Swami Keshvanand Instituteof Technology,

Management & Gramothan

(Accredited by NAAC with 'A++' Grade)

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Recognized by UGC under Section 2(f) of the UGC Act, 1956
Affiliated to Rajasthan Technical University, Kota

1.2.2 Brochure of Add-on Courses

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Course: Campus Recruitment Training Program

Course Code: CRT

Session: 2023-24

Duration: 6 months

Assessment procedures: Diagnostic Test

Curriculum of the Course:

Week-1

- CT2101201 - Diagnostic Test
- No.series,analogies + LAHO2101101
- oddman.coding-decoding, LAT2101101
- Numbers + QAHO2I01101
- Vocab Basics (RPS approach) -1 + VAHO350655
- ERPV-1 + QAHO2101102

Week-2

- ERPV-2 - QAT2101102
- Number Systems+ QAT2101101
- Vocab Basics (RPS approach) -2 VAHO320501
- CT2101102
- Blood Relations LAHO2101102
- Direction Sense

Week-3

- Symbol & Notations + LAT2101102
- Vocabulary-2 + VAHO2101101/02
- Vocabulary-3+ VAHO2101103+
- QE + QAHO2101103 +
- Progressions - QAT2101103
- Profit, percentage & Loss + QAHO2101104

Week-4

- Partnerships + QAT2101104
- Deductions +LAHO2101103
- Connectives - LAT2101103
- Vocab 2 & 3 - VAT2101101/02
- Clocks+ LAHO2101104
- Calendars + LAT2101104

Week-5

- Paragraph Fonning Questions + VAHO2101109
- Gram # 1 + VAHO2101104/05
- Binary Logic & Puzzles + LAT2101105
- AMA + QAHO2101105
- SI-CI +QAT2101105
- Time & Work - 1 + QAHO2101106

Week-6

- Distribution + LAHO2101105
- Time & Work - 2 + QAT2101106
- Selection, Routes & Networks + LAHO2101106
- Comparison, Arrangement LAT2101106

- Cubes + LAHO2I01107

Week-7

- Venn Diagrams + LAT2101107
- Gram#3+VAH02101108
- Gram Exercise - VAT2101103/04
- Time & Distance - I + QAHO2101107
- Geometry + QAHO2101108

Week-8

- Gram # 1 + VAHO2101106
- Gram # 2 Part-2 + VAHO2101107
- Time & Distance - 2 + QAT2101107
- Mensuration + QAT2101108
- Non Verbal Reasoning 1 + LAHO2101108

Week-9

- Non Verbal Reasoning - 2 + LAT2101108
- P & C + QAHO2101109
- Probability + QAT2101 109
- Data Interpretation -1 + QAHO2101110
- Reading Comprehension + RCHO2101101
- Data Sufficiency + QAHO210111

Week-10

- Data Interpretation exercise + QAT2101110
- Data Sufficiency exercise + QAT2101111
- Reading Comprehension Ex+RCT2101101
- Reading Comprehension Ex + RCT2101102/03
- Logical Reasoning + LRIIO2101101 -
- Logical Reasoning exercise LRT2101101

Week-11

- Quant & Logical Ability Practice Exercise (Infosys & Accenture Model) + PTQ2101101
- Logical Ability Practice Exercise (Infosys & Accenture model)+ PTQ2101101/02
- Logical Ability Practice Exercise + PTQ2101103
- Quant & Logical Ability Practice Exercise (IBM & Wipro Model) + PTQ2101104
- Quant & Logical Ability Practice Exercise (IBM & Wipro Model) + PTQ2101105/06

Week-12

- CT2101103 (T.H.) (Wipro Model)
- CT2101104 (T.H.) (Wipro Model)
- Test Feedback and doubt-solving-1
- Verbal Ability Practice Exercise(Infosys & Wipro Model) + PTV2101101
- Verbal Ability Practice Exercise(Infosys & Wipro Model) PTV2101 102

