

ENGINEERING SCIENCE COURSES (ESC)

INTRODUCTION TO CIVIL ENGINEERING

Course Code: ESC131/231

Credits: 3:0:0

Pre-requisites: Nil

Contact Hours: 42L

Course Coordinator: Dr. B Suguna Rao

Course Content

Unit I

Civil Engineering Disciplines and Building Science

Introduction to Civil Engineering: Surveying, Structural Engineering, Geotechnical Engineering, Hydraulics & Water Resources, Transportation Engineering, Environmental Engineering, Construction planning & Project management.

Basic Materials of Construction: Bricks, Cement & mortars, Plain, Reinforced & Pre-stressed Concrete, Structural steel, Construction Chemicals.

Structural elements of a building: foundation, plinth, Masonry wall, column, beam, slab, and staircase.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos
- Links: Introduction: <https://a.impartus.com/ilc/#/video/id/534326>
- Scopes of Various fields: <https://a.impartus.com/ilc/#/video/id/536441>

Self Study: Building components such as Lintel and Chejja

Unit II

Societal and Global Impact of Infrastructure

Infrastructure: Introduction to sustainable development goals, Smart city concept, Safe city concept

Environment: Water Supply and Sanitary systems, urban air pollution management, Solid waste management, urban flood control

Built-environment: Energy efficient buildings, recycling, Temperature and Sound control in buildings, Security systems; Smart buildings.

- Pedagogy/ Course delivery tools: Chalk and Talk, Power point presentations, Videos
- Links: Infrastructure Habitats: <https://www.youtube.com/watch?v=wpvbVyUCi78>
<https://www.youtube.com/watch?v=Irq4BigInDU>

Self Study: Clean city concept, identification of Landfill sites.

Unit III

Analysis of force systems: Concept of idealization, system of forces, principles of superposition and transmissibility, Resolution and composition of forces, Resultant of concurrent and non-concurrent coplanar force systems, moment of forces, couple, Varignon's theorem, free body diagram, equations of equilibrium, equilibrium of concurrent and non-concurrent coplanar force systems.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos
- Links: Introduction to:
Engg. Mechanics - <https://a.impartus.com/ilc/#/video/id/532408>
Resultants - <https://a.impartus.com/ilc/#/video/id/537603>
Equilibrium Concepts: <https://a.impartus.com/ilc/#/video/id/550330>

Self Study: Law of Parallelogram of forces, Numerical on Couple, and moment.

Unit IV

Centroid: Importance of centroid and centre of gravity, methods of determining the centroid, locating the centroid of plane laminae from first principles, centroid of built-up sections. Numerical examples.

Friction: Definition of friction and its application, angle of friction, angle of repose, coefficient of friction, Types of friction, laws of static friction, Description, and application of friction on blocks on horizontal and inclined planes.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos
- Links: https://www.youtube.com/watch?v=QK_TuE2lfSc
- Friction concepts: <https://www.youtube.com/watch?v=AlenFWwK3Ek>

Self Study: Derivation of Centroid of semicircle and quarter circle.

Unit V

Moment of inertia: Importance of Moment of Inertia, method of determining the second moment of area (moment of inertia) of plane sections from first principles, parallel axis theorem and perpendicular axis theorem, section modulus, radius of gyration, moment of inertia of built-up sections, Numerical Examples.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations
- Links: Moment of Inertia: <https://www.youtube.com/watch?v=BlS5KnQOWkY>

Self Study: Derivation of moment of inertia of semicircle and quarter circle.

Text Books:

1. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 2015, Laxmi Publications.
2. Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 2014, EBPB.

Reference Books:

1. Beer F.P. and Johnston E. R., Mechanics for Engineers, Statics and Dynamics, 1987, McGraw Hill.
2. Irving H. Shames, Engineering Mechanics, 2019, Prentice-Hall.
3. Hibbler R. C., Engineering Mechanics: Principles of Statics and Dynamics, 2017, Pearson Press.
4. Timoshenko S, Young D. H., Rao J. V., Engineering Mechanics, 5th Edition, 2017, Pearson Press.

