimates, Implication of precision, Illustrations of errors due to round-off.

Solution of non-linear equations: Bisection, Fixed point iteration, Newton - Raphson method, Aitkins process, rate of convergence, zeros of polynomials, real & complex.

Unit 2

Solution of Linear system of equations: Direct method - Gaussian elimination including pivoting and scaling, iterative method: Jacobi's and Gauss-Siedel, Solution of ordinary differential equations - Taylor's series method Euler's and modified Euler's method. Local and global error analysis, Runge-methods, Predictro-Corrector method, ultistep method.

Unit 3

Interpolation: Lagrangian Polynomials, divided differences, Evenly spaced data, Newton-Gregory forward and backward interpolations, Interpolating with cubic splins, Inverse inverse interpolations, Error terms and error of interpolation, Approximation: Approximation of functions by Taylor's series, Least squares approximations, Fitting nonlinear curves by least squares, Chebysheve polynomials.

Unit 4

Numerical differentiation: Differentiation formula based on interpolating polynomials, formulae for higher derivatives, Extrapolation techniques, round-off & accuracy of derivatives, Numerical integration: Newton-Cotes integration formulae, The Trapezoidal, rule, Romberg integration Simpson's 1/3 & 3/8 rule, Gaussian quardrature formulae for integration.

Unit 5

Applicable statistics: Curve fitting by principle of least square, Correlation and regression-simple & multiple, model building and forecasting test of significance for large samples, chisquare test for goodness of fit, concept of population and sample, analysis of variance for one way classified data, Statistical decision making.

Text/Reference Books:

1. V. Rajaraman, Computer Oriented Numerical Methods, Prentice Hall, New Delhi
2. R. Govil , Kamputer se sankhyatmak Reetiyan, et.al. Pitamber Publications, New Delhi,
3. S.P. Gupta., Statistical Methods, Sultan Chand Publications
4. S. S. Shastri,, Introducing Methods of Numerical Analysis, PHI, New Delhi

2.3-Materials Physics & Engineering

Unit 1

WATER-Common impurities of water, hardness of water:-determination of hardness by Clark's test and complex metric (EDTA) method, degree of hardness, numerical based on hardness and EDTA method, municipal water supply:-requisites of drinking water, steps

involved in purification of water, sedimentation, coagulation, filtration and sterilization, break point chlorination, Water Treatment- Softening of water**:** lime-soda method, zeolite method and deionization or demineralization method, boiler troubles (scale and sludge, priming and foaming), their causes, disadvantages and prevention; boiler corrosion and caustic embrittlement, numerical problems based on lime-soda and zeolite softening methods.

Unit 2

Corrosion-Definition and its significance, mechanisms of corrosion: chemical corrosion and electrochemical corrosion, protection from corrosion: protective coatings, cathodic protection, sacrificial anode and modification in designs, Polymers-Different methods of classification and constituents of polymers, plastics:-thermosets and thermoplasts; preparation, properties and uses of polyethylene, bakelite, terylene and nylon; elastomers:-natural rubber, vulcanization, synthetic rubbers viz. Buna-S, Buna-N, Butyl and neoprene rubbers.

Unit 3

Cement-Definition, composition, basic constituents and their significance, manufacturing of Portland cement by rotary kiln technology, chemistry of setting and hardening of cement and role of gypsum, Glasses-Definition, properties, manufacturing of glass, types of silicate glasses and their commercial uses, importance of annealing in glass making.

Unit 4

Refractories-Definition, classification, properties, requisites of good refractory and manufacturing of refractory, detailed study of silica and fire clay refractory and their uses, Seger's cone test and RUL test.

Unit 5

Fuels-Organic fuels: general aspects of organic fuels; solid fuels:-coal, carbonization of coal, manufacturing of coke by Beehive oven and Otto-Hoffman byproduct oven method; liquid fuels:-advantages and refining of petroleum, cracking, refining, reforming, polymerization and isomerization of refinery products, synthetic petrol:-Berguis and Fischer-Tropsch process, gaseous fuels: composition and calorific value of coal, gas and oil gas, Fuels (Analyses)-calculations of calorific value based on Dulong's formula, combustion and requirement of oxygen/ air in combustion process, flue gas analysis by Orsat's apparatus and its significance.

Text/Reference Books:

1. Senapati, M. "Advanced Engineering Chemistry", Second Edition, Laxmi Publications, New Delhi, 2007.
2. Qanungo, K. "Engineering Chemistry", PHI, New Delhi, 2009.
3. Material Science & Engineering, A first course, V Raghavan, PHI, New Delhi.
4. Material Science & Engineering an introduction, William D Callister Jr., John Wiley & Sons.