Week-13

- CT2101301 (T.H.) (TCS Model)
- CT2101302 (T.H.) (TCS Model)
- Quant & Logical Ability Practice Exercise (TCS model) + PTQ2101107/08
- Quant & Logical Ability Practice Exercise - CTS Model + PTQ210110910

- Verbal Ability Practice Exercise(CTS) + PTV2101103
- Test Feedback and doubt-solving-2

Week-14

- Verbal Ability Practice Exercise(Accenture Model) + PTV2101104
- Verbal Ability Practice Exercise (General Model) + PTV2101105
- Quant & Logical Ability Practice Exercise General Model + PTQ2101110
- CT2101107 (T.H.) (CTS Model)
- CT2101108 (T.H.) (CTS Model)
- CT2101303 T.H. (Tech Mahindra MODEL

Week-15

- CT2101110 (T.H.) & Accenture Model
- CT21011U (IBM MODEL)
- CT2101112 (T.H.) General Model)
- GD Basics
- Interview Basics
- Extempore-Self introduction

Course: Introduction To Aircraft Design

Course Code: noc23-ae15 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Aerospace engineering **Coordinating Institute: IITB**

Name of Course Instructor: Prof. Rajkumar Pant

Curriculum of the Course:

Week 1: Introduction to Aircraft Design & Requirements Capture

Week 2: Design Considerations in Airliners, Cargo, and SST

Week 3: Design Considerations in GA and Military Aircraft

Week 4: Aircraft Configuration Design

Week 5: Aircraft Layout Choices

Week 6: Initial Sizing

Week 7: Estimation of Lift Coefficient

Week 8: Estimation of subsonic parasite drag coefficient

Week 9: Constraint Analysis of Military Aircraft

Week 10: Constraint Analysis of Transport Aircraft

Week 11: Aircraft Loads and V-N Diagram

Week 12: Cost Estimation in Aircraft Design

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 1

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Course: Building Materials And Composites

Course Code: noc23-ar10 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Architecture and Planning **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Sumana Gupta

Curriculum of the Course:

Week 1: Clay products and alternatives like Fly-ash, CEB, CSEB

Week 2: Stone, stone tiles and stone dust blocks Wood and engineered wood

Week 3: Glass and glazing systems, ceramic tiles, vitrified tiles, insulation

Week 4: Fine aggregate, Coarse aggregate, Cement, Concrete

Week 5: Precast items – flooring, roofing, walling system, HBC, AAB

Week 6: Ferrous and non-ferrous metals

Week 7: Bitumen as damp proofing materials, Paints

Week 8: Plastics, Composites, nanotechnology applications

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Housing Policy & Planning

Course Code: noc23-ar18 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Architecture and Planning **Coordinating Institute: IITR**

Name of Course Instructor: Prof. Uttam Kumar Roy

Curriculum of the Course:

Week 1: Introduction Learning Objective

Week 2: Legal, Policy Framework and Land for Housing

Week 3: Affordability, Delivery Systems and Housing finance

Week 4: Planning Framework for Housing & Infrastructure

Week 5: Planning for Social Infrastructure & Housing Strategy for Cities

Week 6: Planning for Major Formal Housing typologies

Week 7: Planning for Informal and Special Housing Typologies

Week 8: Housing Development and Management

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Animal Physiology

Course Code: noc23-bt67 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Biotechnology and Bioengineering **Coordinating Institute: IITK**

Name of Course Instructor: Prof. Mainak Das

Curriculum of the Course:

Week 1: Basic Physiology
Week 2: Homeostasis
Week 3: Membrane Physiology
Week 4: Cardiovascular Physiology
Week 5: Excretory System
Week 6: Hematology
Week 7: Extreme Physiology
Week 8: Nervous System
Week 9: Digestive System
Week 10: Endocrine System
Week 11: Sports Physiology

