

Diploma in Computer Science Engineering



National Institute of Electronics and Information Technology

(An Autonomous Scientific Society of Ministry of Electronics and Information Technology, Government of India)

NIELIT Bhawan, Plot No. 3, PSP Pocket, Sector-8, Dwarka, New Delhi-110077,

Email: contact@nielit.gov.in

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The Diploma in Computer Science Engineering at NIELIT University delves into the intricacies of managing and analyzing vast datasets, providing students with a comprehensive understanding of the field. This program, designed by industry experts and academic leaders, covers fundamental areas such as mathematical foundations, advanced data structures, and diverse electives including advanced algorithms and soft computing.

The curriculum not only focuses on theoretical foundations but also emphasizes hands-on experience through laboratory sessions. In these laboratories, students work on real-world scenarios, honing their skills in applying advanced data structures, implementing algorithms, and delving into core areas like machine learning and data visualization. The program offers a balanced blend of theoretical knowledge and practical application, ensuring that graduates are not only well-versed in the principles of data engineering but also adept at solving complex problems in the dynamic and evolving landscape of data science.

This innovative program is enriched with elective courses, allowing students to tailor their learning experience based on their interests and career goals. Courses such as Data Science, Distributed Systems, and Cloud Computing provide students with specialized knowledge, enabling them to explore diverse aspects of data engineering. The emphasis on a mini project further allows students to synthesize their skills in a real-world context, fostering a deep understanding of how data engineering principles translate into practical solutions.

Program Education Objectives (PEO):

PEO1: Graduates leverage foundational and advanced concepts in data engineering to excel in diverse professional roles, fostering innovation and critical problem-solving.

PEO2: Graduates demonstrate proficiency in advanced data engineering techniques, algorithms, and tools, addressing industry challenges and contributing to research and development.

PEO3: Graduates exhibit effective communication, teamwork, and ethical values, positioning them as responsible leaders and collaborators in the data engineering domain.

Program Outcomes (PO):

PO1: Graduates apply mathematical foundations and data engineering principles to solve complex computing challenges independently and collaboratively.

P02: Graduates design, analyze, and implement advanced data structures, algorithms, and computational solutions, showcasing competence in data engineering.

P03: Graduates critically evaluate and select appropriate data engineering methodologies and tools, demonstrating adaptability to evolving technologies and industry trends.

P04: Graduates proficiently analyze and interpret data, employ machine learning techniques, and contribute to advancements in data preparation, analysis, and storage technologies.

P05: Graduates exhibit expertise in data warehousing, data mining, and data security, ensuring efficient management, retrieval, and protection of large-scale data sets.

Computer Science Engineering Curriculum

Core Courses

SEMESTER - I			
Sl. No	Category of Course	Code No.	Course Title
1.	Basic Science	BS101	Mathematics-I
2.	Basic Science	BS103	Applied Physics-I
3.	Basic Science	BS105	Applied Chemistry
4.	Humanities & SocialScience	HS101	Communication Skills in English
5.	Engineering Science	ES101	Engineering Graphics
6.	Engineering Science	ES103	Engineering Workshop Practice
7.	Basic Science	BS107	Applied Physics-I Lab
8.	Basic Science	BS109	Applied Chemistry Lab
9.	Humanities & SocialScience	HS103	Sports and Yoga
10.	Humanities & SocialScience	HS105	Communication Skills in English Lab

SEMESTER - II			
Sl. No	Category of Course	Code No.	Course Title
1	Basic Science	BS102	Mathematics-II
2	Basic Science	BS104	Applied Physics-II
3	Engineering Science	ES102	Introduction to IT Systems
4	Engineering Science	ES104	Fundamentals of Electrical & Electronics Engineering
5	Engineering Science	ES106	Engineering Mechanics
6	Basic Science	BS106	Applied Physics-II Lab
7	Engineering Science	ES108	Introduction to IT Systems Lab
8	Engineering Science	ES110	Fundamentals of Electrical & Electronics Engineering Lab

9	Engineering Science	ES112	Engineering Mechanics Lab
10	Audit	AU102	Environmental Science

SEMESTER - III			
S. No	Category	Code No.	Course Title
1.	Program core course	COPC201	Computer Programming
2.	Program core course	COPC203	Scripting Languages (Python, Perl, etc. - anyone)
3.	Program core course	COPC205	Data Structures
4.	Program core course	COPC207	Computer System Organisation
5.	Program core course	COPC209	Algorithms
6.	Summer Internship-I (4 weeks) after 2nd Sem	SI201	Summer Intern-ship-1
7.	Program core course	COPC211	Computer Programming Lab
8.	Program core course	COPC213	Scripting Languages Lab
9.	Program core course	COPC215	Data Structures Lab

SEMESTER - IV			
Sl. No	Category	Code No.	Course Title
1.	Program core course	COPC202	Operating Systems
2.	Program core course	COPC204	Introduction to DBMS
3.	Program core course	COPC206	Computer Networks
4.	Program core course	COPC208	SSAD/Software Engineering
5.	Program core course	COPC210	Web Technologies
6.	Open Elective	**OE202	Open Elective-1
7.	Minor Project	Proj.202	Minor Project
8.	Program core course	COPC212	Operating Systems Lab
9.	Program core course	COPC214	Introduction to DBMS Lab
10.	Program core course	COPC216	Computer Networks Lab
11.	Program core course	COPC218	Web Technologies Lab
12.	Mandatory Course	AU202	Essence of Indian Knowledge and Tradition

SEMESTER - V			
Sl. No	Category	Code No.	Course Title
1.	Program core course	COPC301	Introduction to e-Governance
2.	Program core course	COPC303	IoT
3.	Program Elective course	COPE###	Program Elective-1
4.	Program Elective course	COPE###	Program Elective-2
5.	Open Elective	**OE301	Open Elective-2
6.	Summer Internship-II (6 weeks) after IVth Sem	SI301	Summer Internship-2
7.	Major Project	PR302	

SEMESTER -VI			
Sl. No	Category	Code No.	Course Title
1.	Program Elective course	COPE###	Program Elective-3
2.	Program Elective course	COPE###	Program Elective-4
3.	Humanities and Social Science course	HS302	Entrepreneurship and Start-ups
4.	Open Elective	**OE###	Open Elective-3
5.	Mandatory Course	AU302	Indian Constitution
6.	Major Project	PR302	
7.	Seminar	SE302	

Detailed First Year Curriculum

SEMESTER – I		
Course Code	:	BS101
Course Name	:	Mathematics- I
Credits	:	3

Detailed Syllabus:

Lecture Detail
<p>UNIT - I: Trigonometry Concept of angles, measurement of angles in degrees, grades and radians and their conversions, T-Ratios of Allied angles (without proof), Sum, difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa). T- Ratios of multiple angles, sub-multiple angles (2A, 3A, A/2). Graphs of $\sin x$, $\cos x$, $\tan x$ and e^x.</p>
<p>Unit II: Differential Calculus Definition of function: Concept of limits Four standard $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}$, $\lim_{x \rightarrow 0} \frac{\sin x}{x}$, $\lim_{x \rightarrow a} (1+x)^{\frac{1}{x}}$ $\lim_{x \rightarrow a} \left(\frac{a^x - 1}{x} \right)$ Differentiation by definition x^n, $\sin x$, $\cos x$, $\tan x$, $\log_a x$ Differentiation of sum, product and quotient of functions. Differentiation of function of a function. Differentiation of trigonometric and inverse trigonometric functions, Logarithmic differentiation, Exponential functions.</p>
<p>Unit III: Algebra Complex Numbers: Definition, real and imaginary parts of a Complex number, polar and Cartesian, representation of a complex number and its conversion from one form to other, conjugate of a complex number, modulus and amplitude of a complex number Addition, Subtraction, Multiplication and Division of a complex number. De-moivier's theorem, its application. Partial fractions: Definition of polynomial fraction proper & improper fractions and definition of partial fractions. To resolve proper fraction into partial fraction with denominator containing non-repeated linear factors, repeated linear factors and irreducible non-repeated quadratic factors. To resolve improper fraction into partial fraction. Permutations and Combinations: Value of ${}^n P_r$ and ${}^n C_r$. Binomial theorem: Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof) first and second binomial approximation with applications to engineering problems</p>

References:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.
2. G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.
3. Reena Garg, Engineering Mathematics, Khanna Publishing House, New Delhi (Revised Ed. 2018)
4. V. Sundaram, R. Balasubramanian, K.A. Lakshminarayanan, Engineering Mathematics, 6/e., Vi- First Year Curriculum Structure Common to All Branches 14 kas Publishing House.
5. Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House, New Delhi

Course Code	:	BS103
Course Name	:	Applied Physics-I
Credits	:	3
Prerequisites	:	NIL Course
Category	:	BS

Detailed Syllabus:

Lecture Detail
<p>Unit 1: Physical world, Units and Measurements</p> <p>Physical quantities: fundamental and derived, Units and systems of units (FPS, CGS and SI units), Dimensions and dimensional formulae of physical quantities, Principle of homogeneity of dimensions, Dimensional equations and their applications (conversion from one system of units to other, checking of dimensional equations and derivation of simple equations), Limitations of dimensional analysis.</p> <p>Measurements: Need, measuring instruments, least count, types of measurement (direct, indirect), Errors in measurements (systematic and random), absolute error, relative error, error propagation, error estimation and significant figures.</p>
<p>Unit 2: Force and Motion</p> <p>Scalar and Vector quantities – examples, representation of vector, types of vectors. Addition and Subtraction of Vectors, Triangle and Parallelogram law (Statement only), Scalar and Vector Product, Resolution of a Vector and its application to inclined plane and lawn roller.</p> <p>Force, Momentum, Statement and derivation of conservation of linear momentum, its applications such as recoil of gun, rockets, Impulse and its applications.</p> <p>Circular motion, definition of angular displacement, angular velocity, angular acceleration, frequency, time period, Relation between linear and angular velocity, linear acceleration and angular acceleration (related numerical), Centripetal and Centrifugal forces with live examples, Expression and applications such as banking of roads and bending of cyclist.</p>
<p>Unit 3: Work, Power and Energy</p> <p>Work: Concept and units, examples of zero work, positive work and negative work Friction: concept, types, laws of limiting friction, coefficient of friction, reducing friction and its engineering applications, Work done in moving an object on horizontal and inclined plane for rough and plane surfaces and related applications. Energy and its units, kinetic energy, gravitational potential energy with examples and derivations, mechanical energy, conservation of mechanical energy for freely falling bodies, transformation of energy (examples). Power and its units, power and work relationship, calculation of power (numerical problems).</p>
<p>Unit 4: Rotational Motion</p> <p>Translational and rotational motions with examples, Definition of torque and angular momentum and their examples, Conservation of angular momentum (quantitative) and its applications. Moment of inertia and its physical significance, radius of gyration for rigid body, Theorems of parallel and</p>

perpendicular axes (statements only), Moment of inertia of rod, disc, ring and sphere (hollow and solid); (Formulae only).

Unit 5: Properties of Matter Elasticity: definition of stress and strain, moduli of elasticity, Hooke's law, significance of stress-strain curve. Pressure: definition, units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications. Surface tension: concept, units, cohesive and adhesive forces, angle of contact, Ascent Formula (No derivation), applications of surface tension, effect of temperature and impurity on surface tension. Viscosity and coefficient of viscosity: Terminal velocity, Stoke's law and effect of temperature on viscosity, application in hydraulic systems. Hydrodynamics: Fluid motion, stream line and turbulent flow, Reynold's number Equation of continuity, Bernoulli's Theorem (only formula and numericals) and its applications.

Unit 6: Heat and Thermometry Concept of heat and temperature, modes of heat transfer (conduction, convection and radiation with examples), specific heats, scales of temperature and their relationship, Types of Thermometer (Mercury thermometer, Bimetallic thermometer, Platinum resistance thermometer, Pyrometer) and their uses. Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them, Co-efficient of thermal conductivity, engineering applications.

References:

1. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
2. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi.
3. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
4. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
5. Engineering Physics by DK Bhattacharya & PoonamTandan; Oxford University Press, New Delhi.
6. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi
7. Practical Physics by C. L. Arora, S. Chand Publication.
8. e-books/e-tools/ learning physics software/websites etc.

Course Code	:	BS105
Course Name	:	Applied Chemistry
Credits	:	3

Detailed Syllabus:

Lecture Detail
<p>Unit 1: Atomic Structure, Chemical Bonding and Solutions</p> <p>Rutherford model of atom, Bohr's theory (expression of energy and radius to be omitted), and hydrogen spectrum explanation based on Bohr's model of atom, Heisenberg uncertainty principle, Quantum numbers – orbital concept. Shapes of s,p and d orbitals, Pauli's exclusion principle, Hund's rule of maximum multiplicity Aufbau rule, electronic configuration.</p> <p>Concept of chemical bonding – cause of chemical bonding, types of bonds: ionic bonding (NaCl example), covalent bond (H₂, F₂, HF hybridization in BeCl₂, BF₃, CH₄, NH₃, H₂O), coordination bond in NH₄⁺, and anomalous properties of NH₃, H₂O due to hydrogen bonding, and metallic bonding. Solution – idea of solute, solvent and solution, methods to express the concentration of solution- molarity (M = mole per liter), ppm, mass percentage, volume percentage and mole fraction.</p>
<p>Unit 2: Water</p> <p>Graphical presentation of water distribution on Earth (pie or bar diagram). Classification of soft and hard water based on soap test, salts causing water hardness, unit of hardness and simple numerical on water hardness.</p> <p>Cause of poor lathering of soap in hard water, problems caused by the use of hard water in boiler (scale and sludge, foaming and priming, corrosion etc), and quantitative measurement of water hardness by EDTA method, total dissolved solids (TDS) alkalinity estimation.</p> <p>i). Water softening techniques – soda lime process, zeolite process and ion exchange process.</p> <p>ii). Municipal water treatment (in brief only) – sedimentation, coagulation, filtration, sterilization. Water for human consumption for drinking and cooking purposes from any water sources and enlist Indian standard specification of drinking water (collect data and understand standards).</p>
<p>Unit 3: Engineering Materials</p> <p>Natural occurrence of metals – minerals, ores of iron, aluminium and copper, gangue (matrix), flux, slag, metallurgy – brief account of general principles of metallurgy. Extraction of - iron from haematite ore using blast furnace, aluminium from bauxite along with reactions. Alloys – definition, purposes of alloying, ferrous alloys and non-ferrous with suitable examples, properties and applications.</p> <p>General chemical composition, composition based applications (elementary idea only details omitted):</p>

Port land cement and hardening, Glasses Refractory and Composite materials. Polymers – monomer, homo and co polymers, degree of polymerization, simple reactions involved in preparation and their application of thermoplastics and thermosetting plastics (using PVC, PS, PTFE, nylon – 6, nylon-6,6 and Bakelite), rubber and vulcanization of rubber. energy, conservation of mechanical energy for freely falling bodies, transformation of energy (examples). Power and its units, power and work relationship, calculation of power (numerical problems).

Unit 4: Chemistry of Fuels and Lubricants

Definition of fuel and combustion of fuel, classification of fuels, calorific values (HCV and LCV), calculation of HCV and LCV using Dulong's formula.

