GOVERNMENT COLLEGE (AUTONOMOUS), BHAWANIPATNA

(College with potential for excellence)

COURSES OF STUDIES

FOR THREE YEAR DEGREE COURSE
IN
S C I E N C E
(UNDER CBCS)

SUB: COMPUTER SCIENCE

Semester-I	**2017**	**Semester-II**	**2018**
Semester-III	**2018**	**Semester-IV**	**2019**
Semester-V	**2019**	**Semester-VI**	**2020**

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COURSE STRUCTURE

		Paper Code	Credit Points
Semester-I	1	AECC-1	02
	2	GE-1	06
	3	CORE-1	06
	4	CORE-2	06
		TOTAL	**20**
Semester-II	1	AECC-2	02
	2	GE-2	06
	3	CORE-3	06
	4	CORE-4	06
		TOTAL	**20**
Semester-III	1	SEC-1	02
	2	GE-3	06
	3	CORE-5	06
	4	CORE-6	06
	4	CORE-7	06
		TOTAL	**26**
Semester-IV	1	SEC-2	02
	2	GE-4	06
	3	CORE-8	06
	4	CORE-9	06
	4	CORE-10	06
		TOTAL	**26**
Semester-V	1	CORE-11	06
	2	CORE-12	06
	3	DSE-1	06
	4	DSE-2	06
		TOTAL	**24**
Semester-VI	1	CORE-13	06
	2	CORE-14	06
	3	DSE-3	06
	4	DSE-4	06
		TOTAL	**24**
		GRAND TOTAL	**140**

C O N T E N T

ABILITY ENHANCEMENT COMPULSORY COURSE (AECC)

SEMESTER–I

AECC-I : ENVIRONMENTAL STUDIES (ENVS)

(CREDITS: 2, Theory=2)
(Total Marks: 50, Mid Sem=10, Term End=40, Duration: 2 hrs)

MODULE-1: Introduction to environmental studies and Ecosystem [BOTANY Dept]

Multidisciplinary nature of environmental studies;
Scope and importance; Concept of sustainability and sustainable development.

Ecosystems : **[ZOOLOGY Dept]**

What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: Food chains, food webs and ecological succession. Case studies of the aquatic ecosystems (ponds) (8 lectures)

MODULE-2:

Natural Resources : Renewable and Non-renewable Resources [ZOOLOGY Dept]

- Land resources and land use change; Land degradation, soil erosion and desertification.
- Deforestation: Causes and impacts due to mining, dam building on environment, forests, Biodiversity and tribal populations.
- Water : Use and over---exploitation of surface and ground water, floods, droughts, conflicts Over water (international & inter-state).
- Energy resources : Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies. (8 lectures)

MODULE-3: Biodiversity and Conservation [BOTANY Dept]

- Levels of biological diversity : genetic, species and ecosystem diversity; Biogeographic zones Of India; Biodiversity patterns and global biodiversity hot spots
- India as a mega-biodiversity nation; Endangered and endemic species of India
- Threats to biodiversity : Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions;
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value. (8 lectures) **[BOTANY Dept]**

MODULE-4: Environmental Pollution [CHEMISTRY Dept]

- Environmental pollution : types, causes, effects and controls; Air, water, soil and noise pollution
- Nuclear hazards and human health risks
- Solid waste management: Control measures of urban and industrial waste.
- Global warming, ozone layer depletion. (8 lectures)

References:

1. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. *Ecology, Environmental Science and Conservation*. S.Chand Publishing, New Delhi.
2. Das and Mishra. Man and Environment.
3. S. Swain. Environmental Studies.
4. M C Dash. Fundamental of Ecology.
5. Shukla and Chandel. A Text Book of Plant Ecology.

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ABILITY ENHANCEMENT COMPULSORY COURSE (AECC)

SEMESTER-II

AECC-II : ENGLISH

(CREDITS: 2, Theory=2)
(Total Marks: 50, Mid Sem=10, Term End=40, Duration: 2 hrs)

This course aims at enhancing the English language proficiency of undergraduate students in humanity, science and commerce streams to prepare them for the academic, social and professional expectations during and after the course. The course will help develop academic and social English competencies in speaking, listening, pronunciation, reading and writing, grammar and usage, vocabulary, syntax, and rhetorical patterns.

Students, at the end of the course, should be able to use English appropriately and effectively for further studies or for work where English is used as the language of communication.

MODULE-1: Reading Comprehension [15]

- Locate and remember the most important points in the reading
- Interpret and evaluate events, ideas, and information
- Read "between the lines" to understand underlying meanings
- Connect information to what they already know

MODULE-2: Writing [15]

Expanding an Idea	Writing a Memo	Report Writing
Creative Writing	News Story	Setting in Creative Writing
Writing a Business Letter	Letters to the Editor	Précis Writing
CV & Resume Writing	Dialog writing	Covering Letter
Writing Formal Email	Elements of Story Writing	Note Making
Information Transfer	Interviewing for news papers	

MODULE-3: Language functions in listening and conversation [06]

1. Discussion on a given topic in pairs
2. Speaking on a given topic individually

(Practice to be given using speaking activities from the prescribed textbooks)

Grammar and Usage [14]

Simple and Compound Sentences; Complex Sentences; Noun Clause; Adjective Clause; Adverb Clause; The Conditionals in English; The Second Conditional; The Third Conditional; Words and their features; Phrasal Verbs; Collocation; Using Modals; Use of Passives; Use of Prepositions; Subject-verb Agreement; Sentence as a system; Common Errors in English Usage

Examination pattern

Each reading and writing question will invite a 200 word response.
Language function questions set in context will carry 01 mark per response. There will be 15 bit questions.

Midterm test:	Writing	: 1 question	04 x 01qn = 04 marks
	Speaking:	2 questions	03x02 qns = 06 marks
	Total		10 marks
Term End :	MODULE-1	Reading: 05 questions (3 prose and two poetry questions)	03x 05 qns= 15 marks
	MODULE-2	Writing: 03 questions	05 x 03 qns= 15 marks
	MODULE-3	Grammar & usage: 10 qns	01x 10 qns = 10 marks
	Total		40 marks

Grammar questions must be set in contexts; not as isolated sentences as used for practice in the prescribed textbook.

Book Prescribed

Vistas and Visions: An Anthology of Prose and Poetry. (Ed.)Kalyani Samantray, Himansu S. Mohapatra, Jatindra K. Nayak, Gopa Ranjan Mishra, Arun Kumar Mohanty. OBS
Texts to be studied : **Prose** (Decoding Newspapers, The Gold Frame, Of Truth, Lifestyle English)
Poetry (Lines Composed a few miles above Tintern Abbey; Sonnet 46 (Shakespeare); Pigeons)
All grammar and writing activities in the textbook

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AECC-II : ODIA
SEMESTER-II

ଆସ୍ଥାମୂଲ୍ୟାଂକ -୨, ମୋଟ୍ ଶ୍ରେଣୀ ପାଠଦାନ-୨୦ ଘଣ୍ଟା, ପୂର୍ଣ୍ଣସଂଖ୍ୟା -୫୦, ପରୀକ୍ଷା ସମୟ-୨ ଘଣ୍ଟା

ପାଠ୍ୟରୁ କୌଣସି ଗୋଟିଏ ପାଠ୍ୟକୁ ବାଛିବାକୁ ହେବ।

ପାଠ୍ୟ-୧ / Course-1 :

ଉପାଂଶ-୧: (ଗଳ୍ପବିଭାଗ) ଗଳ୍ପ ତରଂଗ-ପ୍ରକାଶକ ସମ୍ବଲପୁର ସାହିତ୍ୟ ସଂସଦ
ଭଗବାନ ମଲାପରେ-ମହାପାତ୍ର ନୀଳମଣି ସାହୁ
ବିଷକନ୍ୟାର କାହାଣୀ-ମନୋଜ ଦାସ
ଦ୍ୱିତୀୟ ଶ୍ମଶାନ-ରାମଚନ୍ଦ୍ର ବେହେରା
ଯେକୌଣସି ଦୁଇଟି ପ୍ରଶ୍ନର ଗୋଟିଏ ପ୍ରଶ୍ନର ଉତ୍ତର ପାଞ୍ଚଶହ ଶବ୍ଦରେ ଲେଖିବାକୁ ହେବ। (୧୦)

ଉପାଂଶ-୨: (କବିତାଶ୍ରୀ) ଅନୁଭବାଚ -ଯୁଗପ୍ରସାସ ମହାନ୍ତି
ଲାଞ୍ଛନ-ରମାକାନ୍ତ ରଥ
ଯୁଗପତିସଭାସ୍ଥଳେ -ପ୍ରତିଭା ଶତପଥୀ
ଯେକୌଣସି ଦୁଇଟି ପ୍ରଶ୍ନର ଗୋଟିଏ ପ୍ରଶ୍ନର ଉତ୍ତର ପାଞ୍ଚଶହ ଶବ୍ଦରେ ଲେଖିବାକୁ ହେବ। (୧୦)

ଉପାଂଶ-୩: (ଅବବୋଧ) ଏକଶହପଚାଶ ଶବ୍ଦର ଏକ ଅନୁଚ୍ଛେଦ ପ୍ରଦାନ କରାଯିବ।
୫ଟି ପ୍ରଶ୍ନ ପଡିବ ଏବଂ ପ୍ରତ୍ୟେକ ପ୍ରଶ୍ନର ମୂଲ୍ୟ ୨। (୫X୨=୧୦)

ଉପାଂଶ-୪: (ଭାବ ସଂପ୍ରସାରଣ) କୌଣସି ଏକ ଛୋଟିକୁ ପ୍ରଶ୍ନଭାବରେ ପ୍ରଦାନ କରାଯିବ। (୧୦)

ଉପାଂଶ-୫: (ବିଭକ୍ତି) ବ୍ୟାକରଣ। ଆଠଟିର ପାଞ୍ଚଟି ପ୍ରଶ୍ନର ଉତ୍ତର ଦେବାକୁ ହେବ। ପ୍ରତ୍ୟେକ ପ୍ରଶ୍ନର ମୂଲ୍ୟ ୨ ନମ୍ବର। (୫X୨=୧୦)

ପାଠ୍ୟ-୨ / Course-2 : ସଂପର୍କ ଅନୁବିଧି

ଉପାଂଶ-୧: ସଂପର୍କର ଭିତ୍ତି, ପରିଭାଷା, ଅନୁବିଧି ଓ ପରିସର

ଉପାଂଶ-୨: ସଂପର୍କର ପ୍ରକାରଭେଦ: କଥିତ-ଲିଖିତ, ବ୍ୟକ୍ତିଗତ-ସାମାଜିକ-ସାଂସ୍କୃତିକ-ବ୍ୟାବସାୟିକ-ସାହିତ୍ୟିକ