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Project Planning & Control

Course Code: noc23-ce59 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Civil Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Koshy Varghese

Curriculum of the Course:

Week 1: Introduction, Course Context, Construction Project Management
Week 2: Time Management, Work Breakdown Structure (WBS), Gantt Charts
Week 3: Duration Estimation, Network Representation & Analysis -1
Week 4: Network Representation & Analysis -2; Two-Span Bridge: Scheduling, Network Analysis and Application
Week 5: Time-Cost Trade-o (Crashing)
Week 6: Resource Scheduling
Week 7: Precedence Diagramming Method (PDM), Project Monitoring & Control
Week 8: Project Monitoring & Control (Earned Value Concepts), Uncertainty in Project Schedules (PERT), Course

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Admixtures And Special Concretes

Course Code: noc23-ce61 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Civil Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Manu Santhanam

Curriculum of the Course:

Week 1: Cement chemistry and concrete performance - An overview

Week 2: Chemical admixtures: Introduction & Water reducers

Week 3: Chemical admixtures: Set controllers, Standards on chemical admixtures & Air entraining agents

Week 4: Chemical admixtures: Understanding concrete rheology, Viscosity modifying agents, Shrinkage reducing admixtures, & Other specialty admixtures

Week 5: Mineral Admixtures: Introduction, classification and pozzolanic activity

Week 6: Mineral Admixtures: Fly ash and Silica fume

Week 7: Mineral Admixtures: GGBFS, Metakaolin and LC3

Week 8: Mineral Admixtures: Agricultural ashes, characterization techniques Life Cycle Assessment

Week 9: Special Concretes: High strength concrete and ultra high performance concrete

Week 10: Special Concretes: Self compacting concrete and mass concreting

Week 11: Special Concretes: Mass concreting and lightweight concrete

Week 12: Special Concretes: High density concrete and concrete for 3D printing

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 4

Students Certified: 2

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Course: Fluid Mechanics

Course Code: noc23-ce65 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Civil Engineering **Coordinating Institute: IITG**

Name of Course Instructor: Prof. Subashisa Dutta

Curriculum of the Course:

Week 1 : Introduction And Basic Concepts

Week 2 : Properties Of Fluids

Week 3 : Pressure And Fluid Statics

Week 4 : Fluid Kinematics

Week 5 : Mass, Bernoulli, And Energy Equations

Week 6 : Momentum Analysis Of Flow Systems

Week 7 : Dimensional Analysis And Modeling

Week 8 : Flow In Pipes

Week 9 : Differential Analysis Of Fluid Flow

Week 10 : Approximate Solution Of Navier Stokes Equation

Week 11 : Drag And Lift

Week 12 : Introduction To Open Channel Flow

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 1

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Course: Municipal Solid Waste Management

Course Code: noc23-ce66 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Civil Engineering **Coordinating Institute: IITG**

Name of Course Instructor: Prof. Ajay Kalamdhad

Curriculum of the Course:

Week 1: Evolution of Solid Waste Management

Week 2: Sources/Types and Characteristics of Solid Waste

Week 3: Generation of Solid Waste

Week 4: Waste Handling, Separation, storage, and Processing

Week 5: Collection of Solid Waste

Week 6: Transfer and Transport

Week 7: Separation and processing of Solid Waste

Week 8: Chemical Transformation (combustion/incineration)

Week 9: Biological Treatment (Composting)

Week 10: Biological Treatment (Anaerobic Digestion)

Week 11: Disposal of Solid Waste

Week 12: ISWM and legistlation

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 3

Students Certified: 3

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Course: Design Of Reinforced Concrete Structures

Course Code: noc23-ce79 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Civil Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Nirjhar Dhang

Curriculum of the Course:

Week 1: Introduction, Different methods of design of reinforced concrete structures