Proximate analysis of coal solid fuel

petrol and diesel - fuel rating (octane and cetane numbers),

Chemical composition, calorific values and applications of LPG, CNG, water gas, coal gas, producer gas and biogas.

Lubrication – function and characteristic properties of good lubricant, classification with examples, lubrication mechanism – hydrodynamic and boundary lubrication, physical properties (viscosity and viscosity index, oiliness, flash and fire point, cloud and pour point only) and chemical properties (coke number, total acid number saponification value) of lubricants.

Unit 5: Electro Chemistry

Electronic concept of oxidation, reduction and redox reactions. Definition of terms: electrolytes, non-electrolytes with suitable examples, Faradays laws of electrolysis and simple numerical problems.

Industrial Application of Electrolysis –

- Electrometallurgy
- Electroplating
- Electrolytic refining.

Application of redox reactions in electrochemical cells –

- Primary cells – dry cell,
- Secondary cell - commercially used lead storage battery, fuel and Solar cells.

Introduction to Corrosion of metals –

- definition, types of corrosion (chemical and electrochemical), H₂ liberation and O₂ absorption mechanism of electrochemical corrosion, factors affecting rate of corrosion. Internal corrosion preventive measures –

- Purification, alloying and heat treatment and

External corrosion preventive measures: a) metal (anodic, cathodic) coatings, b) organic inhibitors.

References/Suggested Learning Resources:

(a) Books:

1. Text Book of Chemistry for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi, 2017-18.
2. Agarwal, & Shikha, Engineering Chemistry, Cambridge University Press; New Delhi, 2015.
3. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
4. Dara, S. S. & Dr.S.S.Umare, Engineering Chemistry, S.Chand. Publication, New Delhi, New Delhi, 2015.
5. Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons; New Delhi, 2015.
6. Dr. Vairam, S., Engineering Chemistry, Wiley India Pvt.Ltd., New Delhi, 2013.
7. Dr. G. H. Hugar & Prof A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. I and Vol. II, NITTTR, Chandigarh, Publications, 2013-14.
8. Agnihotri, Rajesh, Chemistry for Engineers, Wiley India Pvt.Ltd., 2014.

(b) Open source software and website address:

1. www.chemguide.co.uk/atommenu.html (Atomic structure and chemical bonding)
2. www.visionlearning.com (Atomic structure and chemical bonding)
3. www.chem1.com (Atomic structure and chemical bonding)
4. <https://www.wastewaterelearning.com/elearning/> (Water Treatment)
5. www.capital-refractories.com (Metals, Alloys, Cement, and Refractory Materials)
6. www.em-ea.org/guide%20books/book-2/2.1%20fuels%20and%20combustion.pdf (Fuel and Combustion) 7 www.chemcollective.org (Metals, Alloys) 8 www.wqa.org(Water Treatment)

Course Code	:	HS101
Course Name	:	Communication Skills in English
Credits	:	2

Detailed Syllabus:

Lecture Detail
<p>Unit-1 Communication: Theory and Practice</p> <ul style="list-style-type: none"> ▪ Basics of communication: Introduction, meaning and definition, process of communication etc. ▪ Types of communication: formal and informal, verbal, non-verbal and written Barriers to effective communication. ▪ 7 Cs for effective communication (considerate, concrete, concise, clear, complete, correct, courteous). ▪ Art of Effective communication, <ul style="list-style-type: none"> • Choosing words • Voice • Modulation • Clarity • Time • Simplification of words ▪ Technical Communication.
<p>Unit-2 Soft Skills for Professional Excellence</p> <ul style="list-style-type: none"> • Introduction: Soft Skills and Hard Skills. • Importance of soft skills. • Life skills: Self-awareness and Self-analysis, adaptability, resilience, emotional intelligence and empathy etc. • Applying soft skills across cultures. • Case Studies.
<p>Unit-3: Reading Comprehension Comprehension, vocabulary enhancement and grammar exercises based on reading of the following texts:</p> <p>Section-1 Malgudi Days: R.K. Narayan The Room on Roof: Ruskin Bond "The Gift of the Magi" by O. Henry "Uncle Podger Hangs a Picture" Jerome K. Jerome</p> <p>Section-2 Night of the Scorpion by Nissim Ezekiel, Stopping by Woods on a Snowy Evening by Robert Frost, Where the Mind is Without Fear by Rabindranath Tagore, Ode to Tomatoes by Pablo Neruda,</p>
<p>Unit-4: Professional Writing The art of précis writing, Letters: business and personnel,</p>

Drafting e-mail, notices, minutes of a meeting etc.
Filling-up different forms such as banks and on-line forms for placement etc.

Unit-5: Vocabulary and Grammar

Vocabulary of commonly used words

Glossary of administrative terms (English and Hindi)

One-word substitution, Idioms and phrases etc.

Parts of speech, active and passive voice, tenses etc., Punctuation

References:

1. J.D.O'Connor. Better English Pronunciation. Cambridge: Cambridge University Press, 1980.
2. Lindley Murray. An English Grammar: Comprehending Principles and Rules. London: Wilson and Sons, 1908.
3. Kulbhushan Kumar, Effective Communication Skills, Khanna Publishing House, New Delhi (Revised Edition 2018)
4. Margaret M. Maison. Examine your English. Orient Longman: New Delhi, 1964.
5. M. Ashraf Rizvi. Effective Technical Communication. Mc-Graw Hill: Delhi, 2002.
6. John Nielson. Effective Communication Skills. Xlibris, 2008.
7. Oxford Dictionary
8. Roget's Thesaurus of English Words and Phrases
9. Collin's English Dictionary

Course Code	:	ES101
Course Name	:	Engineering Graphics
Credits	:	1.5

Detailed Syllabus:

<p>Lecture Detail</p> <p>Unit - I Basic elements of Drawing Drawing Instruments and supporting materials: method to use them with applications.</p> <p>Convention of lines and their applications.</p> <p>Representative Fractions – reduced, enlarged and full size scales; Engineering Scales such as plain and diagonal scale.</p> <p>Dimensioning techniques as per SP-46:2003 – types and applications of chain, parallel and coordinate dimensioning.</p> <p>Geometrical and Tangency constructions. (Redraw the figure)</p>
<p>Unit - II Orthographic projections</p> <p>Introduction of projections-orthographic, perspective, isometric and oblique: concept and applications. (No question to be asked in examination).</p> <p>Introduction to orthographic projection, First angle and Third angle method, their symbols.</p> <p>Conversion of pictorial view into Orthographic Views – object containing plain surfaces, slanting surfaces, slots, ribs, cylindrical surfaces. (use First Angle Projection method only)</p>
<p>Unit - III Isometric Projections</p> <p>Introduction to isometric projections.</p> <p>Isometric scale and Natural scale.</p> <p>Isometric view and isometric projection.</p> <p>Illustrative problems related to objects containing lines, circles and arcs shape only.</p> <p>Conversion of orthographic views into isometric view/projection.,</p>
<p>Unit - IV Free Hand Sketches of engineering elements Free hand sketches of machine elements: Thread profiles, nuts, bolts, studs, set screws, washer, Locking arrangements. (For branches other than mechanical Engineering, the teacher should select branch specific elements for free hand sketching) Free hand sketches of orthographic view (on squared graph paper) and isometric view (on isometric grid paper)</p>

Unit – V Computer aided drafting interface

Computer Aided Drafting: concept. Hardware and various CAD software available. System requirements and Understanding the interface.

Components of AutoCAD software window: Title bar, standard tool bar, menu bar, object properties tool bar, draw tool bar, modify tool bar, cursor cross hair. Command window, status bar, drawing area, UCS icon.

File features: New file, Saving the file, Opening an existing drawing file, Creating templates, Quit.

Setting up new drawing: Units, Limits, Grid, Snap.

Undoing and redoing action.

Unit – VI Computer aided drafting Draw basic entities like Line, Circle, Arc, Polygon, Ellipse, Rectangle, Multiline, PolyLine. Method of Specifying points: Absolute coordinates, Relative Cartesian and Polar coordinates. Modify and edit commands like trim, extend, delete, copy, offset, array, block, layers. Dimensioning: Linear, Horizontal Vertical, Aligned, Rotated, Baseline, Continuous, Diameter, Radius, Angular Dimensions. Dim scale variable. Editing dimensions. Text: Single line Text, Multiline text. Standard sizes of sheet. Selecting Various plotting parameters such as Paper size, paper units, Drawing orientation, plot scale, plot offset, plot area, print preview.

Practical Exercises

1. Draw horizontal, Vertical, 30 degree, 45 degree, 60 and 75 degrees lines, different types of lines, dimensioning styles using Tee and Set squares/ drafter. (do this exercise in sketch book)
2. Write alphabets and numerical (Vertical only) (do this exercise in sketch book)
3. Draw regular geometric constructions and redraw the given figure (do this exercise in sketch book)
4. Draw a problem on orthographic projections using first angle method of projection having plain surfaces and slanting
5. Draw another problem on orthographic projections using first angle method of projection having slanting surfaces with slots.
6. Draw two problems on orthographic projections using first angle method of projection having cylindrical surfaces, ribs.
7. Draw two problems on Isometric view of simple objects having plain and slanting surface by using natural scale.
8. Draw some problems on Isometric projection of simple objects having cylindrical surface by using isometric scale.
9. Draw free hand sketches/ conventional representation of machine elements in sketch book such as thread profiles, nuts, bolts, studs, set screws, washers, Locking arrangements.
10. Problem based Learning: Given the orthographic views of at least three objects with few missing lines, the student will try to imagine the corresponding objects, complete the views and draw these views in sketch book

11. Draw basic 2D entities like: Rectangle, Rhombus, Polygon using AutoCAD(Printout should be a part of progressive assessment).
12. Draw basic 2D entities like: Circles, Arcs, circular using AutoCAD (Printout should be a part of progressive assessment).
13. Draw basic 2D entities like: Circular and rectangular array using AutoCAD (Printout should be a part of progressive assessment).
14. Draw blocks of 2D entities comprises of Rectangle, Rhombus, Polygon, Circles, Arcs, circular and rectangular array, blocks using AutoCAD (Print out should be a part of progressive assessment).
15. Draw basic branch specific components in 2D using AutoCAD (Print out should be a part of term work).
16. Draw complex branch specific components in 2D using AutoCAD (Print should be a part of progressive assessment).

SUGGESTED LEARNING RESOURCES

1. Bureau of Indian Standards. Engineering Drawing Practice for Schools and Colleges IS: Sp-46. BIS. Government of India, Third Reprint, October 1998; ISBN: 81-7061-091-2.
2. Bhatt, N. D. Engineering Drawing. Charotar Publishing House, Anand, Gujrat 2010; ISBN: 978-93- 80358-17-8.
3. Jain & Gautam, Engineering Graphics & Design, Khanna Publishing House, New Delhi (ISBN: 978- 93-86173-478)
4. Jolhe, D. A. Engineering Drawing. Tata McGraw Hill Edu. New Delhi, 2010; ISBN: 978-0-07- 064837-1
5. Dhawan, R. K. Engineering Drawing. S. Chand and Company, New Delhi; ISBN: 81-219-1431-0.
6. Shah, P. J. Engineering Drawing. S. Chand and Company, New Delhi, 2008, ISBN:81-219-2964-4.
7. Kulkarni, D. M.; Rastogi, A. P.; Sarkar, A. K. Engineering Graphics with AutoCAD. PHI Learning Private Limited-New Delhi (2010); ISBN: 978-8120337831.
8. Jeyapoovan, T. Essentials of Engineering Drawing and Graphics using AutoCAD. Vikas Publishing House Pvt. Ltd, Noida, 2011; ISBN: 978-8125953005.
9. Autodesk. AutoCAD User Guide. Autodesk Press, USA, 2015.
10. Sham, Tickoo. AutoCAD 2016 for Engineers and Designers. Dreamtech Press; Galgotia Publication, New Delhi, 2015; ISBN 978-9351199113.

Software/Learning Websites

1. <https://www.youtube.com/watch?v=TJ4jGyD-WCw>
2. https://www.youtube.com/watch?v=dmt6_n7Sgcg
3. <https://www.youtube.com/watch?v=MQScnLXL0M>
4. <https://www.youtube.com/watch?v=3WXPanCq9LI>
5. <https://www.youtube.com/watch?v=fvjk7PlxAuo>
6. <http://www.me.umn.edu/coursesme2011/handouts/engg%20graphics.pdf>
7. <https://www.machinedesignonline.com>

Course Code	:	ES103
Course Name	:	Engineering Workshop Practice
Credits	:	1.5

Detailed Syllabus:

Lecture Detail	
Carpentry:	<ul style="list-style-type: none"> i) Demonstration of different wood working tools / machines. ii) Demonstration of different wood working processes, like planing, marking, chiseling, grooving, turning of wood etc. iii) One simple job involving any one joint like mortise and tenon dovetail, bridle, half lap etc
Fitting:	<ul style="list-style-type: none"> i) Demonstration of different fitting tools and drilling machines and power tools ii) Demonstration of different operations like chipping, filing, drilling, tapping, sawing, cutting etc. iii) One simple fitting job involving practice of chipping, filing, drilling, tapping, cutting etc
Welding:	<ul style="list-style-type: none"> i) Demonstration of different welding tools / machines. ii) Demonstration on Arc Welding, Gas Welding, MIG, MAG welding, gas cutting and rebuilding of broken parts with welding. iii) One simple job involving butt and lap joint
Sheet Metal Working:	<ul style="list-style-type: none"> i) Demonstration of different sheet metal tools / machines. ii) Demonstration of different sheet metal operations like sheet cutting, bending, edging, end curling, lancing, soldering, brazing, and riveting. iii) One simple job involving sheet metal operations and soldering and riveting.
Electrical House Wiring:	<p>Practice on simple lamp circuits (i) one lamp controlled by one switch by surface conduit wiring,</p> <ul style="list-style-type: none"> (ii) Lamp circuits- connection of lamp and socket by separate switches, (iii) Connection of Fluorescent lamp/tube light, (iv) simple lamp circuits-install bedroom lighting. (v) Simple lamp circuits- install stair case wiring.
Demonstration:	<ul style="list-style-type: none"> 1. Demonstration of measurement of Current, Voltage, Power and Energy. 2. Demonstration of advance power tools, pneumatic tools, electrical wiring tools and accessories. 3. Tools for Cutting and drilling

References:

- 1) S.K. Hajara Chaudhary, Workshop Technology, Media Promoters and Publishers, New Delhi, 2015

- 2) B.S. Raghuwanshi, Workshop Technology, Dhanpat Rai and sons, New Delhi 2014
- 3) K. Venkat Reddy, Workshop Practice Manual, BS Publications, Hyderabad 2014
- 4) Kents Mechanical Engineering Hand book, John Wiley and Sons, New York

Course Code	:	BS107
Course Name	:	Applied Physics-1 Lab
Credits	:	1

List of Practical's/Activities (To perform minimum 10 practical's).

