Complete Course Grid and Syllabus

Diploma in Computer Science and Engineering

Rajiv Gandhi Institute of Petroleum Technology

RGIPT Sivasagar Campus

Course: Diploma in Computer Science and Engineering

Total Number of Credits: 354

SEMESTER I					
Course Code	**Subjects**	**L**	**T**	**P**	**Credits**
MA101	Mathematics-I	3	1	0	11
PY101	Physics-I	3	1	0	11
CY101	Chemistry-I	3	0	0	9
ME101	Engineering Mechanics	2	1	0	8
CS101	Fundamentals of Computer Engineering	2	0	2	8
ME102L	Engineering Drawing	0	0	3	3
PY101L	Physics Laboratory	0	0	2	2
TOTAL					**52**
HU101	Universal Human Values	1	1	0	5
L101	Communication Skills	2	0	1	7

SEMESTER II					
Course Code	**Subjects**	**L**	**T**	**P**	**Credits**
MA102	Mathematics-II	3	1	0	11
PY102	Physics-II	3	1	0	11
CY102	Chemistry-II	3	0	0	9
EE101	Fundamentals of Electrical and Electronics Engineering	3	1	0	11
CS102	Computer Programming	2	0	2	8
ME103L	Engineering Workshop Practices Laboratory	0	0	3	3
CY101L	Chemistry Laboratory	0	0	2	2
EE101L	Fundamentals of Electrical and Electronics Engineering Laboratory	0	0	2	2
TOTAL					**57**
HU102	Community Internship	1	1	0	5

SEMESTER III					
Course Code	**Subjects**	**L**	**T**	**P**	**Credits**
CS201	Algorithms	3	0	2	11
CS202	Data Structures	3	0	2	11
CS203	Computer Architecture	3	0	0	9
CS204	Web Technology and Mobile Computing	3	0	2	11
EIE214	Digital Logic Circuits	3	0	0	9
MA202	Mathematics-III	3	1	0	11
CS205	Group Discussion	0	0	2	2
TOTAL					**64**

SEMESTER IV					
Course Code	**Subjects**	**L**	**T**	**P**	**Credits**
CS206	Introduction to DBMS	3	1	0	11
CS207	Scripting Languages	3	0	2	11
CS208	Software Engineering	3	0	0	9
CS209	Advanced Programming	3	0	0	9
CS210	Operating Systems	3	0	0	9
CS211	Cloud Computing	3	0	0	9
EIE209	Microprocessors and Applications	3	0	0	9
EIE209L	Microprocessors and Applications Laboratory	0	0	2	2
CS212	Seminar	0	0	2	2
TOTAL					**71**

SEMESTER V					
Course Code	**Subjects**	**L**	**T**	**P**	**Credits**
CS301	Introduction to Data Science	3	0	0	9
CS302	Computer Networks	2	1	0	8
CS303	Machine Learning and AI	3	1	0	11
HU301	Humanities	2	0	0	6
MT301	Engineering Economics	2	1	0	8
CS304L	Advanced Programming Laboratory	0	0	3	3
	Departmental Elective	3	0	0	9
	Open Elective	3	0	0	9
TOTAL					**63**

SEMESTER VI					
Course Code	**Subjects**	**L**	**T**	**P**	**Credits**
CS310	Skill Development Certificate Course				x*
CS311	Project				30-x
TOTAL					**47**

Subject Code	Departmental Elective
CS305	Internet of Things
CS306	Digital Image Processing
CS307	Multimedia Technologies
CS308	Information Security

Subject Code	Open Elective
CS309	Introduction to e-Governance

Component distribution for diploma in Computer Science and Engineering					
Category	**Program Components**	**Approved Range**		**Computer Science**	
		Min	**Max**	**Existing**	**Recommended (Revised)**
HU	Humanities and Social Science	12	24	16	16
IS	Institute Science Courses	50	80	77	77
IE	Institute Engineering Courses	40	70	61	57
EP	Engineering Drawing, Workshop	8	24	10	10
LM	Language and Management	8	20	15	15
DC	Departmental Core	125	160	142	131
DE	Departmental Elective	8	20	9	9
OE	Open Elective	8	20	9	9
DP	Project/ Industrial visit	20	50	20	30
	Total	**340**	**360**	**359**	**354**

Syllabus

Semester I

Mathematics-I

1.1 Course Number: MA101
1.2 Contact Hours:3-1-0 Credits:11
1.3 Semester-offered: 1st Year –Odd
1.4 Prerequisite: Class 10th level Mathematics
1.5 Syllabus Committee Members: Dept. of Mathematical Sciences, RGIPT

2. Objective:

This course is designed to give a comprehensive coverage at an introductory level to the subject of Trigonometry, Co-ordinate Geometry, Complex Numbers, Differential Calculus and Vector Algebra.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Trigonometry**	Concept of angle; Measurement of angle in degree, grades and radians and their conversions; Trigonometric ratios; Sum, difference formulae and their applications (Without proof); Product formula (Transformation of Product to Sum and Differences and vice versa); Trigonometric Ratios of multiple angles, sub-multiple angles (2A,3A, A/2); Graph of sinx, cosx, tanx, cosecx, secx and cotx., Basic concept of inverse trigonometric functions.	8
2	**Co-ordinate Geometry**	Equation of straight line in various standard form (Without Proof); Intersection of two straight lines Angle between two straight lines; Parallel lines and perpendicular lines; Perpendicular distance formula Sections of a cone: Circle, Parabola, Ellipse and Hyperbola; General equation of a circle and its characteristics; Definition of conics (Parabola, Ellipse, Hyperbola) their standard equations (without proof).	8
3	**Complex Numbers**	Definition of Complex numbers; Real and imaginary parts of a Complex number; Conjugate of a complex number; Modulus and amplitude of a complex number; Addition, Subtraction, Multiplication and Division of complex numbers, Polar and Cartesian form of a complex number and its conversion from one form to other, De-Movier's theorem and its application.	7
4	**Differential Calculus**	Definition of function; Concept of limits; Four standard limits $\lim_{x\to a}\frac{x^n-a^n}{x-a}, \lim_{x\to 0}\frac{\sin x}{x}, \lim_{x\to 0}\frac{a^x-1}{x}$ and $\lim_{x\to 0}(1+x)^{1/x}$, Differentiation of $x^n, \sin x, \cos x, e^x$ and $\log_a x$ by the first principle rule of derivative, 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.Definition & meaning of partial derivative. Evaluation	12

		of partial derivatives. Definition & examples of homogeneous functions. Euler's theorem (1st order) on Homogeneous functions for 2 variables (without proof). Problems.	
5	**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.	6
	Total		**41**

4. Reading

4.1 Textbooks:

1. B.S. Grewal, Higher Engineering Mathematics, Khana Publishers, New Delhi, 40th Edition, 2007.
2. Mathematics Textbook for Class XI and XII (NCERT).
3. S. L. Loney, The Elements of Coordinate Geometry Part-1 Cartesian Coordinate.

4.2 Reference Books:

1. R. D. Sharma, Mathematics for Class 11and 12.
2. E. Kreyszig, Advanced Engineering Mathematics, Khanna Publisher.
3. Murray R. Spiegel, Robert E. Moyer, College Algebra, Tata McGraw Hill, New Delhi, 2nd Edition, 2000.
4. Frank Ayers, Elliot Mendelson, Calculus, McGraw Hill, New York, 4th Edition.

5. Outcome of the Course:

After the completion of the course the students will be able to

1) Solve problems involving angles, triangles, and periodic phenomena using trigonometric functions. Apply trigonometry in real-world situations, such as navigation, physics, and engineering
2) Understand the cartesian coordinate system and the relationship between points, lines, and curves. Represent geometric figures using equations and inequalities.
3) Understand the concept of a derivative as the rate of change and slope of a function.
4) Apply complex numbers in solving equations and expressing solutions.
5) Understand the geometric and algebraic properties of vectors.

Physics-I

1.1 Course Number: PY101
1.2Contact Hours: 3-1-0 Credits:11
1.3 Semester-offered: 1st Year - Odd
1.4 Prerequisite: Class 10th level Physics and Mathematics
1.5 Syllabus Committee Members: Dr. Shikha Dwivedi & Dr. Nimisha Raghuvanshi

2. Objective:

i) Physics is the mother of all engineering disciplines hence students must have a fundamental understanding of the topic in order to grasp their core engineering subjects more readily. As a result, while reviewing the curriculum, emphasis was placed on the concepts, laws, working equations, and basic notions of physics to assist students in studying the key courses.
ii) This will give a solid foundation for future self-development in order to cope with new advances. The study of physics encompasses a wide range of fascinating subjects, many of which have something to do with the materials and objects that surround us. It tries to provide a knowledge of this environment via both observation and behavior prediction of such items.
iii) The course material places a strong emphasis on the practical application of physical concepts and analysis in a variety of engineering and technological sectors.
iv) The course will assist diploma engineers in using fundamental ideas and principles to tackle complex engineering issues and comprehend various technology-based applications.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Units and Measurements**	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. Measurements: Need, Measuring instruments, Least count, Types of measurement (direct and indirect), Errors in measurements (systematic and random), Absolute error, Relative error, Error propagation, Error estimation and significant figures.	8
2	**Scalars and Vectors**	Scalar and Vector quantities: Examples, Representation of vectors, 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. Kinematics equations in scalar and vector form with related	7

		numerical problems.	
3	**Force and Motion**	Force, Momentum, Statement and derivation of conservation of linear momentum, its applications such as recoil of gun, Rockets, Impulse and its applications. Circular motion, 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, Moment of inertia and its physical significance, Definition of torque and angular momentum and their examples.	8
4	**Work, Power and Energy**	Work: Concept and unit, Examples of zero work, Positive work and negative work. Friction: Concept, Types of friction, 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 smooth surfaces) and related applications. Energy and its unit, 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 unit, Power and work relationship, Calculation of power (numerical problems).	7
5	**Properties of Matter**	Elasticity: Definition of stress and strain, Moduli of elasticity, Hooke's law, Significance of stress-strain curve. Pressure: Definition, Unit, Atmospheric pressure, Gauge pressure, Absolute pressure, Fortin's Barometer and its applications. Surface tension: Concept, Unit, 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, Stokes' 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 numerical) and its applications.	12
Total			**42**

4. Readings

4.1 **Textbooks:**

1. Textbook of Physics for Class XI (Part-1, Part-2); N.C.E.R.T., Delhi.

4.2 **Reference Books:**

1. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi.
2. Concepts in Physics by H. C. Verma, Vol. I&II, Bharti Bhawan Ltd., New Delhi.
3. Engineering Physics by P. V. Naik, Pearson Education Pvt. Ltd, New Delhi.
4. Engineering Physics by D. K. Bhattacharya & Poonam Tandan; Oxford University Press, New Delhi.
5. Comprehensive Practical Physics, Vol, I & II, J. N. Jaiswal, Laxmi Publications (P) Ltd., New Delhi.
6. Practical Physics by C. L. Arora, S. Chand Publication.

5. Outcomes of the Course:

After undergoing this subject, the student will be able to:

1) Explain and identify physical quantities along with their units and make measurements with accuracy by minimizing different types of errors.
2) Understand the scalar and vector quantities and use this knowledge in solving relevant real-life problems.
3) Describe the types of friction, its coefficients and methods to reduce or increase friction between different surfaces.
4) Analyze different types of motion, acting forces along the motion and conservation of momentum principle to describe rocket propulsion, recoil of gun etc.
5) Compare and relate physical properties associated with linear motion and rotational motion along with the application of conservation of angular momentum.
6) Understanding of relationships for work, energy and power and solve related problems. Explain the principle of conservation of energy also identify various forms of energy, and energy transformations.
7) Describe the phenomenon related to properties of matter such as pressure, surface tension, stress, strain, elasticity, viscosity and their effect.

Chemistry-I

1.1 Course Number: CY101
1.2 Contact Hours: 3-0-0 Credits:9
1.3 Semester-offered: 1st Year –Odd
1.4 Prerequisite: Class 10th level Chemistry and Mathematics
1.5 Syllabus Committee Members: Dr. Sabyasachi Pramanik & Dr. Souvik De

2. Objective:

i) To impart the knowledge of fundamental principles of chemistry for future learning of engineering principles
ii) To make students realize the importance of fundamental chemistry in engineering disciplines.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1.	**Atomic Structure**	Atomic number, isotopes and isobars. Thompson's model and its limitations, Rutherford's model and its limitations, Bohr's model and its limitations Quantum number, Aufbau principle, Hund's rule, Pauli's exclusion principle, electronic configuration.	8
2.	**Periodic Properties of Elements**	Classification of Elements, Significance of classification, brief history of the development of periodic table, modern periodic law and the present form of periodic table, periodic trends in properties of elements -atomic radii, ionic radii, inert gas radii Ionization enthalpy, electron gain enthalpy, electronegativity, valency. Nomenclature of elements with atomic number greater than 100. Basic Concepts of s, p, d and f-block Elements	8
3.	**Chemical Bonding and Molecular Structure**	Orbit vs. Orbital, Valence electrons, ionic bond, covalent bond; Lewis structure, polar character of covalent bond, covalent character of ionic bond, resonance, geometry of covalent molecules, VSEPR theory, concept of hybridization, involving s, p and d orbitals and shapes of some simple molecules, Valence-Bond Theory.	8
4.	**Concept of Moles and Chemical Equation**	Phases, Mole concept and problems, Standard solution, normal solution and molar solution, concentration terms-normality, molarity, gm/l, ppm, normality equation, acid-base titration. Chemical equation-definition, qualitative and quantitative significance, limitations, balancing by partial and ion-electron method, electronic concept of oxidation and reduction, Stoichiometric calculations.	7
5.	**Acids-Bases and Salt**	Acids, bases and salts, Theories of acids and bases- Arrhenius, Bronsted-Lowry, Lewis theory, Strong acids and strong bases, Concept of pH and pKa, conjugate acid-base pair, classification of salts, hydrolysis of salts and its effect, Concept of Buffer, Indicator.	7
Total			**38**

4. Readings

4.1 Textbooks:

1. NCERT Textbook (Class XI and XII)
2. Engineering Chemistry, B. K. Sharma

4.2 References Books:

1. A Textbook of Engineering Chemistry, Sashi Chawla
2. Engineering Chemistry, Jain and Jain
3. Applied Chemistry, Dr.Raman Rani Mittal

5. Outcomes of the Course:

After completion of this course students will be able to

1) Know about the structure of an atom and write the electronic configurations of atoms.