Week 2: Working stress method

Week 3: Limit state of collapse - flexure

Week 4: Design of singly reinforced beam

Week 5: Design of doubly reinforced beam

Week 6: Limit state of collapse - shear

Week 7: Design for shear

Week 8: Design of slab

Week 9: Design of compression members

Week 10: Design of footing

Week 11: Design of staircase

Week 12: Limit state of serviceability

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Sustainable Engineering Concepts And Life Cycle Analysis

Course Code: noc23-ce90 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Civil Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Brajesh Kumar Dubey

Curriculum of the Course:

Week 1: An Introduction to Sustainability Concepts and Life Cycle Analysis (Introduction, Material flow and waste management, What it all means for an engineer? Water energy and food nexus)

Week 2: Risk and Life Cycle Framework for Sustainability (Introduction, Risk, Environmental Risk Assessment, Example Chemicals and Health Effects, Character of Environmental Problems)

Week 3: Environmental Data Collection and LCA Methodology (Environmental Data Collection Issues, Statistical Analysis of Environmental Data, Common Analytical Instruments, Overview of LCA Methodology - Goal Definition, Life Cycle Inventory, Life Cycle Impact Assessment, Life Cycle Interpretation, LCA Software tools)

Week 4: Life Cycle Assessment – Detailed Methodology and ISO Framework (Detailed Example on LCA Comparisons, LCA Benefits and Drawbacks, Historical Development and LCA Steps from ISO Framework)

Week 5: Life Cycle Inventory and Impact Assessments (Unit Processes and System Boundary Data Quality, Procedure for Life Cycle Impact Assessment, LCIA in Practice with Examples, Interpretation of LCIA Results)

Week 6: Factors for Good LCA Study (ISO Terminologies, LCA Steps Recap, Chemical Release and Fate and Transport, and Green Sustainable Materials)

Week 7: Design for Sustainability (Environmental Design for Sustainability: Economic, Environmental Indicators, Social Performance Indicators, Sustainable Engineering Design Principles and Environmental Cost Analysis)

Week 8: Case Studies (e.g., Odour Removal for Organics Treatment Plant, Comparison of Hand Drying Methods, Biofuels for Transportation, Kerosene Lamp vs. Solar Lamp, Bioplastic etc.).

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Sustainable Transportation Systems

Course Code: noc23-ce91 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Civil Engineering **Coordinating Institute: IITR**

Name of Course Instructor: Prof. Bhola Ram Gurjar

Curriculum of the Course:

Week 1: Introduction to Environmental Impact Assessment (EIA) and Transportation systems

Week 2: Land-use plans, zoning schemes and provisions

Week 3: Urban and regional transport planning

Week 4: Impacts on humans, flora and fauna, soil, water, air, climate and landscape

Week 5: Establishment of baseline conditions w.r.t soil, water and air quality

Week 6: Noise, air and water pollution modelling

Week 7: Modelling of impacts and scenario-based analysis

Week 8: Assessment of potential project impacts including indirect, cumulative and synergistic impacts

Week 9: Decision support systems for EIA of transport infrastructures

Week 10: Abatement measures

Week 11: Sustainable transportation systems

Week 12: Case studies of highway, railway and airport projects, OpenLCA tool for life Cycle Assessment, STAN for material flow analysis

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 2

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Course: Geometric Design Of Highways

Course Code: noc23-ce95 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Civil Engineering **Coordinating Institute: IITR**

Name of Course Instructor: Prof. Rajat Rastogi

Curriculum of the Course:

Week-1: Introduction, Design factors, functional classification of roads and Space requirements

Week-2: Sight distances – Factors, types, and sight distance under specific conditions

Week-3: Cross-sectional elements – Profiles, Factors controlling, common elements

Week-4: Cross-sectional elements – Specific elements (bicycle and pedestrian facilities, service roads); Road furniture – Categorization

Week-5: Road furniture – Longitudinal markings, Junction markings, Object markings, Messages, Road Traffic Signs

Week-6: Road Traffic signs, Road furniture – delineators, speed breakers; Alignment – Types, Factors, surveys, Horizontal alignment – guiding principles, simple circular curve

Week-7: Skidding and overturning control speeds; Superelevation, Extra-widening,

Week-8: Transition curve, Gradients, Vertical curves – general guidelines and types; Alignment coordination and issues.

