LNCT University B. Tech CSE

II Semester Syllabus

Advanced Physics & Sustainable Environment (CS-201)

COURSE OUTCOMES:

After Completing the course student should be able to:

CO1	Apply physical significance of gradient, divergence and curl on various surfaces in engineering physics
CO2	Determine various parameters related to laser, fibre optics and optics
CO3	Find position and momentum of free particle by Schrodinger wave equation
CO4	Analyse and compare energy storage technologies
CO5	Study and analyse social issues and environmental ethics

COURSE CONTENTS:

Unit I Electrodynamics & Solid State Physics: Gradient, divergence and curl, Gauss divergence and Stoke's theorem, Equation of Continuity, Maxwell;s equations, Maxwell;s equations in vacuum. Qualitative discussion of Kronig Penny model (no derivation), Fermi-Dirac statistical distribution function, Fermi level for Intrinsic and Extrinsic Semiconductors, PN junction diode, Zener diode, photodiode, Hall effect.

Unit II Quantum Physics & LASER:Group and particle velocities & their relationship, Heisenberg's uncertainty principle, Wave function and its properties, energy and momentum operators, time dependent and time independent Schrödinger wave equation. Application of time independent Schrödinger wave equation. Stimulated and spontaneous processes, Einstein's A & B Coefficients, active medium, population inversion, pumping, Optical resonators, Characteristics of laser beam, Coherence length, Principles and working of Ruby, He-Ne lasers with energy level diagram, Applications of laser.

Unit III -- Optical Fiber and wave optics: Fundamental idea about optical fiber, acceptance angle & cone, numerical aperture, V-number, Types of optical fiber, Number of modes.Applications of optical fibers.Interference of light, Division of amplitude, Interference in thin films (due to reflected and transmitted light), interference from a wedge shaped thin film, Newton's rings experiment. Diffraction of light, Diffraction at single slit and N-slits or grating.

UNIT IV: Physics of Renewable Energy Systems &Sustainable Energy:Basics of nano-materials and nanotechnology, Renewable energy sources and classifications.Unsustainable to Sustainable developments (Goals).Energy storage Technology: Introduction to energy storage for power systems and applications, solar energy (Photo voltaic cell), fuel cells, Mobile storage system: electric vehicle.

UNIT V: Social Issues and Environment: Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.

Reference /Books: -

1. Engineering Physics by R K Gaur & S L Gupta, Dhanpat Rai Publications
2. A Text Book of Engineering Physics – M N Avadhanulu,P G Kshirsagar, S Chand & Company Ltd (VI revised Edition)
3. A Text Book of Engineering Physics – N. Gupta & S.K. Tiwari , Dhanpat Rai & Co. , Delhi
4. Advanced renewable Energy Systems, S C Bhatia
5. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
6. Online MOOCS/SWAYAM NPTEL Courses
7. List of suggestive core experiments: - (Any ten)
    1. Measurement of energy band gap of semiconductor. (2) V-I Characteristics of PN Junction diode
    2. V-I Characteristics of Zener diode
    3. V-I Characteristics of Photo diode
    4. V-I Characteristics of Solar cell (Photo-Voltaic Cell)
    5. Measurements by LASER- To find the width of s single slit by He-Ne Laser..
    6. Measurements by Fibre optics - To determine various parameters by Optical Fibre.
    7. Newton's Rings Experiment 9.Spectrometers- Wavelength, using grating
    8. Spectrometers-R.I, using prism
    9. To study Hall effect. To determine plank's constant.
    10. Uses of Potentiometers and Bridges (Electrical) & CRO.
    11. Other conceptual experiments other than theory syllabus

Linear Algebra and Optimization (CS-202)

COURSE OUTCOMES:

After Completing the course student should be able to:

CO1	Solve analytical problems of algebra
CO2	Use the concept of matrices decomposition in relevant fields.
CO3	Analyse statistical techniques to handle problems.
CO4	Develop the logics that is useful in engineering.
CO5	Investigate the tools to optimize problems.