2) Understand the variation of physical and chemical properties of elements such as ionization potential, electron affinity, electronegativity and learn about the periodic table.

3) Understand chemical bonding, concept of hybridization, as well as structure and shape of molecules.

4) Impart knowledge about various atomic and molecular quantities, strength and balancing chemical reaction.

5) Explore acid-base chemistry with a focus on the equilibrium aspects of these reactions.

Engineering Mechanics

1.1 Course Number: ME101
1.2 Contact Hours: 2-1-0 Credits: 8
1.3 Semester-offered: 1st Year –Odd
1.4 Prerequisite: Class 10th level Physics & Mathematics
1.5 Syllabus Committee Members: Dr. Naveen Mani Tripathi, Dr. Sanat Kumar Singha, Dr. Abhimanyu Kar & Dr. Karthik Babu NB

2. Objective:

i) To develop the ability to model and analysis of mechanical engineering systems using vectorial representation of forces and moments.
ii) To be able to draw free-body diagrams of mechanical components and systems.
iii) To develop the capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering.
iv) To understand the phenomenon of friction and the ability to solve problems related to the same. Ability to apply the principles of virtual work.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Basics and statics of particles**	Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces – Vector representation of forces –Vector operations of forces – additions, subtraction, dot product, cross product –Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility.	6
2	**Equilibrium of rigid bodies**	Free body diagram – Types of supports –Action and reaction forces – stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions	6
3	**Properties of surfaces and solids**	Centroids and centre of mass – Centroids of lines and areas - Rectangular, circular, triangular areas by integration – T section, I section, and Hollow section by using standard formula –Theorems of Pappus - Area moments of inertia of plane areas – Rectangular,	6

		circular, triangular areas by integration – T section, I section –Parallel axis theorem and perpendicular axis theorem – Principal moments of inertia of plane areas – Principal axes of inertia-Mass moment of inertia –mass moment of inertia for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia.	
4	**Dynamics of particles**	Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion - Newton's laws of motion – Simple problems – Impact of elastic bodies.	5
5	**Friction and rigid body dynamics**	Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction-. Rolling resistance -Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder and disc/wheel.	5
	Total		**28**

4. Readings

4.1 Textbooks:

1. Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004).
2. Vela Murali, "Engineering Mechanics", Oxford University Press (2010)

4.2 References Books:

1. Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, 1998.
2. Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education 2010.
3. Irving H. Shames and Krishna Mohana Rao. G., "Engineering Mechanics – Statics and Dynamics", 4th Edition, Pearson Education 2006.
4. Meriam J.L. and Kraige L.G., " Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2", Third Edition, John Wiley & Sons,1993.
5. Rajasekaran S and Sankarasubramanian G., "Engineering Mechanics Statics and Dynamics", 3rd Edition, Vikas Publishing House Pvt. Ltd., 2005.

5. Outcome of the Course:

On successful completion of this course, the student will be able to

1) Illustrate the vectorial and scalar representation of forces and moments
2) Analyse the rigid body in equilibrium
3) Evaluate the properties of surfaces and solids

4) Calculate dynamic forces exerted in rigid body
5) Determine the friction and the effects by the laws of friction

Fundamentals of Computer Engineering

1.1 Course Number: CS101
1.2 Contact Hours: 2-0-2 Credits:8
1.3 Semester-offered: 1st Year –Odd
1.4 Prerequisite: Basic knowledge of computers
1.5 Syllabus Committee Members: Dr. Shikha Dwivedi

2. **Objective:**

The aim of the course is to help the students to attain the following basic competency through various teaching-learning experiences:

i) Identifying and learning about various computer hardware and their uses.
ii) Understanding of computer memory and its internal architecture.
iii) Basic knowledge of software including different operating systems and its working.
iv) Introduction to web designing using HTML coding.
v) Developing awareness regarding cyber security.
vi) Evolving logical thinking and problem-solving skills.
vii) The course will assist diploma engineers in using fundamental ideas and principles to tackle complex engineering issues and comprehend various technology-based applications.

3. **Course Content:**

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Computer Organization**	Introduction to generations of computer and its classification, Logical organization of computer (functional block diagram), Input & Output devices (keyboard, mouse, joystick, scanner, OCR, OMR, MICR, barcode reader, web camera, monitor, printer, plotter), Central processing unit.	5
2	**Memory & Architecture**	Primary, secondary and auxiliary memory, Main memory unit, RAM, ROM, Cache memory, Registers, System bus, Hard disks & optical disks, CPU, SMPS, Motherboard, Ports and Interfaces, Expansion cards, Ribbon cables, Memory chips, Processors.	4
3	**Human Computer Interface**	Types of software (System and application), Operating system as user interface, Types of operating systems (Window, Linux, Mac), MS Office (Word, Excel, PowerPoint), Unix Shell and Commands, Programming languages, Compiler, Interpreter, VI editor, Computer viruses and its type, Detection and prevention of viruses.	5
4	**Computer Networks &**	Internet, TCP/IP, World Wide Web, Browser, Internet address (Domain name, URL), Search engine.	10

	Web Design	Introduction to computer networks, Data communication and its components, Data transmission mode, LAN, MAN, WAN, Wireless LAN, Client/server network and peer-to-peer network, Intranet, Extranet. Hyper Text Mark-up Language (HTML), Cascading Style Sheet (CSS), Creating web pages, Lists, Hyperlinks, Tables, Web forms, Inserting images, Frames, Hosting options and domain name registration.	
5	**Information Security**	Protection, Security, Risk, Threat, Vulnerability, Exploit, Attack, Confidentiality, Integrity, Availability, Non-repudiation, Authentication, Authorization, Codes, Plain text, Encryption, Decryption.	3
	Total		**27**

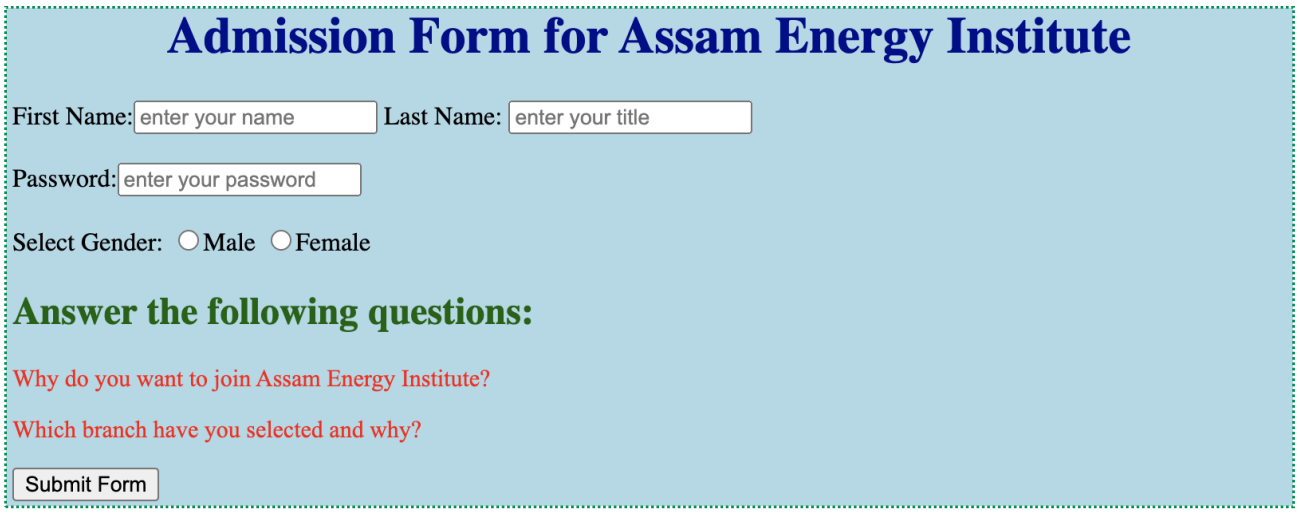
List of Experiments:

1. Introduction to various components of Computer system.
2. Study and Practice of handling Microsoft Windows – Folder related operations, My-Computer, Window explorer, Control Panel.
3. Introduction to Microsoft Office.
4. Creation and editing of Text files using MS Word.
5. Creation and operating of spreadsheet using MS Excel.
6. Creation and editing power-point slides using MS Power Point.
7. Introduction to Unix operating system (Ubuntu).
8. Study and practice of Open Office: OpenOffice Writer, OpenOffice Spreadsheet, OpenOffice Impress.
9. Study and practice of Basic Linux Commands.
10. Study and practice of Vim editor and its various commands in different modes.
11. Introduction to inter-networking protocols, world wide web, browsers and search engines.
12. Understanding of IP addresses, significance and uses of various domain names and URLs.
13. Create webpages and webforms including lists, hyperlinks, images, table etc. by using basic HTML program with HTML tag.
14. Modify the same webpages by using CSS codes.
15. Write the complete HTML coding using CSS for the following table:

Gradesheet of Diploma Students

	Maths	Physics	Chemistry	Human Values	Communication Skills	Engineering Themodynamics
Tom	47	39	25	33	43	36
Jimi	23	45	25	37	40	39
Tus	50	43	38	44	40	37
Ross	31	30	42	35	29	22
Max	34	35	38	44	49	43

16. Write the complete HTML coding using CSS for the following form :



4. Readings:

4.1 References Books:

1. A. Goel, Computer Fundamentals, Pearson Education.
2. P. Aksoy, L. De Nardis, Introduction to Information Technology, Cengage Learning.
3. P. K. Sinha, P. Sinha, Fundamentals of Computers, BPB Publishers.
4. R. S. Salaria, Computer Fundamentals, Khanna Publishing House.
5. Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House.
6. Andrew S. Tanenbaum, David J. Wetherall Computer Networks (5th Edition), PHI.
7. M. Merkow, J. Breithaupt, Information Security Principles and Practices, Pearson Education.
8. J. Minnick, Web Design with HTML5 and CSS3 (8th edition), Cengage Learning.

5. Outcomes of the Course:

After undergoing this subject, the student will be able to:

1) Describe functional units of a computer, its various peripherals and their applications.
2) Identify computer hardware as well as software (in the lab).
3) List the features of Word, Excel, PowerPoint and also able to perform calculations on excel sheet and demonstrate the use of PowerPoint for seminar presentations.
4) Identify various operating system file management commands (create, copy, move, delete and rename folders and files).
5) Demonstrate installation of application software in windows as well as in Linux operating system.
6) Acknowledge various computer languages and also able to differentiate between compiler and interpreters.
7) State computer networks such as LAN, MAN and WAN together with the internet, intranet and extranet.
8) Design basic web pages using the HTML along with the CSS.
9) Aware regarding the issues related to cyber security.

Engineering Drawing

1.1 Course Number: ME102L
1.2 Contact Hours: 0-0-3 Credits:3
1.3 Semester-offered: 1st Year –Odd/Even
1.4 Prerequisite: Class 10^{th} level Mathematics
1.5 Syllabus Committee Members: Dr. Naveen Mani Tripathi, Dr. Sanat Kumar Singha, Abhimanyu Kar & Dr. Karthik Babu

2. Objective:

i) To understand the basic concepts of dimensioning and scales and their roles in engineering drawing.
ii) To draw orthographic projections of points, straight lines, laminae and solids when the mentioned objects are located with different configurations with respect to the plane of projections.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lab Sessions
1	**Introduction to Engineering Drawing**	1.1 Introduction to drawing instruments, materials, layout and sizes of drawing sheets and drawing boards. 1.2 Different types of lines in engineering drawing as per BIS specifications 1.3 Practice of vertical, horizontal and inclined lines, geometrical figures such as triangles, rectangles, circles, ellipses and curves, hexagonal, pentagon with the help of drawing instruments 1.4 Free hand and instrumental lettering (alphabets and numerals) – upper case (capital letters), single stroke, vertical and inclined at 75 degree, free hand and instrumental lettering in the ratio of 7:4	2
2	**Dimensioning Technique and Scales**	2.1 Necessity of dimensioning, method and principles of dimensioning (mainly theoretical instructions) 2.2 Dimensioning of overall sizes, circles, angles, tapered surfaces, holes, counter sunk holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches 2.3 Scales – their needs and importance (theoretical instructions), type of scales, definition of representative fraction and length of scale	2

3	**Orthographic Projections**	3.1 Theory of orthographic projections (elaborate theoretical instructions) 3.2 Projection of Points in different quadrants 3.3 Projection of straight lines (1st angle and 3rd angle) 3.4 Line parallel to both the planes 3.5 Line perpendicular to any one of the reference planes 3.6 Line inclined to any one of the references plane 3.7 Projection of planes – different lamina like square, rectangular, triangular and circle inclined to one plane, parallel and perpendicular to another plane in 1st angle only. 3.8 Three views of orthographic projection of different objects	5
4	**Projection and Sections of Solids**	4.1. Definition and salient features of a solid 4.2. Types of Solid (polyhedral and solids of revolution) 4.3 To make projections, sources, top view, front view and side view of various types of solids. 4.4 Importance and salient features 4.5 Drawing of full section, half section, partial or broken out sections, offset sections, revolved sections and removed sections. 4.6 Convention sectional representation of various materials, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections. 4.7 Orthographic sectional views of different objects	3
5	**Isometric Views**	5.1 Fundamentals of isometric projections and isometric scale 5.2 Isometric views of combination of regular solids like cylinder, cone, cube and prism	1
Total			**13**

4. Readings

4.1 Textbooks:

1. A Textbook of Engineering Drawing by Surjit Singh; Dhanpat Rai& Co., Delhi
2. Engineering Drawing by PS Gill; SK Kataria& Sons, New Delhi
3. Elementary Engineering Drawing in First Angle Projection by ND Bhatt; Charotar Publishing House Pvt. Ltd., Anand
4. Engineering Drawing I by DK Goel, GBD Publication.

4.2 Reference Book:

1. Engineering Drawing I & II by JS Layall; Eagle Parkashan, Jalandhar

5. Outcome of the Course:

Knowledge of working with various drawing instruments.

1) Classify dimensioning methods and scales.
2) Understand the difference between first angle and third angle projection schemes.
3) Draw the orthographic and isometric views of simple objects.

Physics Laboratory

1.1 Course Number: PY101L
1.2 Contact Hours: 0-0-2 Credits:2
1.3 Semester-offered: 1st Year –Odd/Even
1.4 Prerequisite: Class 10th level Physics
1.5 Syllabus Committee Members: Dr. Shikha Dwivedi & Dr. Nimisha Raghuvanshi

2. Objective:

i) Experiments demonstrate the principle of physics covered in the theory and also provide the familiarities with various apparatus along with developing an attitude of perfection in practical tasks.
ii) The basic purpose of laboratory experiments in physics is to verify and validate the concepts, principles and hypotheses related to the physical phenomena.