5. Bhavikatti S S, Engineering Mechanics, 2019, New Age International
6. Reddy Vijaykumar K and Suresh Kumar K, Engineering Mechanics, 2011, BS publication

Web links and video Lectures (e- Resources):

1. <https://www.youtube.com/watch?v=nGfVTNfNwnk&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT>
2. <https://www.youtube.com/watch?v=nkg7VNW9UCc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=2>
3. <https://www.youtube.com/watch?v=3YBXteL-qY4>
4. <https://www.youtube.com/watch?v=z95UW4wwzSc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=10>
5. <https://www.youtube.com/watch?v=lheoBL2QaQU&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=7>
6. https://www.youtube.com/watch?v=atoP5_DeTPE
7. <https://www.youtube.com/watch?v=kmsmp9OzAsI>
8. <https://www.youtube.com/watch?v=x1ef048b3CE>

Course Outcomes (COs):

On successful completion of the course students will be able to

1. Understand the vast interface of civil engineering fields towards the society at large.
2. Recognize the societal and global impact towards employment creation and its contribution to the GDP.
3. Analyze and evaluate the coplanar concurrent and non concurrent force system.
4. Locate the centroid of bodies and frictional force developed between the bodies.
5. Compute the moment of inertia of plane areas about a given axis.

Course Assessment and Evaluation:

| Continuous Internal Evaluation (CIE): 50 Marks | | |
|---|--------------|---------------------------------|
| Assessment Tool | Marks | Course outcomes attained |
| Internal Assessment-I | 30 | CO1, CO2, CO3 |
| Internal Assessment-II | 30 | CO3, CO4, CO5 |
| Average of the two internal tests shall be taken for 30 marks. | | |
| Other Components | | |
| Assignment | 10 | CO1, CO2 |
| Assignment | 10 | CO3, CO4, CO5 |
| Semester End Examination (SEE) | | |
| Course end examination (Answer one question from each unit –internal choice) | 100 | CO1, CO2, CO3, CO4, CO5 |

INTRODUCTION TO ELECTRICAL ENGINEERING

Course Code: ESC132/232

Credits: 2:1:0

Pre-requisites: Nil

Contact Hours: 28L+14T

Course Coordinators: Sri. Vinayaka V Rao and Dr Nagaraj C

Course Content

Unit I

Introduction: Conventional and non-conventional energy resources; General structure of electrical power systems using single line diagram approach.

Power Generation: Hydel, Nuclear, Solar & wind power generation (Block Diagram approach). Grid and its types. Types of loads.

- Pedagogy / Course delivery tools: Chalk and Talk, Power Point Presentation
- Link for power generation, transmission distribution and Tariff: <http://www.nptelvideos.in/2012/11/power-sys-generation-transmission.html>

Unit II

DC Circuits: Ohm's Law and its limitations. KCL, KVL, Thevenin, Maximum power transform and Superposition theorems. Series, parallel, series-parallel circuits. (Only for resistive networks) Simple Numerical

- Pedagogy / Course delivery tools: Chalk and Talk
- Link for Introduction to KCL, KVL and Power Balance: <https://nptel.ac.in/courses/108105159>

Unit III

A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor. (Only definitions)

Analysis of R, L, C, R-L, R-C and R-L-C Series circuits. Concept of power and power factor. (Simple Numerical).

- Pedagogy / Course delivery tools: Chalk and Talk, Power Point Presentation
- Link for AC and DC waveform: <https://www.youtube.com/watch?v=vN9aR2wKv0U>
- Link for Generation of sine wave: <https://www.youtube.com/watch?v=gQyamjPrw-U>

Unit IV

Introduction to Electrical Machines: Transformers: Necessity of transformer, principle of operation, Types and construction of single- phase transformers, EMF equation, losses, Efficiency. Simple numerical.

Introduction to Three-Phase systems.

Three-phase induction Motors: Concept of rotating magnetic field, Principle of operation, constructional features of motor, types – squirrel cage and wound rotor. Slip and its significance simple numerical.