ଉପାଂଶ-୩: ସଂପର୍କର ବାଧକ ଓ ସଫଳସାଧନର ଦିଗ

ଉପାଂଶ-୪: ସଂପର୍କରେ ସାହିତ୍ୟର ଭୂମିକା

ଉପାଂଶ-୫: ସଫଳ ସଂପର୍କର ଭାଷା

ପାଠ୍ୟ-୩ / Course-3 : ସଂପର୍କର ରୀତି / ଭଙ୍ଗୀ ଓ ମାଧ୍ୟମ

ଉପାଂଶ-୧: ସ୍ୱଗତକଥନ ଓ ସାଂଳାପିକ ଭଙ୍ଗୀ / ସାହିତ୍ୟ-ମାଧ୍ୟମ ଓ ଯୋଗାଯୋଗ

ଉପାଂଶ-୨: ଦଳଗତ ଆଲୋଚନା ଓ ବିତର୍କ

ଉପାଂଶ-୩: ସାକ୍ଷାତ୍କାର

ଉପାଂଶ-୪: ପତ୍ରଲିଖନ ପଦ୍ଧତି / ବିବରଣି ଲିଖନ

ଉପାଂଶ-୫: ବୈଦ୍ୟୁତିକ ପଦ୍ଧତି ଓ ସଂପର୍କର ଭାଷା (ଯୁଗଭାଷ , ସଂକ୍ଷିପ୍ତ ସୂଚନା ପ୍ରେରଣ, ଦୃଶ୍ୟଶ୍ରାବ୍ୟ ସଂଚାର ବିଧାନ, ୱେବ୍‌ସାଇଟ୍, ଆନ୍ତର୍ଜାତିକ ପଦ୍ଧତି / ଇଣ୍ଟରନେଟ୍)

ଗ୍ରନ୍ଥ ତାଲିକା

୧- ଗଳ୍ପତରଂଗ- ପ୍ରକାଶକ ସମ୍ବଲପୁର ସାହିତ୍ୟ ସଂସଦ।

୨- ସଂଯୋଗ ଅନୁବିଧି /ବ୍ୟାବହାରିକ ଓଡିଆ ଭାଷା ଓ ପ୍ରୟୋଗାତ୍ମକ ବ୍ୟାକରଣ, ସନ୍ତୋଷ ତ୍ରିପାଠୀ, ନାଳନ୍ଦା, କଟକ।

୩- ପ୍ରାୟୋଗିକ ଓଡିଆ ଭାଷା- ଓଡିଶା ରାଜ୍ୟ ପାଠ୍ୟପୁସ୍ତକ ପ୍ରଣୟନ ଓ ପ୍ରକାଶନ ସଂସ୍ଥା।

୪- ସମ୍ବାଦ ଓ ସାମ୍ବାଦିକତା- ଚନ୍ଦ୍ରଶେଖର ମହାପାତ୍ର, ଓଡିଶା ରାଜ୍ୟ ପାଠ୍ୟପୁସ୍ତକ ପ୍ରଣୟନ ଓ ପ୍ରକାଶନ ସଂସ୍ଥା।

୫- ଆଧୁନିକ ଓଡିଆ ବ୍ୟାକରଣ – ଧନେଶ୍ୱର ମହାପାତ୍ର।

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AECC-II : HINDI

SEMESTER-II

(CREDITS: 2, Theory=2)

(Total Marks: 50, Mid Sem=10, Term End=40, Duration: 2 hrs)

MODULE-1: **कविता**

(i) कबीर - साखी : १ से १०

(ii) तुलसी - विनयपत्रिका - पद १ और २

(iii) प्रसाद - मधुमय देश

(iv) निराला - भिक्षुक

(v) अज्ञेय - हिरोशिमा

MODULE-2: **गद्य**

(i) रामचन्द्र शुक्ल - उत्साह

(ii) हजारी प्रसाद द्विवेदी - कुटज

(iii) हरिशंकर परसाई - सदाचार का तावीज

MODULE-3: **शब्द ज्ञान**

(i) शब्द सुद्धि

(ii) बाक्य सुद्धि

(iii) पयायिवाची शब्द

(iv) विलोम शब्द

MODULE-4: **सामान्य ज्ञान**

(i) निबंध लेखन

अंक विभाजन:

विभाग - (क)	अपर्युक्त इकाइयो ६, ६६ और ६७ से ०३ प्रश्न पूछे जाएँगे। उनमें से ०२ के उत्तर लिखने होंगे। (प्रत्येक उत्तर ७००-१००० शब्दों के बिच)	10X2=20
विभाग - (ख)	अपर्युक्त इकाइयों ६ और ६६ से ०४ पद्यांश / गद्यांश पूछे जाएँगे। जिनमें से ०२ के उत्तर लिखने होंगे। (प्रत्येक उत्तर ४००-५०० शब्दों के बिच)	05X2=10
विभाग - (ग)	युनिट ६६६ से अति संक्षीत्प प्रश्न पूछे जाएँगे।	02X5=10
	End Semester	40
	Internal	10
	Total	50

पाठ्य पुस्तक:

हिन्दी प्रसून - सं डॉ अंजुमन आरा, प्लानेट भी, कटक

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SKILL ENHANCEMENT COURSE (SEC)

SEMESTER-III

SEC-1: BASIC COMPUTER APPLICATION (BCA)

(CREDITS: 2, Theory=2)
(Total Marks: 50, Mid Sem=10, Term End=40, Duration: 2 hrs)

MODULE-1: **4 classes**

Introduction: Introduction to computer system: Computer, Hardware, Software, Types of software, Types of Computer, uses of computer**.**

MODULE-2: **6 Classes**

Human Computer Interface: Operating system as user interface, utility programs**,** Input and output devices: Keyboard, Mouse, Joystick, Scanner (OCR, OBR, OMR, MICR), Digital Camera, Touch Screen. Monitor, Printer, Plotter,

Windows-Introduction, functions, properties and different versions, Working with Start Menu, Control Panel, Explorer, Desktop and Icons, My computer, Recycle bin, My Document, Good practices to make the windows run efficiently.

MODULE-3: **6 classes**

Memory: Primary, secondary, auxiliary memory, RAM, ROM, cache memory, hard disks, optical disks, USB storage, Memory Card, C.P.U., registers, ALU, Control Unit, system bus, processors(only basic idea about function and type).

MODULE-4: **5 classes**

VIRUS –Meaning, function, characteristics and types, Uses of Firewall and Antivirus.

Electronic mail and its features- inbox, composing mails, sending mail, thrash, spam folder in email.

MODULE-5: **9 classes**

Introduction to Ms.Office:

Ms.Word: Creating a file, Page formatting, editing, printing, saving a file, bullet and numbering, spell check, indenting, paragraph formatting, find and replace.

Ms. Excel: Spread sheet and its uses, Setting column and row, Inserting formula and uses of various functions (AND, IF, NOT, OR, SUM, MAX, COUNT, COUNTA, COUNTIF, AVERAGE), use of Auto sum, Formatting cell, printing, copying and saving.

Ms.Power Point: Features, Uses, Menus, Tool bar, template and wizard, creating animation and effects, saving, deleting and opening a presentations. characteristics of a good presentation.

Reference Book:

1. Computer Fundamental by PK Sinha – BPB publication.
2. Ms.Office 2007 by Rutkoshy, Seguin – BPB publication.
3. Goel, Computer Fundamentals, Pearson Education, 2010.

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SEMESTER-IV

SEC-2: COMMUNICATIVE ENGLISH AND WRITING SKILL (CEWS)

(CREDITS: 2, Theory=2)
(Total Marks: 50, Mid Sem=10, Term End=40, Duration: 2 hrs)

MODULE-1: Communication Process 10 Marks (1 long question / 2 short questions)

- Process of Communication, Characteristics of Business Communication, Inter-personal, Intra-personal and Group communication
- Definition, Objectives, Process, Channels and importance of Communication
- Principles of effective communication and Barriers to effective Communication.
- Types of Communication – Written, Verbal, Non-verbal, informal and Formal and Grape-vine
- Written Communication – Writing letters for inquiries, orders, complaints and claims, Condolence, Complement letters.

MODULE-2: Analytical Grammar 10 Marks (1 x 10 = 10)

- **Vocabulary :** Phrasal Verbs, Synonyms, Antonyms, Idioms, Commercial Terms, Countable and uncountable Nouns, Tense Patterns, Modal Verbs, Prepositions and Phrasal Verbs, The Imperatives, Interrogative, The Passive, Direct and Reported Speech.

MODULE-3: WRITING SKILL: 10 Marks (1 long question/ 2 short questions)

- Writing paragraph**,** developing ideas into paragraphs**,** writing personal letters and notes**,** writing applications, official letters and business letters**,** writing curriculum vitae/resume**,** writing e-mails, sms, advertisement and short notes.

MODULE-4: Creative Skills 10 Marks (1 long question)

- Reporting (on issues, events and business matters), Note making and summarising, Description of objects/events/process, Writing and designing pamphlet/brochure, Writing Review/ comment.

Recommended reading:

1. Fluency in English – Part I & II, Oxford University Press.
2. A. J. Thomson & A. V. Matrinet, Practice English Grammar.
3. L. Garteside (ELBS) Modern Business Letters.
4. Business English, Pearson, 2008
5. Pradhan, Bhende and Thakur – Business Communication, Himalaya Publishing House.
6. U. S. Rai & M. S. Rai, Business Communication, Himalaya Publishing House, Bombay.
7. Language, Literature and Creativity, Orient Blackswan 2013

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GENERIC ELECTIVE (GE)

CHEMISTRY

SEMESTER-I

GE- 1: ATOMIC STRUCTURE, BONDING, GENERAL ORGANIC CHEMISTRY & ALIPHATIC HYDROCARBONS

(CREDITS: 6, Theory=4 + Practical=2)
(Total Marks: 100, Mid Sem=15, Practical=25, Term End=60: Duration: 3 hrs.)

SECTION A (INORGANIC CHEMISTRY-1)

MODULE-1: Atomic Structure

(a) Review of: Bohr's theory and its limitations, dual behaviour of matter and radiation, de-Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atom spectra. Need of a new approach to Atomic structure.

(b) What is Quantum mechanics? Time independent Schrodinger equation and meaning of various terms in it. Significance of ψ and ψ^2, Schrödinger equation for hydrogen atom. Radial and angular parts of the hydrogenic wavefunctions (atomic orbitals) and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbitals (Only graphical representation). Radial and angular nodes and their significance. Radial distribution functions and the concept of the most probable distance with special reference to 1s and 2s atomic orbitals. Significance of quantum numbers, orbital angular momentum and quantum numbers ml and ms.