3. List of Experiments:

1. To measure length, radius of a given metallic cylinder and a metallic spherical ball using a Vernier caliper and find volume of each object.
2. To determine the diameter of a wire, a metallic spherical ball and thickness of cardboard using a screw gauge.
3. To verify the laws of reflection using a plane mirror and to study the characteristics of the image formed.
4. To determine the refractive index of the material of the glass slab by pin method.
5. To locate the poles of a bar magnet and measure the magnetic length. To plot the magnetic field lines of the bar magnet.
6. a). To verify Ohm's law by Ammeter-Voltmeter method. b). Find equivalent resistance using voltmeter with three resistors connected in series and then in parallel.
7. To plot $L-T$ and $L-T^2$ graph using a simple pendulum. To find effective length of a second's pendulum using appropriate graph.
8. To study the relation between the length of a given wire and tension for constant frequency using sonometer.
9. To study the co-efficient of viscosity of a given viscous liquid by measuring the terminal velocity of a given spherical body.
10. To study the variation in volume with pressure for a sample of air at constant temperature by plotting graphs between pressure and volume.

4. Readings (Textbooks / Reference Books):

1. Textbook of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi.
2. Comprehensive Practical Physics, Vol, I & II, J.N. 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.

5. Outcomes of the Course:

After undergoing this subject, the student will be able to:

1) Use various measuring device such as Vernier Callipers and Screw Gauge.
2) Verify the laws of reflection using mirror and the laws of refraction using glass.
3) Study the magnetic field lines of a Bar magnet.
4) Verify the Ohm's law and find an unknown resistance using meter bridge.
5) Understand the relation between length and time period of simple pendulum.
6) Learn the effect & use of resonance in sonometer.
7) Determine the coefficient of viscosity of any spherical metallic body.
8) Understand the relation between volume and pressure of air using Boyle's Law.

Universal Human Values

1.1 Course Number: HU101
1.2 Contact Hours: 1-1-0 Credits: 5
1.3 Semester-offered: 1st Year –Odd
1.4 Prerequisite: NA
1.5 Syllabus Committee Members: All Faculties of AEI

2. **Objective:**

i) To help the student see the need for developing a holistic perspective of life.
ii) To sensitize the student about the scope of life – individual, family (inter-personal relationship), society and nature/existence
iii) To strengthen self-reflection
iv) To develop more confidence and commitment to understand, learn and act accordingly.

3. **Course Content:**

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Motivation and Objectives of Human Values Course**	Introduction to the objectives of the course. Content and process of the course including mode of conduct. Daily life as lab for the course. Activities in the course.	1
2	**Purpose of Education**	How human being has a need for Knowledge, what should be the content of knowledge, how the content should be discussed in education. Complimentarily of skills and values, how the current education system falls short.	2
3	**Peers Pressure, Social Pressure**	In various dimensions of life, how do these things work. What is the way out? In the context of education, peer pressure etc.	1
4	**Concept of Competition and Excellence**	How competition leads to degradation of self and relationships. How excellence is the basic need of a human being. What is excellence?	1
5	**Time Management**	How does one deal with myriads of activities in college? Focus of the mind.	1
6	**Concept of Preconditioning**	How preconditioning affects our thinking, behavior, work, relationships, society and nature. How do we develop pre-conditioning? What are the various sources of preconditioning? How do we evaluate our Preconditioning? How do we come out of it?	1

7	**Concept of Natural Acceptance in Human Being**	What is natural acceptance? How can the concept of natural acceptance be used to evaluate our preconditioning? Universal nature of natural acceptance. Are anger, jealousy, hatred natural? How do we feel when we experience them? Which feelings are natural for a human being and which are not?	2
8	**Understanding Relationships**	Are relationships important? What is the role of relationships in our life? If relationships are important then why they are important? If they are important then why it is the case that we are not discussing them? What are the notions/conditions and factors which stop us to explore more into relationships? Relationships in family and extended family. Dealing with anger, Basic expectations in relationships. Seven types of relations, Gratitude as a universal value in relationships, Nine universal values in human relationships, Trust as the founding value, Concept of acceptance, Unconditional acceptance in relationships, Our preconditioning affecting our relationships, Our relationships with subordinate staff, with people of opposite gender, caste, class, race, How relationships have the power to force a person to change his preconditioning.	2
9	**Concept of prosperity Material goods**	What role others have played in making material goods available to me: Identifying from one's own life.	1
10	**Idea of Society**	What is a society? What constitutes a society? What systems are needed for a society to work? What is the purpose of society and various systems which are working in it? How understanding of Human Nature is important in order to understand the purpose of Society and various social systems? And what happens when this understanding is lacking?	1
11	**Balance in nature**	Balance which already exists in nature, How human beings are disturbing the balance. Resource depletion and pollution, our own role in wastage of electricity, water and in use of plastics, Waste management, Issues like global warming, animal extinction	1
	Total		**14**

4. Readings

4.1 Suggested Readings:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
2. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
3. On Education - J Krishnamurthy
4. Siddhartha - Hermann Hesse
5. Old Path White Clouds -ThichNhatHanh
6. Diaries of Anne Frank - Anne Frank
7. Life and Philosophy of Swami Vivekananda
8. Swami Vivekananda on Himself
9. Small is Beautiful - E. F Schumacher
10. Slow is Beautiful - Cecile Andrews
11. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi
12. Rediscovering India - by Dharampal
13. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
14. India Wins Freedom -Maulana Abdul Kalam Azad
15. Autobiography of a Yogi – by ParamhansaYogananda
16. Gandhi and Question of Science – Sahasrabudhe

5. Outcome of the Course:

1. Analyze the significance of value inputs provided in formal education along with skills and develop a broader perspective about life and education.
2. Formulate their aspirations and concerns at different levels of living, and the way to fulfill them them in a sustainable manner.
3. Evaluate their current state of understanding and living and model a healthy lifestyle.
4. Examine the issues of home sickness, interactions with seniors on the campus, peer pressure with better understanding and feel grateful towards parents, teachers and others
5. Develop more confidence and commitment for value-based living in family, society and nature.

Communication Skills

1.1 Course Number: L101
1.2 Contact Hours: 2-0-1 Credits:7
1.3 Semester-offered: 1st Year –Odd
1.4 Prerequisite: Class 10th level English
1.5 Syllabus Committee Members: DUGC

2. **Objective:**

i) To make the students confident of speaking in English impeccably and with utmost enthusiasm.
ii) To familiarize the students with different styles of communication.
iii) To enlighten the students with the seven concepts of communication.
iv) To make the students understand the nuances of communication.
v) To train the students and make them comprehend various aspects of Interview skills.

3. **Course Content:**

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Parts of Speech**	Recognition and review of Nouns, Pronouns, Verbs, Adverbs, Adjectives, Prepositions, Conjunctions, Interjections, Knowledge of Courses/ Subjects, Object and Compliment of the Verb, Verbals –Infinitival, Gerund and Preposition Recognition and review	3
2	**Prepositions of time and place**	Contextual teaching of prepositions of time - on, in, at, since, for, ago, before, to, past, to, from, till/until, by Prepositions of place: in, at, on, by, next to, besides, near, between, behind, in front of, under, below, over, above, across, through, to, into, towards, onto, from	3
3	**Clause, phrases and Relative Clauses**	Basic definitions of clauses and phrases, Focus on Relative Pronouns and their use in sentences as relative clauses.	2
4	**Courses/Subjects Verb Agreement**	Rules that guide the agreement of the Courses/Subjects to its verb	2
5	**Sentence types and Transformation of sentences**	Assertive sentences, Exclamatory sentences, Interrogative sentences, Negative sentences, Compound sentences, complex sentences, simple sentences, Degrees of Comparison	2

6	**Voice**	Change from Active Voice to Passive Voice and vice versa	2
7	**Punctuation**	Use of the comma, semi-colon, colon, apostrophe, exclamation mark, question mark and quotation marks	2
8	**Word formation**	Change of one part of speech to the other: from Verbs to Nouns, Nouns to Verbs, Adjectives to Nouns, Nouns to Adjectives, Verbs to adverbs, and Adverbs to Verbs	2
9	**Affixation**	Prefixes and Suffixes and new word formations	2
10	**Nominal Compounds**	Common nominal compound	2
11	**Paragraph Writing**	Descriptive Paragraph on various related topics.	2
	Total		**24**

4. Readings

4.1 Suggested Readings**:**

1. Essential English Grammar with Answers by Raymond Murphy (Cambridge University Press)
2. English for Polytechnics by Dr Papori Rani Barooah (Eastern Book House Publishers)
3. English Grammar by Annie Brinda (Cambridge University Press)

5. Outcome of the Course:

1) Develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others.
2) Understand and practice different techniques of communication.
3) Practice and adhere to the 7Cs of Communication.
4) Familiarize with different types of Communication.
5) Understand and practice Interview Etiquettes.

Semester II

Mathematics-II

1.1 Course Number: MA102
1.2 Contact Hours: 3-1-0 Credits: 11
1.3 Semester-offered: 1st Year –Even
1.4 Prerequisite: Class 10th level Mathematics
1.5 Syllabus Committee Members: Dept. of Mathematical Sciences, RGIPT

2. Objective:

This course is designed to give a comprehensive coverage at an introductory level to the subject of Determinants and Matrices, Integral Calculus, Differential Equations, Permutations & Combinations, Probability & Statistics.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Determinants and Matrices**	Elementary properties of determinants up to 3rd order, Algebra of matrices, Inverse of a matrix, Consistency of equations; Crammer's rule, Matrix inverse method to solve a system of linear equations in 3 variables.	8
2	**Integral Calculus**	Integration as inverse operation of differentiation; Simple integration by substitution, by parts and by partial fractions (for linear factors only); Definite Integral, Use of formula $\int_0^{\pi/2} \sin^n x dx, \int_0^{\pi/2} \cos^n x dx$ & $\int_0^{\pi/2} \sin^m x \cos^n x dx$ for solving problems where m and n are positive integers.	9
3	**Ordinary Differential Equations**	Definition of differential equations; Order and degree of a differential equation; General and particular solution of a differential equation; Formation of differential equation whose general solution is given; Solution of first order and first-degree differential equation by variable separation method; Homogeneous differential equation of 1st order, Exact differential equation, First order linear differential equation.	9
4	**Permutations & Combinations**	Definition of factorial of a number, permutation (${}^nP_r$) & combination (${}^nC_r$) with formula only. Binomial Theorem (without proof) for any index, simple problems on positive index only. Expansion of $(1 + x)^{-1}$, $(1 - x)^{-1}$, where $\|x\| < 1$, exponential & logarithmic series only (no problem).	5
5	**Probability and Statistics**	Definition & examples of frequency distribution. Measure of Central Tendency (mean, median, mode) for ungrouped frequency distribution. Measures of dispersion-Standard deviation, Simple problems. Definition of random experiment, sample space, event, occurrence of events & types of events (eg. Impossible, Mutually exclusive, Exhaustive, Equally likely). Classical definition of probability, simple problems.	9
	Total		**40**

4. Readings

4.1 Textbook:

- H. K. Das, Applied Mathematics for Polytechnics.
- B.S. Grewal, Higher Engineering Mathematics, Khana Publishers, New Delhi, 40th Edition, 2007.
- Mathematics Textbook for Class XI and XII (NCERT).

4.2 Reference Books:

1. R. D. Sharma, Mathematics for Class 11and 12.
2. R. K. Jain and S. R. K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.
3. M. D. Raisinghania, Advanced Differential Equation.
4. E. Kreyszig, Advanced Engineering Mathematics, Khanna Publisher.
5. J. J. Sciller, R. A. Srinivasan, M. R. Spiegel, Probability & Statistics, Schaum's outline series, McGraw Hill.

5. Outcome of the Course:

After the completion of the course the students will be able to

1) Understand the concept of matrices and their properties. Apply matrix operations to real-world problems, such as transformations and Markov chains.

2) Apply integration to solve problems in physics, engineering, and economics.

3) Solve first-order ODEs using various methods, such as separation of variables, integrating factors, and exact equations.

4) Understand the fundamental principles of permutations-combinations & probability-statistics.

Physics-II

1.1 Course Number: PY102
1.2 Contact Hours: 3-1-0 Credits: 11
1.3 Semester-offered: 1st Year – Even
1.4 Prerequisite: Class 10th level Physics &Mathematics
1.5 Syllabus Committee Members: Dr. Shikha Dwivedi & Dr. Nimisha Raghuvanshi

2. Objective:

i) Physics is a core science subject from which all engineering technologies have evolved, a thorough understanding of the basic principles and applied aspects will assist students in understanding, applying, and evolving technologies more effectively, thereby improving the quality of life in society.
ii) This course will provide the knowledge of the physical environment through observations and predictions.
iii) The course attempts to enhance the student's factual knowledge along with the applications. This will foster a scientific mindset and aid in the application of fundamental concepts and principles to engineering and technology-based challenges.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Wave motion and its applications**	Wave motion, Transverse and longitudinal waves with examples, Definitions of wave velocity, Frequency and Wavelength and their relationship, Sound and light waves and their properties, Wave equation, 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. Simple harmonic progressive wave and energy transfer, Free, Forced and resonant vibrations with examples, Acoustics of buildings. Ultrasonic waves: Introduction and properties, Applications of ultrasonics in engineering and medicals.	9
2	**Optics**	Basic optical laws of 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.	6
3	**Electrostatics**	Coulomb's law, Electric field, Electric lines of force and their properties, Electric flux, Electric potential and potential difference, Gauss law: Application of Gauss law, Calculation of electrostatic potential at a point due to point charge,	9

		Relation between potential and electric field intensity. 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 breakdown.	
4	**Current Electricity**	Electric Current, Resistance, Specific resistance, Conductance, Specific conductance, Series and parallel combination of resistances. Factors affecting resistance of a wire, Ohm's law and its verification, Kirchhoff's laws. Cells, Internal resistance, Concept of terminal voltage and Electromotive force (EMF). Chemical effect of current, Electrolysis, Faraday's law of electrolysis, Heating effect of current, Joule's law, Electric power, Electrical energy and related numerical problems, Advantages of electrical energy over other forms of energy.	8
5	**Magnetism & Electromagnetism**	Inverse square law of magnetism, Magnetic field and intensity, Magnetic lines of force, Magnetic flux, Ampere's circuital law, Solenoid, Torque on a current loop, Magnetic moment, Magnetic dipole, Moving coil galvanometer, Conversion of a galvanometer into ammeter and voltmeter. Uniform & non-uniform field, Magnetization, Earth's magnetism, Permanent magnets and electromagnets, Types of magnetic materials: Dia, para and ferromagnetic with their properties. Electromagnetic induction, Faraday's Laws, Lenz law, Self and mutual induction, Motional electromotive force, Eddy currents, Alternating current, Transformers (step-up & step-down), Displacement current, EM waves and its spectrum.	10
	Total		**42**

4. Readings

4.1 Textbooks:

1. Textbook of Physics for Class XII (Part-1, Part-2); N.C.E.R.T., Delhi

4.2 Reference Books:

1. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi.
2. Concepts in Physics by H. C. Verma, Vol. I & II, Bharti Bhawan Ltd., New Delhi.
3. Engineering Physics by P. V. Naik, Pearson Education Pvt. Ltd., New Delhi.