Week-9: Good and bad practices; Intersection – Types, Profiles, design principles for at-grade intersections,

Week-10: Visibility, attributes influencing design, factors affecting layouts, Auxiliary lanes, Channelization and Warrants for signalized intersection; Interchanges – Types, design principles, warrants.

Week-11: Ramps – layouts, terminals, weaving sections, metering, lane balancing; Parking facilities – on-street and off-street, Supply and demand, and characteristics; Bus bays and Shelters.

Week-12: Truck Lay byes, Bus Rapid Transport stations and terminals; Toll Plaza layout design, Pedestrian over bridge and subway, Kilometer stone, Clearances and Access control

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 3

Students Certified: 1

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Course: Introduction To Operating Systems

Course Code: noc23-cs101 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Chester Rebeiro

Curriculum of the Course:

Week 1 : Introduction

Week 2 : Memory Management

Week 3 : Processes

Week 4 : Interrupts and Context Switching

Week 5 : Scheduling

Week 6 : Synchronization

Week 7 : Deadlocks

Week 8 : Operating System Security

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 14

Students Certified: 10

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Course: The Joy Of Computing Using Python

Course Code: noc23-cs108 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Sudarshan Iyengar

Curriculum of the Course:

- Motivation for Computing
- Welcome to Programming!!
- Variables and Expressions : Design your own calculator
- Loops and Conditionals : Hopscotch once again
- Lists, Tuples and Conditionals : Lets go on a trip
- Abstraction Everywhere : Apps in your phone
- Counting Candies : Crowd to the rescue
- Birthday Paradox : Find your twin
- Google Translate : Speak in any Language
- Currency Converter : Count your foreign trip expenses
- Monte Hall : 3 doors and a twist
- Sorting : Arrange the books
- Searching : Find in seconds
- Substitution Cipher : What's the secret !!
- Sentiment Analysis : Analyse your Facebook data
- 20 questions game : I can read your mind
- Permutations : Jumbled Words
- Spot the similarities : Dobble game
- Count the words : Hundreds, Thousands or Millions.
- Rock, Paper and Scissor : Cheating not allowed !!
- Lie detector : No lies, only TRUTH
- Calculation of the Area : Don't measure.
- Six degrees of separation : Meet your favourites
- Image Processing : Fun with images
- Tic tac toe : Let's play
- Snakes and Ladders : Down the memory lane.
- Recursion : Tower of Hanoi
- Page Rank : How Google Works !!

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 40

Students Certified: 37

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Course: Discrete Mathematics

Course Code: noc23-cs109 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Sudarshan Iyengar
Prof. Anil Shukla

Curriculum of the Course:

Week 1: Counting

Week 2: Set Theory

Week 3: Logic

Week 4: Relations

Week 5: Functions

Week 6: Mathematical Induction and Pegionhole Principle

Week 7: Graph Theory - 01

Week 8: Graph Theory - 02

Week 9: Graph Theory - 03 and Generating Functions

Week 10: Principle of Inclusion-Exclusion

Week 11: Recurrence relations

Week 12: Advanced Topics

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 2

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Course: Big Data Computing

Course Code: noc23-cs112 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITK**

Name of Course Instructor: Prof. Rajiv Misra

Curriculum of the Course:

Week 1 : Introduction to Big Data

Week 2 : Introduction to Enabling Technologies for Big Data

Week 3 : Introduction to Big Data Platforms

Week 4 : Introduction to Big Data Storage Platforms for Large Scale Data Storage

Week 5 : Introduction to Big Data Streaming Platforms for Fast Data

Week 6 : Introduction to Big Data Applications (Machine Learning)