2.4-Waves and Oscillations

Unit 1

Oscillations in a potential well, harmonic oscillator, examples - mass on a spring, torsional oscillators, LC circuit, energy of the oscillator, damping, viscous and solid friction damping, damped harmonic oscillator, power dissipation.

Unit 2
Forced harmonic oscillator with viscous damping, frequency response, phase relation, quality factor, resonance, electrical oscillation, Anharmonic oscillator, simple pendulum as an example.

Unit 3
Equation of motion of two coupled simple harmonic oscillators, normal modes, motion in mixed modes, transient behavior, effect of coupling in mechanical systems, electrically coupled circuits, frequency response, reflected impedance, effect of coupling and resistive load.

Unit 4
Dynamics of number of oscillators with near-neighbour interactions, equation of motion for one dimensional monoatomic and diatomic lattices, acoustic and optical mode, dispersion relations, concept of group and phase velocities.

Unit 5
Wave Motion-Wave motion and its parameters, stationary waves, Wave velocity and group velocity, Ultrasonics: Production, properties and uses of ultrasonic waves, Reverberation time, Sabine's formula.

Text/Reference Books:
1. Oscillations and Waves by M. P. Saxena and S. S. Rawat, College Book House,1997.
2. Berkley Physics Course Vol. I, Mc Graw Hill International, New York.
3. Vibration and Waves by A. P. French, CBS Publications, Delhi, 1987

2.5-Environment Studies

Time 3 Hrs. Max. Marks 100 Min Pass Marks 36
In pursuance of the directions of the Hon'ble Supreme Court of India and the University Grants Commission, New Delhi, the University of Kota has declared to introduce compulsory paper of "Environmental Studies" in Part- I of all streams (B.A./B.Sc./B.com.) etc. w.e.f. the session 2005-2006 and onwards. The marks secured in this paper will not be counted for working out the division. The candidate can clear this paper in three chances. Therefore all the candidates regular/Ex/Non-Collegiate appearing in Part-I of B.A./B.Sc and B.Com etc. examination of 2006 are required to appear and clear this paper and they must enter this paper in their examination forms. The code number of this paper is 5106.

The syllabus and scheme of examination is as under:
The question paper shall contain 100 objective type questions with multiple choice (four) answers. The student will be required to blacken the circle of correct choice of answer on the computer scan able OMR sheet with the help of H.B. pencil. Evaluation of the answer sheets be made with the help of computer. Four different types of question papers (A,B,C, and D) each containing 100 questions shall be printed. The student will be required to mark/write the type of question paper he is answering on the answer sheet, so that answers marked by him/her may be correctly assessed with the help of relevant key of answers, by the computer.

Each question shall carry one mark, with no negative marking. As such, one mark shall be awarded for the correct answer in each question.
Note:
1. The marks secured in this paper shall not be counted in awarding the division to a candidate.
2. The candidate has to clear compulsory paper in three chances.
3. Non appearing or absent in the examination of compulsory paper will be counted a chance.

Model syllabus for compulsory paper of "Environmental studies" in the first year of B.A./B.Sc./B.Com. Courses:

Core Unit 1. Introduction: the multidisciplinary nature of environmental studies: Definition, scope and important need for public awareness (5 Questions)

Core Unit 2. Natural Resources: Renewable and non-renewable resources, natural resources and
associated problems. (20 questions)
A) Forest resources: use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest, and tribal people.
B) Water resources: use and over- utilization of surface and groundwater, floods, drought, conflicts over water, dams-benefits and problems.
C) Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, case studies.
D) Food resources: world food problems, changes caused by agriculture and overgrazing, effects of
modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
E) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
F) Land resources: land as a resource, land degradation, man induced landslides, soil erosion and desertification.
• Role of an individual in conservation of natural resources.
• Equitable use of resources for sustainable lifestyles.

Unit 3: Ecosystems (15 Questions)
• Concept of an ecosystem.
• Structure and function of an ecosystem.
• Producers, consumers and decomposers.
• Energy flow in the ecosystem
• Ecological succession
• Food chains, food webs and ecological pyramids
• Introduction, type, characteristic, features, structure and function of the following ecosystem:
a. Forest ecosystem b. grassland ecosystem c. desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes)

Unit 4: Biodiversity and its conservation (15 Questions)
• Introduction – definition: genetic, species and ecosystem diversity.
• Biogeographically classification of India.

• Value of biodiversity: Consumptive use, productive use, social, ethical, aseptic and option values
• Biodiversity at global, National and local levels.
• India as a mega- diversity nation
• Hot-spots of biodiversity.
• Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts
• Endangered and endemic species of India
• Conservation of biodiversity: in- situ and Ex-situ conservation of biodiversity.