4. Engineering Physics by H. K. Malik and A. K. Singh, Mc Graw Hill.
5. Modern approach to Applied Physics- I and II, A. S. Vasudeva, Modern Publishers.
6. A Textbook of Optics, N. Subramanyam, Brij Lal, M. N. Avahanulu, S Chand and Company Ltd.
7. Introduction to Fiber Optics, Ajoy Ghatak and K. Thyagarajan, Cambridge University Press India Pvt. Ltd., New Delhi.

5. Outcomes of the Course:

After undergoing this subject, the student will be able to;

1) Explain wave motion, periodic motion as well as simple harmonic motion and their basic parameters such as amplitude, frequency, wavelength, velocity and related numerical problems. Also, able to describe ultrasonic waves and its applications in engineering, medical and industrial areas.
2) Understand the basic optical laws of refraction and reflection, establish the location and characteristics of the images formed by mirrors and lenses. Also, able to explain critical angle, total internal reflection and its applications.
3) Describe electric filed, electric flux, electric potential along with the examples, also able to explain the function of capacitors in simple circuits and solve simple problems.
4) Express electric current as flow of charge and concept of resistance. Also, able to list the effects of an electric current and its common applications, state Ohm's law, calculate the equivalent resistance of a variety of resistor combinations, determine the energy consumed by an appliance, Faraday's law, Joule's law and their numerical applications.
5) Understand magnetism, its intensity, flux and related laws, explain the operation of appliances like moving coil galvanometer. Also, able to differentiate among different types of magnetic materials for engineering applications, learn the eddy currents, alternating current, displacement current and applications of electromagnetic induction in transformers.
6) Have basic idea of atomic structure and modern Physics regarding wave-particle duality, uncertainty principle.

Chemistry-II

1.1 Course Number: CY102
1.2 Contact Hours: 3-0-0 Credits:9
1.3 Semester-offered: 1st Year –Even
1.4 Prerequisite: Class 10th level Chemistry & Mathematics
1.5 Syllabus Committee Members: Dr. Sabyasachi Pramanik & Dr. Souvik De

2. Objective:

i) To apply the fundamental concepts of chemistry for the understanding of process and technology relevant to industry.
ii) To become familiar with the scope, methodology, and application of modern chemistry and to learn to appreciate its ability to explain the physical world.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Organic Chemistry**	General introduction, IUPAC nomenclature of organic compounds. Electronic displacements in a covalent bond: inductive effect, electrometric effect, resonance and hyper conjugation. Homolytic and heterolytic fission of a covalent bond: free radicals, carbocations, carbanions; electrophiles and nucleophiles, types of organic reactions. Classification of Hydrocarbons: Aliphatic Hydrocarbon- Alkane, Alkene, Alkyne. Aromatic Hydrocarbon- Benzene: resonance, aromaticity; chemical properties: mechanism of electrophilic substitution – nitration sulphonation, halogenation, Friedel Craft's alkylation and acylation.	9
2	**Fuels & Combustion**	Sources of Energy, Fuels- classification, examples, relative merits, types of coal, Gaseous fuels: LPG, natural gas, CNG: Composition and applications. determination of calorific value of solid fuels, Bomb calorimeter, Knocking and anti-knocking for petrol and diesel (octane number and cetane number) - diesel index.	8
3	**Environmental Chemistry**	Industrial revolutions and pollution. Air/water/ soil pollution, greenhouse gas & effect, chemical reactions involved, acid rain, effects of depletion of ozone layer, greenhouse effect and global warming – pollution due to industrial wastes; pollution due to industrial wastes; strategy for control of environmental pollution.	6
4	**Chemical Kinetics**	Rate of a reaction (average and instantaneous), factors affecting rates of reaction: concentration, temperature, catalyst; order and molecularity of a reaction; rate law and specific rate constant, integrated rate equations and half life (only for zero and first order reactions); concept of collision	8

		theory (elementary idea, no mathematical treatment). Activation energy, Arrhenius equation.	
5	**Electrochemistry**	Redox reactions; conductance in electrolytic solutions, specific and molar conductivity variations of conductivity with concentration, Electrochemical cells: Galvanic cell (daniel cell); Electrode potential; electrochemical series and its applications; Nernst equation and it's application. Fundamental concept of corrosion.	8
	Total		**39**

4. Reading

4.1 Textbooks:

1. NCERT Textbook (Class XI and XII)
2. Engineering Chemistry, B. K. Sharma

4.2 References Books:

1. A Textbook of Engineering Chemistry, Sashi Chawla
2. Engineering Chemistry, Jain and Jain
3. Applied Chemistry, Dr.Raman Rani Mittal

5. Outcome of the Course:

After completion of this course students will able to

1) Explain why the element carbon gives rise to a variety of compounds, and how those organic compounds are classified and will learn about the naming of organic compound and basic concept of mechanism of organic reactions.

2) Understand the importance of chemistry related to the environment, energy and fuels and importance of fuels in our daily life. Knowledge of environmental pollutions, green chemistry.

3) Understand the factors that influence chemical reaction rates, reaction mechanisms, and the quantitative techniques used to describe those rates.

4) Understand the fundamental aspects of redox chemistry and the technologies made possible from discoveries in the field of electrochemistry and to identify the appropriate materials, design and operation conditions to reduce the likelihood of corrosion in engineering systems and operations.

Fundamentals of Electrical and Electronics Engineering

1.1 Course Number: EE101
1.2 Contact Hours: 3-1-0 Credits: 11
1.3 Semester-offered: 1st Year –Even
1.4 Prerequisite: Class 10th level Mathematics & Science
1.5 Syllabus Committee Members: Dr. Chinmayee Hazarika, Dr. M. Chakkarapani & Dr. Santosh Kumar Verma

2. Objective:

i) To impart basic knowledge of electrical quantities such as current, voltage, power, energy and frequency to understand the impact of technology in a global and societal context.
ii) To introduce the students about domestic wiring, the functioning of various electrical apparatus and the safety measures. Emphasize the effects of electric shock and precautionary measures.
iii) To establish the basic knowledge of DC and AC electric circuits and magnetic circuits and its application in generators, motors, transformers.
iv) To introduce the students about basic knowledge of electronic components like Diode, BJT, FETs, Op-Amp, Digital Circuits etc. and their application.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**DC Circuit Analysis**	Electrical circuit elements (R, L and C), voltage and current sources, Series and parallel resistive circuits, Ohm's Law, Kirchhoff's current and voltage laws, Nodal and Mesh analysis of simple circuits. Source Transformation, Superposition Theorem, Thevenin and Norton's Theorem.	9
2	**AC Circuit Analysis**	A.C. Circuits: Cycle, Frequency, Periodic time, Amplitude, Angular velocity, RMS value, Average value, Form Factor, Peak Factor, impedance, phase angle, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations. Three phase balanced circuits, voltage and current relations in star and delta connections.	8
3	**Magnetic Circuits and Electrical Machines**	Electromagnetic induction, Faraday's laws of electromagnetic induction, Lenz's law; Dynamically induced emf; Statically induced emf; Equations of self and mutual inductance; Ideal and Practical transformer, Principle of operation, EMF equation. Construction and Working principle of AC and DC machines; Basic equations and characteristic of motors.	7

4	**Semiconductor Devices**	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 diodes. Diode as rectifier –half wave and full wave rectifier, Working of BJT, BJT as amplifier.	9
5	**Introduction to Analog and Digital Circuits**	Introduction to Operational Amplifiers-Ideal, Practical Op-Amp, Inverting and Non-inverting amplifier. Introduction to Boolean Algebra, Logic Gates and their implementation as adder and subtractor, Flip-Flop and its application.	8
Total			**41**

4. Readings

4.1 Recommended Books:

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

5. Outcome of the Course:

After the completion of this course the students will be able to:

1) Demonstrate an understanding of the basic knowledge of electrical quantities such as current, voltage, power, energy and frequency to understand the impact of technology in a global and societal context.

2) Demonstrate an understanding of basic concepts of analysis of simple DC and AC circuits used in electrical devices like generators, motors and transformers etc.

3) Demonstrate an understanding of basic concepts of semiconductor material, electronics devices, and Digital electronics to perform the multidisciplinary tasks.

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Computer Programming

1.1 Course Number: CS102
1.2 Contact Hours: 2-0-2 Credits:8
1.3 Semester-offered: 1st Year –Even
1.4 Prerequisite: Class 10th level Computer knowledge
1.5 Syllabus Committee Members: Dr. Rupjit Saikia & Dr. Satish Kumar Tiwari

2. Objective:

To enable student, develop structured solutions to problems and implementing them using computers. This involves two parts: i) Formulating a solution for a given problem as a well-defined sequence of actions, and ii) Expressing solution in a machine-readable form or a programming language.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Basics of C Programming**	1.1 Introduction to number system 1.2 Introduction to flowchart and algorithm 1.3 History of C, where C stands 1.4 C character set, tokens, constants, variables, keywords 1.5 C operators (arithmetic, Logical, assignment, relational, increment and decrement, conditional, bit wise, special, operator precedence), C expressions data types. 1.6 Formatted input, formatted output.	6
2	**Decision Making**	2.1 Decision making and branching if statement (if, if-else, else-if ladder, nested if-else) Switch case statement, break statement. 2.2 Decision making and looping while, do, do-while statements for loop, continue statement.	9
3	**Arrays and Strings**	3.1 Arrays Declaration and initialization of one dimensional, two dimensional and character arrays, accessing array elements. 3.2 Declaration and initialization of string variables, string handling functions from standard library (strlen(), strcpy(), strcat(), strcmp()).	6
4	**Functions and Structures**	4.1 Functions: Need of functions, scope and life time of variables, defining functions, function call (call by value, call by reference), return values, storage classes. category of function (No argument No return value, No argument with return value, argument with return value), recursion. 4.2 Structures: Defining structure, declaring and accessing	7

		structure members, initialization of structure, arrays of structure.	
	Total		**28**

4. Readings

4.1 Recommended Books:

1. Programming in C by Sachaum Series, McGraw Hills
2. Programming in C by Kerning Lan and Riechle Prentice Hall of India, New Delhi
3. Programming in C by BalaguruSwamy, Tata McGraw Hill, New Delhi
4. Let us C by Yashwant Kanetkar, BPB Publications, New Delhi
5. Vijay Mukhi Series for C and C++
6. Programming in C by R Subburaj,Vikas Publishing House Pvt Ltd.,Jangpura, New Delhi
7. Programming in C by Kris A Jansa, Galgotia Publications Pvt. Ltd., Daryaganj, New Delhi
8. Programming in C by BP Mahapatra, Khanna Publishers, New Delhi
9. Elements of C by MH Lewin, Khanna Publishers, New Delhi

5. Outcome of the Course:

Student will be able to computationally formulate basic problems and write code snippets to execute them. Also, the students will be able to take decisions when to use an array, when to use loop and when to use conditional statements.

Engineering Workshop Practices Laboratory

1.1 Course Number: ME103L
1.2 Contact Hours: 0-0-3 Credits:3
1.3 Semester-offered: 1st Year –Odd/Even
1.4 Prerequisite: Class 10th level Mathematics
1.5 Syllabus Committee Members: Dr. Naveen Mani Tripathi, Dr. Sanat Kumar Singha, Dr. Abhimanyu Kar & Dr. Karthik Babu NB

2. Objective:

i) To get a hands-on basic training of various common manufacturing processes
ii) To understand the feasibility of different manufacturing processes depending on the raw materials and the product.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lab Sessions
1	**Carpentry**	Study of the joints in roofs, doors, windows and furniture, Hands-on-exercise: ɔodwork, joints by sawing, planning and cutting	2
2	**Fitting Shop**	Introduction and practice of various fitting processes: Use of hand tools in fitting, preparing a male and female joint of M.S.	3
3	**Welding Shop**	Introduction and practice of various Welding processes: Electric Arc welding Practice and Gas welding, TIG, MIG, Gas Cutting and application. Joints such as a Lap joint, a T-joint or a Butt joint are to be prepared.	2
4	**Machine Shop**	Introduction and practice of various Machining processes: Plain and Stepped cylindrical turning, grooving, knurling and Thread-cutting of a job in lathe.	3
5	**Sheet Metal Work**	Basics of Sheet Metal Work, essential properties required for sheet metal (malleable and formable), Forming & Bending, Model making – Trays and funnels, Different type of joints.	2
	Total		**12**

4. Readings

4.1 Textbooks:

1. Elements of Workshop Technology, Vol. I and II by Hajra Choudhary, Khanna Publishers
4.2 Reference Books:

1. Workshop Technology by WAJ Chapman, Viva Books
2. Workshop Manual by Kannaiah / Narayana,Scitech

5. Outcome of the Course:

1) Practical knowledge of the several manufacturing processes
2) Skills developed in carpentry, fitting welding, machining and sheet metal work
3) Basic idea of how things are produced in the industry

Chemistry Laboratory

1.1 Course Number: CY101L
1.2 Contact Hours: 0-0-2 Credits:2
1.3 Semester-offered: 1st Year –Odd/Even
1.4 Prerequisite: Class 10th level Chemistry
1.5 Syllabus Committee Members: Dr. Sabyasachi Pramanik & Dr. Souvik De

2. Objective:

i) To incorporate the habit of working in laboratory while maintaining discipline, safety and integrity.
ii) To provide hands-on experience on the basic methods of quantitative analysis.