1. To measure length, radius of a given cylinder, a test tube and a beaker using a Vernier caliper and find volume of each object.
2. To determine diameter of a wire, a solid ball and thickness of cardboard using a screw gauge.
3. To determine radius of curvature of a convex and a concave mirror/surface using a spherometer.
4. To verify triangle and parallelogram law of forces.
5. To find the co-efficient of friction between wood and glass using a horizontal board.
6. To determine force constant of a spring using Hook's Law.
7. To verify law of conservation of mechanical energy (PE to KE).
8. To find the moment of inertia of a flywheel.
9. To find the viscosity of a given liquid (Glycerin) by Stoke's law.
10. To find the coefficient of linear expansion of the material of a rod.
11. To determine atmospheric pressure at a place using Fortin's barometer.
12. To measure room temperature and temperature of a hot bath using mercury thermometer and convert it into different scales.

References:

1. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
2. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P)Ltd.,
3. Practical Physics by C. L. Arora, S. Chand Publication.
4. e-books/e-tools/ learning physics software/YouTube videos/websites etc.

Course Code	:	BS109
Course Name	:	Applied Chemistry Lab
Credits	:	1

LIST OF PRACTICALS: Perform any 12 (twelve) Laboratory Practicals.

Volumetric and Gravimetric analysis:

- 1 Preparation of standard solution of oxalic acid or potassium permanganate.
- 2 To determine strength of given sodium hydroxide solution by titrating against standard oxalic acid solution using phenolphthalein indicator.
- 3 Standardization of KMnO_4 solution using standard oxalic acid and Determine the percentage of iron present in given Hematite ore by KMnO_4 solution.
- 4 Iodometric estimation of copper in the copper pyrite ore. 5 Volumetric estimation of total acid number (TAN) of given oil.
- 6 Volumetric estimations of
 - a) Total hardness of given water sample using standard EDTA solution.
 - b) Alkalinity of given water sample using 0.01M Sulphuric acid
- 7 Proximate analysis of coal
 - a) Gravimetric estimation moisture in given coal sample
 - b) Gravimetric estimation ash in given coal sample.

Instrumental analysis

8. Determine the conductivity of given water sample.
9. Determination of the Iron content in given cement sample using colorimeter.
10. Determination of calorific value of solid or liquid fuel using bomb calorimeter.
11. Determination of viscosity of lubricating oil using Redwood viscometer.
12. Determination of flash and fire point of lubricating oil using Able's flash point apparatus.
13. To verify the first law of electrolysis of copper sulfate using copper electrode.
14. Construction and measurement of emf of electrochemical cell (Daniel cell).
15. To study the effect of dissimilar metal combination.

Reference Books:

1. Text Book of Chemistry for Class XI & XII (Part-I, Part-II); N.C.E.R.T., Delhi, 2017-18.
2. Dr. G. H. Hugar and Prof A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. I and Vol. II, NITTTR, Chandigarh, Publications, 2013-14.

3. Agnihotri, Rajesh, Chemistry for Engineers, Wiley India Pvt.Ltd., 2014.
4. Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons; New Delhi, 2015.

Course Code	:	HS103
Course Name	:	Sports and Yoga
Credits	:	1

Detailed Syllabus:

Lecture Detail
<p>Introduction to Physical Education</p> <ol style="list-style-type: none"> 1. Meaning & definition of Physical Education 2. Aims & Objectives of Physical Education <ul style="list-style-type: none"> • Changing trends in Physical Education
<p>Olympic Movement</p> <ol style="list-style-type: none"> 3. Ancient & Modern Olympics (Summer & Winter) 4. Olympic Symbols, Ideals, Objectives & Values 5. Awards and Honours in the field of Sports in India (Dronacharya Award, Arjuna Award, Dhyanchand Award, Rajiv Gandhi Khel Ratna Award etc.)
<p>Physical Fitness, Wellness & Lifestyle</p> <ol style="list-style-type: none"> 6. Meaning & Importance of Physical Fitness & Wellness 7. Components of Physical fitness o Components of Health related fitness 8. Components of wellness o Preventing Health Threats through Lifestyle Change <ul style="list-style-type: none"> • Concept of Positive Lifestyle
<p>Fundamentals of Anatomy & Physiology in Physical Education, Sports and Yog</p> <ul style="list-style-type: none"> • Define Anatomy, Physiology & Its Importance • Effect of exercise on the functioning of Various Body Systems. (Circulatory System, Respiratory System, Neuro-Muscular System etc.)
<p>Kinesiology, Biomechanics & Sports</p> <ul style="list-style-type: none"> • Meaning & Importance of Kinesiology & Biomechanics in Physical Edu. & Sports • Newton's Law of Motion & its application in sports. • Friction and its effects in Sports.
<p>Postures</p> <ul style="list-style-type: none"> • Meaning and Concept of Postures. • Causes of Bad Posture. • Advantages & disadvantages of weight training. • Concept & advantages of Correct Posture. • Common Postural Deformities – Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, Bow Legs and Scoliosis. • Corrective Measures for Postural Deformities
<p>Yoga</p> <ul style="list-style-type: none"> • Meaning & Importance of Yoga • Elements of Yoga • Introduction - Asanas, Pranayama, Meditation & Yogic Kriyas • Yoga for concentration & related Asanas (Sukhasana; Tadasana; Padmasana & Shashankasana) • Relaxation Techniques for improving concentration - Yog-nidra
Yoga & Lifestyle

- Asanas as preventive measures.
- Hypertension: Tadasana, Vajrasana, Pavanuktasana, Ardha Chakrasana, Bhujangasana, Sharasana.
- Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana, Trikonasana, Ardha Matsyendrasana.
- Back Pain: Tadasana, Ardha Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana.
- Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana, Pavanuktasana, Ardha Matsyendrasana.
- Asthma: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana.

Training and Planning in Sports

- Meaning of Training
- Warming up and limbering down o Skill, Technique & Style
- Meaning and Objectives of Planning.
- Tournament – Knock-Out, League/Round Robin & Combination.

Psychology & Sports

- Definition & Importance of Psychology in Physical Edu. & Sports
- Define & Differentiate Between Growth & Development
- Adolescent Problems & Their Management
- Emotion: Concept, Type & Controlling of emotions or Meaning, Concept & Types of Aggressions in Sports.
- Psychological benefits of exercise.
- Anxiety & Fear and its effects on Sports Performance.
- Motivation, its type & techniques. o Understanding Stress & Coping Strategies

Doping

- Meaning and Concept of Doping
- Prohibited Substances & Methods
- Side Effects of Prohibited Substances

Sports Medicine

- First Aid – Definition, Aims & Objectives.
- Sports injuries: Classification, Causes & Prevention.
- Management of Injuries: Soft Tissue Injuries and Bone & Joint Injuries

Sports / Games

Following subtopics related to any one Game/Sport of choice of student out of: Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming, Table Tennis, Volleyball, Yoga etc.

- History of the Game/Sport.
- Latest General Rules of the Game/Sport.
- Specifications of Play Fields and Related Sports Equipment.
- Important Tournaments and Venues.
- Sports Personalities.
- Proper Sports Gear and its Importance

References:

1. Modern Trends and Physical Education by Prof. Ajmer Singh.
2. Light On Yoga by B.K.S. Iyengar.
3. Health and Physical Education – NCERT (11th and 12th Classes)

Course Code	:	HS105
Course Name	:	Communication Skills in English - Lab
Credits	:	1

Detailed Syllabus:

Lecture Detail
Unit 1 Listening Skills Listening Process and Practice: Introduction to recorded lectures, poems, interviews and speeches, listening tests
Unit II Introduction to Phonetics Sounds: consonant, vowel, diphthongs, etc. transcription of words (IPA), weak forms, syllable division, word stress, intonation, voice etc.
Unit III Speaking Skills Standard and formal speech: Group discussion, oral presentations, public speaking, business presentations etc. Conversation practice and role playing, mock interviews etc.
Unit IV Building vocabulary Etymological study of words and construction of words, phrasal verbs, foreign phrases, idioms and phrases. Jargon/ Register related to organizational set up, word exercises and word games to enhance self-expression and vocabulary of participants.

Recommended Readings:

1. Daniel Jones. The Pronunciation of English. Cambridge: Cambridge University Press, 1956.
2. James Hartman & et al. Ed. English Pronouncing Dictionary. Cambridge: Cambridge University 35 First Year Curriculum Structure Common to All Branches Press, 2006.
3. Kulbhushan Kumar, Effective Communication Skills, Khanna Publishing House, New Delhi (Revised Ed. 2018)
4. J.D.O'Connor. Better English Pronunciation. Cambridge: Cambridge University Press, 1980.
5. Lindley Murray. An English Grammar: Comprehending Principles and Rules. London: Wilson and Sons, 1908.
6. Margaret M. Maison. Examine your English. Orient Longman: New Delhi, 1964.
7. J.Sethi & et al. A Practice Course in English Pronunciation. New Delhi: Prentice Hall, 2004.
8. Pfeiffer, William Sanborn and T.V.S Padmaja. Technical Communication: A Practical Approach. 6th ed. Delhi: Pearson, 2007.

SEMESTER - II

Course Code	:	BS102
Course Name	:	Mathematics - II
Credits	:	4

Detailed Syllabus:

Lecture Detail
<p>UNIT - I: Determinants and Matrices Elementary properties of determinants up to 3rd order, consistency of equations, Cramer's rule. Algebra of matrices, Inverse of a matrix, matrix inverse method to solve a system of linear equations in 3 variables.</p>
<p>UNIT - II: Integral Calculus Integration as inverse operation of differentiation. Simple integration by substitution, by parts and by partial fractions (for linear factors only). Use of formulas and for solving problems Where m and n are positive integers. Applications of integration for i. Simple problem on evaluation of area bounded by a curve and axes. ii. Calculation of Volume of a solid formed by revolution of an area about axes. (Simple problems).</p> <p>iv)</p>
<p>UNIT - III: Co-Ordinate Geometry Equation of straight line in various standard forms (without proof), inter section of two straight lines, angle between two lines. Parallel and perpendicular lines, perpendicular distance formula. General equation of a circle and its characteristics. To find the equation of a circle, given: i. Centre and radius, ii. Three points lying on it and iii. Coordinates of end points of a diameter. Definition of conics (Parabola, Ellipse, Hyperbola) their standard equations without proof. Problems on conics when their foci, directories or vertices are given.</p>
<p>UNIT - IV: Vector Algebra Definition notation and rectangular resolution of a vector. Addition and subtraction of vectors. Scalar and vector products of 2 vectors. Simple problems related to work, moment and angular velocity</p>
<p>UNIT-V: Differential Equations Solution of first order and first degree differential equation by variable separation method (simple problems). MATLAB – Simple Introduction.</p>

References:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.

2. G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.
3. S.S. Sabharwal, Sunita Jain, Eagle Parkashan, Applied Mathematics, Vol. I & II, Jalandhar.
4. Comprehensive Mathematics, Vol. I & II by Laxmi Publications, Delhi.
5. Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House, New Delhi

Course Code	:	BS104
Course Name	:	Applied Physics- II
Credits	:	3

Detailed Syllabus:

Lecture Detail
<p>UNIT - 1: Wave motion and its applications Wave motion, transverse and longitudinal waves with examples, definitions of wave velocity, frequency and wave length and their relationship, Sound and light waves and their properties, wave equation ($y = r \sin \omega t$) amplitude, phase, phase difference, principle of superposition of waves and beat formation. Simple Harmonic Motion (SHM): definition, expression for displacement, velocity, acceleration, time period, frequency etc. Simple harmonic progressive wave and energy transfer, study of vibration of cantilever and determination of its time period, Free, forced and resonant vibrations with examples. Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time and their applications, Ultrasonic waves – Introduction and properties, engineering and medical applications of ultrasonic.</p>
<p>UNIT - 2: Optics Basic optical laws; reflection and refraction, refractive index, Images and image formation by mirrors, lens and thin lenses, lens formula, power of lens, magnification and defects. Total internal reflection, Critical angle and conditions for total internal reflection, applications of total internal reflection in optical fiber. Optical Instruments; simple and compound microscope, astronomical telescope in normal adjustment, magnifying power, resolving power, uses of microscope and telescope, optical projection systems.</p>
<p>UNIT - 3: Electrostatics Coulombs law, unit of charge, Electric field, Electric lines of force and their properties, Electric flux, Electric potential and potential difference, Gauss law: Application of Gauss law to find electric field intensity of straight charged conductor, plane charged sheet and charged sphere. Capacitor and its working, Types of capacitors, Capacitance and its units. Capacitance of a parallel plate capacitor, Series and parallel combination of capacitors (related numerical), dielectric and its effect on capacitance, dielectric break down.</p>
<p>UNIT - 4: Current Electricity Electric Current and its units, Direct and alternating current, Resistance and its units, Specific resistance, Conductance, Specific conductance, Series and parallel combination of resistances. Factors affecting resistance of a wire, carbon resistances and colour coding. Ohm's law and its verification, Kirchhoff's laws, Wheatstone bridge and its applications (slide wire bridge only), Concept of terminal potential difference and Electro motive force (EMF) Heating effect of current, Electric power, Electric energy and its units (related numerical problems), Advantages of Electric Energy over other forms of energy.</p>
<p>UNIT - 5: Electromagnetism Types of magnetic materials; dia, para and ferromagnetic with their properties, Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and units, magnetization. Concept of electromagnetic induction, Faraday's Laws, Lorentz force (force on moving charge in magnetic field). Force on current carrying conductor, force on rectangular coil placed in magnetic</p>

field. Moving coil galvanometer; principle, construction and working, Conversion of a galvanometer into ammeter and voltmeter

UNIT - 6: Semiconductor Physics Energy bands in solids, Types of materials (insulator, semi-conductor, conductor), intrinsic and extrinsic semiconductors, p-n junction, junction diode and V-I characteristics, types of junction diodes. Diode as rectifier – half wave and full wave rectifier (centre taped). Transistor; description and three terminals, Types- pnp and npn, some electronic applications (list only). Photocells, Solar cells; working principle and engineering applications

UNIT - 7: Modern Physics Lasers: Energy levels, ionization and excitation potentials; spontaneous and stimulated emission; population inversion, pumping methods, optical feedback, Types of lasers; Ruby, He-Ne and semiconductor, laser characteristics, engineering and medical applications of lasers. Fiber Optics: Introduction to optical fibers, light propagation, acceptance angle and numerical aperture, fiber types, applications in; telecommunication, medical and sensors. Nanoscience and Nanotechnology: Introduction, nanoparticles and nanomaterials, properties at nanoscale, nanotechnology, nanotechnology based devices and applications.

References:

1. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
2. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi
3. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
4. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi.
5. Modern approach to Applied Physics-I and II, AS Vasudeva, Modern Publishers.
6. A Textbook of Optics, N Subramanyam, Brij Lal, MN Avahanulu, S Chand and Company Ltd.
7. Introduction to Fiber Optics, Ajoy Ghatak and K Thyagarajan, Cambridge University Press India Pvt. Ltd, New Delhi.
8. Nanoscience and Nanotechnology, KK Choudhary, Narosa Publishing House, Pvt. Ltd. New Delhi.
9. Nanotechnology: Importance and Applications, M.H. Fulekar, IK International Publishing House Pvt. Ltd, New Delhi.
10. e-books/e-tools/ learning physics software/websites etc.