Unit 5: Environmental Pollution Definition (15 Questions)

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

Unit 6: Social Issues and the Environment (15 Questions)

• From Unsustainable to sustainable development
• Urban problems related to energy
• Water conservation, rain water harvesting, watershed management
• Resettlement and rehabilitation of people; its problems and concerns, case studies.
• Environmental ethics: issues and possible solutions.
• Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies
• Wasteland reclamation.
• Consumerism and waste products.
• Environmental protection Act.
• Air (Prevention and Control of Pollution) Act.
• Water (Prevention and Control of Pollution) Act.
• Wild life protection Act.
• Forest conservation Act.
• Issues involved in enforcement of environmental legislation.
• Public awareness.

Unit 7: Human Population and the Environment (15 Questions)

• Population growth, variation among nations.
• Population explosion- family welfare programme.
• Environment and human health
• Human rights
• Value education.
• HIV/AIDS.
• Women and child welfare.
• Role of information technology in environment and human health
• Case studies

Text/Reference Books:

1. S.V.S. Rana, 2004. Environmental Studies. Rastogi Publications, Meerut.

2. P. Bakre, V. Bakre and V. Wadhwa. 2005. Paryavarniya Adhyyan. Rastogi Publications Meerut.
3. E. Bharucha, 2005. Environmental Studies. University Press, Hyderabad.
4. G.. R. Chatisel and H. Sharma. 2005. A Text Book of Environmental Studies. Himalaya Publishing House. Delhi.

2.6-General English

Duration: 3hrs Min. Pass Marks: 36 Max.Marks:100

Objectives

An essentially language based course that aims at making students study English Prose with a view to enlarge their comprehension of the language and develop all the four skills. It also aims at giving them basic skills in grammar and composition, widening their vocabulary and teaching them to write simple and correct English.

1) Comprehension and vocabulary

Prose: Indian Voices: A course in English literature and language; ed. By Kshamta Chaudhary and Sanjay Chawla. Published by Orient Blackswan, Hyderabad. The following chapters from the text have been prescribed:

1. The Child	:	Premchand
2. The mark of Vishnu	:	Khushwant Singh
3. Brain Bhownik's Ailment	:	Satyajit Ray
4. Drought	:	Sarat Chand Chatterjee
5. A vision for 2020	:	A.P.J. Abdul Kalam
6. Elixir of Life	:	C.V. Raman
7. Photographs	:	Shama Futehally
8. The death of a Hero	:	Jai Nimbkar

Questions based on the content from the prescribed text.

1. Short answers in one sentence each. 10
2. Answers in 20-30 words. 10
3. Answers in 100 words. 10

2. (a) Objective / Multiple choice questions based on the content from the prescribed text. 10

(b) Short answers from the same text. 10

3. Basic Language Skills : Parts of speech, Determiners, Voice, Reported-Speech, Correct Verbs, form of Modals, Phrasal Verbs, Prepositions and Question Tags. 30

4) Writing Skills

a) Paragraph writing / C.V. Curriculum –Vitae 10

b) Leter Writing / E_mail / Report Writing 10

Text/Reference Books:

1. A Practical English Grammar by A.J. Thomson & A.V. Martinet

2. Oxford English Grammar Course by Michael Swan & Catherine

2.7-Laboratory Practices

1. Study the behaviour of RC circuit with AC source and determine the impedance and phase relation.
2. Study the behaviour of growth and decay of current in LR circuit with DC source.
3. Study the resonance in series and parallel LCR circuit and determine the quality factor.
4. Study of RC/LC transmission line.
5. Perform floating point operations using normalization (addition, subtraction, multiplication, division)
6. Find the roots of equation (bisection method, regula-falsi method, Newton raphson method, secant method, successive approximation method)
7. Find solution of n linear equation (Gauss elimination method (with & without pivoting), Gauss Seidel method, Gauss Jordan method)
8. Generate following difference tables (forward, backward, divided difference)
9. Interpolate value of f(x) at given x (Lagrange's interpolation method, Newton forward interpolation method, Newton's backward interpolation method)
10. Interpolate value of x at given f(x) using Inverse interpolation method.
11. Fitting of different curves (straight line fit (x on y), straight line fit (y on x), parabola, geometric curve, exponential curve)
12. Find order of polynomial.
13. Find derivative of a given tabulated function at given value (Newton's forward method, Newton's backward method)
14. Find Integrated value, (when tabulated function given-Trapezoidal rule (simple & modified), Simpson's 1/3 (simple & modified), Simpson's 3/8 (simple & modified)
15. Find Integrated value, when algebraic expression given (when algebraic expression given-Trapezoidal rule (simple & modified), Simpson's 1/3 (simple & modified), Simpson's 3/8 (simple & modified)
16. Solve differential equation (Euler's method, Runge-Kutta 2^{nd} order method, Runge-kutta 4^{th} order method, Modified Euler's method, Predictor-corrector method