3. Course Content:

Sl. No.	List of Experiments
1	Introduction of a Chemistry Laboratory
2	Preparation of standard solution of oxalic acid or potassium permanganate.
3	Determination of strength of given sodium hydroxide solution by titrating against standard oxalic acid solution using phenolphthalein indicator
4	Standardization of $KMnO_4$ solution using primary standard oxalic acid solution.
5	Determination of Fe content in Mohr Salt using $KMnO_4$ solution
6	Estimation of total hardness of given water sample using standard EDTA solution
7	Determination of Alkalinity of given water sample using known concentration of an acid
8	Determination of pH of given water sample
9	Determination of the total dissolved solid of a given water sample
10	Determination of viscosity of a solution using Ostwald viscometer

4. Outcome of the Course:

1) To prepare solution of a given strength
2) To use basic laboratory techniques and equipment such as titration, pH meter, viscometer etc.
3) To estimate of strength of acid /base and ions present in domestic/industry water
4) To estimate iron content in metal and alloys
5) To determine the quality of domestic/industry water

Fundamentals of Electrical and Electronics Engineering Laboratory

1.1 Course Number: EE101L
1.2 Contact Hours: 0-0-2 Credits:2
1.3 Semester-offered: 1st Year –Even
1.4 Prerequisite: Class 10th level Mathematics & Science
1.5 Syllabus Committee Members: Dr. Chinmayee Hazarika, Dr. M. Chakkarapani & Dr. Santosh Kumar Verma

1. Introduction to basic electrical circuit elements (R, L and C).
2. Study of CRO.
3. Measurement of Amplitude, Frequency and Time-period with the help of CRO.
4. Verification of the ohm's law.
5. Verification of KCL and KVL.
6. Verification of Mess and Nodal Analysis for the given circuits.
7. Verification of Basic Theorems (Thevenin, Norton and Superposition).
8. Study of Step-up and Step-down Transformer.
9. Analysis of RLC circuit.
10. Study of speed control of DC motor.
11. Study of V-I Characteristics of PN-Junction Diode.
12. Study the operation of Half Wave and Full Wave rectifier.
13. Study of BJT and FET Characteristics.
14. Study the operation of Op-Amp in Inverting and non-inverting mode.
15. Verification of Basic Logic Gates.

Recommended Books:

1. Mittle and Mittal, Basic Electrical Engineering, McGraw Education, New Delhi, 2015, ISBN :978-0-07-0088572-5
2. Theraja, B. L., Electrical Technology Vol – I, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924405
3. Sedha, R.S., A textbook of Applied Electronics, S. Chand, New Delhi, 2008, ISBN-13: 978-8121927833
4. Mehta, V.K., Mehta, Rohit, Principles of Electronics, S. Chand and Company, New Delhi, 2014, ISBN-13-9788121924504.

Community Internship

1.1 Course Number: HU103
1.2 Contact Hours: 1-1-0 Credits: 5
1.3 Semester-offered: 1st Year –Even
1.4 Prerequisite: NA
1.5 Syllabus Committee Members: All Faculties of AEI

2. **Objective:**

i) Explore career alternatives prior to graduation.
ii) Integrate theory and practice.
iii) Assess interests and abilities in their field of study.
iv) Learn to appreciate work and its function in the economy.
v) Develop work habits and attitudes necessary for job success.
vi) Develop communication, interpersonal and other critical skills in the job interview process.
vii) Build a record of work experience.
viii) Acquire employment contacts leading directly to a full-time job following graduation from college.

3. **Course Content:**

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	Understanding Society	Understanding Society Social structure and relationships, Social institutions and social groups, Socialization and social control: development of self	2
2	Community Health	Illness and Disease, Health and public health: Meaning, components, determinants of health, Wellbeing and Quality of life, Health as an aspect of social development, Nutrition and malnutrition, Community Health: relevance, needs assessment, developing mechanisms for people's participation, Community Mental Health	3
3	**Working with Groups**	Social Groups: Definitions, characteristics, functions and group structure, Principles of group work and Models of group work practice, Leadership - Theories of leadership, roles and responsibilities of group leader, Leadership Power, Leadership Styles, Leadership in Administration,	2

		Techniques and skills in group work, Group worker: roles and functions	
4	**Work with Communities**	Understanding Community: Definitions, types, approaches and framework, Community dynamics: Caste, class, religion and gender, Issues of identity, inclusion and exclusion, Community power structure, Community organization- principles, steps and process, Community work and community participation - Strategies and principles; Models and processes, Professionalism and inculcation of ethics in community practice	3
5	**Personality Development**	Definition of Personality, Determinants of Personality- biological, psychological and sociocultural factors, Communication, Flow and barriers of Communication, Listening, Spirituality and its role in personality development Stress: Causes, Management and Impact, Groups in organization, Interactions in group, Group Decision Taking, Team Building	2
6	**Development Communication**	Communication: concept, principles and its significance Process of Communication, Forms of communication: Verbal, non-verbal and written. Self-awareness in communication Barriers to communication	2
	Total		**14**

4. Readings

4.1 Suggested Readings:

1) Davis, K. 1969. Human Society, New York: The Macmillan.
2) Giddens, A.1999. Sociology, Cambridge: The Polity Press.
3) Dasgupta, M. & Lincoln, C.C. 1996, Health, Poverty and Development in India. New Delhi: Oxford University Press.
4) Trecker, H.B. 1972, Social Group Work: Principles and Practices. New York: Association Press.
5) Weil, M. (ed,) 1996, Community Practice: Conceptual Models. New York: The Haworth Press Inc.
6) Hergenhahn, B. R., &Olson., M. H. 2003, An Introduction to Theories of Personality, New Jersey: Prentice Hall.

5. Outcome of the Course:

As a result of participation in the course, students will be able to:

1) Assess and improve upon their own cultural competency skills.
2) Demonstrate understanding of theory and research guiding positive youth development programs.
3)Develop familiarity with positive youth development programs and approaches in building relationships with families and communities.
4) Understand how observation, documentation, and assessment are used to support children and families.
5) Develop applied professional skills to foster positive developmental outcomes for children and families.

Semester III

Algorithms

1.1 Course Number: CS201
1.2 Contact Hours: 3-0-2 Credits:11
1.3 Semester-offered: 2nd Year –Odd
1.4 Prerequisite: Class 11thand 12th Physics & Chemistry
1.5 Syllabus Committee Members: Dr. Abhimanyu Kar

2. **Objective:**

i) The objective of this course is to prepare the student with the algorithmic foundations of computing.

3. **Course Content:**

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Fundamentals**	Programming Models. Data Abstraction. Sets, Multisets, Stacks, Queues. Asymptotic and worst-case analysis of algorithms.	3
2	**Sorting**	The sorting problem. Bubble sort, Selection sort, Insertion sort, Mergesort, Quicksort.	9
3	**Searching**	Symbol Tables, Binary Search Trees, Balanced Search Trees. Hash Tables.	9
4	**Graph**	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.	9
5	**String**	String Sort. Tries. Substring Search. Regular Expressions. Elementary Data compression.	9
Total			**39**

List of Experiments

Sl no.	Experiments	Lab Sessions
1	Write a program to implement stacks and queues	2
2	Write a program to implement Bubble sort/selection sort/insertion sort	2
3	Write a program to implement quick sort	2
4	Write a program to implement binary sort and binary search	2
5	Write a program to implement a simple binary tree	2
6	Write a program to implement regular expression based substring search	2
		12

4. Readings

4.1 Textbooks:

1. Algorithms, Sedgewick and Wayne, Pearson
2. Introduction to Algorithms, Cormen, Leiserson, Rivestand Stein. MIT Press

4.2 Reference Books:

3. Introduction to Theory of Computation, Sipser Michael, Cengage Learnng.
4. Design & Analysis of Algorithms, Gajendra Sharma, Khanna Publishing House

5. Outcome of the Course:

1) Describe the fundamentals of material science and concepts of unit cell & crystallography.
2) Illustrate different properties of materials and co-relate to the practical applications of different material.
3) Apply different heat treatment processes according to their corresponding needs.
4) Describe the basic properties of ceramics, composites and alloys with their applications.

Data Structures

1.1 Course Number- CS202
1.2 Contact Hours- 3-0-2 Credits: 11
1.3 Semester Offered- 2nd Year Odd
1.4 Prerequisite: None
1.5 Syllabus Committee members- Dr. Abhimanyu Kar

2. Objective:

i) To provide strong foundation for implementing programming language to formulate, analyze and develop solutions related to various data structures problems.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Introduction**	Basic Terminology, Classification of Data Structures, Operations on Data Structures.	3
2	**Stack**	Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on a Stack, Applications of Stacks: Infix-to-Postfix Transformation, evaluating Postfix Expressions.	9
3	**Queue**	Introduction to Queues, Array Representation of Queues, Operations on a Queue, Types of Queues-De Queue, Circular Queue, Applications of Queues-Round Robin Algorithm.	9
4	**Linked List**	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.	9
5	**Non-linear Data Structures**	Tree: 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. Graph: Graph Terminologies, Representation of Graphs: Set, Linked, Matrix, Graph Traversals	9
Total			**39**

List of experiments

Unit	Practice Programs	Experiments
1	Write a program using recursive and non-recursive functions to perform search operation in a given list of integers using linear search technique	1
2	Search operation in a given list of integers using binary search technique	1
3	Write a program to implement insertion sorting for a given random data	1
4	Write a program to implement bubble sorting for a given random data	1
5	Write a program to implement quick sorting for a given random data	1
6	Write a program to implement selection sorting for a given random data	1
7	Write a program to implement heap sorting for a given random data	1
8	Write a program to implement hashing tables	1
9	Write a program to implement single linked list	1
10	Write a program to implement double linked list	1
11	Write a program to implement circular linked list	1
	Total	**11**

4. Readings

4.1 Textbooks/ 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, McGraw Hill Education, India.

5. Outcome of the Course:

Have a good understanding of Data Structures and its applications in algorithms.

Computer Architecture

1.1 Course Number- CS203
1.2 Contact Hours- 3-0-0 Credits:9
1.3 Semester Offered- 2nd Year Odd
1.4 Prerequisite: Fundamentals of Computer Engineering
1.5 Syllabus Committee members- Dr. Abhimanyu Kar

2. Objective:

i) To have a thorough understanding of the basic structure and operation of a digital computer, its architectures and computational designs.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Register Transfer and Micro Operations**	Computer Functional units, Von-Neumann architecture, Bus structures, Basic Operational Concepts, Data representation (Fixed and Floating point), Error detecting codes. Register transfer, Bus and memory transfers, Arithmetic micro-operations, Logic micro-operations, Shift micro-operations, and Arithmetic logic shift unit.	8
2	**Computer Arithmetic**	Control memory, Address sequencing, and design of control unit. Addition and Subtraction, Multiplication and Division algorithms, Floating point arithmetic operation, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Vector Pro-cessing, Array Processors.	7
3	**Microprocessor Architecture**	Instruction Set Architecture design principles from programmer's perspective. One example microprocessor (Intel, ARM, etc).	7
4	**Assembly Language Programming**	Simple Assembly language programs involving logical, branch and call instructions, sorting, evaluation of arithmetic expressions, string manipulation, assembler directives, procedures and macros.	7
5	**Memory and Digital Interfacing**	Addressing and address decoding, interfacing RAM, ROM, EPROM, programmable peripheral interface, various modes of operation and interfacing to processor, inter- facing keyboard, displays, etc.	7
Total			**36**

4. Readings:

4.1 Textbooks/ 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 Hardware/Software Interface (MIPS Edition) by Patterson and Hennessy

5. Outcome of the Course:

1) Have a good understanding of functioning of computer system as such and its various subcomponents.
2) Student will be able to understand computing requirement for a specific purpose, analyse performance bottlenecks of the computing device and choose appropriate computing device for a given use case.

Web Technologies and Mobile Computing

1.1 Course Number- CS204
1.2 Contact Hours- 3-0-2 Credits: 11
1.3 Semester Offered- 2nd Year Odd
1.4 Prerequisite: Computer Programming
1.5 Syllabus Committee members- Dr. Abhimanyu Kar

2. Objective:

1. To provide basic skills on tools, languages and technologies related to website development. Learnings from this course may be used in the Mini Project and summer internship.
2. To teaches how to build mobile apps for Android. Students are expected to work on a project as part of the course.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Web Systems Architecture**	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: Website design principles, planning the site and navigation. 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)	9
2	**Client Side Scripting**	Client side scripting, What is Java script, simple Java script, variables, functions, conditions, loops and repetition. Java script and objects, Java script's own objects, DOM and web browser environments, forms and validations DHTML: Combining HTML, CSS and Java script, 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	9
3	**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 my admin and database bugs.	9
4	**Android Basics**	Installing Android SDK Tools, Configuring Android in Eclipse IDE, Android Development Tools (ADT),	9

		Creating Android Virtual Devices (AVD). 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	
5	**Advanced Android Features**	Fragments life cycle, Interaction between fragments, Understanding the components of a screen (Layouts), Adapting to display orientation, Action Bar, Views(UI Widgets)-Button, Toast, Toggle But- ton, Check Box, Radio Button, Spinner, WebView, Edit Text, Date Picker, Time Picker, List View, Progress- Bar, Analog and Digital clock, Handling UI events, List fragment, Dialog fragment. Fragments life cycle, Interaction between fragments, Understanding the components of a screen (Layouts), Adapting to display orientation, Action Bar, Views(UI Widgets)-Button, Toast, Toggle But- ton, Check Box, Radio Button, Spinner, WebView, Edit Text, Date Picker, Time Picker, List View, Progress- Bar, Analog and Digital clock, Handling UI events, List fragment, Dialog fragment Fragments life cycle, Interaction between fragments, Understanding the components of a screen (Layouts), Adapting to display orientation, Action Bar, Views(UI Widgets)-Button, Toast, Toggle But- ton, Check Box, Radio Button, Spinner, WebView, Edit Text, Date Picker, Time Picker, List View, Progress- Bar, Analog and Digital clock, Handling UI events, List fragment, Dialog fragment	9
Total			**45**

Unit-wise distribution of content and number of Lab Sessions

No.	**Experiments**	**Lab Sessions**
1	Developing Web Application using HTML, JavaScript	2
2	Developing Advanced Web Application Programs using CSS	2
3	Practicing PHP: Basics	2
4	Practicing PHP: Web Application Development	2
5	Practicing PHP: My SQL tier Applications	2
6	Developing a fully functional Web Service Application using all the technologies learned in this course.	2
Total		**12**

4. Readings

4.1 Web Technologies:

1. 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.

4.2 Mobile Computing:

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

5. Outcome of the Course:

1) Student will be able to develop/build a functional website with full features.