- Pedagogy / Course delivery tools: Chalk and Talk, Power Point Presentation
- Link for Transformer: https://www.youtube.com/watch?v=vh_aCAHThTQ
- Link for 3-Phase Induction Motor:
https://www.youtube.com/watch?v=AQqyGNOP_3o
<https://www.youtube.com/watch?v=Mle-ZvYi8HA>

Unit V

Domestic Wiring: Requirements, Types of wiring: Two way and three-way control of load.

Electricity Bill: Power rating of household appliances, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety measures: Fuse and Fuse gauge. Miniature circuit breaker (MCB), merits and demerits.

Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock

- Pedagogy / Course delivery tools: Chalk and Talk, Power Point Presentation
- Link for MCB: <https://www.youtube.com/watch?v=9Xgn40eGcqY>
- Link for Electrical safety animation: <https://www.youtube.com/watch?v=yAz9Ungv2Xc>

Text Books:

1. Basic Electrical Engineering by D C Kulshreshtha, Tata McGraw Hill, First Edition 2019.
2. A text book of Electrical Technology by B.L. Theraja, S Chand and Company, reprint edition 2014.

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw Hill 4th edition, 2019.
2. Principles of Electrical Engineering & Electronics by V. K. Mehta, Rohit Mehta, S. Chand and Company Publications, 2nd edition, 2015.
3. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI, 3rd edition, 2014.

Web links and video Lectures (e- Resources):

1. <https://nptel.ac.in/courses/108/108/108108076/>
2. <https://a.impartus.com/ilc/#/course/59745/295>

Course Outcomes (COs):

At the end of the course, students will be able to:

1. Interpret the concepts of Electrical Power (PO-1)
2. Solve problems in DC and AC circuits (PO-1)
3. Exemplify the concepts of Electrical Machines (PO-1)
4. Explain the types of wiring and lighting systems (PO-1)
5. Identify types of protective systems and safety precautions (PO-1, PO-6)

Course Assessment and Evaluation:

| Continuous Internal Evaluation (CIE): 50 Marks | | |
|--|--------------|---------------------------------|
| Assessment Tool | Marks | Course outcomes attained |
| Internal Test-I | 30 | CO1, CO2 |
| Internal Test-II | 30 | CO3 |
| Average of the two internal tests shall be taken for 30 marks. | | |
| Other Components | | |
| Assignment | 10 | CO4, CO5 |
| Quiz | 10 | CO2, CO3 |
| Semester End Examination (SEE) | | |
| Course end examination (Answer one question from each unit- internal choice) | 100 | CO1,CO2,CO3,CO4, CO5 |

INTRODUCTION TO ELECTRONICS ENGINEERING

Course Code: ESC133/233

Credits: 3:0:0

Pre-requisites: Physics of Semiconductors

Contact Hours: 42L

Course Coordinator: Mr. Manjunath C Lakkannavar

Course Content

Unit I

Semiconductor Devices: Introduction, Semiconductor diodes: PN junction diode and its characteristics, Diode types, Zener diodes, Light emitting diodes, Bipolar junction transistors: BJT operation, Characteristics, Current gain.

- Pedagogy/Course delivery tools: Chalk and talk
- Links: <https://nptel.ac.in/courses/117103063>
- Links: <https://a.impartus.com/ilc/#/course/80947/295>

Unit II

Power Supplies: Block diagram, Half-wave rectifier, Full-wave rectifiers (Center Tapped/Bi-phase and Bridge) and Capacitor filter circuit, Zener diode voltage regulators, Output resistance and voltage regulation, Voltage multipliers

- Pedagogy/Course delivery tools: Chalk and talk
- Links: <https://nptel.ac.in/courses/117103063>
- Links: <https://a.impartus.com/ilc/#/course/80947/295>

Unit III

Amplifiers: Types of amplifier, Gain, Common-emitter configuration as an Amplifier, Common-emitter configuration as Switch: Cut-off and saturation modes.

Oscillators: Positive feedback, Conditions for oscillation, BJT as an Oscillator (LC).