Shapes of s, p and d atomic orbitals, nodal planes. Discovery of spin, spin quantum number (s) and magnetic spin quantum number (ms). Rules for filling electrons in various orbitals, Electronic configurations of the atoms. Stability of half-filled and completely filled orbitals, concept of exchange energy. Relative energies of atomic orbitals, Anomalous electronic configurations.

MODULE-2: Chemical Bonding and Molecular Structure

(a) Ionic Bonding: General characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character.

(b) Covalent bonding: VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonalbipyramidal and octahedral arrangements. Concept of resonance and resonating structures in various inorganic and organic compounds.

(c) MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their characteristics for s-s, s-p and p-p combinations of atomic orbitals, nonbonding combination of orbitals, MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including idea of s-p mixing) and heteronuclear diatomic molecules such as CO, NO and NO+.

SECTION B (ORGANIC CHEMISTRY-1)

MODULE-3: Fundamentals of Organic Chemistry

(a) Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis.

Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals.

(b) Strength of organic acids and bases: Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Hückel's rule.

MODULE-4: Stereochemistry

Conformations with respect to ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds). Threo and erythro; D and L; cis - trans

nomenclature; CIP Rules: R/ S (for upto 2 chiral carbon atoms) and E / Z Nomenclature (for upto two C=C systems).

MODULE-5: Aliphatic Hydrocarbons

(a) Alkanes: (Upto 5 Carbons). Preparation: Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. Reactions: Free radical Substitution: Halogenation.

(b) Alkenes: (Upto 5 Carbons) Preparation: Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (Partial catalytic hydrogenation) and trans alkenes (Birch reduction). Reactions: cis-addition (alk. $KMnO_4$) and trans-addition (bromine), Addition of HX (Markownikoff's and anti-Markownikoff's addition), Hydration, Ozonolysis.

(c) Alkynes: (Upto 5 Carbons) Preparation: Acetylene from CaC_2 and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides. Reactions: formation of metal acetylides, addition of bromine and alkaline $KMnO_4$, ozonolysis and oxidation with hot alk. $KMnO_4$.

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CHEMISTRY

SEMESTER-II

GE-2: CHEMICAL ENERGETICS, EQUILIBRIA & FUNCTIONAL ORGANIC

(CREDITS: 6, Theory=4 + Practical=2)
(Total Marks: 100, Mid Sem=15, Practical=25, Term End=60: Duration: 3 hrs.)

Section A (Physical Chemistry-1)

MODULE-1: Chemical Energetics

(a) Review of thermodynamics and the Laws of Thermodynamics.

(b) Important principles and definitions of thermochemistry. Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and dilution. Calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data. Variation of enthalpy of a reaction with temperature – Kirchhoff's equation.

(c) Statement of Third Law of thermodynamics and calculation of absolute entropies of substances.

MODULE-2:

(a) Chemical Equil ibrium: Free energy change in a chemical reaction. Thermodynamic derivation of the law of chemical equilibrium. Distinction between ΔG and ΔG^o, Le Chatelier's principle. Relationships between Kp, Kc and Kx for reactions involving ideal gases.

(b) Ionic Equilibria: Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect. Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Solubility and solubility product of sparingly soluble salts – applications of solubility product principle.

Section B (Organic Chemistry-2)

MODULE-3: (Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure)

(a) Aromatic hydrocarbons (i) Preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid

(ii) Reactions: (Case benzene): Electrophilic substitution: nitration, halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation) (upto 4 carbons on benzene). Side chain oxidation of alkyl benzenes (upto 4 carbons on benzene).

(b) Alkyl and Aryl Halides: **Alkyl Halides** (Upto 5 Carbons) (i) Types of Nucleophilic Substitution (SN1, SN2 and SNi) reactions. (ii) Preparation: from alkenes and alcohols. (iii) Reactions: hydrolysis, nitrite & nitro formation, nitrile &isonitrile formation. Williamson's ether synthesis: Elimination vs substitution.

(c) Aryl Halides (i)Preparation: (Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer&Gattermann reactions. (ii) Reactions (Chlorobenzene): Aromatic nucleophilic substitution (replacement by –OH group) and effect of nitro substituent. Benzyne Mechanism: KNH2/NH3 (or NaNH2/NH3). (iii) Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides.

MODULE-4: Alcohols, Phenols and Ethers (Upto 5 Carbons)

(a) Alcohols: (i) Preparation: Preparation of 1^0 , 2^0 and 3^0 alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters.

(ii) Reactions: With sodium, HX (Lucas test), esterification, oxidation (with PCC, alk. $KMnO_4$, acidic dichromate, conc. HNO_3). Oppeneauer oxidation Diols: (Upto 6 Carbons) oxidation of diols. Pinacol-Pinacolone rearrangement.

(b) Phenols: (Phenol case) Preparation: Cumenehydroperoxide method, from diazonium salts. Reactions: Electrophilic substitution: Nitration, halogenation and sulphonation. ReimerTiemann Reaction, Gattermann-Koch Reaction, Houben–Hoesch Condensation, Schotten – Baumann Reaction.

(c) Ethers (aliphatic and aromatic): Cleavage of ethers with HI.

MODULE-5: Aldehydes and ketones (aliphatic and aromatic): (Formaldehye, acetaldehyde, acetone and benzaldehyde);

(i) Preparation: from acid chlorides and from nitriles.

(ii) Reactions – Reaction with HCN, ROH, $NaHSO_3$, NH2-G derivatives. Iodoform test. Aldol Condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation. Clemensen reduction and Wolff Kishner reduction. Meerwein-PondorffVerley reduction.

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CHEMISTRY

SEMESTER-III

GE-3: ATOMIC STRUCTURE, BONDING, GENERAL ORGANIC CHEMISTRY & ALIPHATIC HYDROCARBONS

(CREDITS: 6, Theory=4 + Practical=2)
(Total Marks: 100, Mid Sem=15, Practical=25, Term End=60: Duration: 3 hrs.)

SECTION A
(INORGANIC CHEMISTRY-1)

MODULE-1: Atomic Structure

(a) Review of: Bohr's theory and its limitations, dual behaviour of matter and radiation, de-Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atom spectra. Need of a new approach to Atomic structure.

(b) What is Quantum mechanics? Time independent Schrodinger equation and meaning of various terms in it. Significance of ψ and ψ 2, Schrödinger equation for hydrogen atom. Radial and angular parts of the hydrogenic wavefunctions (atomic orbitals) and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbitals (Only graphical representation). Radial and angular nodes and their significance. Radial distribution functions and the concept of the most probable distance with special reference to 1s and 2s atomic orbitals. Significance of quantum numbers, orbital angular momentum and quantum numbers ml and ms. Shapes of s, p and d atomic orbitals, nodal planes. Discovery of spin, spin quantum number (s) and magnetic spin quantum number (ms). Rules for filling electrons in various orbitals, Electronic configurations of the atoms. Stability of half-filled and completely filled orbitals, concept of exchange energy. Relative energies of atomic orbitals, Anomalous electronic configurations.

MODULE-2: Chemical Bonding and Molecular Structure

(a) Ionic Bonding: General characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character.

(b) Covalent bonding: VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square

planar, tetrahedral, trigonalbipyramidal and octahedral arrangements. Concept of resonance and resonating structures in various inorganic and organic compounds.
(c) MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their characteristics for s-s, s-p and p-p combinations of atomic orbitals, nonbonding combination of orbitals, MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including idea of s-p mixing) and heteronuclear diatomic molecules such as CO, NO and NO+ .

SECTION B (ORGANIC CHEMISTRY-1)

MODULE-3: Fundamentals of Organic Chemistry
(a) Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis.
Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals.
(b) Strength of organic acids and bases: Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Hückel's rule.

MODULE-4: Stereochemistry
Conformations with respect to ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds). Threo and erythro; D and L; cis - trans nomenclature; CIP Rules: R/ S (for upto 2 chiral carbon atoms) and E / Z Nomenclature (for upto two C=C systems).

MODULE-5: Aliphatic Hydrocarbons
(Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure.)
(a) Alkanes: (Upto 5 Carbons). Preparation: Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. Reactions: Free radical Substitution: Halogenation.
(b) Alkenes: (Upto 5 Carbons) Preparation: Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (Partial catalytic hydrogenation) and trans alkenes (Birch reduction). Reactions: cis-addition (alk. $KMnO_4$) and trans-addition (bromine), Addition of HX (Markownikoff's and anti-Markownikoff's addition), Hydration, Ozonolysis.
(c) Alkynes: (Upto 5 Carbons) Preparation: Acetylene from CaC_2 and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides.
Reactions: formation of metal acetylides, addition of bromine and alkaline $KMnO_4$, ozonolysis and oxidation with hot alk. $KMnO_4$.

PRACTICAL: Mark 25 / Credit- 2

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CHEMISTRY

SEMESTER-IV

GE-4: CHEMICAL ENERGETICS, EQUILIBRIA& FUNCTIONAL ORGANIC CHEMISTRY-I

(CREDITS: 6, Theory=4 + Practical=2)
(Total Marks: 100, Mid Sem=15, Practical=25, Term End=60: Duration: 3 hrs.)

SECTION A (PHYSICAL CHEMISTRY-1)

MODULE-1: Chemical Energetics
(a) Review of thermodynamics and the Laws of Thermodynamics.
(b) Important principles and definitions of thermochemistry. Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and dilution. Calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data. Variation of enthalpy of a reaction with temperature – Kirchhoff's equation.

(c) Statement of Third Law of thermodynamics and calculation of absolute entropies of substances.

MODULE-2: (a) Chemical Equilibrium: Free energy change in a chemical reaction. Thermodynamic derivation of the law of chemical equilibrium. Distinction between ΔG and ΔGo, Le Chatelier's principle. Relationships between Kp, Kc and Kx for reactions involving ideal gases.

(b) Ionic Equilibria: Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect. Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Solubility and solubility product of sparingly soluble salts – applications of solubility product principle.

SECTION B (ORGANIC CHEMISTRY-2)

MODULE-3: (Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure)

(a) Aromatic hydrocarbons (i) Preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid. (ii) Reactions: (Case benzene): Electrophilic substitution: nitration, halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation) (upto 4 carbons on benzene). Side chain oxidation of alkyl benzenes (upto 4 carbons on benzene).

(b) Alkyl and Aryl Halides: Alkyl Halides (Upto 5 Carbons) (i) Types of Nucleophilic Substitution (SN1, SN2 and SNi) reactions. (ii) Preparation: from alkenes and alcohols. (iii) Reactions: hydrolysis, nitrite & nitro formation, nitrile &isonitrile formation. Williamson's ether synthesis: Elimination vs substitution.