Course Code	:	ES102
Course Name	:	Introduction to IT Systems
Credits	:	2

Detailed Syllabus:

Lecture Detail
UNIT 1: Basic Internet skills: Understanding browser, efficient use of search engines, awareness about Digital India portals (state and national portals) and college portals. General understanding of various computer hardware components – CPU, Memory, Display, Keyboard, Mouse, HDD and other Peripheral Devices.
UNIT 2: OS Installation (Linux and MS Windows), Unix Shell and Commands, vi editor
Unit 3 HTML4, CSS, making basic personal webpage
UNIT 4: Office Tools: OpenOffice Writer, OpenOffice Spreadsheet (Calc), OpenOffice Impress.
UNIT 5: Information security best practices. Class lectures will only introduce the topic or demonstrate the tool, actual learning will take place in the Lab by practicing regularly.

References:

1. R.S. Salaria, Computer Fundamentals, Khanna Publishing House
2. Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House • Online Resources, Linux man pages, Wikipedia
3. Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and Shell programming, by Mokhtar Ebrahim, Andrew Mallett

Course Code	:	ES104
Course Name	:	Fundamentals of Electrical and Electronics Engineering
Credits	:	3

Detailed Syllabus:

Lecture Detail
<p>UNIT I Overview of Electronic Components & Signals: Passive Active Components: Resistances, Capacitors, Inductors, Diodes, Transistors, FET, MOS and CMOS and their Applications. Signals: DC/AC, voltage/current, periodic/non-periodic signals, average, rms, peak values, different types of signal waveforms, Ideal/non-ideal voltage/current sources, independent/dependent voltage current sources.</p>
<p>UNIT II Overview of Analog Circuits: Operational Amplifiers-Ideal Op-Amp, Practical op amp, Open loop and closed loop configurations, Application of Op-Amp as amplifier, adder, differentiator and integrator.</p>
<p>UNIT III Overview of Digital Electronics: Introduction to Boolean Algebra, Electronic Implementation of Boolean Operations, Gates-Functional Block Approach, Storage elements-Flip Flops-A Functional block approach, Counters: Ripple, Up/down and decade, Introduction to digital IC Gates (of TTL Type).</p>
<p>Unit IV Electric and Magnetic Circuits: EMF, Current, Potential Difference, Power and Energy; M.M.F, magnetic force, permeability, hysteresis loop, reluctance, leakage factor and BH curve; Electromagnetic induction, Faraday's laws of electromagnetic induction, Lenz's law; Dynamically induced emf; Statically induced emf; Equations of self and mutual inductance; Analogy between electric and magnetic circuits.</p>
<p>Unit V A.C. Circuits: Cycle, Frequency, Periodic time, Amplitude, Angular velocity, RMS value, Average value, Form Factor Peak Factor, impedance, phase angle, and power factor; Mathematical and phasor representation of alternating emf and current; Voltage and Current relationship in Star and Delta connections; A.C in resistors, inductors and capacitors; A.C in R-L series, R-C series, R-L-C series and parallel circuits; Power in A. C. Circuits, power triangle.</p>
<p>Unit VI Transformer and Machines: General construction and principle of different type of transformers; Emf equation and transformation ratio of transformers; Auto transformers; Construction and Working principle of motors; Basic equations and characteristic of motors.</p>

References:

1. Ritu Sahdev, Basic Electrical Engineering, Khanna Publishing House
2. Mittle and Mittal, Basic Electrical Engineering, McGraw Education, New Delhi, 2015, ISBN : 978-0-07-0088572-5
3. Saxena, S. B. Lal, Fundamentals of Electrical Engineering, Cambridge University Press, latest edition ISBN : 9781107464353
4. Theraja, B. L., Electrical Technology Vol – I, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924405
5. Theraja, B. L., Electrical Technology Vol – II, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924375

6. Jegathesan, V., Basic Electrical and Electronics Engineering, Wiley India, New Delhi, 2015, ISBN : 97881236529513
7. Sedha, R.S., A text book of Applied Electronics, S.Chand, New Delhi, 2008, ISBN-13: 978- 8121927833
8. Malvino, Albert Paul, David, Electronics Principles, McGraw Hill Education, New Delhi,2015, ISBN-13: 0070634244-978
9. Mehta, V.K., Mehta, Rohit, Principles of Electronics, S. Chand and Company, New Delhi, 2014, ISBN-13-9788121924504
10. Bell Devid, Fundamental of Electronic Devices and Circuits, Oxford University Press, New Delhi 2015 ISBN : 9780195425239

Course Code	:	ES106
Course Name	:	Engineering Mechanics
Credits	:	3

Detailed Syllabus:

Lecture Detail
<p>Unit – I Basics of mechanics and force system Significance and relevance of Mechanics, Applied mechanics, Statics, Dynamics. Space, time, mass, particle, flexible body and rigid body. Scalar and vector quantity, Units of measurement (SI units) - Fundamental units and derived units. Force – unit, representation as a vector and by Bow’s notation, characteristics and effects of a force, Principle of transmissibility of force, Force system and its classification. Resolution of a force - Orthogonal components of a force, moment of a force, Varignon’s Theorem. Composition of forces – Resultant, analytical method for determination of resultant for concurrent, non-concurrent and parallel co-planar force systems – Law of triangle, parallelogram and polygon of forces.</p>
<p>Unit– II Equilibrium Equilibrium and Equilibrant, Free body and Free body diagram, Analytical and graphical methods of analysing equilibrium Lami’s Theorem – statement and explanation, Application for various engineering problems. Types of beam, supports (simple, hinged, roller and fixed) and loads acting on beam (vertical and inclined point load, uniformly distributed load, couple), Beam reaction for cantilever, simply supported beam with or without overhang – subjected to combination of Point load and uniformly distributed load. Beam reaction graphically for simply supported beam subjected to vertical point loads only.</p>
<p>Unit– III Friction Friction and its relevance in engineering, types and laws of friction, limiting equilibrium, limiting friction, co-efficient of friction, angle of friction, angle of repose, relation between co-efficient of friction and angle of friction. Equilibrium of bodies on level surface subjected to force parallel and inclined to plane. Equilibrium of bodies on inclined plane subjected to force parallel to the plane only</p>
<p>Unit– IV Centroid and centre of gravity Centroid of geometrical plane figures (square, rectangle, triangle, circle, semi-circle, quarter circle) Centroid of composite figures composed of not more than three geometrical figures Centre of Gravity of simple solids (Cube, cuboid, cone, cylinder, sphere, hemisphere) Centre of Gravity of composite solids composed of not more than two simple solids.</p>
<p>Unit – V Simple lifting machine Simple lifting machine, load, effort, mechanical advantage, applications and advantages. Velocity ratio, efficiency of machines, law of machine. Ideal machine, friction in machine, maximum Mechanical advantage and efficiency, reversible and non-reversible machines, conditions for reversibility.</p>

Velocity ratios of Simple axle and wheel, Differential axle and wheel, Worm and worm wheel, Single purchase and double purchase crab winch, Simple screw jack, Weston's differential pulley block, geared pulley block.

References:

1. D.S. Bedi, Engineering Mechanics, Khanna Publications, New Delhi (2008)
2. Khurmi, R.S., Applied Mechanics, S. Chand & Co. New Delhi.
3. Bansal R K, A textbook of Engineering Mechanics, Laxmi Publications.
4. Ramamrutham, Engineering Mechanics, S. Chand & Co. New Delhi.
5. Dhade, Jamadar & Walawelkar, Fundamental of Applied Mechanics, Pune Vidhyarthi Gruh.
6. Ram, H. D.; Chauhan, A. K., Foundations and Applications of Applied Mechanics, Cambridge University Press.
7. Meriam, J. L., Kraige, L.G., Engineering Mechanics- Statics, Vol. I, Wiley Publication, New Delhi.

Course Code	:	BS106
Course Name	:	Applied Physics II Lab
Credits	:	1

List of Practicals/Activities: (To perform minimum 12 Practicals)

1. To determine and verify the time period of a cantilever.
2. To determine velocity of ultrasonic in different liquids using ultrasonic interferometer.
3. To verify laws of reflection from a plane mirror/ interface.
4. To verify laws of refraction (Snell's law) using a glass slab.
5. To determine focal length and magnifying power of a convex lens.
6. To verify Ohm's law by plotting graph between current and potential difference.
7. To verify laws of resistances in series and parallel combination.
8. To find the frequency of AC main using electrical vibrator.
9. To verify Kirchhoff's law using electric circuits.
10. To study the dependence of capacitance of a parallel plate capacitor on various factors and determines permittivity of air at a place.
11. To find resistance of a galvanometer by half deflection method.
12. To convert a galvanometer into an ammeter.
13. To convert a galvanometer into a voltmeter.
14. To draw V-I characteristics of a semiconductor diode (Ge, Si) and determine its knee voltage.
15. To verify inverse square law of radiations using a photo-electric cell.
16. To measure wavelength of a He-Ne/diode laser using a diffraction grating.
17. To measure numerical aperture (NA) of an optical fiber.
18. Study of an optical projection system (OHP/LCD) - project report.

References:

1. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
2. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi
3. Practical Physics by C. L. Arora, S. Chand & Company Ltd.
4. e-books/e-tools/ learning physics software/you Tube videos/ websites etc.

Course Code	:	ES108
Course Name	:	Introduction to IT Systems Lab
Credits	:	2

Topics for Practice:

1. Browser features, browsing, using various search engines, writing search queries
2. Visit various e-governance/Digital India portals, understand their features, services offered
3. Read Wikipedia pages on computer hardware components, look at those components in lab, identify them, recognise various ports/interfaces and related cables, etc.
4. Install Linux and Windows operating system on identified lab machines, explore various options, do it multiple times.
5. Connect various peripherals (printer, scanner, etc.) to computer, explore various features of peripheral and their device driver software.
6. Practice HTML commands, try them with various values, make your own Webpage
7. Explore features of Open Office tools, create documents using these features, do it multiple times
8. Explore security features of Operating Systems and Tools, try using them and see what happens.

References:

1. Online resources, Linux man pages, Wikipedia.
2. R.S. Salaria, Computer Fundamentals, Khanna Publishing House.
3. Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House.
4. Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and Shell programming, by Mokhtar Ebrahim, Andrew Mallett.
5. IT Essentials PC Hardware and Software Companion Guide, Davis Anfinson and Ken Quamme, CISC Press, Pearson Education.
6. PC Hardware and A+ Handbook, Kate J. Chase PHI (Microsoft).

Course Code	:	ES110
Course Name	:	Fundamentals of Electrical and Electronics Engineering Lab
Credits	:	1

Topics for Practice:

1. Determine the permeability of magnetic material by plotting its B-H curve.
2. Measure voltage, current and power in 1-phase circuit with resistive load.
3. Measure voltage, current and power in R-L series circuit.
4. Determine the transformation ratio (K) of 1-phase transformer.
5. Connect single phase transformer and measure input and output quantities
6. Make Star and Delta connection in induction motor starters and measure the line and phase values.
7. Identify various passive electronic components in the given circuit
8. Connect resistors in series and parallel combination on bread board and measure its value using digital multimeter.
9. Connect capacitors in series and parallel combination on bread board and measure its value using multimeter
10. Identify various active electronic components in the given circuit.
11. Use multimeter to measure the value of given resistor.
12. Use LCR-Q tester to measure the value of given capacitor and inductor.
13. Determine the value of given resistor using digital multimeter to confirm with colour code.
14. Test the PN-junction diodes using digital multimeter.
15. Test the performance of PN-junction diode.
16. Test the performance of Zener diode.
17. Test the performance of LED.
18. Identify three terminals of a transistor using digital multimeter.
19. Test the performance of NPN transistor.
20. Determine the current gain of CE transistor configuration.
21. Test the performance of transistor switch circuit.
22. Test the performance of transistor amplifier circuit.
23. Test Op-Amp as amplifier and Integrator.

References:

1. Ritu Sahdev, Basic Electrical Engineering, Khanna Publishing House, 2018
2. Mittle and Mittal, Basic Electrical Engineering, McGraw Education, New Delhi, 2015, ISBN : 978-0-07-0088572-5
3. Saxena, S. B. Lal, Fundamentals of Electrical Engineering, Cambridge University Press, latest edition ISBN : 9781107464353
4. Theraja, B. L., Electrical Technology Vol – I, S. Chand publications, New Delhi, 2015, ISBN: 9788121924405
5. Theraja, B. L., Electrical Technology Vol – II, S. Chand publications, New Delhi, 2015, ISBN: 9788121924375

6. Jegathesan, V., Basic Electrical and Electronics Engineering, Wiley India, New Delhi, 2015, ISBN : 97881236529513
7. Sedha, R.S., A text book of Applied Electronics, S.Chand ,New Delhi, 2008, ISBN-13: 978- 8121927833
8. Malvino, Albert Paul, David, Electronics Principles, McGraw Hill Education, New Delhi,2015, ISBN-13: 0070634244-978
9. Mehta, V.K., Mehta, Rohit, Principles of Electronics, S. Chand and Company, New Delhi, 2014, ISBN-13-9788121924504
10. Bell Devid, Fundamental of Electronic Devices and Circuits, Oxford University Press, New Delhi 2015 ISBN : 9780195425239

Course Code	:	ES112
Course Name	:	Engineering Mechanics Lab
Credits	:	1

List of Practical to be performed:

1. To study various equipments related to Engineering Mechanics.
2. To find the M.A., V.R., Efficiency and law of machine for Differential Axle and Wheel.
3. To find the M.A., V.R., Efficiency and law of machine for Simple Screw Jack.
4. Derive Law of machine using Worm and worm wheel.
5. Derive Law of machine using Single purchase crab.
6. Derive Law of machine using double purchase crab.
7. Derive Law of machine using Weston's differential or wormed geared pulley block.
8. Determine resultant of concurrent force system applying Law of Polygon of forces using force table.
9. Determine resultant of concurrent force system graphically.
10. Determine resultant of parallel force system graphically. 11. Verify Lami's theorem.
11. Study forces in various members of Jib crane. 13. Determine support reactions for simply supported beam.
12. Obtain support reactions of beam using graphical method.
13. Determine coefficient of friction for motion on horizontal and inclined plane.
14. Determine centroid of geometrical plane figures.

References:

1. Bedi D.S., Engineering Mechanics, Khanna Publishing House
2. Khurmi, R.S., Applied Mechanics, S.Chand & Co. New Delhi.
3. Bansal R K, A text book of Engineering Mechanics, Laxmi Publications.
4. Ramamrutham, Engineering Mechanics, S.,S Chand & Co. New Delhi.
5. Dhade, Jamadar & Walawelkar, Fundamental of Applied Mechanics, Pune Vidhyarthi Gruh.
6. Ram, H. D.; Chauhan, A. K. Foundations and Applications of Applied Mechanics, Cambridge University Press.
7. Meriam, J. L., Kraige, L.G. , Engineering Mechanics- Statics, Vol. I, Wiley Publication, New Delhi.