Course Contents

UNIT I Vector Spaces: Vector Space, Vector Sub Space, Linear Combination of Vectors, Linearly Dependent, Linearly Independent, Basis of a Vector Space, Linear Transformations.

UNIT II Matrix Decomposition: Determinant and Trace, Cramer's rule, LU- decomposition, Cholesky Decomposition, Eigen decomposition, Singular Value decomposition(SVD),Gram-Schmidt orthogonalization.

UNIT III Concept of Probability: Probability Mass function, Probability Density Function, Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution.

UNIT IV Applied Statistics: Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

UNIT V Small samples: Test for single mean, difference of means and correlation coefficients, test for ratio of variances, Chi-square test for goodness of fit and independence of attributes.

Reference Books: -

1. K. Hoffman and R. Kunze: Linear Algebra, 2nd Edition, Prentice Hall of India, 2005
2. S. Axler: Linear Algebra Done Right, 2nd Edition, Springer UTM, 1997.
3. Dr. Hari Arora" Probability and Statistics" S.K.Kataria &Sons.
4. C.L.Liu, "Elements of Discrete Mathematics" Tata Mc Graw-Hill Edition.
5. Trembley, J.P & Manohar; "Discrete Mathematical Structure with Application CS", McGraw Hill.
6. Kenneth H. Rosen, "Discrete Mathematics and its applications", McGraw Hill.
7. Bisht, "Discrete Mathematics",Oxford University Press N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
8. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
9. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill,New Delhi, 2010Basic Computer Engineering (CS-203)

Digital Circuits &Embedded Systems(CS-203)

COURSE OUTCOMES:

After Completing the course student should be able to:

CO1	Design of various Combinational logic circuit
CO2	Understand the concept of synchronous sequential logic circuit.
CO3	Apply the concept of Asynchronous logic circuit for designing transition and flow table.
CO4	To differentiate the various requirements for general purpose computing systems and embedded systems.
CO5	Apply the programming using assembly level language in microcontroller for simple arithmetic, logical operation.

COURSE CONTENTS:

UNIT I - COMBINATIONAL LOGIC CIRCUIT Introduction to number system, Karnaugh map Minimization, Don't care conditions, Half Adder, Full Adder, Half Subtractor, Full Subtractor, Serial Adder, Parallel Adder, Carry Look Ahead Adder, Code Converters, Encoders, Decoders, Multiplexers and De-multiplexers, Design of combinational circuits.

UNIT II - SYNCHRONOUS SEQUENTIAL LOGIC CIRCUIT Latches ,Flip flops – SR, D, JK, T and Master Slave Flip Flop, Characteristics Equation , State Table ,Excitation Table, Analysis of synchronous sequential circuits, Design of synchronous sequential circuits , Counters, Serial Counter, Up down Counter ,Modulo n Counter, Decade Counter ,Registers ,Types of Shift Registers, Universal Shift Registers ,Shift Register Counter, Ring Counter

UNIT III - ASYNCHRONOUS SEQUENTIAL LOGIC CIRCUIT Design of Asynchronous sequential circuits, Algorithmic State Machines, ASM Charts, Transition table ,Flow table, State Reduction, State assignments in asynchronous sequential machine, races and hazards.

UNIT IV-OVERVIEW OF EMBEDDED SYSTEMS Embedded Systems and general purpose computing systems,classification, major application areas,general purpose processor, application specific processor, single purpose processor.Micro-controller architecture -8051 registers, Instruction set, addressing modes,PIC Micro Controller –CPU architecture, ARM processor – Architecture.