(c) Aryl Halides: (i)Preparation: (Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer&Gattermann reactions. (ii) Reactions (Chlorobenzene): Aromatic nucleophilic substitution (replacement by –OH group) and effect of nitro substituent. Benzyne Mechanism: KNH2/NH3 (or NaNH2/NH3). (iii) Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides.

MODULE-4: Alcohols, Phenols and Ethers (Upto 5 Carbons)

(a) Alcohols: (i) Preparation: Preparation of 1^0 , 2^0 and 3^0 alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters. (ii) Reactions: With sodium, HX (Lucas test), esterification, oxidation (with PCC, alk. $KMnO_4$, acidic dichromate, conc. HNO_3). Oppeneauer oxidation Diols: (Upto 6 Carbons) oxidation of diols. Pinacol-Pinacolone rearrangement.

(b) Phenols: (Phenol case) Preparation: Cumenehydroperoxide method, from diazonium salts. Reactions: Electrophilic substitution: Nitration, halogenation and sulphonation. ReimerTiemann Reaction, Gattermann-Koch Reaction, Houben–Hoesch Condensation, Schotten – Baumann Reaction.

(c) Ethers (aliphatic and aromatic): Cleavage of ethers with HI.

MODULE-5: Aldehydes and ketones (aliphatic and aromatic): (Formaldehye, acetaldehyde, acetone and benzaldehyde) : (i) Preparation: from acid chlorides and from nitriles. (ii) Reactions – Reaction with HCN, ROH, $NaHSO_3$, NH2-G derivatives. Iodoform test. Aldol Condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation. Clemensen reduction and Wolff Kishner reduction. Meerwein-PondorffVerley reduction.

PRACTICAL: Mark 25 / Credit- 2

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MATHEMATICS

SEMESTER-I

GE-1: CALCULUS AND ORDINARY DIFFERENTIAL EQUATIONS

(CREDITS: 6, Theory=4 + Practical=2)
(Total Marks: 100, Mid Sem=15, Practical=25, Term End=60: Duration: 3 hrs.)

MODULE-1: Curvature, Asymptotes,Tracing of Curves(Cartenary,Cycloid,Folium of Descartes, Astroid, Limacon, Cissoid & loops), Rectification, Quardrature, Volume and Surface area of solids of revolution.
MODULE-2: Sphere, Cones and Cylinders, Conicoid.
MODULE-3: Explicit and Implicit functions,Limit and Continuity of functions of several variables,Partial derivatives, Partial derivatives of higher orders,Homogeneous functions,Change of variables, Mean value theorem, Taylors theorem and Maclaurins theorem for functions of two variables. Maxima and Minima of functions of two and three variables, Implicit functions, Lagranges multipliers. Multiple integrals.
MODULE-4: Ordinary Differential Equations of 1^{st} order and 1^{st} degree (Variables separable, homogenous, exact and linear).Equations of 1^{st} order but higher degree.
MODULE-5: Second order linear equations with constant coefficients, homogeneous forms, Second order equations with variable coefficients, Variation of parameters. Laplace transforms and its applications to solutions of dfferential equations.

BooksRecommended:

1. Shantinarayan-Text Book of Calculus, Part-II, S.Chandand Co., Chapter-8 (Art. 24,25,26)
2. Shantinarayan-Text Book of Calculus, Part-III, S.Chandand Co., Chapter-1 (Art1,2), 3,4 (Art.10 to 12 ommitting Simpsons Rule), 5 (Art-13) and 6 (Art-15).
3. B.P.AcharyaandD.C.Sahu-Analytical Geometry of Quadratic Surfaces, Kalyani Publishers, New Delhi, Ludhiana.
4. SantoshK.Sengar-Advanced Calculus, Chapters: 2,4,5,6,7,11,12,13.
5. J.Sinharoy and S.Padhy-A Course of Ordinary and Partial Diferential Equations, Kalyani PuBlishers. Chapters: 2 (2.1to2.7), 3, 4 (4.1to4.7), 5,9 (9.1, 9.2, 9.3, 9.4, 9.5, 9.10, 9.11, 9.13).

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MATHEMATICS

SMESTER-II

GE-2 : LINEAR ALGEBRAAND ADVANCEDALGEBRA

(CREDITS: 6, Theory=6)
(Total Marks: 100, Mid Sem=15, Tutorial=05, Term End=80: Duration: 3 hrs.)

MODULE-1: Vectorspace, Subspace, Spanofaset, Linear dependence and Independence, Dimensions and Basis. Linear transformations, Range, Kernel, Rank, Nullity, Inverse of a linear map, Rank-Nullity theorem.
MODULE-2: Matrices and linear maps, Rank and Nullity of a matrix, Transpose of a matrix, Types of matrices. Elementary row operations, System of linear equations, Matrix inversion using row operations, Determinant and Rank of matrices, Eigenvalues, Eigenvectors, Quadraticforms.
MODULE-3: GroupTheory: Defnition and examples, Subgroups, Normal subgroups, Cyclicgroups, Cosets, Quotient groups, Permutation groups, Homomorphism. RingTheory: Defnition and examples, some special classes of Rings, Ideals, Quotientring, Ring homomorphism. Isomorphism theorems.
MODULE-4: Zerodivisors, Integraldomain, Finitefelds, Finitefeld Z / pZ, Field of quotients of an Integraldomain, Polynomialring, Divisionalgorithm, Remaindertheorem, Factorization of polynomials, irreducible and Reducible polynomials, Primitive polynomials, Irreducibility tests, Eisenstein Criterion.

BooksRecommended:

1. V.Krishnamurty, V.P.Mainra, J.L.Arora-Anintroduction to Linear Algebra, Afliated East-West Press Pvt. Ltd., New Delhi, Chapters: 3,4 (4.1to4.7), 5 (except 5.3), 6 (6.1, 6.2, 6.5, 6.6, 6.8), 7 (7.4 only).
2. I.H.Seth-Abstract Algebra, Prentice Hall of India Pvt. Ltd., New Delhi. Chapters: 13,14,15,16, 17,18,19,20.

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PHYSICS

SEMESTER-III

GE-3: MECHANICS

(CREDITS: 6, Theory=4 + Practical=2)
(Total Marks: 100, Mid Sem=15, Practical=25, Term End=60: Duration: 3 hrs.)

MODULE-1: Vectors: Vector algebra. Scalar and vector products. Derivatives of a vector with respect to a parameter.
Ordinary Differential Equations: 1st order homogeneous differential equations. 2nd order homogeneous differential equations with constant coefficients.
MODULE-2: Laws of Motion: Frames of reference. Newton's Laws of motion. Dynamics of a system of particles. Centre of Mass.
Momentum and Energy: Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets.
Rotational Motion: Angular velocity and angular momentum. Torque. Conservation of angular momentum.
MODULE-3: Gravitation: Newton's Law of Gravitation. Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). Kepler's Laws (statement only).Satellite in circular orbit and applications. Geosynchronous orbits. Basic idea of global positioning system (GPS). Weightlessness.Physiological effects on astronauts.
MODULE-4: Elasticity: Hooke's law - Stress-strain diagram - Elastic moduli-Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants - Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion – Torsional pendulum-Determination of Rigidity modulus and moment of inertia - q, η and σ bySearles method.
MODULE-5: Oscillations: Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped oscillations.
Special Theory of Relativity: Constancy of speed of light. Postulates of Special Theory of Relativity.Length contraction.Time dilation. Relativistic addition of velocities.

Essential Readings:

- Mechanics, D.S. Mathur, S. Chand and Company Limited, 2000
- Physics for Degree Students-I Das Jena and others (SrikrishnaPrakashan)
- Physics, Resnick, Halliday and Walker 8/e. 2008, Wiley.
- Feynman Lectures, Vol. I, R.P.Feynman, R.B.Leighton, M.Sands, 2008, Pearson Education
- University Physics. F.W Sears, M.W Zemansky, H.D Young 13/e, 1986, Addison Wesley
- An introduction to mechanics, D. Kleppner, R.J. Kolenkow, 1973, McGraw-Hill.
- Introduction to Special Relativity, R. Resnick, 2005, John Wiley and Sons. Mechanics, Berkeley Physics, vol.1, C.Kittel, W.Knight, et.al.2007, Tata McGraw-Hill.

References:

- Analytical Mechanics, G.R. Fowles and G.L. Cassiday. 2005, Cengage Learning.
- University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
- Physics for scientists and Engineers with Modern Phys., J.W. Jewett, R.A.Serway, 2010, Cengage Learning
- Theoretical Mechanics, M.R. Spiegel, 2006, Tata McGraw Hill.
- Mechanics - J. C. Slater and N. H. Frank (McGraw-Hill) Theoretical Mechanics, M.R. Spiegel, 2006, Tata McGraw Hill.

PRACTICAL: Mark 25 / Credit- 2

1. To study the random error in observations.
2. To determine the height of a building using a Sextant.
3. To study the Motion of Spring and calculate (a) Spring constant, (b) **g** and (c) Modulus of rigidity
4. To determine the Moment of Inertia of a Flywheel.
5. To determine g and velocity for a freely falling body using Digital Timing Technique
6. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method).
7. To determine the Young's Modulus of a Wire by Optical Lever Method.
8. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.

9. To determine the elastic Constants of a wire by Searle's method.
10. To determine the value of g using Bar Pendulum.
11. To determine the value of g using Kater's Pendulum
12 To determine the Young's Modulus by bending of beam
13 To determine the Modulus of Rigidity by Torsion Pendulum
14 To determine the surface tension by soap bubble
15 To determine the thermal conductivity by Lee's method
16 To determine the Viscosity by capillary flow method
17 To determine the unknown frequency of given tuning fork
18 To verify the laws of Transverse vibration of strings by using a sono meter
19 To determine the Poissions ratio of rubber
20 To determine the surface tension of mercury by Quien's method

Reference Books

- A Text Book of Practical Physics, I.Prakash& Ramakrishna, 11th Edn, 2011, KitabMahal
- B.Sc. Practicle Physics by C.L.arora (S.Chand and Sons)
- Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, 1971, Asia Publishing House
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, reprinted 1985, Heinemann Educational Publishers
- A Text Book of Practical Physics, I.Prakash& Ramakrishna, 11th Edn, 2011, KitabMahal
- Engineering Practical Physics, S.Panigrahi& B.Mallick, 2015, Cengage Learning India Pvt. Ltd.
- Practical Physics, G.L. Squires, 2015, 4th Edition, Cambridge University Press.