SEMESTER - III

Course Code	:	COPC201
Course Name	:	Computer Programming
Credits	:	2

Detailed Syllabus:

Lecture Detail
UNIT 1: Introduction to Problem Solving (computational way of thinking); Variables and Representation
UNIT 2: Arithmetic, Relational, Logical and Bitwise Operators; Input, Output, Formatting and File I/O
UNIT 3: Conditional Statements, Repeat Statements, Loops and Nested Loops
UNIT 4: Arrays and Memory Organization, Strings, Multidimensional Arrays, Functions and Parameter Passing
UNIT 5: Recursion and Recursive solutions

Reference Books:

1. Let Us C, Yashavant Kanetkar
2. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House
3. C Programming Absolute Beginner's Guide, Dean Miller and Greg Perry
4. The C Programming Language, Kernighan and Ritchie, Prentice Hall of India
5. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill
6. C Programming & Data Structures, B. A. Fouruzan and R. F. Gilberg, CENGAGE Learning.
7. Outline of Programming with C, Byron Gottfried, Schaum, McGraw-Hill

Course Code	:	COPC203
Course Name	:	Scripting Language using Python
Credits	:	2

Detailed Syllabus:

Lecture Detail
UNIT 1: Introduction, Variables and Data Types History, Features, Setting up path, Installation and Working with Perl/Python, Basic Syntax Understanding Perl/Python variables, Numeric data types, Using string data type and string operations, Basic Operators, Understanding coding blocks, Defining list and list slicing, Other Data Types (Tuples, List, Dictionary -Python, Arrays, Associative Arrays/Hashes - Perl)
UNIT 2: Control Structures Conditional blocks using if, else and elif, For loops and iterations, while loops, Loop manipulation using continue, break and else (and pass in Python), Programming using conditional and loops block
UNIT 3: Functions, Modules and Packages Organizing Perl codes using functions, Organizing Perl projects into modules, Importing own module as well as external modules, Understanding Packages
UNIT 4: File I/O, Text Processing, Regular Expressions Understanding read functions, Understanding write functions, Programming using file operations, Powerful pattern matching and searching, Power of pattern searching using regex
UNIT 5: Frameworks Frameworks - Web2Py, Django, Ruby on Rails, Struts (any one of these or any other)

Reference Books:

1. Taming Python by Programming, Jeeva Jose, Khanna Publishing House
2. Starting Out with Python, Tony Gaddis, Pearson
3. Core Python Programming, Wesley J. Chun, Prentice Hall
4. Python Programming: Using Problem Solving Approach, Reema Thareja, Oxford University
5. Introduction to Computation and Programming Using Python. John V. Guttag, MIT Press.
6. Beginning Python using Python 2.6 and Python 3, James Payne, Wrox publishing
7. Practical Programming: An Introduction to Computer Science using Python 3, Paul Gries, The Pragmatic Bookshelf

Course Code	:	COPC203
Course Name	:	Data Structures
Credits	:	2

Detailed Syllabus:

Lecture Detail
UNIT 1: Introduction to Data Structures: Basic Terminology, Classification of Data Structures, Operations on Data Structures
UNIT 2: Linear Data Structures- Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on a Stack, Applications of Stacks-Infix-to-Postfix Transformation, evaluating Postfix Expressions. Queues: Introduction to Queues, Array Representation of Queues, Operations on a Queue, Types of Queues-DeQueue, Circular Queue, Applications of Queues-Round Robin Algorithm.
UNIT 3: Linked Lists: Singly Linked List, Representation in Memory, Operations on a Single Linked List, Circular Linked Lists, Doubly Linked Lists, Linked List Representation and Operations of Stack, Linked List Representation and Operations of Queue.
UNIT 4: Non Linear Data Structures - Trees: Basic Terminologies, Definition and Concepts of Binary Trees, Representations of a Binary Tree using Arrays and Linked Lists, Operations on a Binary Tree-Insertion, Deletion, Traversals, Types of Binary Trees.
UNIT 5: GRAPHS: Graph Terminologies, Representation of Graphs- Set, Linked, Matrix, Graph Traversals

Reference Books:

1. Data Structures, R.S. Salaria, Khanna Book Publishing, New Delhi
2. Data Structures Using C, Reema Thareja, Oxford University Press India.
3. Classic Data Structures, Samanta Debasis, Prentice Hall of India.
4. Fundamentals of Data Structure in C, Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan, University Press, India.
5. Data Structures: A Pseudo code approach with C, Richard F. Gilberg, Behrouz A. Forouzan, CENGAGE Learning, India.
6. Data Structures and Algorithms: Concepts, Techniques and Applications, G. A. V. Pai, McGrawHill Education, India

Course Code	:	COPC207
Course Name	:	Computer System Organisation
Credits	:	4

Detailed Syllabus:

Lecture Detail
UNIT 1: Structure of Computers: Computer Functional units, Von-Neumann architecture, Bus structures, Basic Operational Concepts, Data representation (Fixed and Floating point), Error detecting codes. Register Transfer and Micro Operations: Register transfer, Bus and memory transfers, Arithmetic micro-operations, Logic micro-operations, Shift micro-operations, and Arithmetic logic shift unit.
UNIT 2: Micro Programmed Control: Control memory, Address sequencing, and design of control unit. Computer Arithmetic: Addition and Subtraction, Multiplication and Division algorithms, Floating-point arithmetic operation, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Vector Processing, Array Processors.
UNIT 3: Introduction to Microprocessor Architecture: Instruction Set Architecture design principles from programmer's perspective. One example microprocessor (Intel, ARM, etc).
UNIT 4: Assembly Language Programming: Simple programs, Assembly language programs involving logical, branch and call instructions, sorting, evaluation of arithmetic expressions, string manipulation, assembler directives, procedures and macros.
UNIT 5: Memory and Digital Interfacing: addressing and address decoding, interfacing RAM, ROM, EPROM, programmable peripheral interface, various modes of operation and interfacing to processor, interfacing keyboard, displays, etc.

Reference Books:

1. Computer System Architecture, M. Moris Mano, Pearson/PHI, India.
2. Microprocessors Interface, Douglas V.Hall, Tata McGraw-Hill.
3. Computer Organization, Carl Hamacher, Zvonks Vranesic, SafeaZaky, McGraw-Hill
4. Advanced Microprocessors and Peripherals- Architecture, Programming and interfacing, A.K.Ray, K.M.Bhurchandi, Tata McGraw-Hill, New Delhi, India.
5. Computer Organization and Design: A Hardwar/Software Interface (MIPS Edition) by Patterson and Hennessy

Course Code	:	COPC209
Course Name	:	Algorithms
Credits	:	4

Detailed Syllabus:

Lecture Detail
UNIT 1: Fundamentals Programming Models. Data Abstraction. Sets, Multisets, Stacks, Queues. Asymptotic and worst-case analysis of algorithms.
UNIT 2: Sorting The sorting problem. Bubble sort, Selection sort, Insertion sort, Mergesort, Quicksort.
UNIT 3: Searching Symbol Tables, Binary Search Trees, Balanced Search Trees. Hash Tables.
UNIT 4: Graphs Definition of a directed and undirected graph. Paths, Cycles, spanning trees. Directed Acyclic Graphs. Topological Sorting. Minimum Spanning Tree algorithms. Shortest Path algorithms: Dijkstra's algorithm. Flow-based algorithms.
UNIT 5: Strings String Sort. Tries. Substring Search. Regular Expressions. Elementary Data compression.

Reference Books:

1. Algorithms, Sedgewick and Wayne, Pearson
2. Introduction to Algorithms, Cormen, Leiserson, Rivest and Stein. MIT Press
3. Introduction to Theory of Computation, Sipser Michael, Cengage Learning.
4. Design & Analysis of Algorithms, Gajendra Sharma, Khanna Publishing House

Course Code	:	COPC211
Course Name	:	Computer Programming Lab
Credits	:	2

Topics for Practice

1. Familiarization with programming environment (Editor, Compiler, etc.)
2. Programs using, I/O statements and various operators
3. Programs using expression evaluation and precedence
4. Programs using decision making statements and branching statements
5. Programs using loop statements
6. Programs to demonstrate applications of n dimensional arrays
7. Programs to demonstrate use of string manipulation functions
- 8 Programs to demonstrate parameter passing mechanism
8. Programs to demonstrate recursion
9. Programs to demonstrate use of pointers
10. Programs to demonstrate command line arguments
11. Programs to demonstrate dynamic memory allocation
- 12.** Programs to demonstrate file operations

Reference Books:

1. Let Us C, Yashavant Kanetkar
2. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House
3. C Programming Absolute Beginner's Guide, Dean Miller and Greg Perry
4. The C Programming Language, Kernighan and Ritchie, Prentice Hall of India
5. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill
6. C Programming & Data Structures, B. A. Fouruzan and R. F. Gilberg, CENGAGE Learning

Course Code	:	COPC213
Course Name	:	Scripting Languages Lab
Credits	:	2

Topics for Practice

1. Practice basic coding syntax
2. Write and execute scripts based on data types
3. Write and execute Python scripts with conditionals and loops
4. Write and execute Scripts based on Functions and Modules
5. File Processing scripts
6. Write and execute Regular Expressions
7. Write and execute SQL Queries
8. Write and execute scripts using DBI
9. Develop a simple web application

Reference Books:

1. Taming Python by Programming, Jeeva Jose, Khanna Publishing House
2. Starting Out with Python, Tony Gaddis, Pearson
3. Core Python Programming, Wesley J. Chun, Prentice Hall
4. Python Programming: Using Problem Solving Approach, Reema Thareja, Oxford University Press
5. Introduction to Computation and Programming Using Python. John V. Guttag, MIT Press.
6. Beginning Python using Python 2.6 and Python 3, James Payne, Wrox publishing
7. Practical Programming: An Introduction to Computer Science using Python 3, Paul Gries, The Pragmatic Bookshelf

Topics for Practice

Course Code	:	COPC215
Course Name	:	Data Structures Lab
Credits	:	1

1. Write a program using recursive and non-recursive functions to perform search operation in a given list of integers using linear search technique.
2. Search operation in a given list of integers using binary search technique.
3. Write a program to implement insertion sorting for a given random data.
4. Write a program to implement bubble sorting for a given random data.
5. Write a program to implement quick sorting for a given random data.
6. Write a program to implement selection sorting for a given random data.
7. Write a program to implement heap sorting for a given random data.
8. Write a program to implement hashing tables.
9. Write a program to implement a single linked list.
10. Write a program to implement a double linked list.
11. Write a program to implement a circular linked list.
12. Write a program to Implement Stack operations using array and linked list.
13. Write a program to Implement Queue operations using array and linked list.
14. Write a program to implement Breadth First Search (BFS)
15. Write a program to implement Depth First Search (DFS)
16. Write a program to implement a binary tree of integers.
17. Write a program to find the minimum depth of a binary tree.

Reference Books:

1. Data Structures, R.S. Salaria, Khanna Book Publishing
2. Data Structures Using C, Reema Thareja, Oxford University Press India.
3. Classic Data Structures, Samanta Debasis, Prentice Hall of India.
4. Fundamentals of Data Structure in C, Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan, University Press, India.
5. Data Structures: A Pseudo code approach with C, Richard F. Gilberg, Behrouz A. Forouzan, CENGAGE Learning, India.
6. Data Structures and Algorithms: Concepts, Techniques and Applications, G. A. V. Pai, McGrawHill Education, India

SEMESTER - IV

Course Code	:	COPC202
Course Name	:	Operating Systems
Credits	:	2

Detailed Syllabus:

Lecture Detail
UNIT 1: Overview of Operating System, basic concepts, UNIX/LINUX Architecture, Kernel, services and systems calls, system programs.
UNIT 2: Process Management: Process concepts, operations on processes, IPC, Process Scheduling, Multithreaded programming Memory management: Memory allocation, Swapping, Paging, Segmentation, Virtual Memory, various faults.
UNIT 3: File management: Concept of a file, access methods, directory structure, file system mounting, file sharing and protection, file system structure and implementation, directory implementation, freespace management, efficiency and performance. Different types of file systems
UNIT 4: I/O System: Mass storage structure - overview, disk structure, disk attachment, disk scheduling algorithms, swap space management, RAID types.
UNIT 5: OS Security: Authentication, Access Control, Access Rights, System Logs

Reference Books:

1. Operating System Concepts, Silberschatz and Galvin, Wiley India Limited
2. UNIX Concepts and Applications, Sumitabha Das, McGraw-Hill Education
3. Operating Systems, Internals and Design Principles, Stallings, Pearson Education, India
4. Operating System Concepts, Ekta Walia, Khanna Publishing House
5. Modern Operating Systems, Andrew S. Tanenbaum, Prentice Hall of India
6. Operating systems, Deitel & Deitel, Pearson Education, India

Course Code	:	COPC204
Course Name	:	Introduction to DBMS
Credits	:	2

Detailed Syllabus:

Lecture Detail
UNIT 1: Introduction; Database System Concepts and Architecture
UNIT 2 : Data Modeling using the Entity-Relationship Model; The Enhanced Entity-Relationship (EER) model
UNIT 3: The Relational Data Model and Relational Database Constraints; ER/EER to Relational Model mapping; Relational Algebra and Relational Calculus
UNIT 4: SQL-99: Schema definition, Constraints, Queries, and Views; Security; Introduction to SQL programming Techniques
UNIT 5: Functional dependencies and normalization for relational databases; Relational database design algorithms and further dependencies.

Reference Books:

1. Fundamentals of Database Systems, Elmasri & Navathe, Pearson Education
2. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata McGraw-Hill.
3. Database System Concepts, Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGrawHill, New Delhi, India.
4. Introduction to Database Systems, C.J.Date, Pearson Education
5. Introduction to SQL, Rick F.Vander Lans, Pearson Education

Course Code	:	COPC206
Course Name	:	Computer Networks
Credits	:	2

Detailed Syllabus:

Lecture Detail
UNIT 1: Introduction to computer networks; Network Models- OSI Reference Model, TCP/IP Model;
UNIT 2: Transmission Media – principles, issues and examples; Wired Media – Coaxial, UTP, STP, Fiber Optic Cables; Wireless Media – HF, VHF, UHF, Microwave, Ku Band; Network topologies; Data Link Layer – design issues, example protocols (Ethernet, WLAN, Bluetooth); Switching Techniques;
UNIT 3: Network Layer - design issues, example protocols (IPv4); Routing - principles/issues, algorithms (Distance-vector, Link-state) and protocols (RIP, OSPF);
UNIT 4: Transport Layer - design issues, example protocols (TCP); Application Layer Protocols (SMTP, DNS).
UNIT 5: Functioning of Network Devices – NIC, Hub, Switch, Router, WiFi Devices; Network Management System and example protocol (SNMP)

Reference Books:

1. Computer Networks, 4th Edition (or later), Andrew S. Tanenbaum, PHI
2. TCP/IP Illustrated, Volume-1, W. Richard Stevens, Addison Wesley
3. Data and Computer Communications, William Stallings, PHI
4. An Engineering Approach to Computer Networking, S. Keshav, Addison Wesley/Pearson
5. An Integrated Approach to Computer Networks, Bhavneet Sidhu, Khanna Publishing House

Course Code	:	COPC208
Course Name	:	Software Engineering
Credits	:	3

Detailed Syllabus:

Lecture Detail
UNIT 1: Introduction to Software Engineering, Lifecycle, Process Models - Traditional v/s Agile processes.
UNIT 2: Development Activities - Requirements Gathering and Analysis, Design Concepts, Software architecture and Architectural styles, Basic UI design, Effective Coding and Debugging techniques.
UNIT 3: Software Testing Basics, Unit, Integration, System and Acceptance Testing, Introduction to various testing techniques (e.g. Stress testing), Writing and executing test cases, Quality Assurance.
UNIT 4: Project Management - Project management concepts, Configuration and Release Management, Version Control and its tools (Git), Release Planning, Change Management, Software Maintenance, Project Metrics.