- Pedagogy/Course delivery tools: Chalk and talk
- Links: <https://nptel.ac.in/courses/117103063>
- Links: <https://a.impartus.com/ilc/#/course/80947/295>

Unit IV

Logic Circuits: Logic functions, Logic gates: NOT, AND, OR, NAND, NOR, X-OR, X-NOR, Combinational Logic: Introduction, Adders: Half adder, Full adder, Sequential Logic: Introduction to Flip Flops, JK flip flop and its applications.

- Pedagogy/Course delivery tools: Chalk and talk
- Links: <https://nptel.ac.in/courses/117103063>
- Links: <https://a.impartus.com/ilc/#/course/80947/295>

Unit V

Microprocessor: Introduction, Block diagram of a microprocessor system, Internal architecture of 8-bit microprocessor CPU, Microprocessor operation

Microcontroller: Introduction, Block diagram of a microcontroller system.

- Pedagogy/Course delivery tools: Chalk and talk
- Links: <https://nptel.ac.in/courses/117103063>
- Links: <https://a.impartus.com/ilc/#/course/80947/295>

Text Books:

1. Mike Tooley, 'Electronic Circuits: Fundamentals & Applications', 4th Edition, Elsevier, 2015. DOI <https://doi.org/10.4324/9781315737980eBook>, ISBN: 9781315737980

Reference Books:

1. Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN-978-81-203- 0417-84
2. D P Kothari, I J Nagrath, 'Basic Electronics', 2nd edition, McGraw Hill Education (India),Private Limited, 2018.

Course Outcomes (COs):

At the end of the course, students will be able to:

1. Describe semiconductor devices. (PO-1, PO-2, PO-8)
2. Understand semiconductor applications. (PO-1, PO-2, PO-8)
3. Analyze the various circuits of BJT. (PO-1, PO-2, PO-8)
4. Analyze logic circuits. (PO-1, PO-2, PO-8)
5. Understand the architecture and operation of microprocessor and micro controller. (PO-1, PO-8, PO-10)

Course Assessment and Evaluation:

| Continuous Internal Evaluation (CIE): 50 Marks | | |
|--|---------------------------------|---------------------------------|
| Assessment Tool | Marks | Course outcomes attained |
| Internal Test-I | 30 | CO1, CO2 |
| Internal Test-II | 30 | CO3, CO4, CO5 |
| Average of the two internal tests shall be taken for 30 marks. | | |
| Other Components | | |
| Quiz | 10 | CO1, CO2 |
| Troubleshooting | 10 | CO1, CO2, CO3, CO4, CO5 |
| Semester End Examination (SEE) | 100 (Scale down to 50 Marks) | CO1, CO2, CO3, CO4, CO5 |

INTRODUCTION TO MECHANICAL ENGINEERING

Course Code: ESC134/234

Credits: 3:0:0

Pre-requisites: Nil

Contact Hours: 42L

Course Coordinator: Dr. Anil Kumar T

Course Content

Unit I

Introduction to Mechanical Engineering (Overview only):

Role of Mechanical Engineering in Industries and Society - Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

Steam Formation and Application:

Steam formation, Types of steam, Steam properties and applications of steam (simple numerical problems).

Energy Sources and Power Plants:

Basic working principles of Hydel power plant, Thermal power plant, nuclear power plant, Solar power plant, Tidal power plant and Wind power plant.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation, animated videos
- Lab component/Practical topics: Arc Welding and soldering
- Links: Mechanical Properties of Engineering materials: <https://www.youtube.com/watch?v=WSRqJdT2COE&t=83s>
- Links: Thermal power plant: <https://youtu.be/IdPTuwKEfmA>

Unit II

Machine Tool Operations:

Lathe: Principle of working of a center lathe, lathe operations: Turning, facing, knurling, thread cutting, taper turning by swivelling the compound rest,

Drilling Machine: Working of simple drilling machine, drilling operations: drilling, boring, reaming, tapping, counter sinking, counter boring,

Milling Machine: Working and types of milling machine, milling operations: plane milling, end milling and slot milling.

(No sketches of machine tools, sketches to be used only for explaining the operations).

Introduction to Advanced Manufacturing Systems: Introduction, components of CNC, advantages and applications of CNC, 3D printing.