Student will be able to develop and deploy basic mobile applications.

Digital Logic Circuits

1.1 Course Number: EIE214
1.2 Contact Hours:3-0-0 Credits:9
1.3 Semester-offered: 2nd Year –Odd
1.4 Pre-requisite: Fundamental of Electrical and Electronics Engineering
1.5Syllabus Committee Members: Dr. Chinmayee Hazarika, Dr.M. Chakkarapani & Dr. Santosh Kumar Verma

2. **Objective:**

i) To present a problem oriented introductory knowledge of Digital circuits and its applications.
ii) To help in understanding for future subjects like microprocessor and embedded systems.

3**. Course Content:**

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Digital Systems and Binary Numbers**	Digital systems, binary numbers, number base conversions, octal and hexadecimal numbers, complements, signed binary numbers, binary codes, error detection and error correction codes.	7
2	**Gate Level Minimization**	Positive and negative logic, pulse waveform, definition, symbols, truth tables, pulsed operations of NOT, OR, AND, NAND, NOR, EX-OR, EX-NOR gates, NAND and NOR implementation Karnaugh mapping techniques up to 4 variables and their applications.	7
3	**COMBINATIONAL CIRCUITS**	Design procedure, Binary Adder, Binary Subtractor, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, and Demultiplexers.	9
4	**SYNCHRONOUS SEQUENTIAL LOGIC**	Latches, SR Latch, Flip-flops, difference between latch and flip-flop, Conversion from one flip flop to another. Race around condition, JK flip-flop, master slave and their operation using waveform and truth tables.	6
5	**REGISTERS AND COUNTERS**	Registers, shift registers, ripple counters, synchronous counters, counters with unused states, ring counter, Johnson counter.	9
Total			**38**

4. Readings

4.1 Textbooks:

1. Digital Electronics by KS Jamwal, DhanpatRai& Co., New Delhi
2. Digital Electronics by Rajiv Sapra, Ishan Publication, Ambala
3. Digital Electronics by BR Gupta, Dhanpat Rai & Co., New Delhi
4. Digital Systems: Principles and Applications by RJ Tocci, Prentice Hall of India, New Delhi
5. Digital Electronics by Rajaraman V., Prentice Hall of India, New Delhi

4.2 Reference Books:

1. Digital Electronics and Applications by Malvino leach, Tata McGral Hill, New Delhi
2. Digital Logic Designs by Morris Mano, Prentice Hall of India, New Delhi
3. Digital Fundamentals by Thomas Floyds, Universal Book Stall
4. Digital Electronics by RP Jain, Tata McGraw Hill, New Delhi

5. Outcome of the Course:

1) Use digital electronics in the present contemporary world
2) Design various combinational digital circuits using logic gates
3) Do the analysis and design procedures for synchronous and asynchronous sequential circuits

Mathematics-III

1.1 Course Number- MA202
1.2 Contact Hours- 3-1-0 Credits: 11
1.3 Semester Offered- 2nd Year -Odd
1.4 Prerequisite: Class 12th level Mathematics
1.5 Syllabus Committee members- Dr. Abhimanyu Kar

UNIT 1: Solution of System of Equations

Solution of algebraic and transcendental equations: Fixed point iteration method, Bisection method, Fixed point iteration, Secant method, Regula Falsi, Newton Raphson method, Solution of linear system of equations, Gausse limination method, Gauss Jordan method, Iterative methods.

UNIT 2: Interpolation and Approximation

Difference operators and relations, Interpolation with equal intervals, Newton's Forward and Backward difference formulae, Interpolation with unequal intervals, Lagrange's interpolation, Newton's divided difference interpolation.

UNIT 3: Numerical Integration

Numerical integration using Quadrature formula, Trapezoidal, Simpson's 1/3 rule, Simpson's 3/8 rule.

UNIT4: Initial value problems for ordinary differential equations

Single step methods: Taylor's series method, Euler's method, Modified Euler's method, Fourth order Runge - Kutta method for solving first order equations.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Solution of System of Equations**	Solution of algebraic and transcendental equations: Fixed point iteration method, Bisection method, Fixed point iteration, Secant method, Regula Falsi, Newton Raphson method, Solution of linear system of equations, Gauss elimination method, Gauss Jordan method, Iterative methods.	10
2	**Interpolation and**	Difference operators and relations, Interpolation with equal	10

	Approximation	intervals, Newton's Forward and Backward difference formulae, Interpolation with unequal intervals, Lagrange's interpolation, Newton's divided difference interpolation.	
3	**Numerical Integration**	Numerical integration using Quadrature formula, Trapezoidal, Simpson's 1/3 rule, Simpson's 3/8 rule.	8
4	**Initial value problems for ordinary differential equations**	Single step methods: Taylor's series method, Euler's method, Modified Euler's method, Fourth order Runge - Kutta method for solving first order equations.	10
Total			**38**

4. Readings

Text Books

1) B.S. Grewal, "Numerical Methods in Engineering & Science", Khanna Publication, Ed. 9th.

2) E. Balagurusamy, "Numerical Method", Tata McGraw Hill Publication.

3) S.S. Sastry, "Introductory Methods of Numerical Analysis", PHI learning Pvt. Ltd.

4) Santosh K. Gupta"Numerical Methods for Engineers" New Academic Science Ltd; 3rd edition

Reference

1) Curtis F. Gerald and Patrick O. Wheatley, "Applied Numerical Analysis", Pearson Education.

2) M.K Jain, S. R. K. Iyengar and R.K Jain, "Numerical Methods for Scientific and Engineering computation", New age International Publishers.

Semester IV

Introduction to DBMS

1.1 Course Number:CS206
1.2 Contact Hours: 3-1-0 Credits: 11
1.3 Semester-offered: 2nd Year - Even
1.4 Prerequisite: None
1.5 Syllabus Committee Members: Dr. Abhimanyu Kar

2. Objective:

It covers the development of database-driven applications using the capabilities provided by modern database management system software. The concepts include conceptual modeling, relational database design and database query languages.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Introduction**	Database System Concepts and Architecture	4
2	**Data Modelling**	Data Modelling using the Entity-Relationship Model; The Enhanced Entity-Relationship (EER) model	8
3	**Relational Data Model**	The Relational Data Model and Relational Database Constraints; ER/EER to Relational Model map- ping; Relational Algebra and Relational Calculus	8
4	**SQL 99**	Schema definition, Constraints, Queries, and Views; Security; Introduction to SQL programming Techniques	8
5	**Functional Dependencies**	Functional dependencies and normalization for relational databases; Relational database design algorithms and further dependencies.	10
Total			**38**

4. Readings

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, McGraw-Hill, New Delhi, India.
4. Introduction to Database Systems, C.J.Date, Pearson Education
5. Introduction to SQL, RickF. VanderLans, Pearson Education

5. Outcome of the Course:

After completing the course, the students will understand

1) How to design a database, database-based applications
2) How to use a DBMS
3) The critical role of database system in designing several information system-based software systems or applications.

Scripting Language

1.1 Course Number- CS207
1.2 Contact Hours- 3-0-2 Credits: 11
1.3 Semester Offered- 2nd Year Even
1.4 Prerequisite: Computer Programming, Data Structures
1.5 Syllabus Committee members- Dr. Abhimanyu Kar

2. Objective:

To learn how to work with a scripting language.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
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)	4
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	10
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	10
4	**File I/O, Text Processing and Regular Expressions**	Understanding read functions, Understanding write functions, Programming using file operations, Powerful pattern matching and searching, Power of pattern searching using regex	10
5	**Frameworks**	Frameworks - Web2Py, Django, Ruby on Rails, Struts (any one of these or any other)	4
Total			**38**

Unit-wise distribution of content and number of Lab Sessions

No.	Experiments	Lab Sessions
1	Practice basic coding syntax	2
2	Write and execute scripts based on data types	1
3	Write and execute Python scripts with conditionals and loops	1
4	Write and execute Scripts based on Functions and Modules	1
5	File Processing scripts	1
6	Write and execute Regular Expressions	1
7	Write and execute SQL Queries	1
8	Write and execute scripts using DBI	1
9	Develop a simple web application	1
		10

Teacher may choose any one scripting language.

4. Readings

1. Taming Python by Programming, Jeeva Jose, Khanna Publishing House
2. Starting Out with Python, Tony Gaddis, Pearson
3. Core Python Programming, WesleyJ. 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

5. Outcome of the Course:

At the end of the course student will be able to build program with a scripting language and will be able to learn any other scripting language on their own.

Software Engineering

1.1 Course Number- CS208
1.2 Contact Hours- 3-0-0 Credits: 9
1.3 Semester Offered- 2nd Year Even
1.4 Prerequisite: Computer Programming
1.5 Syllabus Committee members- Dr. Abhimanyu Kar

2. Objective:

1. Inculcate essential technology and software engineering knowledge and skills essential to build a reasonably complex usable and maintainable software iteratively.
2. Emphasize on structured approach to handle software development.
3. Enhance communication skills.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Introduction**	Introduction to Software Engineering, Lifecycle, Process Models - Traditional v/s Agile processes.	8
2	**Development Activities**	Requirements Gathering and Analysis, Design Concepts, Software architecture and Architectural styles, Basic UI design, Effective Coding and Debugging techniques.	10
3	**Testing**	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.	8
4	**Project Management**	Project management concepts, Configuration and Release Management, Version Control and its tools (Git), Release Planning, Change Management, Software Maintenance, Project Metrics.	8
Total			**34**

4. Readings

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

5. Outcome of the Course:

The proposed course is expected to provide an introduction to software engineering concepts and techniques to undergraduate students, thus enabling them to work in a small team to deliver a

software system. The course content and project will introduce various software technologies, process and project management skills that are needed for the delivery of software in a team setting.

Advanced Programming

1.1 Course Number- CS209
1.2 Contact Hours- 3-0-0 Credits: 9
1.3 Semester Offered- 3rd Year Odd
1.4 Prerequisites: Computer Programming, Data Structures
1.5 Syllabus Committee members- Dr. Abhimanyu Kar

2. Objective:

1. Understanding the build system: IDE, tools for testing, debugging, profiling, and source code management.
2. Students are able to demonstrate proficiency in object-oriented programming.
3. Identify and abstract the programming task involved for a given programming problem.
4. Learning and using language libraries for building large programs.
5. Ability to apply defensive programming techniques (e.g., assertions, exceptions).

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Familiarity with the Programming Environment**	Understanding the build system, IDE, debugging, profiling (Eclipse TPTP / gprof / VTune etc.), and source code management	3
2	**Basic principles of the object-oriented development process**	Introduction to Object-Oriented Paradigm: Data encapsulation, modularity, code reuse, identifying classes, attributes, methods and objects, class relationships	5
3	**Advanced features of OOP**	Interfaces, inheritance, polymorphism, abstract classes, immutability, copying and cloning objects	5
4	**Unit Testing**	Unit testing, developing test suite	5
5	**Using language APIs**	Language supported libraries for handling advanced data structures	5
6	**Defensive programming**	Exception handling, assertions	5
7	**Modelling and Design patterns**	Basic modelling techniques –e.g. Class diagram, sequence diagram, use case diagrams, etc. Introduction to design patterns: iterator, singleton, flyweight, adapter, strategy, template, prototype, factory, façade, decorator, composite, proxy, chain of responsibility, observer, state)	5
Total			**33**

4. Readings

Text Books

T1. Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen, Kelli A.

Houston. Object-Oriented Analysis and Design with Applications.

T2. M. Scott. Programming Language Pragmatics. 4th edition.

Reference Books

1. R. Sebesta. Concepts of Programming Languages. 10th edition

2. J. Rumbaugh et al. The Unified Modeling Language Reference Manual.

3. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, and Grady Booch. Design Patterns:

Elements of Reusable Object-Oriented Software.

4. P. Van Roy and S. Haridi. Concepts, Techniques, and Models of Computer Programming.

5. https://missing.csail.mit.edu/

6. https://www.baeldung.com/junit

7. https://www.tutorialspoint.com/junit/index.htm

8. For UML tools, opensource tools may be used (e.g. www.starUML.io, argouml.tigris.org/

5. Outcome of the Course:

1) After attending the course, the student shall be able to calculate the amount of solar or wind energy that can be extracted at a given area from weather data and also calculate the specifications of the required equipment.
2) Being able to choose from the various energy storage methods available for intermitted power sources.
3) Understanding of the mechanism of direct use of solar energy in dryers, water heaters refrigerators etc.

Operating Systems

1.1 Course Number- CS210
1.2 Contact Hours- 3-0-0 Credits: 9
1.3 Semester Offered- 2nd Year Even
1.4 Prerequisite: Fundamentals of Computer Engineering
1.5 Syllabus Committee members- Dr. Abhimanyu Kar

2. Objective:

A general introduction to various ideas in implementation of operating systems, particularly UNIX. Introduce to various options available so as to develop capacity to compare, contrast, and evaluate the key trade-offs between different design choices.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Introduction**	Overview of Operating System, basic concepts, UNIX/LINUX Architecture, Kernel, services and systems calls, system programs.	4
2	**Processes and Memory**	Process Management: Process concepts, operations on processes, IPC, Process Scheduling, Multi- threaded programming Memory management: Memory allocation, Swapping, Paging, Segmentation, Virtual Memory, various faults.	8
3	**File Management**	File management: Concept of a file, access methods, directory structure, file system mounting, file sharing and protection, file system structure and implementation, directory implementation, free- space management, efficiency and performance. Different types of file systems	7
4	**Input/Output**	I/O System: Mass storage structure - overview, disk structure, disk attachment, disk scheduling algorithms, swap space management, RAID types.	8
5	**Security**	OS Security: Authentication, Access Control, Access Rights, System Logs	7
Total			**34**

4. Readings

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

5. Outcome of the Course:

Students should be able to demonstrate basic knowledge about Operating System, be able to apply OS concepts such as processes, memory and file systems to system design, able to configure OS in an efficient and secure manner.