Reference Books:

1. Software Engineering – A Practitioner’s Approach, 7th Edition, Roger Pressman.
2. Software engineering, Ian Sommerville, Pearson Education
3. An Integrated Approach to Software Engineering, Pankaj Jalote, Springer Verlag
4. Software Engineering, Nasib Singh Gill, Khanna Book Publishing Co. India.
5. Software Engineering, K. K. Agarval, Yogesh Singh, New Age International Publishers

Course Code	:	COPC210
Course Name	:	Web Technologies
Credits	:	2

Detailed Syllabus:

Lecture Detail
<p>UNIT 1: Introduction to www Protocols and programs, secure connections, application and development tools, the web browser, What is server, setting up UNIX and LINUX web servers, Logging users, dynamic IP Web Design: Web site design principles, planning the site and navigation</p>
<p>UNIT 2: Web Systems Architecture Architecture of Web based systems- client/server (2-tier) architecture, 3-Tier architecture, Building blocks of fast and scalable data access Concepts - Caches-Proxies- Indexes-Load Balancers- Queues, Web Application architecture (WAA)</p>
<p>UNIT 3: Javascript Client side scripting, What is Javascript, simple Javascript, variables, functions, conditions, loops and repetition</p>
<p>UNIT 4: Advance scripting Javascript and objects, Javascript own objects, DOM and web browser environments, forms and validations DHTML: Combining HTML, CSS and Javascript, events and buttons, controlling your browser, Ajax: Introduction advantages & disadvantages, ajax based web application, alternatives of ajax XML, XSL and XSLT: Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, XML with application, XSL and XSLT. Introduction to Web Services</p>
<p>UNIT 5: PHP Server side scripting, Arrays, function and forms, advance PHP Databases :Basic command with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP myadmin and database bugs.</p>

Reference Books:

1. "Web Technologies--A Computer Science Perspective", Jeffrey C. Jackson,
2. "Internet & World Wide Web How To Program", Deitel, Deitel, Goldberg, Pearson Education
3. "Web programming- Building Internet Application", Chris Bales
4. Web Applications: Concepts and Real World Design, Knuckles

Course Code	:	COPC212
Course Name	:	Operating Systems Lab
Credits	:	1

Topics for Practice

1. Revision practice of various commands like man, cp, mv, ln, rm, unlink, mkdir, rmdir, etc and many more that were learnt in IT Workshop course and later.
2. Implement two-way process communication using pipes
3. Implement message queue form of IPC
4. Implement shared memory and semaphore form of IPC
5. Simulate the CPU scheduling algorithms - Round Robin, SJF, FCFS, priority
6. Simulate Bankers algorithm for Deadlock Avoidance and Prevention
7. Simulate all FIFO Page Replacement Algorithm using C program
8. Simulate all LRU Page Replacement Algorithms using C program
9. Simulate Paging Technique of Memory Management
10. Practice various commands/utilitiessuch as catnl, uniq, tee, pg, comm, cmp, diff, tr, tar, cpio, mount, umount, find, umask, ulimit, sort, grep, egrep,fgrep cut, paste, join, du, df , ps, who, etc and many more.

Reference Books:

1. Operating System Concepts, Silberschatz, Abraham and Galvin, Peter, Wiley India Limited
2. UNIX Concepts and Applications, Sumitabha Das, McGraw-Hill Education
3. Operating System Concepts, Ekta Walia, Khanna Publishing House

Course Code	:	COPC218
Course Name	:	Web Technologies Lab
Credits	:	1

Topics for Practice

1. Coding Server Client Programs
2. Developing Web Application using HTML, JavaScript
3. Developing Advanced Web Application Programs using CSS
4. Practicing PHP: Basics
5. Practicing PHP: Web Application Development
6. Practicing PHP: MySQL - tiered Applications
7. Developing a fully functional Web Service Application using all the technologies learned in this course.

Reference Books:

1. "Web Technologies--A Computer Science Perspective", Jeffrey C.Jackson,
2. "Internet & World Wide Web How To Program", Deitel, Deitel, Goldberg, Pearson Education
3. "Web programming- Building Internet Application", Chris Bales
4. Web Applications: Concepts and Real World Design, Knuckles

Topics for Practice

1. Case Study-1: Employee database – ‘Create’ employee table, ‘Select’ and display an

Course Code	:	COPC214
Course Name	:	Operating Systems Lab
Credits	:	1

employee matching a given condition, ‘Delete’ duplicate records, delete rows using triggers, insert and update records, find net salary, etc.

2. Case Study-2: Visitor Management database
3. Case Study-3: Students Academic database
4. Case Study-4: Inventory Management System database
5. Case study-5: Bank Operations database
6. Case Study-6: Bus Operator (Roadways) – Do related activities such as prepare E-R Model, Relational Model, do Normalisation, Create Tables, Insert data, Delete Data, Query database, create stored procedures, etc.

Reference Books:

1. Elmasri & Navathe, Fundamentals of Database Systems, Pearson Education
2. Raghurama Krishnan, Johannes Gehrke, Database Management Systems, Tata McGraw-Hill, New Delhi, India.
3. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, McGrawHill, New Delhi, India.
4. Introduction to Database Systems, C.J.Date, Pearson Education
5. Introduction to SQL, Rick F.Vander Lans, Pearson Education

Course Code	:	COPC214
Course Name	:	Introduction to DBMS Lab
Credits	:	1

Detailed Syllabus:

Lecture Detail
Case Study-1: Employee database – ‘Create’ employee table, ‘Select’ and display an employee matching a given condition, ‘Delete’ duplicate records, delete rows using triggers, insert and update records, find net salary, etc.
Case Study-2: Visitor Management database.
Case Study-3: Students Academic database.
Case Study-4: Inventory Management System database
Case Study-5: Bank Operations database
Case Study-6: Bus Operator (Roadways) – Do related activities such as prepare E-R Model, Relational Model, do Normalisation, Create Tables, Insert data, Delete Data, Query database, create stored procedures, etc.

Reference Books:

1. Elmasri & Navathe, Fundamentals of Database Systems, Pearson Education
2. Raghurama Krishnan, Johannes Gehrke, Database Management Systems, Tata McGraw-Hill, New Delhi, India.
3. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, McGrawHill, New Delhi, India.
4. Introduction to Database Systems, C.J.Date, Pearson Education
5. Introduction to SQL, Rick F.Vander Lans, Pearson Education

Course Code	:	COPC216
Course Name	:	Computer Networks Lab
Credits	:	1

Topics for Practice

1. Showing various types of networking cables and connectors, identifying them clearly
2. Looking at specifications of cables and connectors of various companies on Internet, find out differences.
3. Making patch cords using different types of cables and connectors - crimping, splicing, etc
4. Demonstration of different type of cable testers, using them for testing patch cords prepared by the students in Lab and standard cables prepared by professionals
5. Configuring computing devices (PC, Laptop, Mobile, etc) for network, exploring different options and their impact – IP address, gateway, DNS, security options, etc
6. Showing various networking devices – NICs, Hub, Switch, Router, WiFi access point, etc.
7. Looking at specifications of various networking devices various companies on Internet, find out differences.
8. Network simulation tool (e.g. Cisco Packet Tracer)
9. Setting up a small wired LAN in the Lab 10 Setting up a small wireless LAN in the Lab

Reference Books:

1. Cisco press books on CCNA
2. User manual of networking devices available in the lab
3. Wiki pages on networking devices

SEMESTER – V

Course Code	:	COPC
Course Name	:	Introduction to e-Governance
Credits	:	3

Detailed Syllabus:

Lecture Detail
UNIT 1: Exposure to emerging trends in ICT for development; Understanding of design and implementation of e-Government projects, e-governance lifecycle.
UNIT 2: Need for Government Process Re-engineering (GPR); National e-Governance Plan (NeGP) for India; SMART Governments & Thumb Rules.
UNIT 3: Architecture and models of e-Governance, including Public Private Partnership (PPP); Need for Innovation and Change Management in eGovernance; Critical Success Factors; Major issue including corruption, resistance for change, e-Security and Cyber laws.
UNIT 4: Focusing on Indian initiatives and their impact on citizens; Sharing of case studies to highlight best practices in managing e-Governance projects in Indian context. Visits to local e-governance sites (CSC, eSeva, Post Office, Passport Seva Kendra, etc) as part of Tutorials.
UNIT 5: Mini Projects by students in groups – primarily evaluation of various e-governance projects.

Reference Books:

1. Managing Transformation –Objectives to Outcomes. J Satyanarayana, Prentice Hall India
2. The State, IT and Development. Kenneth Kenniston, RK Bagga and Rohit Raj Mathur, Sage Publications India Pvt Ltd.
3. e-Government -The Science of the Possible. J Satyanarayana, Prentice Hall, India
4. <http://www.csi-sigegov.org/publications.php>

<https://negd.gov.in> 6. <https://www.nisg.org/case-studies-on-e-governance-in-india>

Course Code	:	COPC303
Course Name	:	Internet of Things
Credits	:	3

Detailed Syllabus:

Lecture Detail
UNIT 1: Introduction to IoT; Sensing; Actuation
UNIT 2 : Basics of IoT Networking, Communication Protocols, Sensor networks
UNIT 3: Introduction to Arduino programming, Integration of Sensors/Actuators to Arduino
UNIT 4: Implementation of IoT with Raspberry Pi; Data Handling Analytics
UNIT 5: Case Studies: Agriculture, Healthcare, Activity Monitoring

Reference Books:

1. https://nptel.ac.in/noc/individual_course.php?id=noc17-cs22
2. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
3. Internet of Things by Dr. Jeeva Jose, Khanna Publishing House (Edition 2017)
4. "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti (Universities Press)
5. Internet of Things: Architecture and Design Principles, Raj Kamal, McGraw Hill 6. Research papers

SEMESTER – VI

Course Code	:	HS 302
Course Name	:	Entrepreneurship and Start-ups
Credits	:	4

Detailed Syllabus:

Lecture Detail
UNIT 1: Introduction to Entrepreneurship and Start – Ups <ul style="list-style-type: none">• Definitions, Traits of an entrepreneur, Intrapreneurship, Motivation• Types of Business Structures, Similarities/differences between entrepreneurs and managers.
UNIT 2: Business Ideas and their implementation <ul style="list-style-type: none">• Discovering ideas and visualizing the business• Activity map• Business Plan
UNIT 3: Idea to Start-up <ul style="list-style-type: none">• Market Analysis – Identifying the target market,• Competition evaluation and Strategy Development,• Marketing and accounting,• Risk analysis
UNIT 4: Management <ul style="list-style-type: none">• Company’s Organization Structure,• Recruitment and management of talent.• Financial organization and management
UNIT 5: Financing and Protection of Ideas <ul style="list-style-type: none">• Financing methods available for start-ups in India.• Communication of Ideas to potential investors – Investor Pitch.• Patenting and Licenses.

Reference Books:

1. The Startup Owner’s Manual: The Step-by-Step Guide for Building a Great Company, Steve Blank and Bob Dorf, K & S Ranch ISBN – 978-0984999392
2. The Lean Startup: How Today’s Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, Eric Ries Penguin, UK ISBN – 978-0670921607.
3. Demand: Creating What People Love Before They Know They Want It, Adrian J Slywotzky with Karl Weber, Headline Book Publishing ISBN – 978-0755388974.
4. The Innovator’s Dilemma: The Revolutionary Book That Will Change the Way You Do Business, Clayton M. Christensen, Harvard business ISBN: 978-142219602.

Program Elective Course

Detailed Syllabus:

Course Code	:	COPE301/302
Course Name	:	Mobile Computing
Credits	:	4 (L: 3, T: 0, P: 2)
Lecture Detail		
UNIT 1: A brief history of Mobile, Types of mobile phone generations, The Mobile Ecosystem, Types of Mobile Applications, Mobile Information Architecture Android Versions, Features of Android, Android Architecture, Installing Android SDK Tools, Configuring Android in Eclipse IDE, Android Development Tools (ADT), Creating Android Virtual Devices (AVD)		
UNIT 2: Creating first android application, Anatomy of android application, Deploying Android app on USB connected Android device, Android application components, Activity life cycle, understanding activities, Exploring Intent objects, Intent Types, linking activities using intents		
UNIT 3: Fragments life cycle, Interaction between fragments, Understanding the components of a screen (Layouts), Adapting to display orientation, Action Bar, Views (UI Widgets)-Button, Toast, ToggleButton, CheckBox, RadioButton, Spinner, WebView, EditText, DatePicker, TimePicker, ListView, ProgressBar, Analog and Digital clock, Handling UI events, List fragment, Dialog fragment		
UNIT 4: Menu-Option, Context, Popup, Images-ImageView, ImageSwitcher, AlertDialog, Alarm manager, SMS, E-mail, Media Player, using camera, recording video, Handling Telephony Manager		
UNIT 5: Storing the data persistently-Data Storage Options: preferences, Internal Storage, External Storage, Content Provider, The SQLite database, Connecting with SQLite database and operations-Insert, Delete, Update, Fetch, Publishing android applications, Deploying APK files		

Suggested Lab Work: This is a skill course. Topics/tools taught in the class should be practiced in the Lab same week and practiced regularly during the semester till student becomes confident about it. Students should explore features of various tools/technologies introduced during the course and become comfortable with their use. Teacher should give weekly practice tasks as assignments. Learnings from this course should be used in the project/software built.

Reference Books:

1. Wei-Meng Lee, Beginning Android 4 Application Development, Wiley Publishing, Inc.
2. Pradeep Kothari, "Android Application Development Black Book", DreamTech Press
3. James C. Sheusi, "Android Application Development for Java Programmers", Cengage Learning
4. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd

5. Sayed Y Hashimi and Satya Komatineni(2009), "Pro Android", Wiley India Pvt Ltd
6. Reto Meier, Professional Android 4 Application Development, Wiley India Pvt Ltd

Course Code	:	COPE303/304
Course Name	:	Multimedia Technologies
Credits	:	4 (L: 3, T: 0, P: 2)

Detailed Syllabus:

Lecture Detail
UNIT 1: Introduction to Multimedia Foundation and Concepts: Multimedia Hardware, Multimedia Software, Multimedia operating systems , Multimedia communication system
UNIT 2: Basic Compression Techniques Video and Audio Data Compression Techniques – Lossy and Lossless. Example algorithms/standards: Huffman, RLE, JPEG, MPEG, MP3, MP4, LZMA, FLAC, ALAC, ITU G.722, H.261, H.265
UNIT 3: Content Development and Distribution Desktop publishing (Coral Draw, Photoshop, Page maker) Multimedia Animation & Special effects (2D/3D animation, Flash)
UNIT 4: Introduction to Digital Imaging Basics of Graphic Design and use of Digital technology, Definition of Digital images, Digital imaging in multimedia
UNIT 5: Introduction to Multimedia Programming and Applications

Suggested Lab Work: This is a skill course. Topics/tools taught in the class should be practiced in the Lab same week and practiced regularly during the semester till student becomes confident about it. Students should explore features of various tools introduced during the course and become comfortable with their use. Teacher should give weekly tasks as assignment.