- Pedagogy/ Course delivery tools: Chalk and talk, Power point presentation, animated videos, Demonstration using IC engine models
- Lab component/Practical topics: Lathe operations, Demonstration of Drilling, Milling machine
- Links: 3D Printing: <https://youtu.be/nb-Bzf4nQdE>
- Links: CNC machine: https://youtu.be/e_PDuQePdOE

Unit III

Introduction to IC Engines: Components and working principles, 4-Stroke Petrol and Diesel engines, Application of IC Engines, performance of IC engines (Simple numerical).

Introduction to Refrigeration and Air Conditioning: Principle of refrigeration, Refrigerants and their desirable properties. Working principle of VCR refrigeration system, working principle of room air conditioner & Applications of air Conditioners

- Pedagogy/ Course delivery tools: Chalk and talk, Power point presentation, animated videos, Demonstration using IC engine models
- Lab component/Practical topics: Vapour Compression Refrigeration (Demonstration)
- Links: Refrigeration: <https://youtu.be/PjcdqAkP0UA>
- Links: Airconditioning: <https://youtu.be/gVLhrLTF878>

Unit IV

Mechanical Power Transmission:

Gear Drives: Types - spur, helical, bevel, worm and rack and pinion, velocity ratio, simple and compound gear trains (simple numerical problems)

Belt Drives: Introduction, Types of belt drives (Flat and V-Belt Drive), length of the belt and tensions ratio (simple numerical problems)

Joining Processes: Soldering, Brazing and Welding, Definitions, classification of welding process, Arc welding, Gas welding, (types of flames), TIG welding, MIG welding and Fusion welding.

- Pedagogy/ Course delivery tools: Chalk and talk, Power point presentation, animated videos
- Lab component/Practical topics: Gear trains in lathe machine
- Links: Belt drives: https://www.youtube.com/watch?v=0mb_XMGja_c
- Links: Gear trains: <https://www.youtube.com/watch?v=tjNsUzxRjfw>

Unit V

Insight into future mobility technology; Electric and Hybrid Vehicles, Components of Electric and Hybrid Vehicles. Advantages and disadvantages of Electric Vehicles (EVs) and Hybrid vehicles.

Robotics: Introduction to Robots, History, Criteria for defining a robot, work volume, robot anatomy, joint configuration, sensors, industrial and collaborative robots

- Pedagogy/ Course delivery tools: Chalk and talk, Power point presentation, animated videos
- Lab component/Practical topics: Robot technology
- Links: <https://youtu.be/h5ysddrLXLw>
- Links: Robotics: https://youtu.be/a6_fgnuuYfE

Text Books:

1. **K. R. Gopalakrishna, Sudhir Gopalakrishna, S.C.Sharma** - 'Elements of Mechanical Engineering', Sudha Publications, Jan 2016.
2. **Basic Mechanical Engineering** - Pravin kumar, Dorling Kindersley (India) Pvt Ltd, 2013
3. **Ali Emadi** - Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design, CRC Press, 2nd edition

4. **Mikell P Groover, Mitchell Weiss, Roger N.Nagel, Nicholas G Odrey** -Industrial Robotics Technology, Programming and Applications, McGraw-Hill International Edition 1986
5. **Andreas Gebhardt** - Understanding Additive Manufacturing-Hanser Publications, Cincinnati

Reference Books:

1. **K. P. Roy, S. K. Hajra Choudhury, A. K. Hajra Chaudhury & Nirjhar Roy** - Elements of Mechanical Engineering –, Media Promoters & Publishers Pvt Ltd, Seventh edition, 2012.
2. **John Lowry** - Electrical Vehicle Technology Explained –, John Wiley & Sons Ltd, Second Edition, 2012.
3. **P. M. Agrawal and Dr. V. J. Patel** - CNC Fundamentals and Programming, Charotar Publishing House Pvt. Ltd., 3rd edition, 2022
4. **Appu Kuttan K. K.**, Robotics I K International Publishing House, Pvt Ltd, 2013
5. **Manu Srivastava, Sandeep Rathee, Sachin Maheshwari, TK Kundra** - Additive Manufacturing Fundamentals and Advancements CRC Press, 2019.