UNIT V- EMBEDDED SYSTEMS-ASSEMBLY LANGUAGE Structure of Assembly Language, Basic Assembly LanguageProgramming,Programming Tools and Techniques, Programming the 8051

Reference Books: -

10. Malvino & Leach, "Digital Principles and Applications", TMH.
11. M. Morris Mano, "Digital Logic Design", PHI
12. Kohavi: Switching & Finite Automata Theory, TMH.
13. S. Salivahanan & S. Arivazhagan, "Digital Circuits and Design", Vikas Publishing
14. Ronald J Tocci , "Digital Systems, Principles and Applications", PHI.
15. Taub & Schilling, "Digital Integrated Electronics", TMH.
16. Lee: Digital Circuits and Logic Design, PHI Learning.
17. Shibu K.V, Introduction to Embedded Systems - McGraw Hill, 2009.
18. Muhammad Ali Mazidi and Janice Gillespie Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson education, 2005
19. Raj Kamal, Embedded Systems Architecture, Programming and Design, TMH, 2011

List of suggestive core experiments: -

3. Verify the operation of all Logic Gates for various IC's (IC7400, IC 7402, IC 7404, IC 7408, IC 7486, IC 7432) on breadboard.
4. Design and verify the operation of Half Adder and Full Adder circuit.
5. Design and verify the operation of Half Subtractor and Full Subtractor circuit.
6. Implement 4:1/16:1 Multiplexer and verify its operation.
7. Implement 1:4 / 1:8 Demultiplexer and verify its operation.
8. Design &Verification of state tables of RS, JK, T and D flip flops using NAND gates.
9. Design of Decade Counter.
10. To study developmenttools/environment for ATMEL/PIC microcontroller program and Architecture.
11. Write a program for data transfer/exchange between specified memories locations in 8051.
12. Write a program for addition / subtraction / multiplication / division of 8/16 bit data in 8051.
13. Write a program for implementing logical bit and byte operation in 8051.

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Civil Engineering & Mechanics (CS-105)

COURSE OUTCOMES:

After Completing the course student should be able to:

CO1	Student should get general idea of selection of building materials for the components of building construction as per requirement of site.
CO2	Students should be able to get the concepts of surveying methods, results and surveying instruments in field.
CO3	Students should be able to do plotting of area traversed in field survey using conventional and modern techniques.
CO4	Students should be able to understand the use of principle of static and dynamics in civil engineering structures.
CO5	Students should be able to use centre of gravity and moment of inertia for finding complex cross sections.

Course Contents

Unit I : Stones, Bricks, Cement, Lime, Timber-Types, Properties, Test & uses, laboratory tests. Concrete and mortar Materials: Workability, Strength properties of Concrete, Nominal proportion of Concrete preparation of concrete, Compaction, Curing.Elements of Building Construction, Foundations conventional spread footings, RCC footings, Brick masonry walls, Plastering and Pointing, Floors, Roofs, Doors, Windows, Lintels, Staircases – Types and their suitability

Unit II: Introduction to surveying Instruments – Levels, Theodolites, Plane tables and related devices. Electronic surveying instruments etc. Measurement of distances – conventional and EDM methods, measurement of directions by different methods, measurement of elevations by different methods. Reciprocal leveling.

Unit III :Data Analysis of Surveying using Total Station, Theodolite and Electronic Surveying Instruments. Overview of IoT sensors and devices for Structural Health Monitoring, Smart Cities, Intelligent Transportation Systems, Smart Irrigation, Smart Parking Systems, Real-Time Construction Management, and Project Safety Platforms. Introduction to Remote Sensing and its applications.

Unit IV: Forces and Equilibrium: Graphical and Analytical Treatment of Concurrent and non-concurrent Co- planner forces, Free Body Diagram, Force Diagram and Bow's notations, Application of Equilibrium Concepts: Analysis of plane Trusses: Method of joints, Method of Sections. Frictional force in equilibrium problems.

Unit V: Centre of Gravity and moment of Inertia: Centroid and Centre of Gravity, Moment Inertia of Area and Mass, Introduction to product of Inertia and Principle Axes. Support Reactions, Shear force and bending moment Diagram for Cantilever & simply supported beam with concentrated, distributed load and Couple.