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PHYSICS

SEMESTER – IV

GE-4: ELECTRICITY AND MAGNETISM

(CREDITS: 6, Theory=4 + Practical=2)
(Total Marks: 100, Mid Sem=15, Practical=25, Term End=60: Duration: 3 hrs.)

MODULE-1: (12 Lectures)

Vector Analysis: Review of vector algebra (Scalar and Vector product), gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors (statement only).

Electrostatics: Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor.

MODULE-2: (22 Lectures)

Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere.

Calculation of electric field from potential. Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Energy per unit volume in electrostatic field. Dielectric medium, Polarisation, Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric.

MODULE-3: (10 Lectures)

Magnetism: Magnetostatics: Biot-Savart's law and its applications- straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law.

Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia-, para-and ferromagnetic materials.

MODULE-4: (6 Lectures)

Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field.

MODULE-5: (10 Lectures)

Maxwell`s equations and Electromagnetic wave propagation: Equation of continuity of current, Displacement current, Maxwell's equations, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, polarization.

Essential Readings:

- Electricity and magnetism –D.C.Tayal (Himalaya Publishing House)
- Elcricity and Magnetism By K.K.Tiwari
- Introduction to Electrodynamics, D.J. Griffiths,(Low Price Edition)
- Electricity and Magnetism, Edward M. Purcell, 1986 McGraw-Hill Education
- Feynman Lectures Vol.2, R.P.Feynman, R.B.Leighton, M. Sands, 2008, Pearson Education
- Physics for degree students –II B.BhunyaS.MishraM.DasP.K.JenaD.k.RoutB.k.dasD.C.PtraS.sahu (Shrikrishna Prakashan)
- Electricity and Magnetism –Brijlal and subramanyam
- Electricity and Magnetism-Khare and srivastava
- Electricity, Magnetism & Electromagnetic Theory, S. Mahajan and Choudhury, 2012, Tata McGraw

References:

- Elements of Electromagnetics, M.N.O. Sadiku, 2010, Oxford University Press.
- Electricity and Magnetism, J.H.Fewkes&J.Yarwood.Vol.I, 1991, Oxford Univ. Press.
- Elements of Electromagnetics, M.N.O. Sadiku, 2010, Oxford University Press.
- Electricity and Magnetism, J.H.Fewkes&J.Yarwood.Vol.I, 1991, Oxford Univ. Press.

PRACTICAL: Mark 25 / Credit- 2

1. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses.
2. Ballistic Galvanometer: (i) Measurement of charge and current sensitivity, (ii) Measurement of CDR, (iii) Determine a high resistance by Leakage Method, (iv) To determine Self Inductance of a Coil by Rayleigh's Method.
3. To compare capacitances using De'Sauty's bridge.
4. Measurement of field strength B and its variation in a Solenoid (Determine dB/dx)
5. To study the Characteristics of a Series RC Circuit.
6. To study a series LCR circuit LCR circuit and determine its (a) Resonant frequency, (b) Quality factor
7. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q
8. To determine a Low Resistance by Carey Foster's Bridge.
9. To verify the Thevenin and Norton theorems
10. To verify the Superposition, and Maximum Power Transfer Theorems

Reference Books

- Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
- A Text Book of Practical Physics, I.Prakash& Ramakrishna, 11th Ed., 2011, KitabMahal, reprinted 1985, Heinemann Educational Publishers
- A Laboratory Manual of Physics for undergraduate classes, D.P
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition.Khandelwal, 1985, Vani Pub.
- B.ScPracticle Physics –C.L.arora (S Chand & Sons)

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COMPUTER SCIENCE

SEMESTER-I

CORE-1: PROGRAMMING USING C

(CREDITS: 6, Theory=4 + Practical=2)
(Total Marks: 100, Mid Sem=15, Practical=25, Term End=60: Duration: 3 hrs.)

MODULE-1: Introduction to Programming Language, Introduction to C Programming, Character Set, C Tokens, Keywords & Identifiers, Constants, Variables, Data Types, Variables, Storage Classes, Operators (Arithmetic, Relational, Logical, Assignment, Increment & Decrement, Conditional, Bitwise), Expressions , Input and Output Operations.
MODULE-2: Decision Making and Branching: Simple IF Statement, IF ….. ELSE Statement, Nesting IF …. ELSE Statement, ELSE IF Ladder, Switch Statement, Operator, GOTO Statement. Decision Making and Looping: The WHILE Statement, The DO Statement, The FOR Statement, Jumps in LOOPS. Arrays, Character Arrays and Strings.
MODULE-3: User-defined Functions: Need, Elements & Definition, Function Calls, Function Definition, Category of Functions, Recursion. Structures and Unions: Defining, Declaring, Accessing, Initialization Structure, Arrays of Structures, Arrays within Structures, Structures and Functions, Unions.
MODULE-4: Pointers: Accessing the Address of a Variable, Declaring Pointer Variables, Initializations of Pointer Variable, Accessing a Variable through its Pointer, Chain of Pointers, Pointer Expressions, Pointer Increments and Scale Factor, Pointers and Arrays,, Pointers and Character Strings, Array of Pointers, Pointers as Function Arguments, Functions Returning Pointers, Pointers to Functions, Pointers to Structures, Troubles with Pointers.
MODULE-5: File Management in C: Defining and Opening a File, Closing a File, Input/ Output Operations on Files, Error Handling During I/O Operations, Random Access to Files, Command Line Arguments, Dynamic Memory Allocation.

Text Book : Programming in ANSI C: E. Balguruswamy4/e (TMH)

PRACTICAL: **Mark 25 / Credit- 2**
This Lab will cover lesion taught in Core I (**Programming Using C**)

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CORE-2: COMPUTER ORGANIZATION

(CREDITS: 6, Theory=4 + Practical=2)
(Total Marks: 100, Mid Sem=15, Practical=25, Term End=60: Duration: 3 hrs.)

MODULE-1: Character Codes, Decimal System, Binary System, Decimal to Binary Conversion, Hexadecimal Notation, Boolean Algebra, Basic Logic Functions: Electronic Logic Gates, Synthesis of Logic Functions, Minimization of Logic Expressions, Minimization using Karnaugh Maps, Synthesis with NAND and NOR Gates.
MODULE-2: Flip-Flops, Gated Latches, Master-Slave Flip-Flops, Edge-Triggering, T Flip-Flops, JK Flip-Flops. Registers and Shift Registers, Counters, Decoders, Multiplexers, Programmable Logic Devices (PLDs), Programmable Array Logic (PAL), Complex Programmable Logic Devices (CPLDs), Field-Programmable Gate Array (FPGA), Sequential Circuits, Timing Diagrams, The Finite State Machine Model, Synthesis of Finite State Machines,
MODULE-3: Basic Structure of Computers: Computer Types, Functional Units, Input Unit, Memory Unit, Arithmetic and Logic Unit, Output Unit, Control Unit, Basic Operational Concepts, Bus Structures, Software. Machine Instructions and Programs: Numbers, Arithmetic Operations, and Characters: Number Representation, Addition of Positive Numbers, Addition and Subtraction of Signed Numbers, Overflow of Integer Arithmetic, Characters, Memory Locations and Addresses, Byte Addressability, Word Alignment, Accessing Numbers, Characters, and Character Strings, Memory Operations, Instructions and Instruction Sequencing, Register Transfer Notation, Basic Instruction Types, Instruction Execution and Straight-Line Sequencing, Branching, Condition Codes, Generating Memory

Addresses, Addressing Modes, Implementation of Variables and Constants, Indirection and Pointers, Indexing and Arrays, Relative Addressing.
MODULE-4: THE ARM EXAMPLE: Registers, Memory Access, and Data Transfer, Register Structure, Memory Access Instructions and Addressing Modes, Register Move Instructions, Arithmetic and Logic Instructions: Arithmetic Instructions, Logic Instructions, Branch Instructions, Setting Condition Codes, Assembly Language, Psedo-Instructions, I/O Operations, Subroutines, Vector Dot Product Program, Byte-Sorting Program, Linked-List Insertion and Deletion Subroutines. Basic Input-Output Operations, Stacks and Queues, Subroutines. PowerPC Example: Basic PowerPC Processor Organization, Load and Store Instructions, Arithmetic and Logic Instructions, Flow Control Instructions, Compare Instructions, Logic Instructions, Subroutines.
MODULE-5: Memory System: Semiconductor RAM Memories, Internal Organization of Memory Chips, Static Memories, Asynchronous DRAMS, Synchronous DRAMS, Structure of Large Memories, Memory System Considerations, RAMBUS Memory. Read-Only Memories: ROM, PROM, EPROM, EEPROM, Flash Memory, Speed, Size, and Cost of Memory. Secondary Storage: Magnetic Hard Disks, Optical Disks, Magnetic Tape Systems.

Text Book:
Carl Hamacher, Z. Vranesic, S. Zaky: Computer Organization, 5/e (TMH)
Reference Book:
William Stallings: Computer Organization and Architecture (Design for Performance), 9/e

PRACTICAL: Mark 25 / Credit- 2
This Lab will cover lesion taught in Core II (**Computer Organization**)

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SEMESTER-II

CORE-3: PROGRAMMING USING C++

(CREDITS: 6, Theory=4 + Practical=2)
(Total Marks: 100, Mid Sem=15, Practical=25, Term End=60: Duration: 3 hrs.)

MODULE-1: Principles of Object-Oriented Programming: Object-Oriented Programming (OOP) Paradigm, Basic Concepts of OOP, Benefits of OOP, Object Oriented Languages, Applications of OOP. Beginning with C++: Applications of C++, C++ statements, Example with Class, Structure of C++ Program, Creating the Source File, Compiling and Linking. Tokens, Expressions and Control Structures: Tokens, Keywords, Identifiers & Constants, Basic Data Types, User-Defined Data Types, Derived Data Types, Symbolic Constants, Type Compatibility, Declaration of Variables, Dynamic Initialization of Variables, Reference Variables, Operators in C++, Scope Resolution Operator, Member Deferencing Operators, Memory Management Operators, Manipulators, Type Cast Operators, Expressions and their Types, Special Assignment Expressions, Implicit Conversions, Operator Overloading, Operator Precedence, Control Structures.
MODULE-2: Functions in C++: The Main Function, Function Prototyping, Call By Reference, Return by Reference, Inline Functions, Default Arguments, Const. Arguments, Function Overloading, Friend & Virtual Functions, Math. Library Functions. Classes and Objects: Specifying a Class, Defining Member Functions, Making an outside Function Inline, Nested Member Functions, Private Member Functions, Arrays within a Class, Memory Allocation for Objects, Static Data Members, Static Member Functions, Arrays of Objects, Objects as Function Arguments, Friendly Functions, Returning Objects, Cons. Member Functions, Pointer to Members, Local Classes.
MODULE-3: Constructors & Destructors: Constructors, Parameterized Constructors, Multiple Constructors in a Class, Constructors with Default Arguments, Dynamic Initialization of Objects, Copy Constructor, Dynamic Constructors, Constructing Two-Dimensional Arrays, Const. Objects, Destructors. Operator Overloading and Type Conversions: Defining Operator Overloading, Overloading Unary Operators, Overloading Binary Operators, Overloading Binary Operators using Friends, Manipulation of Strings using Operators, Rules for Overloading Operators, Type Conversions.