Web links and video lectures (e-Resources)

1. <https://nptel.ac.in/courses/103103206>
2. <https://youtu.be/1AwOzDv7j6o>
3. <archive.nptel.ac.in/courses/112/105/112105128>
4. <https://nptel.ac.in/courses/112/103/112103263>
5. <https://nptel.ac.in/courses/108/106/108106170>

Course Outcomes (COs):

At the end of the course, students will be able to:

1. Outline the various sources of Energy method of Steam formation and explain the Emerging Trends and Technologies in different sectors
2. Understand the basics of Conventional Machining methods and understand the basic components of CNC the importance of 3D manufacturing techniques
3. Comprehend the basics of IC Engines and as well learn basics of Refrigeration and Air-Conditioning
4. Realize the fundamental power transmission systems and the concepts of metal joining processes
5. Illustrate the concepts of Electric/Hybrid Vehicle Technology and fundamentals of Robotics

INTRODUCTION TO C PROGRAMMING

Course Code: ESC135/235

Credits: 2:0:1

Pre-requisites: Nil

Contact Hours: 28L+14P

Course Coordinator: Shruthi G

Course Content

Unit I

Introduction to C: Introduction to computers, input and output devices, Structure of C program, Files used in a C program, Compilers, Compiling and executing C programs, variables, constants, Input/output statements in C, Operators in C, Type conversion and typecasting.

- Pedagogy /Course delivery tools: Chalk and talk, Power point presentation, Videos
- Link: <https://nptel.ac.in/courses/106/105/106105171/> MOOC courses can be adopted for more clarity in understanding the topics and verities of problem-solving methods
<https://pythontutor.com/c.html#mode=edit> in order to visualize the operations of C Programs.

Unit II

Decision control and Looping statements: Introduction to decision control, Conditional branching statements, iterative statements, nested loops, break and continue statements, goto statement.

- Pedagogy /Course delivery tools: Chalk and talk, Power point presentation, Videos
- Link: <https://nptel.ac.in/courses/106/105/106105171/> MOOC courses can be adopted for more clarity in understanding the topics and verities of problem-solving methods
<https://pythontutor.com/c.html#mode=edit> in order to visualize the operations of C Programs.

Unit III

Functions: Introduction using functions, Function definition, function declaration, function call, return statement, passing parameters to functions, scope of variables, storage classes, recursive functions.

Arrays: Declaration of arrays, accessing the elements of an array, storing values in arrays, Operations on arrays.

- Pedagogy /Course delivery tools: Chalk and talk, Power point presentation, Videos
- Link: <https://nptel.ac.in/courses/106/105/106105171/> MOOC courses can be adopted for more clarity in understanding the topics and verities of problem-solving methods
<https://pythontutor.com/c.html#mode=edit> in order to visualize the operations of C Programs.

Unit IV

Passing arrays to functions, Two dimensional arrays, operations on two-dimensional arrays, two-dimensional arrays to functions.

Applications of arrays: Applications of arrays, case study with sorting and searching techniques. (Linear Search and Binary Search , Bubble Sort, Quick Sort,)

Introduction to strings: Reading strings, writing strings, summary of functions used to read and write characters. Suppressing input using a Scanset.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation, Videos
 - Link: <https://nptel.ac.in/courses/106/105/106105171/> MOOC courses can be adopted for more clarity in understanding the topics and verities of problem-solving methods
- <https://pythontutor.com/c.html#mode=edit> in order to visualize the operations of C Programs.

Unit V

Strings: String taxonomy, operations on strings (length of the string, concatenate two strings, comparing two strings, reversing a string, extracting a substring from the string), Miscellaneous string and character functions, arrays of strings.

Pointers: Understanding the Computer's Memory, Introduction to Pointers, Declaring Pointer Variables

Structures: Introduction to structures, array of structures.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation, Videos
 - Link: <https://nptel.ac.in/courses/106/105/106105171/> MOOC courses can be adopted for more clarity in understanding the topics and verities of problem-solving methods
- <https://pythontutor.com/c.html#mode=edit> in order to visualize the operations of C Programs.