Reference Books:

1. S. Ramamrutam&R.Narayanan. Basic Civil Engineering,3rd.Dhanpat Rai Publication.
2. Prasad I.B., Applied Mechanics,3rd.Khanna Publication
3. Shesha Prakash and Mogaveer. Elements of Civil Engg&Engg. Mechanics.1st.PHI
4. S.P,Timoshenko, Mechanics of structure.1st.East West press Pvt.Ltd.
5. Duggal, Surveying, 1st.Tata McGraw Hill New Delhi
6. S.C. Rangwala, Building Construction,3nd.Charotar publications House, Anand

Rationale

2. Structural Health Monitoring
Structural health monitoring (SHM) involves monitoring and assessing the condition of astructure under working conditions by tracking parameters like stress, strain, vibrationsetc. The emergence of IoT have simplified the manual, laborious task of manual datacollection which is inefficient and slow. The collection of real time data of structures canbe easily done by installing sensors and actuators in the structures in order to improve theoverall performance
3. Smart cities
Smart cities use IoT devices such as connected sensors, lights, and meters to collect andanalyze data. The cities then use this data to improve infrastructure, public utilities andservices, and more.
4. Intelligent transportation system
"Intelligent Transportation Systems (ITS) apply a variety of technologies to monitor,evaluate, and manage transportation systems to enhance efficiency and safety." Theinstallation of smart sensors, GPS based tracking systems can improve the overallperformance of the transportation systems. With the help of IoT enabled devices, real timedata of the exact locations, expected time of arrivals, delays etc can be obtained therebyimproving the traffic efficiency and reduces the traffic problems.
5. Smart irrigation facilities
Smart irrigation system makes use of IoT based sensors in an extensive way to determinethe frequency and depth of irrigation. Sensors of soil moisture content, temperature,piezometers, weather sensors etc are widely used for obtaining data which is thenprocessed and appropriate action (such as turning on/off the water pumps) can be takenwithout human efforts from a remote web or mobile application.
6. Smart parking systems
The parking system can be improved by installing sensors, that can alert the user aboutoccupied or vacant spot via web or mobile applications. This IoT based parking systemenables the user for a hassle free parking in less time thereby reducing the traffic volume.
7. Real-Time Construction Management Solution IoT provides solutionslike remote operative equipment in the construction industry to ensure safetyof the workforce. In addition to that, the project costs can also be reducedby employing IoT applications like Building Information Modelling whichwill help to improve the resource efficiency.
8. Project Safety Platform Use of IoT enabled sensors and wearable in the construction site will improvesafety and efficiency of the workforce thereby increasing the productivity. IoTcan be used to obtain real time data of the construction sites regarding the harsh
working environments, diagnosing and prediction of failures, accidents andmishaps etc. In case of threats or any such incidents, emergency evacuationprocedures, preventive measures or rescue activities can be performedimmediately .List of suggestive core experiments:Practical work will be based on surveying and field work and material of Applied Mechanics
SAMPLE FIELD WORK: 1. Linear measurements: Chain and Tape Surveying, Errors, Obstacles, Booking and Plotting, Calculation of Areas. 2. Angular Measurements: Bearing, Prismatic Compass, Local Attraction, Bowditch's Rule of correction, traverse open and closed, plotting of traverse, accuracy and precision. 3. Levelling : Types of Levels, Levelling Staff, Measurements, recording, curvature and refraction correction, reciprocal levelling, sensitivity of level. 4. Contours: Properties, uses, plotting of contours, measurement of drainage and volume of reservoir. 5. Measurement of area by planimeter.