Week 7 : Introduction of Big data Machine learning with Spark

Week 8 : Introduction to Big Data Applications (Graph Processing)

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 2

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Course: Computer Graphics

Course Code: noc23-cs115 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITG**

Name of Course Instructor: Prof. Samit Bhattacharya

Curriculum of the Course:

Week 1: Introduction – historical evolution, issues and challenges, graphics pipeline, hardware and software basics

Week 2: Object representation – boundary representation, splines, space partitioning

Week 3: Modeling transformations – matrix representation, homogeneous coordinate system, composition, 3D transformations

Week 4: Illumination and shading – background, simple lighting model, shading models, intensity representation, color models, texture synthesis

Week 5: 3D viewing – viewing pipeline, view coordinate system, viewing transformation, projection, window-viewport transformation

Week 6: Clipping and hidden surface removal – clipping in 2D. 3D clipping algorithms, hidden surface removal

Week 7: Rendering – scan conversion of line, circle, fill-area and characters, anti-aliasing

Week 8: Graphics hardware and software – generic architecture, I/O, GPU, Shader programming, graphics software (openGL)

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 9

Students Certified: 5

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Course: Problem Solving Through Programming In C

Course Code: noc23-cs121 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Anupam Basu

Curriculum of the Course:

Week 1 : Introduction to Problem Solving through programs, Flowcharts/Pseudo codes, the compilation process, Syntax and Semantic errors, Variables and Data Types

Week 2 : Arithmetic expressions, Relational Operations, Logical expressions; Introduction to Conditional Branching

Week 3 : Conditional Branching and Iterative Loops

Week 4 : Arranging things : Arrays

Week 5 : 2-D arrays, Character Arrays and Strings

Week 6 : Basic Algorithms including Numerical Algorithms

Week 7 : Functions and Parameter Passing by Value

Week 8 : Passing Arrays to Functions, Call by Reference

Week 9 : Recursion

Week 10 : Structures and Pointers

Week 11 : Self-Referential Structures and Introduction to Lists

Week 12 : Advanced Topics

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 38

Students Certified: 27

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Course: Software Engineering

Course Code: noc23-cs122 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Rajib Mall

Curriculum of the Course:

Week 1 : Introduction

Week 2 : Life Cycle Models I

Week 3 : Life Cycle Models II

Week 4 : Requirements analysis and specification

Week 5 : Basics of software design

Week 6 : Procedural design methodology

Week 7 : Object-oriented concepts

Week 8 : Introduction to UML: Class and Interaction Diagrams

Week 9 : Object-oriented analysis and design

Week 10 : Testing I

Week 11 : Testing II

Week 12 : Testing III

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 9

Students Certified: 3

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Course: Operating System Fundamentals

Course Code: noc23-cs123 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Santanu Chattopadhyay

Curriculum of the Course:

Week 1: Introduction

Week 2: Processes and Threads – Part I

Week 3: Processes and Threads – Part II

Week 4: Interprocess Communication

Week 5: Concurrency and Synchronization – Part I

Week 6: Concurrency and Synchronization – Part II

Week 7: Deadlock

Week 8: CPU Scheduling

Week 9: Memory Management

Week 10: Virtual Memory – Part I

Week 11: Virtual Memory – Part II

Week 12: File System Processes and Threads – Part I

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 19

Students Certified: 11

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Course: Cyber Security and Privacy

Course Code: noc23-cs127 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Saji K Mathew

Curriculum of the Course:

Week 1 : Introduction - Introduction to cyber security, Confidentiality, integrity, and availability.

Week 2 : Foundations - Fundamental concepts, CIA, CIA triangle, data breach at target.

Week 3 : Security management, Governance, risk, and compliance (GRC)- GRC framework, security standards.

Week 4 : Control strategies and protection mechanisms (Guest lecture), Cryptography for security.