Reference Books:

1. An Introduction to Multimedia Authoring, A. Eliens.
2. Fundamentals of Multimedia, Prentice Hall/Pearson, Ze-Nian Li & Mark S. Drew.
3. Multimedia and Animation, V.K. Jain, Khanna Publishing House, Edition 2018
4. Fundamentals of Multimedia, Ramesh Bangia, Khanna Book Publishing Co., N. Delhi (2007)

Course Code	:	COPE305
Course Name	:	Fundamentals of AI
Credits	:	4 (L: 3, T: 1, P: 0)

Detailed Syllabus:

Lecture Detail
UNIT 1: Introduction Overview and Historical Perspective, Turing test, Physical Symbol Systems and the scope of Symbolic AI, Agents.
UNIT 2: Search Heuristic Search: Best First Search, Hill Climbing, Beam Search, Tabu Search Randomized Search: Simulated Annealing, Genetic Algorithms, Ant Colony Optimization.
UNIT 3: Finding Optimal Paths: Branch and Bound, A*, IDA*, Divide and Conquer approaches, Beam Stack Search. Problem Decomposition: Goal Trees, AO*, Rule Based Systems, Rete Net. Game Playing: Minimax Algorithm, AlphaBeta Algorithm, SSS*.
UNIT 4: Planning and Constraint Satisfaction: Domains, Forward and Backward Search, Goal Stack Planning, Plan Space Planning, Graphplan, Constraint Propagation.
UNIT 5: Logic and Inferences: Propositional Logic, First Order Logic, Soundness and Completeness, Forward and Backward chaining

Reference Books:

1. Deepak Khemani. A First Course in Artificial Intelligence, McGraw Hill Education (India)
2. <https://nptel.ac.in/courses/106106126/>
3. Stefan Edelkamp and Stefan Schroedl. Heuristic Search, Morgan Kaufmann.
4. Pamela McCorduck, Machines Who Think: A Personal Inquiry into the History and Prospects of Artificial Intelligence, A K Peters/CRC Press
5. Elaine Rich and Kevin Knight. Artificial Intelligence, Tata McGraw Hill.
6. Stuart Russell and Peter Norvig. Artificial Intelligence: A Modern Approach, Prentice Hall
7. M.C. Trivedi, A classical approach to Artificial Intelligence, Khanna Publishing House

Course Code	:	COPE307/308
Course Name	:	Advance Computer Networks
Credits	:	4 (L: 3, T: 0, P: 2)

Detailed Syllabus:

Lecture Detail
UNIT 1: Review of Networking Basics; Advance Topics in IPv4 – Subnetting, Multicasting, Multicast Routing Protocols (IGMP, PIM, DVMRP); Advance Topics in TCP – flow management, congestion avoidance, protocol spoofing; IPv6
UNIT 2: Telecom Networks, Switching Techniques; Introduction to Frame Relay, ATM, MPLS; VSAT Communication – Star and Mesh architectures, bandwidth reservation; Wireless Networks – WiFi, WiMax, Cellular Phone Technologies – GSM, CDMA, 3G, 4G
UNIT 3: Network Redundancy, Load Balancers, Caching, Storage Networks; QoS; Network Monitoring – SNMP, RMON;
UNIT 4: Introduction to Network Security – VLAN, VPN, Firewall, IPS, Proxy Servers
UNIT 5: Network Simulation, Network design case studies and exercises, IP Addressing schema, Protocol Analysers (Wireshark, etc)

Reference Books:

1. RFCs and Standards Documents (www.ietf.org and other standard body websites)
2. Communication Networking – An Analytical Approach, Anurag-Manjunath-Joy
3. TCP/IP Illustrated (Vol.1,2), Stevens.
4. Data Networks, Bertsekas-Gallager 5. An Engineering Approach to Computer Networking, S. Keshav

Course Code	:	COPE309/310
Course Name	:	Information Security
Credits	:	4 (L: 3, T: 0, P: 2)

Detailed Syllabus:

Lecture Detail
UNIT 1: Introduction to Information Security, Various aspects of information security (PAIN), Security Features of Operating Systems – Authentication, Logs, Audit Features, File System Protection, User Privileges, RAID options, Anti-Virus Software, etc
UNIT 2: Understanding security weaknesses in popular networking protocols – IP, TCP, UDP, RIP, OSPF, HTTP, SMTP, etc.; security weaknesses in common networking devices – Hub, switch, router, WiFi; Security solutions to mitigate security risk of networking protocols (IPSec, HTTPS, etc) and devices (VLAN, VPN, Ingress Filtering, etc)
UNIT 3: Basics of Cryptography, PKI, Security considerations while developing softwares
UNIT 4: Network Security Products – Firewall, IDS/IPS, VPN Concentrator, Content Screening Gateways, etc.
UNIT 5: Introduction to Security Standards – ISO 27001, Indian IT Act, IPR Laws; Security Audit procedures; Developing Security Policies; Disaster Recovery, Business Continuity Planning

Reference Books:

1. Information Security and Cyber Laws, Sarika Gupta, Khanna Publishing House.
2. RFCs of protocols listed in content (<https://www.ietf.org>)
3. Various Acts, Laws and Standards (IT Act, ISO27001 Standard, IPR and Copyright Laws, etc.).
4. Security Guideline documents of Operating Systems (OS Manual, Man Pages, etc).
5. <https://www.cert-in.org.in/> 6. <https://www.sans.org/>

Course Code	:	COPE311/312
Course Name	:	Network Forensics
Credits	:	4 (L: 3, T: 0, P: 2)

Detailed Syllabus:

Lecture Detail
UNIT 1: Review of Networking concepts and Protocols, Introduction to Network Forensics, various aspects of Network Forensics
UNIT 2: Introduction to Network Forensic Tools and techniques: Wireshark, TCP Dump, Syslog, NMS, Promiscuous Mode, Network Port Mirroring, snooping, scanning tools, etc.
UNIT 3: Understanding and Examining Data Link Layer, Physical Layer, Ethernet Switch Logs, MAC Table, ARP Table, etc. Understanding and Examining Network Layer, Router Logs, WiFi Device logs, Firewall logs,
UNIT 4: Understanding audit features of OS and applications; Enabling and Examining Server logs, User activity logs, Browser history analysis, Proxy server logs, Antivirus logs, Email logs
UNIT 5: Limitations and challenges of network forensics due to encryption, spoofing, mobility, storage limitations, privacy laws, etc.

Reference Books:

1. Manuals of OS, application software, network devices
2. RFCs of various networking protocols (<https://www.ietf.org/>)
3. <https://www.sans.org/>
4. <https://www.cert-in.org.in/>
5. Handbook of Digital Forensics and Investigation, Eoghan Casey, Elsevier Academic Press
6. Cyber Forensics, Albert Marcella and Doug Menendez, CRC Press
7. Computer Forensics (5 volume Set) mapping to CHFI (Certified Hacking Forensics Investigator), by EC-Council

Course Code	:	COPE313/314
Course Name	:	Data Sciences: Data Warehousing and Data Mining
Credits	:	4 (L: 3, T: 1, P: 0)

Detailed Syllabus:

Lecture Detail
UNIT 1: Introduction Motivation, Importance, Definitions, Kind of Data, Data Mining Functionalities, Kinds of Patterns, Classification of Data Mining Systems, Data Mining Task Primitives, Integration of A Data Mining System with A Database or Data Warehouse System, Major Issues in Data Mining, Types of Data Sets and Attribute Values, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity. PREPROCESSING: Data Quality, Major Tasks in Data Preprocessing, Data Reduction, Data Transformation and Data Discretization, Data Cleaning and Data Integration.
UNIT 2: Data Warehousing and on-line Analytical Processing Data Warehouse basic concepts, Data Warehouse Modeling - Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute-Oriented Induction, Data Cube Computation.
UNIT 3: Patterns, Associations and Correlations Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods, Pattern Evaluation Methods, Applications of frequent pattern and associations. Frequent Patterns and Association Mining: A Road Map, Mining Various Kinds of Association Rules, Constraint-Based Frequent Pattern Mining, Extended Applications of Frequent Patterns.
UNIT 4: Classification Basic Concepts, Decision Tree Induction, Bayesian Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy: Ensemble Methods, Handling Different Kinds of Cases in Classification, Classification by Neural Networks, Support Vector Machines, Pattern-Based Classification, Lazy Learners (or Learning from Your Neighbors).
UNIT 5: Cluster Analysis Basic Concepts of Cluster Analysis, Clustering Structures, Major Clustering Approaches, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Model-Based Clustering, why outlier analysis, Identifying and handling of outliers, Outlier Detection Techniques. WEB MINING: Basic concepts of web mining, different types of web mining, PAGE RANK Algorithm, HITS Algorithm

Reference Books:

1. Jiawei Han, Micheline Kamber, Jian Pei, Data Mining: Concepts and Techniques, Elsevier
2. Margaret H Dunham, Data Mining Introductory and Advanced Topics, Pearson Education
3. Amitesh Sinha, Data Warehousing, Thomson Learning, India.
4. Xingdong Wu, Vipin Kumar, the Top Ten Algorithms in Data Mining, CRC Press, UK.

Course Code	:	COPE315/316
Course Name	:	FOSS (Free and Open Source Software)
Credits	:	4 (L: 3, T: 0, P: 2)

Detailed Syllabus:

Lecture Detail
UNIT 1: FOSS PHILOSOPHY Understanding the FOSS Community and FOSS Philosophy, Benefits of Community based Software Development, Guidelines for working with FOSS community, Requirements for being open, free software, open-source software, FOSS Licensing Models, FOSS examples
UNIT 2: LINUX Linux Installation and Hardware Configuration, Boot Process, Dual-Booting Linux and other Operating Systems, Kernel Options during Boot, X Windows System Configuration, System Administration (Server Administration, Backup and Restore Procedures, Strategies for keeping a Secure Server)
UNIT 3: Programming Tools and Techniques Libreoffice Tools; Samba: Cross platform; Introduction about LAMP; Brief Introduction to Programming using languages like Java /Python / Perl; Database Systems Mysql, PostgreSQL or equivalent; Open-Source UML Tools; Introduction to Mobile Programming; Version Control Systems like SVN, Git or equivalent; Project Management Tools; Bug Tracking Systems; Package Management Systems
UNIT 4: FOSS CASE STUDIES Some example case studies of FOSS implementation

Suggested Lab Work:

This is a skill course. Topics/tools taught in the class should be practiced in the Lab same week and practiced regularly during the semester till student becomes confident about it. Students should explore features of various FOSS tools/applications on a Linux system. Teacher should give weekly tasks as assignment. Learnings from this course should be used in the major project.

Reference Books:

1. Linux in a Nutshell, by Ellen Siever
2. Philosophy of GNU URL: <http://www.gnu.org/philosophy/>.
3. Linux Administration URL: <http://www.tldp.org/LDP/lame/LAME/linux-admin-madeeasy/>.
4. Version control system URL: <http://git-scm.com/>.
5. Samba: URL : <http://www.samba.org/>. 13. Libre office: <http://www.libreoffice.org/>.

Course Code	:	COPE317/318
Course Name	:	Software Testing
Credits	:	4 (L: 3, T: 0, P: 2)

Detailed Syllabus:

Lecture Detail
UNIT 1: Basics Introduction to Software Quality basics: Verification and validation, quality perspectives, Testing terminology, Software Testing Life Cycle (STLC), “V” model of Testing, QA process, cost of testing, types of tests,
UNIT 2: Writing Test Cases Writing test cases, Functional Testing, non-functional testing, (Performance testing), UI testing. Preparing test data, Writing Unit test, Integration test and User Acceptance Tests, preparing test scenarios from Software requirements
UNIT 3: Test Execution and Management test execution, Test Oracles, test planning, test strategy including when to stop testing, test-coverage - Traceability matrix, JIRA, Bugzilla and other bug tracking tools. Test data mining, test reporting.
UNIT 4: Test Automation Why automation, when not to automate, writing simple automated test cases, learn and practice any one automated testing framework like Selenium
UNIT 5: Other quality Assurance Quality and Defect management - Code reviews, Quality tools, Change management, version control

Suggested Lab Work:

Writing and executing test cases of different types for a sample system, may be for the minor project done earlier; using Bugzilla to report cases; writing performance test cases for different types of tests (load, stress, benchmarking, etc.); Writing automated test for UI, writing-executing test scripts for a sample system.

Reference Books:

1. Software Engineering – A Practitioner’s Approach, 7th Edition, Roger Pressman.
2. Bugzilla (<https://www.bugzilla.org/>)
3. JIRA (<https://www.atlassian.com/software/jira>)

Open Elective Courses

Course Code	:	OE 101
Course Name	:	ECONOMIC POLICIES IN INDIA
Credits	:	3 (L: 3, T: 0, P: 0)

Detailed Syllabus:

Lecture Detail
UNIT-I: Basic features and problems of Indian Economy: Economic History of India; Nature of Indian Economy, demographic features and Human Development Index, Problems of Poverty, Unemployment, Inflation, income inequality, Black money in India.
UNIT-II: Sectoral composition of Indian Economy: Issues in Agriculture sector in India, land reforms Green Revolution and agriculture policies of India,
UNIT-III: Industrial development, small scale and cottage industries, industrial Policy, Public sector in India, service sector in India.
UNIT-IV: Economic Policies: Economic Planning in India, Planning commission v/s NITI Aayog, Five Year Plans, monetary policy in India, Fiscal Policy in India, Centre state Finance Relations, Finance commission in India. LPG policy in India
UNIT-V: External sector in India: - India's foreign trade value composition and direction, India Balance of payment since 1991, FDI in India, Impact of Globalization on Indian Economy, WTO and India.

Reference Books:

1. Dutt Rudder and K.P.M Sunderam (2017). Indian Economy. S Chand & Co. Ltd. New Delhi.
2. Mishra S.K & V.K Puri (2017). Indian Economy and -Its Development Experience. Himalaya Publishing House.
3. Singh, Ramesh, (2016): Indian Economy, Tata-McGraw Hill Publications, New Delhi.
4. Dhingra, I.C., (2017): March of the Indian Economy, Heed Publications Pvt. Ltd.
5. Karam Singh Gill, (1978): Evolution of the Indian Economy, NCERT, New Delhi
6. Kaushik Basu (2007): The Oxford Companion to Economics of India, Oxford University Press.

Course Code	:	OE 102
Course Name	:	ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
Credits	:	3 (L: 3, T: 0, P: 0)

Detailed Syllabus:

Lecture Detail
UNIT-I: Introduction: History and foundations of AI, Problem solving: Uninformed and informed Search; Constraint Satisfaction Problems and Constrained Optimization problems (complete and incomplete techniques).
UNIT-II: Adversarial Search: Two players games, games with uncertainty; Decision support systems and technologies; Knowledge representation, Reasoning, Expert systems Contents (2/2), Planning (basics).
UNIT-III: Machine learning Basics: Decision trees, Ensemble learning, Reinforcement learning, Evolutionary computation, Neural networks, Problems, data, and tools; Visualization;
UNIT-IV: Linear regression; SSE; gradient descent; closed form; normal equations; features, Over fitting and complexity; training, validation, test data, and introduction to Matlab.
UNIT-V: Classification problems; Decision boundaries; Probability and classification, Bayes optimal decisions, Naive Bayes and Gaussian class-conditional distribution.