MODULE-4: Inheritance: Defining Derived Classes, Single Inheritance, Making a Private Member Inheritance, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Virtual Base Classes, Abstract Classes, Constructors in Derived Classes, Member Classes, Nesting of Classes. Pointers, Virtual Functions and Polymorphism: Pointers, Pointers to Objects, this Pointer, Pointers to Derived Classes, Virtual Functions, Pure Virtual Functions.
MODULE-5: Managing Console I/O Operations: C++ Streams, C++ Stream Classes, Unformatted I/O Operations, Formatted Console I/O Operations, Managing Output with Manipulators. Files: Classes for File Stream Operations, Opening and Closing a File, Detecting end-of-file, File Modes, File Pointers and their Manipulations, Sequential Input and Output Operations, Updating a File: Random Access, Error Handling During File Operations, Command-line Arguments.

Text Book:
Object Oriented Programming with C++ : E. Balgurusamy, 4/e (TMH).

PRACTICAL: Mark 25 / Credit- 2
This Lab will cover lesion taught in Core III (C ++)

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CORE-4: DATA STRUCTURE

(CREDITS: 6, Theory=4 + Practical=2)
(Total Marks: 100, Mid Sem=15, Practical=25, Term End=60: Duration: 3 hrs.)

MODULE-1: Introduction and Overview: Definitions, Concept of Data Structures, Overview of Data Structures, Implementation of Data Structures. Arrays: Terminology, One-Dimensional Array, Multi-Dimensional Arrays, Pointer Arrays.
MODULE-2: Linked Lists: Single Linked List, Circular Linked List, Double Linked List, Circular Double Linked List, Application of Linked Lists, Memory Representation, Boundary Tag System, De-allocation Strategy, Buddy System, Compaction.
MODULE-3: Stacks: Definition, Representation of Stack (Array, Linked List), Operations on Stacks, Applications of Stack (Evaluation of Arithmetic Expressions, Code Generation, Implementation of Recursion, Factorial Calculation, Quick Sort, Tower of Hanoi, Activation Record Management).
MODULE-4: Queues: Definition, Representation of Queues (Array, Linked List), Circular Queue, Deque, Priority Queue, Application of Queues (Simulation, CPU Scheduling in Multiprogramming Environment, Round Robin Algorithm).
MODULE-5: Tree: Binary Trees, Properties of Binary Tree, Linear Representation of Binary a Binary Tree, Linked Representation of a Binary Tree, Physical Implementation of Binary Tree in Memory, Operations on Binary Tree (Insertion, Deletion, Traversal, Merging of two Binary Trees), Types of Binary Trees (Expression Tree, Binary Search Tree, Heap Tree, Threaded Binary Trees, Height Balanced Binary Tree, Weighted Binary Tree, Decision Trees).

Text Book:
Classic Data Structures : D. SAMANTA (PHI).

PRACTICAL: Mark 25 / Credit- 2
This Lab will cover lesion taught in Core IV (Data Structure)

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SEMESTER-III

CORE-5: OPERATING SYSTEMS

(CREDITS: 6, Theory=4 + Practical=2)
(Total Marks: 100, Mid Sem=15, Practical=25, Term End=60: Duration: 3 hrs.)

MODULE-1: Introduction (10 Lectures)
Basic OS functions, resource abstraction, types of operating systems–multiprogramming systems, batch systems, time sharing systems; operating systems for personal computers & workstations, process control & real time systems.

MODULE-2: Operating System Organization (6 Lectures)
Processor and user modes, kernels, system calls and system programs.

MODULE-3: Process Management (20 Lectures)
System view of the process and resources, process abstraction, process hierarchy, threads, threading issues, thread libraries; Process Scheduling, non-pre-emptive and pre-emptive scheduling algorithms; concurrent and processes, critical section, semaphores, methods for inter-process communication; deadlocks.

MODULE-4: Memory Management (10 Lectures)
Physical and virtual address space; memory allocation strategies–fixed and variable partitions, paging, segmentation, virtual memory

MODULE-5: File and I/O Management (14 Lectures)
Directory structure, file operations, file allocation methods, device management Protection and Security Policy mechanism, Authentication, Internal access Authorization.

Suggested Readings:

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
2. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.
3. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education 1997.
4. W. Stallings, Operating Systems, Internals & Design Principles 2008 5th Edition, Prentice Hall of India.
5. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.

PRACTICAL: Mark 25 / Credit- 2

1. WRITE A PROGRAM to report behaviour of Linux kernel including kernel version, CPU type and model. (CPU information)
2. WRITE A PROGRAM to report behaviour of Linux kernel including information on configured memory, amount of free and used memory. (memory information)
3. WRITE A PROGRAM to print file details including owner access permissions, file access time, where file name is given as argument.
4. WRITE A PROGRAM to copy files using system calls.
5. Write program to implement FCFS scheduling algorithm.
6. Write program to implement Round Robin scheduling algorithm. 7. Write program to implement SJF scheduling algorithm.
8. Write program to implement non-preemptive priority based scheduling algorithm. 9. Write program to implement preemptive priority based scheduling algorithm.
10. Write program to implement SRJF scheduling algorithm.
11. Write program to calculate sum of n numbers using thread library.
12. Write a program to implement first-fit, best-fit and worst-fit allocation strategies

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CORE-6: DATABASE MANAGEMENT SYSTEM

(CREDITS: 6, Theory=4 + Practical=2)
(Total Marks: 100, Mid Sem=15, Practical=25, Term End=60: Duration: 3 hrs.)

MODULE-1: Introduction (6 Lectures)
Characteristics of database approach, data models, database system architecture and data independence

MODULE-2: Entity Relationship(ER) Modeling (8 Lectures)
Entity types, relationships, constraints

MODULE-3: Relation data model (20 Lectures)
Relational model concepts, relational constraints, relational algebra, SQL queries

MODULE-4: Database design (15 Lectures)

Mapping ER/EER model to relational database, functional dependencies, Lossless decomposition, Normal forms (up to BCNF).

MODULE-5: Transaction Processing (8 Lectures)

ACID properties, concurrency control; File Structure and Indexing; Operations on files, File of Unordered and ordered records, overview of File organizations, Indexing structures for files(Primary index, secondary index, clustering index), Multilevel indexing using B and B+ trees.

Suggested Readings:

1. R. Elmasri, S.B. Navathe, Fundamentals of Database Systems 6th Edition, Pearson Education, 2010.
2. R. Ramakrishanan, J. Gehrke, Database Management Systems 3rd Edition, McGraw-Hill, 2002.
3. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th Edition, McGraw Hill, 2010.
4. R. Elmasri, S.B. Navathe Database Systems Models, Languages, Design and application Programming, 6th Edition, Pearson Education,2013.

PRACTICAL: Mark 25 / Credit- 2

Create and use the following database schema to answer the given queries.

EMPLOYEE Schema

Field	Type	NULL	KEY	DEFAULT
Eno	Char(3)	NO	PRI	NIL
Ename	Varchar(50)	NO	NIL	
Job_type	Varchar(50)	NO	NIL	
Manager	Char(3)	YES	FK	NIL
Hire_date	Date	NO	NIL	
Dno	Integer	YES	FK	NIL
Commission	Decimal(10,2)	YES	NIL	
Salary	Decimal(7,2)	NO	NIL	

DEPARTMENT Schema

Field	Type	NULL	KEY	DEFAULT
Dno	Integer	No	PRI	NULL
Dname	Varchar(50)	Yes		NULL
Location	Varchar(50)	Yes		New Delhi

Query List

1. Query to display Employee Name, Job, Hire Date, Employee Number; for each employee with the Employee Number appearing first.
2. Query to display unique Jobs from the Employee Table.
3. Query to display the Employee Name concatenated by a Job separated by a comma.
4. Query to display all the data from the Employee Table. Separate each Column by a comma and name the said column as THE_OUTPUT.
5. Query to display the Employee Name and Salary of all the employees earning more than $2850.
6. Query to display Employee Name and Department Number for the Employee No= 7900.
7. Query to display Employee Name and Salary for all employees whose salary is not in the range of $1500 and $2850.
8. Query to display Employee Name and Department No. of all the employees in Dept 10 and Dept 30 in the alphabetical order by name.
9. Query to display Name and Hire Date of every Employee who was hired in 1981. 10. Query to display Name and Job of all employees who don't have a current Manager.
11. Query to display the Name, Salary and Commission for all the employees who earn commission.
12. Sort the data in descending order of Salary and Commission.
13. Query to display Name of all the employees where the third letter of their name is 'A'.
14. Query to display Name of all employees either have two 'R's or have two 'A's in their name and are either in Dept No = 30 or their Manger's Employee No = 7788.
15. Query to display Name, Salary and Commission for all employees whose Commission Amount is 14 greater than their Salary increased by 5%.
16. Query to display the Current Date.
17. Query to display Name, Hire Date and Salary Review Date which is the 1st Monday after six months of employment.

18. Query to display Name and calculate the number of months between today and the date each employee was hired.
19. Query to display the following for each employee <E-Name> earns < Salary> monthly but wants < 3 * Current Salary >. Label the Column as Dream Salary.
20. Query to display Name with the 1st letter capitalized and all other letter lower case and length of their name of all the employees whose name starts with 'J', 'A' and 'M'.
21. Query to display Name, Hire Date and Day of the week on which the employee started. 22. Query to display Name, Department Name and Department No for all the employees. 23. Query to display Unique Listing of all Jobs that are in Department # 30.
24. Query to display Name, Dept Name of all employees who have an 'A' in their name.
25. Query to display Name, Job, Department No. And Department Name for all the employees working at the Dallas location
26. Query to display Name and Employee no. Along with their Manger's Name and the Manager's employee no; along with the Employees' Name who do not have a Manager.
27. Query to display Name, Dept No. And Salary of any employee whose department No. and salary matches both the department no. And the salary of any employee who earns a commission
28. Query to display Name and Salaries represented by asterisks, where each asterisk (*) signifies $100.
29. Query to display the Highest, Lowest, Sum and Average Salaries of all the employees 30. Query to display the number of employees performing the same Job type functions. 31. Query to display the no. of managers without listing their names.
32. Query to display the Department Name, Location Name, No. of Employees and the average salary for all employees in that department.
33. Query to display Name and Hire Date for all employees in the same dept. as Blake.
34. Query to display the Employee No. And Name for all employees who earn more than the average salary.
35. Query to display Employee Number and Name for all employees who work in a department with any employee whose name contains a 'T'.
36. Query to display the names and salaries of all employees who report to King.
37. Query to display the department no, name and job for all employees in the Sales department.