Week 5 : Cyber security policy - ESSP, ISSP, SYSSP.

Week 6 : Risk Management - Cyber Risk Identification, Assessment, and Control.

Week 7 : Cyber security: Industry perspective - Defense Technologies, Attack, Exploits.

Week 8 : Cyber security technologies - Access control, Encryption, Standards.

Week 9 : Foundations of privacy - Information privacy, Measurement, Theories.

Week 10 : Privacy regulation - Privacy, Anonymity, Regulation, Data Breach.

Week 11 : Privacy regulation in Europe, Privacy: The Indian Way - Data Protection, GDPR, DPDP, Aadhar.

Week 12 : Information privacy: Economics and strategy, Economic value of privacy, privacy valuation, WTA and WTC, Business strategy and privacy, espionage, Privacy vs safety.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 3

Students Certified: 3

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Course: Computer Architecture

Course Code: noc23-cs67 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITD**

Name of Course Instructor: Prof. Smruti Ranjan Sarangi

Curriculum of the Course:

Week 1 **:** Introduction to Computing

Week 2 **:** Number Systems

Week 3 **:** Floating Point Numbers

Week 4 **:** Assembly Language – I

Week 5 **:** Assembly Language – II

Week 6 **:** Algorithms for Binary Addition

Week 7 **:** Algorithms for Multiplication and Division

Week 8 : Processor Design

Week 9 : Pipelining – I

Week10 **:** Pipelining – II

Week 11 **:** Memory Systems – Caches

Week 12 **:** Virtual Memory

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Privacy And Security In Online Social Media

Course Code: noc23-cs69 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Ponnurangam Kumaraguru

Curriculum of the Course:

Week 1: What is Online Social Networks, data collection from social networks, challenges, opportunities, and pitfalls in online social networks, APIs

Week 2: Collecting data from Online Social Media.

Week 3: Trust, credibility, and reputations in social systems

Week 4: Trust, credibility, and reputations in social systems

Week 5: Online social Media and Policing

Week 6: Information privacy disclosure, revelation and its effects in OSM and online social networks

Week 7: Phishing in OSM & Identifying fraudulent entities in online social networks

Week 8: Refresher for all topics

Week 9 to 12: Research paper discussion

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Theory Of Computation

Course Code: noc23-cs70 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITK**

Name of Course Instructor: Prof. Raghunath Tewari

Curriculum of the Course:

Week 1: Finite Automata – deterministic and nondeterministic, regular operations

Week 2: Regular Expression, Equivalence of DFA, NFA and REs, closure properties

Week 3: Non regular languages and pumping lemma, DFA Minimization,

Week 4: CFGs, Chomsky Normal Form

Week 5: Non CFLs and pumping lemma for CFLs, PDAs, Equivalence of PDA and CFG

Week 6: Properties of CFLs, DCFLs, Turing Machines and its variants

Week 7: Configuration graph, closure properties of decidable languages, decidability properties of regular languages and CFLs

Week 8: Undecidability, reductions, Rice's Theorem, introduction to complexity theory

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Programming In Java

Course Code: noc23-cs74 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Debasis Samanta

Curriculum of the Course:

Week 1 : Overview of Object-Oriented Programming and Java

Week 2 : Java Programming Elements

Week 3 : Input-Output Handling in Java

Week 4 : Encapsulation

Week 5 : Inheritance

Week 6 : Exception Handling

Week 7 : Multithreaded Programming

Week 8 : Java Applets and Servlets

Week 9 : Java Swing and Abstract Windowing Toolkit (AWT)

Week 10 : Networking with Java

Week 11: Java Object Database Connectivity (ODBC)

Week 12: Interface and Packages for Software Development

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 24

Students Certified: 20

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Course: Ethical Hacking

Course Code: noc23-cs75 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Indranil Sengupta

Curriculum of the Course:

Week 1: Introduction to ethical hacking. Fundamentals of computer networking. TCP/IP protocol stack.