Cloud Computing

1.1 Course Number- CS211
1.2 Contact Hours- 3-0-0 Credits: 9
1.3 Semester Offered- 3rd Year Even
1.4 Prerequisite: Computer Networks
1.5 Syllabus Committee members- Dr. Abhimanyu Kar

2. Objective:

The primary objective of this course is to provide students with a comprehensive understanding of cloud computing concepts, architectures, and services. The course aims to cover foundational aspects of cloud computing, practical implementation techniques, security considerations, and emerging trends in the field.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Introduction**	Definition and characteristics of Cloud Computing. History and evolution of cloud computing. Cloud service models: Infrastructure as a Service, Platform as a Service and Software as a Service. Cloud Deployment models: public, private, hybrid and community cloud.	6
2	**Cloud Architecture and Infrastructure**	Design and Management of Data centres. Energy efficiency and green data centres. Cloud networking concepts, software-defined networking (SDN). Stroage types and technologies, distributed file systems.	8
3	**Cloud Services and Applications**	Common Cloud Services (Compute, Storage, Database, etc.). Cloud Service Providers (AWS, Azure, Google Cloud). Cloud-Native Applications. Microservices Architecture. Overview of AWS, Azure, and Google Cloud Platforms. Key Services and Tools. Real-World Cloud Applications and Use Cases. Strategies and Best Practices for Cloud Migration.	8
4	**Cloud Security and Compliance**	• Security Threats and Vulnerabilities in Cloud • Security Best Practices and Standards • IAM Concepts and Solutions • Multi-Factor Authentication • Regulatory Compliance in Cloud Computing • Data Privacy Laws and Regulations	6
5	**Emerging Trends and Future Directions in Cloud Computing**	• Introduction to Edge Computing • Use Cases and Benefits • Concept and Benefits of Serverless Computing • Popular Serverless Platforms • AI and ML Services in Cloud • Real-World Applications • IoT Cloud Platforms • IoT Data Management and Analytics • Blockchain as a Service (BaaS)	6

		• Applications and Use Cases • Trends and Innovations in Cloud Computing • Challenges and Opportunities	
Total			**34**

4. Readings

4.1 "Cloud Computing: Concepts, Technology & Architecture" by Thomas Erl, Zaigham Mahmood, and Ricardo Puttini

4.2 "Cloud Computing Bible" by Barrie Sosinsky

4.3 "Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS)" by Michael J. Kavis

4.4 "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance" by Tim Mather, Subra Kumaraswamy, and Shahed Latif

4.5 "AWS Certified Solutions Architect Official Study Guide: Associate Exam" by Joe Baron, Hisham Baz, Tim Bixler, Biff Gaut, Kevin E. Kelly, and Sean Senior

5. Outcome of the Course:

Upon successful completion of this course, students will be able to:

1) Explain the fundamental concepts and characteristics of cloud computing, including different service and deployment models.

2) Describe and evaluate the architecture and infrastructure of cloud computing environments, including data centers, virtualization, and cloud storage.

3) Develop and deploy cloud-based applications using various cloud service providers and platforms.

4) Identify and address security and compliance challenges associated with cloud computing, and implement best practices for cloud security.

5) Analyze emerging trends and technologies in cloud computing, such as edge computing, serverless computing, and the integration of AI, ML, IoT, and blockchain with cloud environments.

Microprocessors and Applications

1.1 Course Number: EIE209
1.2 Contact Hours: 3-0-0 Credits: 9
1.3 Semester-offered: 2nd Year –Even
1.4 Pre-requisite: Digital Electronics
1.5Syllabus Committee Members: Dr. Chinmayee Hazarika, Dr. M. Chakkarapani, Dr. Santosh Kumar Verma.

2. Objective:

i) Understand the architecture of 8085 and 8086.
ii) Impart the knowledge about the instruction set.
iii) Understand the basic idea about the data transfer schemes and its applications.
iv) Develop skill in simple program writing for 8085 & 8086 and applications.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Introduction to microprocessor 8085**	Introduction to Microprocessor, Basic Block diagram of Microcomputer system, Architecture of 8085, Pin Diagram of 8085, Interrupts.	8
2	**Instructions and Programmingin 8085**	The instruction set of 8085, Timing Diagram, Programming of 8085.	9
3	**Introduction to Microprocessor 8086**	Introduction to 16-bit microprocessor, Introduction to 8086, Pin Diagram and Block Diagram of 8086 and Interrupts.	7
4	**Peripheral Interface**	Interfacing and I/O ports, PPI e.g. 8255 A, 8155 in detail, 8257 in detail, Serial I/O data communication.	8
5	**Semiconductor Memories**	RAM, SRAM, DRAM, ROM, EPROM, EEPROM, Flash Memory.	7
Total			39

4. Readings

1. Microprocessor Architecture, Programming and Applications with 8085 by RS Gaonkar
2. Microprocessor and Applications by B Ram
3. Comprehensive Study of Microprocessor by Naresh Grover
4. Introduction to Microprocessor by Adithya P Mathur, Tata McGraw Hill Publishers, New Delhi

5. Microprocessors and Microcontrollers by Krishna Kant, PHI Learning Private Limited.

5. Outcome of the Course:

After the completion of this course the student will be able to:

1) Understand and demonstrate the basic architecture of 8085 and 8086.
2) Impart the knowledge about the instruction set.
3) Understand the basic idea about the data transfer schemes and its applications.
4) Develop skill in simple program writing for INTEL 8085 and INTEL 8086.

Microprocessors and Applications Laboratory

1.1 Course Number: EIE209L
1.2 Contact Hours: 0-0-2 Credits: 2
1.3 Semester-offered: 2nd Year –Even
1.4 Pre-requisite: Digital Electronics
1.5Syllabus Committee Members: Dr. Chinmayee Hazarika, Dr. M. Chakkarapani, &Dr. Santosh Kumar Verma.

1. Study of 8085 Microprocessor kit.
2. Write a program using 8085 and verify for: a. Addition of two 8-bit numbers. b. Addition of two 8-bit numbers (with carry)
3. Write a program using 8085 and verify for: a. 8-bit subtraction (display borrow) b. 16-bit subtraction (display borrow).
4. Write a program using 8085 for multiplication of two 8- bit numbers by repeated addition method.
5. Check for minimum number of additions and test for typical data and write a program using 8085 for multiplication of two 8- bit numbers by bit rotation method and verify.
6. Write a program using 8085 for division of two 8- bit numbers by repeated subtraction method and test for typical data.
7. Write a program using 8085 for dividing two 8- bit numbers by bit rotation method and test for typical data.
8.Write a program to interface a two-digit number using seven-segment LEDs. Use 8085 microprocessor and 8255 PPI.
9. Write a program to control the operation of stepper motor using 8085 microprocessor and 8255 PPI.
10. Write a program for traffic light controller using 8085 microprocessor and 8255 PPI.

Recommended Books:

1. Microprocessor Architecture, Programming and Applications with 8085 by RS Gaonkar
2. Microprocessor and Applications by B Ram
3. Comprehensive Study of Microprocessor by Naresh Grover
4. Introduction to Microprocessor by Adithya P Mathur, Tata McGraw Hill Publishers, New Delhi
5. Microprocessor by SK Goel.
6. 8051 by Mcakenzie, Prentice Hall of India, New Delhi.

Semester V

Introduction to Data Science

1.1 Course Number- CS301
1.2 Contact Hours- 3-0-0 Credits: 9
1.3 Semester Offered- 3rd Year Odd
1.4 Syllabus Committee members- Dr. Abhimanyu Kar

2. Objective:

Introduce students to the domain of Data Warehousing and Data Mining

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
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 Sys- tem 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.	4
2	**Data Warehousing and Online 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.	12
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.	10
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	4

		(or Learning from Your Neighbors).	
5	**Cluster Analysis**	Basic Concepts of Cluster Analysis, Clustering Structures, Major Clustering Approaches, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Model-Based Clustering, Why outlieranalysis, 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	4
Total			**34**

4. Readings

4.1 JiaweiHan, Micheline Kamber, JianPei, Data Mining: Concepts and Techniques, Elsevier

4.2 Margaret HDunham, Data Mining Introductory and Advanced Topics, Pearson Education

4.3 Amitesh Sinha, Data Warehousing, Thomson Learning, India.

4.4 Xingdong Wu,Vipin Kumar, the Top Ten Algorithms in Data Mining, CRC Press, UK.

5. Outcome of the Course:

Student will have general idea about Artificial Intelligence, will be able to explore AI tools effectively.

Computer Networks

1.1 Course Number- CS302
1.2 Contact Hours- 2-1-0 Credits: 8
1.3 Semester Offered- 3rd Year Odd
1.4 Prerequisite: Fundamentals of Computer Engineering
1.5 Syllabus Committee members- Dr. Abhimanyu Kar

2. Objective:

Understand functioning of computer networks and popular networking protocols

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Introduction**	Introduction to computer networks; Network Models- OSI Reference Model, TCP/IP Model	5
2	**Transmission Media**	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	5
3	**Network Layer**	Network Layer - design issues, example protocols (IPv4); Routing - principles/issues, algorithms (Distance-vector, Link-state) and protocols (RIP, OSPF);	5
4	**Transport Layer**	Transport Layer - design issues, example protocols (TCP); Application Layer Protocols (SMTP, DNS).	5
5	**Network Devices**	Functioning of Network Devices – NIC, Hub, Switch, Router, WiFi Devices; Network Management System and example protocol (SNMP).	5
	Total		**25**

4. Readings

4.1 Textbooks:

1. Rafiq I. Noorani, Rapid Prototyping, “Principles and Applications”, Wiley & Sons, 2006.
2. Chua C.K., Leong K.F., and Lim C.S., Rapid prototyping: Principles and applications, Third edition, World Scientific Publishers, 2010.

4.2 Reference Books:

1. Computer Networks, 4th Edition (or later), Andrew S. Tanenbaum, PHI
2. TCP/IP Illustrated, Volume-1, W. Richard Stevens, Addision Wesley
3. Data and Computer Communications, William Stallings, PHI

4. An Engineering Approach to Computer Networking, S. Keshav, Addision Wesley/Pearson
5. An Integrated Approach to Computer Networks, Bhavneet Sidhu, Khanna Publishing House

5. Outcome of the Course:

1. Understanding of computer networks, issues, limitations, options available.
2. Understanding of the care that needs to be taken while developing applications designed to work over computer networks
3. Able to configure basic LAN and connect computers to it.

Machine Learning and AI

1.5 Course Number- CS303
1.6 Contact Hours- 3-1-0 Credits: 11
1.7 Semester Offered- 3rd Year Odd
1.8 Prerequisites: Mathematics I, Mathematics II and Mathematics III
1.9 Syllabus Committee members- Dr. Abhimanyu Kar

2. Objective:

To introduce students to the domain of Machine Learning and Artificial Intelligence.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Introduction**	AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)	8
2	**Advanced Search**	Constructing Search Trees, Stochastic Search, AO* Search Implementation, Minimax Search, Alpha-Beta Pruning Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem	10
3	**Machine Learning**	Introduction. Machine Learning Systems, Forms of Learning: Supervised and Unsupervised Learning, reinforcement – theory of learning – feasibility of learning – Data Preparation– training versus testing and split.	10
4	**Supervised Learning**	Linear Regression, multi linear regression, Polynomial Regression, logistic regression, Non-linear Regression, Model evaluation methods. Classification: – support vector machines (SVM) , Naïve Bayes classification	5
5	**Unsupervised learning**	Nearest neighbor models – K-means – clustering around medoids – silhouettes – hierarchical clustering – k-d trees ,Clustering trees – learning ordered rule lists – learning unordered rule. Reinforcement learning- Example: Getting Lost -State and Action Spaces	5
Total			**38**

4. Readings

1. Deepak Khemani. A First Course in Artificial Intelligence, McGraw Hill Education (India)
2. MACHINE LEARNING An Algorithmic Perspective 2nd Edition, Stephen Marsland,2015, by Taylor & Francis Group, LLC
3. https://nptel.ac.in/courses/106106126/

4. Stefan Edelkamp and Stefan Schroedl. Heuristic Search,Morgan Kaufmann.
5. Pamela McCorduck, Machines Who Think: A Personal Inquiry into the History and
6. Prospects of Artificial Intelligence, AK Peters/CRC Press
7. Elaine Rich and Kevin Knight. Artificial Intelligence, Tata McGraw Hill.
8. Stuart Russell and Peter Norvig. Artificial Intelligence: A Modern Approach, Prentice Hall M.C. Trivedi, A classical approach to Artificial Intelligence, Khanna Publishing House

5. Outcome of the Course:

1) Student will have general idea about Artificial Intelligence, will be able to explore AI tools effectively.

Humanities

1.1 Course Number: HU301
1.2 Contact Hours: 2-0-0 Credits: 6
1.3 Semester-offered: 3rd Year –Odd
1.4 Prerequisite: Diploma level English
1.5 Syllabus Committee Members: DUGC

2. Objective:

i) Foster intellectual curiosity, global knowledge, critical thinking, personal responsibility, and ethical and cultural awareness.
ii) Prepare students to use language effectively.
iii) Establish a framework for students to develop an aesthetic appreciation for fine arts.
iv) Prepare students to be responsible citizens, lifelong learners, and world-ready leaders in their chosen fields.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Introduction to Sociology**	Definition of sociology, some sociological concepts: social structure, status, role, norms, values etc. Socialization, and culture and change. Social stratification - various approaches and concept of social mobility. Population and society - Trends of demographic change in India and the world, Human Ecology, Trends of Urbanization in the developing countries and the world. Major social institutions - Family and marriage, caste and tribe and organizations: (i) formal organization (bureaucracy) (ii) informal organization. Processes of social change - Modernization (including Sanskritization), industrialization, environmental/ecological changes and development. Social movements - protest movements, reformist movement and radical movements in India.	9
2	**Introduction to Literature**	Nature of Literature: Literature as a Humanistic Experience. Definitions: (i) Humanities: concern with culture, values, ideologies; (ii) Literature: concepts of imitation, expression, intuition & imagination. Major Themes of Literature: Nature, Science, Selfhood, Love, Rebellion. The Language of Literature: Modes of literary and non-literary expression. The concepts of Figurative language, imagery, symbolism, style. The Forms of Literature: Prose Narratives (short stories & novels) Poetry, Drama and Essays (Suitable texts are to be chosen by the instructors), Use of a Learner Dictionary.	7

3	**Introduction to Philosophy**	Philosophy and History of Science: Growth of scientific knowledge: factors leading to the emergence of modern science. Conceptual evolution: internal and external history. Methodology of science: induction, falsifications, confirmation and probability. Nature of scientific laws and theories: realism, instrumentalism, and under-determination. Relationship between scientific observation, experiment and scientific theory. Nature of scientific explanation: teleological explanations and the covering law model. Selected case studies on scientific theories. Logic and the nature of mathematical reasoning: Inductive and deductive forms of reasoning. Nature of axioms: formal axiomatic systems. Concept of consistency, independence, and completeness. Nature of rules of inference and proof. Selected examples of axiomatic systems and proof procedures. Cognition: Current approaches to the understanding of mind and mental processes: empiricist, rationalist, behaviorist and cognitivist. Ethics: Impact of science and technology on man and society: elements of environmental and professional ethics	7
Total			**23**

4. Readings:

4.1 Textbook/Reference Books:

(A) Introduction to Sociology:

(a) L. Broom, P. Selznick and D. Dorrock, Sociology, 11th Edn. 1990 (Harper International).
(b) M. Haralambos, Sociology: Themes and Perspectives, Oxford University Press, 980.
(c) M.S.A. Rao (ed) Social movements in India, vols. 1-2, 1984, Manohar.
(d) David Mandelbaum, Society in India, 1990, Popular.
(e) M.N. Srinivas, Social change in modern India, 1991, Orient Longman.
(f) Guy Rocher, A. General Introduction to Sociology, MacMillan, 1982.