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CORE-7: DISCRETE STRUCTURES

(CREDITS: 6, Theory=4 + Practical=2)
(Total Marks: 100, Mid Sem=15, Practical=25, Term End=60: Duration: 3 hrs.)

MODULE-1: Logic and Proofs: Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Normal Forms, Proof Methods and Strategy, Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms.

MODULE-2: Basic Structures: Sets, Set Operations, Functions, Recursive Functions, Sequences and Summations. Relations: Relations and their Properties, n-ary Relations and their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Ordering. Boolean

MODULE-3: Algebra: Boolean Functions, Representing Boolean Functions, Logic Gates, Minimization of Circuits. Algebraic Structures & Coding Theory: The Structure of Algebras, Semi-groups, Monoids and Groups, Homomorphism, Normal Subgroups, and Congruence Relations, Rings, Integral Domains and Fields, Quotient and Product Algebras, Coding Theory. Polynomial Rings and Polynomial Codes.

MODULE-4: Counting: Basics of Counting, The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients, Generalized Permutations and Combinations, Generating Permutations and Combinations. Advanced Counting Techniques, Applications of Inclusion-Exclusion, Discrete probability, Conditional probability, Bayes' Theorem.

MODULE-5: Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Havel-Hakimi Theorem, Representing Graphs and Graph Isomorphism, Connectivity, Cut-Sets, Euler and Hamiltonian Paths, Shortest-Path Problem, Planar Graphs, Graph Coloring, Network Flows.

Text Book:

Kenneth H Rosen, Discrete Mathematics & Its Applications, McGraw-Hill. 7/e

PRACTICAL: Mark 25 / Credit- 2

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SEMESTER-IV

CORE-8: JAVA PROGRAMMING

(CREDITS: 6, Theory=4 + Practical=2)
(Total Marks: 100, Mid Sem=15, Practical=25, Term End=60: Duration: 3 hrs.)

MODULE-1: Introduction to Java**:** Java Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords Data Types, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting, Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods),

MODULE-2: Arrays, Strings and I/O**:** Creating & Using Arrays (One Dimension and Multi-dimensional), Referencing Arrays Dynamically, Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, Passing Strings To & From Methods, String Buffer Classes. Simple I/O using System.out and the Scanner class, Byte and Character streams, Reading/Writing from console and files. Object-Oriented Programming Overview**:** Principles of Object-Oriented Programming, Defining & Using Classes, Controlling Access to Class Members, Class Constructors, Method Overloading, Class Variables & Methods, Objects as parameters, final classes, Object class, Garbage Collection.

MODULE-3: Inheritance, Interfaces, Packages, Enumerations, Autoboxing and Metadata**:** Inheritance: (Single Level and Multilevel, Method Overriding, Dynamic Method Dispatch, Abstract Classes), Interfaces and Packages, Extending interfaces and packages, Package and Class Visibility, Using Standard Java Packages (util, lang, io, net), Wrapper Classes, Autoboxing/Unboxing, Enumerations and Metadata.

MODULE-4: Exception Handling, Threading, Networking and Database Connectivity: Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions; Multi-threading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/ resuming threads. Using java.net package, Overview of TCP/IP and Datagram programming. Accessing and manipulating databases using JDBC.

MODULE-5: Applets and Event Handling: Java Applets: Introduction to Applets, Writing Java Applets, Working with Graphics, Incorporating Images & Sounds. Event Handling Mechanisms, Listener Interfaces, Adapter and Inner Classes. The design and Implementation of GUIs using the AWT controls, Swing components of Java Foundation Classes such as labels, buttons, text fields, layout managers, menus, events and listeners; Graphic objects for drawing figures such as lines, rectangles, ovals, using different fonts. Overview of servlets.

Text BooK:
Paul Deitel, Harvey Deitel, "Java: How to Program", 10th Edition, Prentice Hall, 2011.

PRACTICAL: Mark 25 / Credit- 2

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CORE-9: COMPUTER NETWORKS

(CREDITS: 6, Theory=4 + Practical=2)
(Total Marks: 100, Mid Sem=15, Practical=25, Term End=60: Duration: 3 hrs.)

MODULE-1: Introduction to Computer Networks (8 Lectures)
Network definition; network topologies; network classifications; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite.

MODULE-2: Data Communication Fundamentals and Techniques: Analog and digital signal; data-rate limits; digital to digital line encoding schemes; pulse code modulation; parallel and serial transmission; digital to analog modulation-; multiplexing techniques- FDM, TDM; transmission media.

MODULE-3: Networks Switching Techniques and Access mechanisms: Circuit switching; packet switching- connectionless datagram switching, connection- oriented virtual circuit switching; dial-up modems; digital subscriber line; cable TV for data transfer.

MODULE-4: Data Link Layer Functions and Protocol (15 Lectures)
Error detection and error correction techniques; data-link control- framing and flow control; error recovery protocols- stop and wait ARQ, go-back-n ARQ; Point to Point Protocol on Internet.; Multiple Access Protocol and Networks; CSMA/CD protocols; Ethernet LANS; connecting LAN and back-bone networks- repeaters, hubs, switches, bridges, router and gateways;

MODULE-5: Networks Layer Functions and Protocols (17 Lectures)
Routing; routing algorithms; network layer protocol of Internet- IP protocol, Internet control protocols; Transport Layer Functions and Protocols
Transport services- error and flow control, Connection establishment and release- three way handshakes; Overview of Application layer protocol; Overview of DNS protocol; overview of WWW &HTTP protocol

Suggested Readings:

1. B. A. Forouzan: Data Communications and Networking, Fourth edition, THM Publishing Company Ltd 2007.
2. A. S. Tanenbaum: Computer Networks, Fourth edition, PHI Pvt. Ltd 2002

PRACTICAL: Mark 25 / Credit- 2

1. Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.
2. Simulate and implement stop and wait protocol for noisy channel.
3. Simulate and implement go back n sliding window protocol.
4. Simulate and implement selective repeat sliding window protocol.
5. Simulate and implement distance vector routing algorithm
6. Simulate and implement Dijkstra algorithm for shortest path routing.

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CORE-10: COMPUTER GRAPHICS

(CREDITS: 6, Theory=4 + Practical=2)
(Total Marks: 100, Mid Sem=15, Practical=25, Term End=60: Duration: 3 hrs.)

MODULE-1: Computer Graphics: A Survey of Computer graphics, Overview of Graphics System: Video Display Devices, Raster-Scan Systems, Input Devices, Hard-Copy Devices, Graphics Software, Introduction to OpenGL. Graphics Output Primitives: Point and Lines, Algorithms for line, circle & ellipse generation, Filled-Area Primitives. Attributes of Graphics Primitives: Point, line, curve attributes, fill area attributes, fill methods for areas with irregular boundaries, Antialiasing

MODULE-2: Geometric Transformations (both 2-D & 3-D): Basic Geometric Transformations, Matrix Representation and Homogeneous Coordinates, Composite Transformations, Inverse Transformations, Other Transformations (Reflection, shear), Transformation between coordinate systems, Affine Transformations. Two Dimensional Viewing: Viewing pipeline, Clipping Window, Normalization & Viewport coordinate Transformations, Clipping Algorithms: Point clipping, Line clipping and Polygon clipping. Three Dimensional Viewing: 3-dimensional Viewing Concepts, Viewing pipeline, Projection Transformations (Orthogonal, Oblique parallel, Perspective), Clipping Algorithms.

MODULE-3: Three Dimensional Object Representations: Curved Surfaces, Quadratic Surfaces, Spline Representations, Bezier Spline Curves and Surfaces, B-Spline Curves and Surfaces, Octrees, BSP Trees, Fractal Geometry Methods, Gamma correction.

MODULE-4: Visible Surface Detection Methods: Classification of Visible-Surface Detection Algorithms, Back-Face Detection, Depth-Buffer method, A-Buffer Method, Scan line and Depth Sorting, Area subdivision Method, Ray Casting Method.

MODULE-5: Illumination Models: Basic Illumination Models, Displaying light Intensities, Halftone Patterns and Dithering techniques, Polygon-Rendering Methods (Gouroud Shading, Phong Shading), Ray-Tracing Methods (Basic Ray-Tracing Algorithm, Ray-Surface Intersection Calculations). Computer Animation, Hierarchical Modeling (introductory idea only).

Text Book :

Donald Hearn & M. Pauline Baker, "*Computer Graphics with OpenGL*", Pearson Education, Inc. New Delhi.

PRACTICAL: Mark 25 / Credit- 2

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SEMESTER-V

CORE-11: INTERNET TECHNOLOGY

(CREDITS: 6, Theory=4 + Practical=2)
(Total Marks: 100, Mid Sem=15, Practical=25, Term End=60: Duration: 3 hrs.)

MODULE-1: Java: Use of Objects, Array and ArrayList class
MODULE-2: JavaScript: Data types, operators, functions, control structures, events and event handling.
MODULE-3: JDBC: JDBC Fundamentals, Establishing Connectivity and working with connection interface, Working with statements, Creating and Executing SQL Statements, Working with Result Set Objects.
MODULE-4: JSP: Introduction to Java Server Pages, HTTP and Servlet Basics, The Problem with Servlets, The Anatomy of a JSP Page, JSP Processing, JSP Application Design with MVC, Setting Up the JSP Environment, Implicit JSP Objects, Conditional Processing, Displaying Values, Using an expression to Set an Attribute, Declaring Variables and Methods, Error Handling and Debugging, Sharing Data Between JSP Pages, Requests, and Users, Database Access.
MODULE-5: Java Beans: Java Beans Fundamentals, JAR files, Introspection, Developing a simple Bean, Connecting to DB

Text Books:

1. Ivan Bayross, Web Enabled Commercial Application Development Using Html, DHTML, Javascript, Perl CGI, BPB Publications, 2009.
2. Cay Horstmann, BIG Java, Wiley Publication, 3rd Edition, 2009
3. Herbert Schildt, Java 7, The Complete Reference, , 8th Edition, 2009.
4. Jim Keogh, The Complete Reference J2EE, TMH, 2002.
5. O'Reilly, Java Server Pages, Hans Bergsten, Third Edition, 2003.