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Data Structures (CS205)

COURSE OUTCOMES:

After Completing the course student should be able to

CO1	Explain stack and queue data structures along with their merits and demerits
CO2	Use primitive operations on arrays, structures, stack and queue data structures.
CO3	Develop programs to perform primitive operations on linked lists.
CO4	Utilize dijkstra's algorithm to find spanning tree for a given graph.
CO5	Apply quick and merge sorting methods in problem solving.

Course contents

UNIT-I: **Arrays and List** Array: Definition, Representation, Address Calculation; Searching: Linear search, Binary search; Sorting: Bubble sort, Insertion sort, Selection sort, Radix sort, Shell sort; List: Introduction, Implementationas Linkedlist, CircularlinkedList ,Doublylinkedlist, Applications of linkedlist.

Unit-II: **Stacks** Definition, Representations: static and dynamic, Implementation of stack,Applications of stack: Polish notation representation and conversion, Tower of Honoi problem, Implementation of recursion, Quick sort and Merge sort.

Unit-III:**Queues and Hashing** Definition, Representations, Static and dynamic, Circular Queue, Double ended Queue, Priority Queue, Implementation of Priority Queue using Heap data structure, HeapSort, applications of queues. Hash Structures: Representation, Search and Implementation and other issues.

Unit-IV: **Trees** Definition, Basic terminology, Binary tree, Complete Binary Tree, representations: Static and dynamic, Traversal techniques in binary tree, Heap tree, Binary Search tree, AVL tree, M way search trees, B-tree &I ts variations.

Unit-V:**Graphs** Definition, Basic terminology, Graph Types, Representations: static, dynamic; Implementations, Searching in graphs, Shortest path in graphs, Applications.

Books Suggested:

- E.Horowitz&Sahni,Fundamental Data Structure,GalgotiaBookSource,1983.
- Tannenbaum,Data Structure Using C,PearsonEducation,2003.
- Kruz,Data Structure and Programming Design,1987.
- N.Wirth,Algorithms+DataStructure=Program,PrenticeHallofIndia,1979.
- Goodrich&Tamassia,DataStructuresandAlgorithmsinC++,2ndEdition,John

Suggested List of Experiments

Array , Linked List-I , Linked List-II, Stack, Queue, Tree-I, Tree-II ,Graph , Searching and Sorting , Hashing

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Computer Network (CS206)

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Explain computer network protocol hierarchy of osi and tcp/ip models.
CO2	Describe mechanisms of data link layer and related protocols to avoid collision and congestion.
CO3	Compare various data transmission protocol.
CO4	Evaluate efficiency of various routing algorithms.
CO5	Differentiate ipv4 and ipv6 internet protocol.

Unit-I Computer Network: Definitions, goals, components, Architecture, Classifications & Types.Layered Architecture: Protocol hierarchy, Design Issues, Interfaces and Services, ConnectionOriented & Connectionless Services, Service primitives, Design issues & its functionality. ISO-OSIReference Model: Principle, Model, Descriptions of various layers and its comparison with TCP/IP. Principals of physical layer: Media, Bandwidth, Data rate and Modulations.

Unit-II Data Link Layer: Need, Services Provided, Framing, Flow Control, Error control. Data LinkLayer Protocol: Elementary &Sliding Window protocol: 1- bit, Go-Back-N, Selective Repeat,Hybrid ARQ. Protocol verification: Finite State Machine Models & Petri net models.ARP/RARP/GARP

Unit-III MAC Sub layer: MAC Addressing, Binary Exponential Back-off (BEB) Algorithm, DistributedRandom Access Schemes/Contention Schemes: for Data Services (ALOHA and Slotted-ALOHA), for Local-Area Networks (CSMA, CSMA/CD, CSMA/CA), Collision Free Protocols:Basic Bit Map, BRAP, Binary Count Down, MLMA Limited Contention Protocols: AdaptiveTree Walk, Performance Measuring Metrics. IEEE Standards 802 series & their variant.