(B) Introduction to Literature:

(b) David Murdoch (ed.). The Siren's Song: An Anthology of British and American Verse, Orient Longman, 1988.
(c) S. Alter & W. Dissanayake (eds.) The Penguin Book of Modern Indian Short Stories. Penguin Books (India), 1989.
(d) Bertrand Russell, Impact of Science on Society. Allen &Unwin, 1952.
(e) Henrik Ibsen, A Doll's House, Macmillan India, 1982.
(f) George Orwell, Animal Farm, Penguin, 1951.
(g) J. Bronowski. The Ascent of Man, BBC, 1973.

(C) Introduction to Philosophy:

(a) A.C. Grayling (ed.) Philosophy: A Guide through the Courses/Subjects, Oxford Univ. Press, London, 1995.
(b) Marx W. Wartofsky, Conceptual Foundations of Scientific Thought: An Introduction to the Philosophy of Science, Macmillan, London, 1968.

(c) I.B. Cohen, The Birth of a New Physics, Vakils, Feffer and Simons Pvt. Ltd., Bombay, 1968.
(d) H. Eves and C.V. Newsom, Foundations and Fundamental Concepts of Mathematics, Boston, PWS-Kart Pub. Co., 1990.
(e) K.E. Goodpaster and K.M. Sayre (eds.) Ethics and Problems of 21st Century, Univ. of Notre Dame Press, London, 1979.
(f) S.D. Agashe, A. Gupta & K. Valicha (eds.) Scientific Method, Science, Technology and Society: A Book of Readings, Univ. of Bombay Press, 1963.

5. Outcome of the Course:

Students will demonstrate:

Knowledge of the conventions and methods of at least one of the humanities in addition to those encompassed by other knowledge areas required by the General Education program.

Engineering Economics

1.1 Course Number: MT301
1.2 Contact Hours: 2-1-0 Credits: 8
1.3 Semester-offered: 3rd Year –Odd
1.4 Prerequisite: Diploma level Mathematics
1.5 Syllabus Committee Members: DUGC

2. Objective:

i) To make fundamentally strong base for decision making skills by applying the concepts of economics.
ii) Educate the students on how to systematically evaluate the various cost elements of a typical manufactured product, an engineering project or service, with a view to determining the price offer.
iii) Prepare engineering students to analyze profit/revenue data and carry out make economic analysis in the decision-making process to justify or reject alternatives/projects.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Introduction to Economics**	Introduction to economics – Flow in an economy – Law of supply and demand – Concept of engineering economics – Engineering efficiency – Economic efficiency – Scope of engineering economics – Element of costs – Marginal cost – Marginal revenue – Sunk cost – Opportunity cost – Break-even analysis – V ratio – Elementary economic analysis – Material selection for product design selection for a product – Process planning.	10
2	**Value Engineering**	Make or buy decision – Value engineering – Function – Aims – Value engineering procedure – Interest formulae and their applications –Time value of money – Single payment compound amount factor – Single payment present worth factor – Equal payment series sinking fund factor – Equal payment series payment Present worth factor – Equal payment series capital recovery factor – Uniform gradient series annual equivalent factor – Effective interest rate – Examples all methods.	8
3	**Cash Flow**	Methods of comparison of alternatives – Present worth method (Revenue dominated cash flow diagram) – Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram) – Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cash flow diagram) – Rate of return method – Examples all methods.	8
	Total		**26**

4. Readings:

4.1 Textbooks:

1. Panneer Selvam, R., “Engineering Economics”, Prentice Hall of India Ltd, 2001.
2. Smith, G.W., “Engineering Economy”, Lowa State Press, 1973.

4.2 Reference books:

1. Park, C.S., “Contemporary Engineering Economics”, Prentice Hall of India, 2002.
2. Newman, D.G. and Lavelle, J.P., “Engineering Economics and Analysis”, Engineering Press, 2002.
3. Degarmo, E.P., Sullivan, W.G. and Canada, J.R, “Engineering Economy”, Macmillan, 1984.
4. Grant, E.L., Ireson, W.G. and Leavenworth, R.S., “Principles of Engineering Economy”, Ronald Press, 1976.

5. Outcome of the Course:

Upon completing the course, students will be able to:

1) Understand major principles of economic analysis for decision making among alternative courses of action in engineering.
2) Apply economic principles to prices and quantities in competitive supply and demand for goods and for money.
3) Solve economic problems involving comparison and selection of alternatives by using analytical techniques including benefit-cost ratio and breakeven analysis.

Advanced Programming Laboratory

1.1 Course Number- CS304L
1.2 Contact Hours- 0-0-3 Credits: 3
1.3 Semester Offered- 3rd Year Odd
1.4 Prerequisite: Computer Programming, Data Structures
1.5 Syllabus Committee members- Dr. Abhimanyu Kar

2. Objective:

i) To apply the theoretical concepts learnt in Advanced Programming Theory course.

3. Course Content:

Unit-wise distribution of content and number of Lab Sessions

Unit	Topics	Lab Sessions
1	**Using IDE**	4
2	**Object Oriented Programming**	4
3	**Testing and Development**	4
		12

4.Outcome of the Course:

After this course the student should be able to write an objected oriented computer program and deliver a working program after debugging and testing.

Departmental Elective

Internet of Things

1.1 Course Number- CS305
1.2 Contact Hours- 3-0-0 Credits: 9
1.3 Semester Offered- 3rd Year Odd
1.4 Prerequisite: Computer Networks
1.5 Syllabus Committee members- Dr. Abhimanyu Kar

2. Objective:

Internet of Things (IoT) is presently an important technology with wide ranging interest from Government, academia and industry. IoT cuts across different application domain verticals ranging from civilian to defense sectors which includes agriculture, space, health care, manufacturing, construction, water, mining, etc. Today it is possible to build different IoT solutions such as shopping system, infrastructure management in both urban and rural areas, remote health monitoring and emergency notification systems, and transportation systems. Therefore, it is very important to learn the fundamentals of this emerging technology.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Introduction**	Introduction to IoT; Sensors and actuators	4
2	**Communication**	Basics of IoT Networking, Communication Protocols, Sensor networks	12
3	**Communication**	Basics of IoT Networking, Communication Protocols, Sensor networks	10
4	**Programming**	Implementation of IoT with Raspberry Pi; Data Handling Analytics	4
5	**Applications**	Case Studies: Agriculture, Healthcare, Activity Monitoring	4
Total			**34**

Readings

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

Outcome of the Course:

Students will have good understanding of various aspects of IoT, know some tools and have basic implementation skills.

Digital Image Processing

1.1 Course Number- CS306
1.2 Contact Hours- 3-0-0 Credits: 09
1.3 Semester Offered- 3rd Year Odd
1.4 Prerequisites: Mathematics I, Mathematics II and Mathematics III
1.5 Syllabus Committee members- Dr. Abhimanyu Kar

2. Objective:

The objective of this course is to provide the fundamentals and different levels of processing of digital images. This course introduces the steps and components of image processing, how digital images are acquired, sampled, quantized and the relationship between pixels. In image enhancement and restoration both spatial and frequency domain techniques are utilized. Segmentation techniques explained with edge detection and morphological processing. This course addresses the compression techniques and standards for efficient storage. It also deals with the techniques to extract features for image representation and recognition.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Digital Image Fundamentals**	Digital Image Representation – Fundamental steps in Image Processing)– Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - colour models.	3
2	**Image Enhancement**	Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering – Frequency Domain: 2D Fourier Transform – Smoothing and Sharpening frequency domain filters.	9
3	**Image Restoration and Segmentation**	Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering. Segmentation: Edge detection Edge Linking and Boundary detection – Region based segmentation- Morphological processing- erosion and dilation.	9
4	**Image Compression and Representation**	Compression: Fundamentals – Image Compression models – Error Free Compression – Lossy compression– Image Compression standards	9
5	**Image Representation and Recognition**	Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments – Boundary description – Shape number – Fourier Descriptor, moments- Regional Descriptors –Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.	9

Total	39

4. Readings

4.1 Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image Processing Using MATLAB”,

4.2 Third Edition Tata Mc Graw Hill Pvt. Ltd., 2011. 2. Willliam K Pratt, “Digital Image Processing”, John

4.3 Willey, 2002. 3. Malay K. Pakhira, “Digital Image Processing and Pattern Recognition”, First Edition, PHI Learning Pvt. Ltd., 2011.

5. Outcome of the Course:

Students will have good understanding of various aspects of IoT, know some tools and have basic implementation skills.

Multimedia Technologies

1.1 Course Number- CS307
1.2 Contact Hours- 3-0-0 Credits: 9
1.3 Semester Offered- 3rd Year Odd
1.4 Prerequisite: Fundamentals of Computer Engineering, Computer Programming
1.6 Syllabus Committee members- Dr. Abhimanyu Kar

2. Objective:

To introduce students to the domain of Multimedia Technologies, which explain the technologies underlying digital images, videos and audio contents, including various compression techniques and standards, and the issues to deliver multimedia content over the Internet.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Introduction to Multimedia**	Multimedia Foundation and Concepts: Multimedia Hardware, Multimedia Software , Multimedia operating systems , Multimedia communication system	8
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	10
3	**Content Development and Distribution**	Desktop publishing (Coral Draw, Photoshop, Page maker) Multimedia Animation & Special effects (2D/3D animation, Flash)	10
4	**Introduction to Digital Imaging**	Basics of Graphic Design and use of Digital technology, Definition of Digital images, Digital imaging in multimedia	5
5	**Multimedia Programming**	Introduction to Multimedia Programming and Applications	5
Total			**38**

2 Readings

2.3.1 An Introduction to Multimedia Authoring, A. Eliens

2.3.2 Fundamentals of Multimedia, Prentice Hall/Pearson, Ze-NianLi & MarkS. Drew.

2.3.3 Multimedia and Animation, V.K.Jain, Khanna Publishing House, Edition 2018

2.3.4 Fundamentals of Multimedia, Ramesh Bangia, Khanna Book Publishing Co., N. Delhi (2007)

3 Outcome of the Course:

Student will understand various aspects of Multimedia and related standards. Student will be able to build multimedia content and applications and also multimedia enable Web applications and mobile applications.

Information Security

1.1 Course Number- CS308
1.2 Contact Hours- 3-0-0 Credits: 9
1.3 Semester Offered- 3rd Year Odd
1.4 Prerequisite: Computer Networks
1.5 Syllabus Committee members- Dr. Abhimanyu Kar

2. Objective:

i) To learn how to evaluate and enhance information security of IT infrastructure and organisations.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Introduction**	Introduction to Information Security, Various aspects of information security (PAIN), Security Fea- tures of Operating Systems – Authentication, Logs, Audit Features, File System Protection, User Priv- ileges, RAID options, Anti-Virus Software, etc.	6
2	**Weaknesses in Existing Systems**	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)	9
3	**Encryption**	Basics of Cryptography, PKI, Security considerations while developing softwares	9
4	**Network Security Productions**	Network Security Products – Firewall, IDS/IPS, VPN Concentrator, Content Screening Gateways, etc.	9
5	**Laws and Standards**	Introduction to Security Standards – ISO 27001, Indian IT Act, IPR Laws; Security Audit procedures; Developing Security Policies; Disaster Recovery, Business Continuity Planning.	6
Total			**39**

4. Readings

4.1 Information Security and Cyber Laws, Sarika Gupta, Khanna Publishing House
4.2 RFCs of protocols listed in content (https://www.ietf.org)
4.3 Various Acts, Laws and Standards (IT Act, ISO27001 Standard, IPR and Copyright Laws, etc.)
4.4 Security Guideline documents of Operating Systems (OS Manual, Man Pages, etc)

4.5 https://www.cert-in.org.in/
4.6 https://www.sans.org/

5. Outcome of the Course:

Understanding of security needs and issues of IT infrastructure. Have basic skills on security audit of networks, operating systems and application software.

Open Elective
Introduction to e-Governance

1.1 Course Number- CS309
1.2 Contact Hours- 3-0-0 Credits: 9
1.3 Semester Offered- 3rd Year Odd
1.4 Prerequisite: Fundamentals of Computer Engineering
1.5 Syllabus Committee members- Dr. Abhimanyu Kar

2. Objective:

To cover the concepts of e-Governance and to understand how technologies and business models shape the contours of government for improving citizen services and bringing in transparency.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Introduction**	Exposure to emerging trends in ICT for development; Understanding of design and implementation of e-Government projects, e-governance lifecycle.	8
2	**Need for e-Governance**	Need for Government Process Re-engineering (GPR); National e-Governance Plan (NeGP) for India; SMART Governments & Thumb Rules	8
3	**Architecture of e-Governane**	Architecture and models of e-Governance, including Public Private Partnership (PPP); Need for In- novation and Change Management in e-Governance; Critical Success Factors; Major issue including corruption, resistance for change, e-Security and Cyber laws	7
4	**Indian Initiatives**	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.	7
5	**Mini Projects**	Mini Projects by students in groups – primarily evaluation of various e-governance projects.	6
Total			**36**

4.Readings

4.1 Managing Transformation –Objectives to Outcomes. J Satyanarayana, Prentice Hall India
4.2 The State, IT and Development. Kenneth Kenniston, RK Bagga and Rohit Raj Mathur, Sage Publications India Pvt Ltd.
4.3 e-Government -The Science of the Possible. J Satyanarayana, Prentice Hall, India
4.4 http://www.csi-sigegov.org/publications.php
4.5 https://negd.gov.in
4.6 https://www.nisg.org/case-studies-on-e-governance-in-india

5. Outcome of the Course:

Through exposure to introductory ideas and practices followed in a selected number of e-Governance initiatives in India, the course will help students to understand and appreciate the essence of e-Governance.