PRACTICAL: Mark 25 / Credit- 2

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CORE-12: SOFTWRE ENGINEERING

(CREDITS: 6, Theory=4 + Practical=2)
(Total Marks: 100, Mid Sem=15, Practical=25, Term End=60: Duration: 3 hrs.)

MODULE-1: Professional Software Development, Software Engineering EthiCSA, Software Processes, Software Process Models, Process Activities, Coping with Change, The Rational Unified Process, Agile Software Development, Agile Methods, Plan-Driven and Agile Development, Extreme Programming, Agile Project Management, Scaling Agile Methods.
MODULE-2: Requirements Engineering, Functional and Non-Functional Requirements, The Software Requirements Document, Requirements Specification, Requirements Engineering Processes, Requirements Elicitation and Analysis, Requirements Validation, Requirements Management, System Modelling, Context Models, Interaction Models, Structural Models, Behavioral Models, Model-Driven, Engineering, Architectural Design, Architectural Design Decisions, Architectural Views, Architectural Patterns, Application Architectures.
MODULE-3: Design and Implementation: Object-Oriented Design using the UML, Design Patterns, Implementation Issues, Open Source Development, Software Testing: Development Testing, Test-Driven Development, Release Testing, User Testing, Software Evolution: Evolution Processes, Program Evolution DynamiCSA, Software Maintenance, Legacy System Management, Dependability and Security.
MODULE-4: Socio-technical Systems: Complex Systems, Systems Engineering, System Procurement, System Development, System Operation. Dependability and Security: Dependability Properties, Availability and Reliability, Safety, Security. Dependability and Security Specification: Risk-Driven Requirements, Specification, Safety Specification, Reliability Specification, Security, Specification, Formal Specification.
MODULE-5: Dependability Engineering: Redundancy and Diversity, Dependable Processes, Dependable Systems Architectures, Dependable Programming. Security Engineering: Security Risk Management, Design for Security, System Survivability. Dependability and

Security Assurance: Static Analysis, Reliability Testing, Security Testing, Process Assurance, Safety and Dependability Cases.

TEXT BOOK: Software Engineering, Ian Sommerville, 9/e (Pearson Education)

PRACTICAL: Mark 25 / Credit- 2

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SEMESTER-VI

CORE-13: ARTIFICIAL INTELLIGENCE

(CREDITS: 6, Theory=4 + Practical=2)
(Total Marks: 100, Mid Sem=15, Practical=25, Term End=60: Duration: 3 hrs.)

MODULE-1: Intelligent Agents, Solving problems by searching, Uninformed search strategies(BFS, DFS, DLS, IDS, BD and Uniform cost search), Informed search and exploration (Greedy Best first, A* and its variations) Constraint satisfaction Problems, Adversarial search(Alpha-beta pruning)
MODULE-2: Knowledge and reasoning, logical agent (Wumpus world), Propositional logic, First order logic, Inference in first order logic (Forward chaining, backward chaining, Resolution), Knowledge representation.
MODULE-3: Planning, Partial-Order planning, Planning Graphs, Planning and acting in the real world, Uncertain knowledge and reasoning.
MODULE-4: Learning from Observations, Decision trees, Neural network (Multilayer), Reinforcement Learning.
MODULE-5: NLP, Communication, A formal grammar for a fragment of English, Syntactic analysis (chat parsing), semantic Interpretation, Ambiguity of grammar, Machine Translation.

Text Book: Stuart Russell and Peter Norvig, "ARTIFICIAL INTELLIGENCE A MODERN APPROACH" 2/e

PRACTICAL: Mark 25 / Credit- 2

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CORE-14: DESIGN AND ANALYSIS OF ALGORITHMS

(CREDITS: 6, Theory=4 + Practical=2)
(Total Marks: 100, Mid Sem=15, Practical=25, Term End=60: Duration: 3 hrs.)

MODULE-1: Analysis and Design of Algorithm (Case study insertion sort and merge sort)Asymptotic Analysis, Divide and Conquer, Recurence Relations, Strassens Matix Multiplication.
MODULE-2: Sorting: Quick sort, heap sort, Counting sort, lower bound for sorting, Randomized quicksort, Order Statistics.
MODULE-3: Amotized Analysis (Aggregate analysis, Accounting analysis, Potential analysis), 2-3-4 tree Advanced Data structure: Fibonacci heap, Redblack tree, hashing, data structure on disjoint set, Sciccinet Data Structure.
MODULE-4: Dynamic Programming : Matrix Chain multiplication, LCS, TSP, Branch and Bound.; Greedy Algoithm: MST: Krushkal , Prims, Dijkstra Algorithm, Huffman Coding, Maxflow matching, Computational geometry: Convex Hall,0-1-knaplock, fractional knapsack, Back tracking (4-Queen Prob.)
MODULE-5: Complexity Class: P. PSPACE, NP, NP-Hard, NP Complete, Satisfiability, Cheque, Vertex Cover, Independent set, Exact cover, Graph Coloring, Hamiltonian, Cycle Matching. Approximation Algorithm: Vertex Cove, TSP, Indepentent Set, Sum of subset

Text Book: Introduction To Algorithm: Corman Leisenm, Rives & Stein

PRACTICAL: Mark 25 / Credit- 2

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DISCIPLINE SPECIFIC ELECTIVE (DSE)

COMPUTER SCIENCE

SEMESTER-V

DSE-1: INFORMATION SECURITY

(CREDITS: 6, Theory=4 + Practical=2)
(Total Marks: 100, Mid Sem=15, Practical=25, Term End=60: Duration: 3 hrs.)

MODULE-1: Introduction: Security, Attacks, Computer Criminals, Security Services, Security Mechanisms. Cryptography: Substitution ciphers, Transpositions Cipher, Confusion, diffusion, Symmetric, Asymmetric Encryption. DES Modes of DES, Uses of Encryption, Hash function, key exchange, Digital Signatures, Digital Certificates.
MODULE-2: Program Security: Secure programs, Non malicious Program errors, Malicious codes virus, Trap doors, Salami attacks, Covert channels, Control against program
MODULE-3: Threats**:** Protection in OS: Memory and Address Protection, Access control, File Protection, User Authentication. Database Security: Requirements, Reliability, Integrity, Sensitive data, Inference, Multilevel Security.
MODULE-4: Security in Networks: Threats in Networks, Security Controls, firewalls, Intrusion detection systems, Secure e-mails
MODULE-5: Administrating Security: Security Planning, Risk Analysis, Organisational Security Policy, Physical Security. Ethical issues in Security: Protecting Programs and data. Information and law.

PRACTICAL: Mark 25 / Credit- 2

Text Book:
1. C. P. Pfleeger, S. L. Pfleeger; Security in Computing, PHI, 2006
2. W. Stallings; Network Security Essentials: Applications and Standards, 4/E, 2010

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DSE-2: MICROPROCESSOR

(CREDITS: 6, Theory=4 + Practical=2)
(Total Marks: 100, Mid Sem=15, Practical=25, Term End=60: Duration: 3 hrs.)

MODULE-1: An Introduction to Processor Design: Processor architecture and organization, Abstraction in hardware design, MU0 - a simple processor, Instruction set design ,Processor design trade-offs ,The Reduced Instruction Set Computer, Design for low power consumption. The ARM Architecture: The Acorn RISC Machine, Architectural inheritance, The ARM programmer's model, ARM development tools.
MODULE-2: ARM Assembly Language Programming: Data processing instructions, Data transfer instructions, Control flow instructions, Writing simple assembly language programs. ARM Organization and Implementation: Pipeline, Types, 3-stage pipeline ARM organization, 5-stage pipeline ARM organization, ARM instruction execution, ARM implementation, The ARM coprocessor interface.
MODULE-3: The ARM Instruction Set: Introduction, Exceptions, Conditional execution , Branch and Branch with Link (B, BL),Branch, Branch with Link and exchange (BX, BLX), Software Interrupt (SWI), Data processing instructions, Multiply instructions, Single word and unsigned byte data transfer instructions , Half-word and signed byte data transfer instructions, Multiple register transfer instructions , Status register to general register transfer instructions ,General register to status register transfer instructions , Coprocessor instructions. Coprocessor data operations, Coprocessor data transfers, Coprocessor register transfers, Breakpoint instruction (BRK - architecture v5T only), Unused instruction space, Memory faults, ARM architecture variants.
MODULE-4: Architectural Support for High-Level Languages: Abstraction in software design, Data types, Floating-point data types, The ARM floating-point architecture, Expressions, Conditional statements, Loops, Functions and procedures, Use of memory, Run-time environment, Examples and exercises.

MODULE-5: Thumb Instruction Set: The Thumb bit in the CPSR, The Thumb programmer's model, Thumb branch instructions, Thumb software interrupt instruction, Thumb data processing instructions , Thumb single register data transfer instructions, Thumb multiple register data transfer instructions, Thumb breakpoint instruction, Thumb implementation, Thumb applications .
Architectural Support for System Development: The ARM memory interface, The Advanced Microcontroller Bus Architecture (AMBA), The ARM reference peripheral specification, Hardware system prototyping tools, The ARMulator.

PRACTICAL: Mark 25 / Credit- 2

Text Book : Steve Furber :"ARM System-On-Chip Architecture".

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SEMESTER-VI

DSE-3: CLOUD COMPUTING

(CREDITS: 6, Theory=4 + Practical=2)
(Total Marks: 100, Mid Sem=15, Practical=25, Term End=60: Duration: 3 hrs.)

MODULE-1: Overview of Computing Paradigm**:** Recent trends in Computing : Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing. Introduction to Cloud Computing**:** Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Benefits and limitations of Cloud Computing.
MODULE-2: Cloud Computing Architecture: Comparison with traditional computing architecture (client/server), Services provided at various levels, Service Models- Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service(SaaS), How Cloud Computing Works, Deployment , Models- Public cloud, Private cloud, Hybrid cloud, Community cloud, Case study of NIST architecture.
MODULE-3: Case Studies: Case Study of Service, Model using Google App Engine, Microsoft Azure, Amazon EC2, Eucalyptus.
MODULE-4:: Service Management in Cloud Computing, Service Level Agreements (SLAs), Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of Scaling.
MODULE-5: Cloud Security: Infrastructure Security- Network level security, Host level security, Application level security, Data security and Storage- Data privacy and security Issues, Jurisdictional issues raised by Data location, Authentication in Cloud Computing.

PRACTICAL: Mark 25 / Credit- 2

Text Books

1. *Cloud Computing Bible,* Barrie Sosinsky, *Wiley-India,* 2010
2. *Cloud Computing: Principles and Paradigms,* Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski*, Wile,* 2011
3. *Cloud Computing: Principles, Systems and Applications, Editors:* Nikos

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DSE-4: PROJECT (CREDIT=6 / MARKS=100) (End Semester Evaluation)

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