Unit-IV Network Layer: Need, Services Provided , Design issues, Routing algorithms: Least CostRouting algorithm, Dijkstra's algorithm, Bellman-ford algorithm, Hierarchical Routing,Broadcast Routing, Multicast Routing. IP Addresses, Header format, Packet forwarding,Fragmentation and reassembly, ICMP, Comparative study of IPv4 & IPv6

Unit-V Transport Layer: Design Issues, UDP: Header Format, Per-Segment Checksum, CarryingUnicast/Multicast Real-Time Traffic, TCP: Connection Management, Reliability of DataTransfers, TCP Flow Control, TCP Congestion Control, TCP Header Format, TCP Timer Management .Application Layer: WWW and HTTP, FTP, SSH, Email (SMTP, MIME, IMAP), DNS, Network Management (SNMP).

References:

1. Andrew S. Tanenbaum, David J. Wetherall, “Computer Networks” Pearson Education.
2. Douglas E Comer, “Internetworking WithTcp/Ip Principles, Protocols, And Architecture - Volume I” 6th Edition,Pearson Education
3. DimitriBertsekas, Robert Gallager, “Data Networks”, PHI Publication, Second Edition.
4. KavehPahlavan, Prashant Krishnamurthy, “Networking Fundamentals”, WileyPublication.
5. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, “Computer Networks: An Open Source Approach”, McGraw Hill.

List of Experiments:

1. Study of Different Type of LAN& Network Equipments.
2. Study and Verification of standard Network topologies i.e. Star, Bus, Ring etc.
3. LAN installations and Configurations.
4. Write a program to implement various types of error correcting techniques.
5. Write a program to implement various types of farming methods.
6. Study of Tool Command Language (TCL).
7. Study and Installation of Standard Network Simulator: N.S-2, N.S3.OpNet,QualNetetc .
8. Study & Installation of ONE (Opportunistic Network Environment) Simulator for High Mobility Networks.
9. Configure 802.11 WLAN.
10. Implement &simulate various types of routing algorithm.
11. Study & Simulation of MAC Protocols like Aloha, CSMA, CSMA/CD and CSMA/CA using Standard Network Simulators.
12. Study of Application layer protocols-DNS, HTTP, HTTPS, FTP and TelNet.

Technical Communication& Seminar (CS-208)(P)

COURSE OUTCOMES:

After Completing the course student should be able to:

CO1	Analyse relevance and importance of communication in a globalized worlds.
CO2	Compare types of communication to overcome barriers to communicate
CO3	Develop writing and speaking skills with different tools
CO4	Prepare for Job interviews with the help of self assessment techniques
CO5	Apply advanced grammar to develop linguistic abilities.

Course Contents

Unit I: Vocabulary building and Comprehension: Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, Synonyms, Antonyms, Reading Skills.

Unit II: Communication: Introduction, Meaning and Importance of Communication, Process of Communication, 7 C's of Communication, Verbal Communication, Nonverbal Communication, Barriers to Communication and Ways to overcome them, Importance of Communication for Technical students

Unit III: Developing Writing Skills: Technical Writing Skills : Letter Writing[Letter To Editor, Invitation Letter, Acceptance Letter, Declining Letter, Permission Letter], Job Application[CV, Resume and Cover Letter], Report Writing[Types, Structure, characteristics], Proposal.

Unit IV: Creative Writing Creative Writing Skills : Precis Writing, Note-Making, Content Writing, Blogs and Tweets.

Unit V: Technical skill Practice

1. Group Discussion
2. Professional Presentation
3. Interview Preparation

Experiments: Practice work and activities are based on the contents included in course

Reference Books:-

1. Bansal, R.K. and J.B. Harrison, Spoken English. Orient Longman: Mumbai.
2. Rizvi, M. Asraf, Effective Technical Communication. Tata McGraw- Hill: New Delhi.
3. V. Sasikumar and P. V. Dhamija, A Self-Learning Guide to English Conversation. TMH