Lab Component:

1. Write a program to calculate the salary of an employee, given his basic pay (to be entered by user), HRA = 10% of the basic pay, TA = 5% of basic pay. Define HRA and TA as symbolic constants and calculate the salary of the employee. [Salary = Basic Pay + HRA + TA]
[Problems as per domain can be assigned]
2. Write a program to calculate the parking charges of a vehicle. Enter the type of vehicle as a character (like c for car, b for bus etc) and the number of hours. Then calculate the charges as given below.
[Program must be implemented using Switch and else-if]
 - Truck / Bus – Rs 20 per hour
 - Car – Rs 10 per hour
 - Scooter/ Cycle/ Motor cycle – Rs 5 per hour
3. Write a program to find the GCD and LCM for any two given numbers using 'while' loop.
4. Write a program to generate prime numbers within a given range. [using for loop]
5. Write a program to multiply two matrices [2 – Dimensional arrays].
6. Write a program to search for a given element within a list of elements using binary search [List of elements to be stored in a 1 – Dimensional array].
7. Write a program to build user defined functions, to calculate
 - a) The factorial of a given number using recursion
 - b) To find whether the given number is a palindrome or not [No arguments but with return values].
8. Write a program to read 6 subject marks from the keyboard for a student.

Generate a report that displays the marks from the highest to the lowest score attained by the student. [Read the marks into a 1-Dimensional array and sort using the Bubble Sort technique].

9. Write a program using built in string functions to
 - a. To convert “gud morning” to “GUD MORNING”.
 - b. Count the number of characters in “Gud Morning”.
 - c. To append the word “All” to the string “Good Morning”.
 - d. Reverse the string “Morning” and check if the given string is a palindrome or not.
10. Write a program using functions to swap two integer values using call by reference.
11. Define a structure containing the following details for 5 students: Name of Student, Age, Marks of 5 subjects [Use array of Structures]. Generate a report for the following
 - a. The total average marks for each student
 - b. The class average for each subject
12. Write a program to find the sum of all elements of a 1 -dimensional array using pointers.

Text Books:

1. Computer fundamentals and programming in c, “Reema Thareja”, Oxford University, Second edition, 2017.

Reference Books:

1. E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill.
2. Brian W. Kernighan and Dennis M. Ritchie, The ‘C’ Programming Language, Prentice Hall of India.

Course Outcomes (COs):

At the end of the course, students will be able to:

1. Understand the basic architecture and functionalities of a computer. (PO-1)
2. Apply programming constructs of C language to solve the real world problems (PO-1, PO-2, PO-3)
3. Develop Solutions to problems using modular programming constructs using user-defined functions. (PO-1, PO-2, PO-3)
4. Use arrays and strings to implement solutions to the given problems. (PO-1, PO-2, PO-3)
5. Apply concept of structures and pointers to solve the given problems. (PO-1, PO-2, PO-3)

Course Assessment and Evaluation:

| Continuous Internal Evaluation (CIE): 50 Marks | | |
|--|--------------|---------------------------------|
| Assessment Tool | Marks | Course outcomes attained |
| Internal test-I | 30 | CO1, CO4 |
| Internal test-II | 30 | CO2, CO3, CO5 |
| Average of the two internal tests shall be taken for 30 marks. | | |
| Other Components | | |
| Lab Component Evaluation | 20 | CO1, CO2, CO3, CO4, CO5 |
| Semester-End Examination (SEE) | 100 | CO1, CO2, CO3, CO4, CO5 |

Laboratory Schedule:

| Session No | Topics: Programming Assignments | No. of hours |
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| 1 | Creating and Running Simple C Programs: <ol style="list-style-type: none"> 1. Write a program to swap two numbers without using a temporary variable. 2. Write a program to convert degrees Fahrenheit into degrees Celsius. 3. Write a program to calculate the area and circumference of a circle, using PI as symbolic constant. 4. Write a C program to calculate the bill amount for an item given its quantity sold, value, discount (declare as constant) and tax (declare as constant). 5. Write a C program to read two floating point numbers. Add these numbers and assign the result to an integer. Finally display the value of all three variables. 6. Write a program to calculate the salary of an employee, given his basic pay (to be entered by user), HRA = 10% of the basic pay, TA = 5% of basic pay. Define HRA and TA as symbolic constants and calculate the salary of the employee. [Salary = Basic Pay + HRA + TA] | 2hr |
| 2 | Creating and Running C Programs on Making Decisions - 1: <ol style="list-style-type: none"> 1. Write a program to find the given year is a leap year or not. 2. Write a program to determine whether the given character is a vowel or not. 3. Write a program to identify whether the given character is an alphabet, digit, whitespace or punctuation using 'simple if' 4. Write a C Program to find whether the given triangle is equilateral, isosceles or scalene. 5. Write a program to find the greatest of two numbers using conditional operator. 6. Write a program, to find the greatest of three numbers using nested –if. | 2hr |

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| 3 | Creating and Running C Programs on Making Decision - 2: <ol style="list-style-type: none"> Find the roots of a quadratic equation using Switch statement. ($D=0, D>0, D<0$) Write a program that accepts a number from 1 to 10. Print whether the number is even or odd using switch case construct. Write a C program to enter the marks of a student in four subjects. Then calculate the total, aggregate and display the grades obtained by the student (Using SWITCH). Write a program to calculate the parking charges of a vehicle. Enter the type of vehicle as a character (like c for car, b for bus etc) and the number of hours. Then calculate the charges as given below. [Program must be implemented using Switch and else-if] <ul style="list-style-type: none"> Truck / Bus – Rs 20 per hour Car – Rs 10 per hour Scooter/ Cycle/ Motor cycle – Rs 5 per hour | 2hr |
| 4 | Creating and Running C Programs on Repetition or Loops: <ol style="list-style-type: none"> Write a program to calculate the sum of numbers from m to n using FOR loop. Write a program to generate the Fibonacci series up to 'nth' given number using WHILE loop. Write a program to generate prime numbers within a given range. [using for loop] Write a program to check whether the given number is a palindrome or not using DO - WHILE loop. | 2hr |
| 5 | Creating and Running C Programs on One Dimensional Arrays: <ol style="list-style-type: none"> Write a C program to find the average of all elements of a 1D array. Write a C program to search for an element using Linear Search. The books are placed in a random order in a library. Write a C program to sort the books based on ISBN (Bubble Sort). Write a C program to search for a book based on the ISBN whether the book is present or not (Binary Search). | 2hr |
| 6 | Creating and Running C Programs on Two Dimensional Arrays: <ol style="list-style-type: none"> Write a C program to find the sum of two matrices using functions. Write a C program to find the product of two matrices. Write a C program to find the transpose of a given matrix. | 2hr |
| 7 | Creating and Running C Programs on User Defined Functions: <ol style="list-style-type: none"> C-program to read a number, find its factorial using recursive function C-Program to read a number, find whether it is prime number using functions (all categories). Write a C program to find the smallest and largest element of an array using functions. Write a program using functions to swap two integer values using call by reference. | 2hr |
| 8 | Creating and Running C Programs on Strings: <ol style="list-style-type: none"> C-program read two strings, compare them without using string built-in functions. C-program read two strings, concatenate them without using string built-in functions. Write a program using built in string functions to <ol style="list-style-type: none"> To convert "gud morning" to "GUD MORNING". Count the number of characters in "Gud Morning". To append the word "All" to the string "Good Morning". Reverse the string "Morning" and check if the given string is a palindrome or not. | 2hr |

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| 9 | Creating and Running C Programs on Storage Classes and Pointers: <ol style="list-style-type: none"> 1. C-program to show the use of auto and static variable. 2. C-program to add elements of an array using pointers. 3. C-program to swap two numbers using pointers. | 2hr |
| 10 | Creating and Running C Programs on Structures <ol style="list-style-type: none"> 1. Write a C program using structures to read and display the information about an employee. 2. Define a structure containing the following details for 5 students: Name of Student, Age, Marks of 5 subjects [Use array of Structures]. Generate a report for the following <ol style="list-style-type: none"> a. The total average marks for each student b. The class average for each subject | 2hr |