Reference Books:

1. Russell, Norvig, Artificial intelligence: A modern approach, 2nd edition. Pearson/Prentice Hall.
2. M.C. Trivedi, A classical approach to Artificial Intelligence, Khanna Publishing House, New Delhi (2018)
3. V.K. Jain, Machine Learning, Khanna Publishing House, New Delhi (2018)
4. Ethem Alpaydin, Introduction to Machine Learning, Second Edition, <http://mitpress.mit.edu/catalog/item/default.asp?ttype=2&tid=12012>.

Course Code	:	OE 103
Course Name	:	SOFT COMPUTING TECHNIQUES
Credits	:	3 (L: 3, T: 0, P: 0)

Detailed Syllabus:

Lecture Detail
UNIT-I: Problem Solving Methods and Tools: Problem Space, Problem solving, State space, Algorithm's performance and complexity, Search Algorithms, Depth first search method, Breadth first search methods their comparison, A*, AO*, Branch and Bound search techniques, p type, Np complete and Np Hard problems.
UNIT-II: Evolutionary Computing Methods: Principles of Evolutionary Processes and genetics, A history of Evolutionary computation and introduction to evolutionary algorithms, Genetic algorithms, Evolutionary strategy, Evolutionary programming, Genetic programming. Genetic Algorithm and Genetic Programming: Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications.
UNIT-III: Swarm Optimization: Introduction to Swarm intelligence, Ant colony optimization (ACO), Particle swarm optimization (PSO), Artificial Bee colony algorithm (ABC), Other variants of swarm intelligence algorithms.
UNIT-IV: Advances in Soft Computing Tools: Fuzzy Logic, Theory and applications, Fuzzy Neural networks, Pattern Recognition, Differential Evolution, Data Mining Concepts, Applications of above algorithms in manufacturing engineering problems. Artificial Neural Networks: Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Back propagation algorithm, factors affecting back propagation training, applications
UNIT-V: Application of Soft Computing to Mechanical Engineering/Production Engineering Problems: Application to Inventory control, Scheduling problems, Production, Distribution, Routing, Transportation, Assignment problems

Reference Books:

1. Tettamanzi Andrea, Tomassini and Marco, Soft Computing Integrating Evolutionary, Neural and Fuzzy Systems, Springer, 2001.
2. Elaine Rich, Artificial Intelligence, McGraw Hill, 2/e, 1990.
3. Kalyanmoy Deb, Multi-objective Optimization using Evolutionary Algorithms, John Wiley and Sons, 2001.

Course Code	:	OE 104
Course Name	:	RENEWABLE ENERGY TECHNOLOGIES
Credits	:	3 (L: 3, T: 0, P: 0)

Detailed Syllabus:

Lecture Detail
UNIT-I: Introduction: World Energy Use; Reserves of Energy Resources; Environmental Aspects of Energy Utilisation; Renewable Energy Scenario in India and around the World; Potentials; Achievements / Applications; Economics of renewable energy systems.
Unit-II: Solar energy: Solar Radiation; Measurements of Solar Radiation; Flat Plate and Concentrating Collectors; Solar direct Thermal Applications; Solar thermal Power Generation Fundamentals of Solar Photo Voltaic Conversion; Solar Cells; Solar PV Power Generation; Solar PV Applications.
Unit-III: Wind Energy: Wind Data and Energy Estimation; Types of Wind Energy Systems; Performance; Site Selection; Details of Wind Turbine Generator; Safety and Environmental Aspects.
Unit-IV: Bio-Energy: Biomass direct combustion; Biomass gasifiers; Biogas plants; Digesters; Ethanol production; Bio diesel; Cogeneration; Biomass Applications.
Unit-V: Other Renewable Energy Sources: Tidal energy; Wave Energy; Open and Closed OTEC Cycles; Small Hydro-Geothermal Energy; Hydrogen and Storage; Fuel Cell Systems; Hybrid Systems.

Reference Books:

1. O.P. Gupta, Energy Technology, Khanna Publishing House, Delhi (ed. 2018)
2. Renewable Energy Sources, Twidell, J.W. & Weir, A., EFN Spon Ltd., UK, 2006.
3. Solar Energy, Sukhatme. S.P., Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.
4. Renewable Energy, Power for a Sustainable Future, Godfrey Boyle, Oxford University Press, U.K., 1996.
5. Fundamental of Renewable Energy Sources, GN Tiwari and MK Ghoshal, Narosa, New Delhi, 2007.
6. Renewable Energy and Environment-A Policy Analysis for India, NH Ravindranath, UK Rao, B Natarajan, P Monga, Tata McGraw Hill.
7. Energy and The Environment, RA Ristinen and J J Kraushaar, Second Edition, John Willey & Sons, New York, 2006.
8. Renewable Energy Resources, JW Twidell and AD Weir, ELBS, 2006.

Course Code	:	OE 105
Course Name	:	Internet of Things Applications
Credits	:	3 (L: 3, T: 0, P: 0)

Detailed Syllabus:

Lecture Detail
Unit I - Introduction to Internet of Things <ul style="list-style-type: none"> • Define the term “Internet of Things” • State the technological trends which have led to IoT. • Describe the impact of IoT on society
Unit II - Design consideration of IoT <ul style="list-style-type: none"> • Enumerate and describe the components of an embedded system. • Describe the interactions of embedded systems with the physical world. • Name the core hardware components most commonly used in IoT devices.
Unit III Interfacing by IoT devices <ul style="list-style-type: none"> • Describe the interaction between software and hardware in an IoT device. • Explain the use of networking and basic networking hardware. • Describe the structure of the Internet.

Reference Books:

1. Internet of Things By Raj Kamal, McGraw Hill Education; First edition (10 March 2017) ISBN 978-9352605224
2. internet of Things: A Hands-On Approach By Arsheep Bahge and Vijay Madiseti, Orient Blackswan Private Limited - New Delhi; First edition (2015) ISBN : 978-8173719547

Course Code	:	OE 106
Course Name	:	Mechatronics
Credits	:	3 (L: 3, T: 0, P: 0)

Detailed Syllabus:

Lecture Detail
Unit 1 – Introduction to Mechatronics <ul style="list-style-type: none"> • Introduction to System Concepts, Analysis and Design • Mechatronics basic definitions; systems and components. • Systems with mixed disciplines • Electronics Fundamentals Review
Unit 2 – Elements in Mechatronics <ul style="list-style-type: none"> • Data conversion devices, sensors, micro-sensors, transducers, signal processing devices, timers • Microprocessors, Microcontrollers • PID Controllers and PLCs
Unit 3 – Drives <ul style="list-style-type: none"> • Stepper Motors, Servo Drives • Linear Motion bearings, cams • Systems controlled by camshafts, electronic cams • Tool magazines and indexing mechanisms.
Unit 4 – Hydraulic Systems <ul style="list-style-type: none"> • Flow, Pressure and Direction Control Valves • Actuators, Supporting Elements, Hydraulic Power Packs, Pumps • Design of Hydraulic circuits
Unit 5 – Pneumatic System <ul style="list-style-type: none"> • Production, Distribution and conditioning of compressed air • System Components and Graphic representations • Design of Systems

Reference Books:

1. Analysis and design of Dynamic Systems By Cochin, Era and Cadwallender, AddisonWesley, 1997
2. Mechatronics Engineering By Tomkinson, D. And Horne, J. Longman, McGraw Hill, 1996
3. Mechatronics By Bolton, W, Pearson
4. Fundamental of mechatronic By M. Jouaneh, Cengage Learning ISBN – 978-1111569020
5. Mechatronics – An Integrated Approach By Clarence W. de Silva, CRC Press ISBN – 978-0849312748

SUGGESTED SOFTWARE/LEARNING WEBSITES:

6. https://youtu.be/Ro_tFv1iH6g
7. <https://www.motioncontroltips.com/faq-what-are-stepper-drives-and-how-do-they-work/>
8. <https://science.howstuffworks.com/robot.htm>

9. <https://howtomechatronics.com/>

Course Code	:	OE 107
Course Name	:	Artificial Intelligence
Credits	:	3 (L: 3, T: 0, P: 0)

Detailed Syllabus:

Lecture Detail
Unit 1 – Introduction to Artificial Intelligence <ul style="list-style-type: none"> • Artificial Intelligence (AI) definition • Goals of AI • History of AI • Applications of AI
Unit 2 – Agents and Environments <ul style="list-style-type: none"> • Agent Terminology, Types of Agents – Simple Reflex Agents, Model Based Reflex Agents, Goal Based Agents • Nature of Environments, Properties of Environments
Unit 3 – Search Algorithms Terminology <ul style="list-style-type: none"> • Brute Force Search Strategies – Breadth First Search, Depth First Search. • Heuristic Search Strategies, Local Search Algorithms.
Unit 4 – Fuzzy Logic Systems Introduction to Fuzzy Logic and Fuzzy systems, <ul style="list-style-type: none"> • Membership functions, • Fuzzification/Defuzzification
Unit 5 – Neural Networks Basic structure of Neural Networks <ul style="list-style-type: none"> • Perceptron • Back-propagation

Reference Books:

- Artificial Intelligence By Example: Develop machine intelligence from scratch using real artificial intelligence use cases By Denis Rothman, Packt Publishing ISBN – 978-1788990547

AUDIT COURSES

Detailed Syllabus:

Course Code	:	AU 102
Course Name	:	Environmental Science
Credits	:	0 (L: 2, T: 0, P: 0)

Lecture Detail

Unit 1: Ecosystem • Structure of ecosystem, Biotic & Abiotic components • Food chain and food web • Aquatic (Lentic and Lotic) and terrestrial ecosystem • Carbon, Nitrogen, Sulphur, Phosphorus cycle. • Global Warming-Causes, effects, process, Green House Effect, Ozone depletion

Unit 2: Air and, Noise Pollution • Definition of pollution and pollutant, Natural and manmade sources of air pollution (Refrigerants, I.C., Boiler) • Air Pollutants: Types, Particulate Pollutants: Effects and control (Bag filter, Cyclone separator, Electrostatic Precipitator) • Gaseous Pollution Control: Absorber, Catalytic Converter, Effects of air pollution due to Refrigerants, I.C., Boiler • Noise pollution: sources of pollution, measurement of pollution level, Effects of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000

Unit- 3 Renewable sources of Energy • Solar Energy: Basics of Solar energy. Flat plate collector (Liquid & Air). Theory of flat plate collector. Importance of coating. Advanced collector. Solar pond. Solar water heater, solar dryer. Solar stills. • Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel. Anaerobic digestion. Biogas production mechanism. Utilization and storage of biogas. • Wind energy: Current status and future prospects of wind energy. Wind energy in India. Environmental benefits and problems of wind energy. • New Energy Sources: Need of new sources. Different types of new energy sources. Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion.) Concept, origin, and power plants of geothermal energy

Unit-4 Solid Waste Management, ISO 14000 & Environmental Management • Solid waste generation- Sources and characteristics of: Municipal solid waste, E- waste, biomedical waste. • Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries. • Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous waste • Air quality act 2004, air pollution control act 1981 and water pollution and control act 1996. • Structure and role of Central and state pollution control board. • Concept of Carbon Credit, Carbon Footprint. • Environmental management in fabrication industry. • ISO14000: Implementation in industries, Benefits.

Reference Books:

1. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
2. Arceivala, Soli Asolekar, Shyam, Waste Water Treatment for Pollution Control and Reuse, McGraw Hill Education India Pvt. Ltd., New York, 2007, ISBN:978-07-062099-5.
3. Nazaroff, William, Cohen, Lisa, Environmental Engineering Science, Willy, New York, 2000, ISBN 10: 0471144940.

4. Rao, C. S., Environmental Pollution Control and Engineering, New Age International Publication, 2007, ISBN: 81-224-1835-X.
5. Rao, M. N.Rao, H.V.N, Air Pollution, Tata Mc-Graw Hill Publication, New delhi, 1988, ISBN: 0-07-451871-8.
6. Frank Kreith, Jan F Kreider, Principles of Solar Engineering, McGraw-Hill, New York ; 1978, ISBN: 9780070354760.
7. Aldo Vieira, Da Rosa, Fundamentals of renewable energy processes, Academic Press Oxford, UK; 2013. ISBN: 9780123978257.
8. Patvardhan, A.D, Industrial Solid Waste, Teri Press, New Delhi, 2013, ISBN:978-81-7993- 502-6
9. Metcalf & Eddy, Waste Water Engineering, Mc-Graw Hill, New York, 2013, ISBN: 077441206.

Course Code	:	AU 202
Course Name	:	Essence of Indian Knowledge and Tradition
Credits	:	0 (L: 2, T: 0, P: 0)

Detailed Syllabus:

Lecture Detail
Unit 1- Basic Structure of Indian Knowledge System: (i) वेद, (ii) उन्नवेद (आयुर्वेद, धनुर्वेद, गन्धर्वेद, स्थानत्य आदद) (iii) वेदांग (शिक्षा, कल्ल, ननरुत, व्याकरण, ज्योनतष छांद), (iv) उनाइग (धर्मिस, र्ीर्ाांसा, नुराण, तकमिस)
Unit 2 – Modern Science and Indian Knowledge System
Unit 3 – Yoga and Holistic Health care
Unit 4 – Case Studies.

Reference Books:

1. Cultural Heritage of India-Course Material by V. Sivaramakrishna, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2. Modern Physics and Vedant Swami Jitatmanand Bharatiya Vidya Bhavan.
3. The wave of Life Fritz of Capra.
4. Tao of Physics Fritzof Capra.
5. Tarkasangraha of Annam Bhatta, Inernational V N Jha Chinmay Foundation, Velliarnad, Amaku, am.
6. 6. Science of Consciousness Psychotherapy and Yoga Practices RN Jha Vidyanidhi Prakasham, Delhi, 2016.

Course Code	:	AU 302
Course Name	:	Indian Constitution
Credits	:	0 (L: 2, T: 0, P: 0)

Detailed Syllabus:

Lecture Detail
Unit 1 – The Constitution - Introduction • The History of the Making of the Indian Constitution • Preamble and the Basic Structure, and its interpretation • Fundamental Rights and Duties and their interpretation • State Policy Principles
Unit 2 – Union Government • Structure of the Indian Union • President – Role and Power • Prime Minister and Council of Ministers • Lok Sabha and Rajya Sabha
Unit 3 – State Government • Governor – Role and Power • Chief Minister and Council of Ministers • State Secretariat
Unit 4 – Local Administration • District Administration • Municipal Corporation • Zila Panchayat
Unit 5 – Election Commission • Role and Functioning • Chief Election Commissioner • State Election Commission

Reference Books:

1. Ethics and Politics of the Indian Constitution by Rajeev Bhargava Oxford University Press, New Delhi, 2008
2. The Constitution of India by B.L. Fadia, Sahitya Bhawan; New edition (2017)
3. Introduction to the Constitution of India by DD Basu, Lexis Nexis; Twenty-Third 2018 edition
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