Week 2: IP addressing and routing. TCP and UDP. IP subnets.

Week 3: Routing protocols. IP version 6.

Week-4: Installation of attacker and victim system. Information gathering using advanced google search, archive.org, netcraft, whois, host, dig, dnsenum and NMAP tool**.**

Week-5: Vulnerability scanning using NMAP and Nessus. Creating a secure hacking environment. System Hacking: password cracking, privilege escalation, application execution. Malware and Virus. ARP spoofing and MAC attack.

Week 6: Introduction to cryptography, private-key encryption, public-key encryption.

Week 7: Cryptographic hash functions, digital signature and certificate, applications.

Week 8: Steganography, biometric authentication, network-based attacks, DNS and Email security.

Week-9: Packet sniffing using wireshark and burpsuite, password attack using burp suite. Social engineering attacks and Denial of service attacks.

Week 10: Elements of hardware security: side-channel attacks, physical inclinable functions, hardware trojans.

Week-11: Different types of attacks using Metasploit framework: password cracking, privilege escalation, remote code execution, etc.Attack on web servers: password attack, SQL injection, cross site scripting.

Week 12: Case studies: various attacks scenarios and their remedies.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 5

Students Certified: 3

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Course: Programming In Modern C++

Course Code: noc23-cs78 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Partha Pratim Das

Curriculum of the Course:

Week 1: Programming in C++ is Fun.

Week 2: C++ as Better C.

Week 3: OOP in C++.

Week 4: OOP in C++.

Week 5: Inheritance.

Week 6: Polymorphism.

Week 7: Type Casting.

Week 8: Exceptions and Templates.

Week 9: Streams and STL.

Week 10: Modern C++.

Week 11: Lambda and Concurrency.

Week 12: Move, Rvalue and STL Containers.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 23

Students Certified: 9

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Course: Data Base Management System

Course Code: noc23-cs79 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Partha Pratim Das Prof. Samiran Chattopadhyay

Curriculum of the Course:

Week 1: Course Overview. Introduction to RDBMS

Week 2: Structured Query Language (SQL)

Week 3: Relational Algebra. Entity-Relationship Model

Week 4: Relational Database Design

Week 5: Application Development. Case Studies. Storage and File Structure

Week 6: Indexing and Hashing. Query Processing

Week 7: Query Optimization. Transactions (Serializability and Recoverability)

Week 8: Concurrency Control. Recovery Systems. Course Summarization.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 28

Students Certified: 25

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Course: Introduction To Internet Of Things

Course Code: noc23-cs83 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Sudip Misra

Curriculum of the Course:

Week 1: Introduction to IoT: Part I, Part II, Sensing, Actuation, Basics of Networking: Part-I

Week 2: Basics of Networking: Part-II, Part III, Part IV, Communication Protocols: Part I, Part II

Week 3: Communication Protocols: Part III, Part IV, Part V, Sensor Networks: Part I, Part II

Week 4: Sensor Networks: Part III, Part IV, Part V, Part VI, Machine-to-Machine Communications

Week 5: Interoperability in IoT, Introduction to Arduino Programming: Part I, Part II, Integration of Sensors and Actuators with Arduino: Part I, Part II

Week 6: Introduction to Python programming, Introduction to Raspberry Pi, Implementation of IoT with Raspberry Pi

Week 7: Implementation of IoT with Raspberry Pi (contd), Introduction to SDN, SDN for IoT

Week 8: SDN for IoT (contd), Data Handling and Analytics, Cloud Computing

Week 9: Cloud Computing(contd), Sensor-Cloud

Week 10: Fog Computing, Smart Cities and Smart Homes

Week 11: Connected Vehicles, Smart Grid, Industrial IoT

Week 12: Industrial IoT (contd), Case Study: Agriculture, Healthcare, Activity Monitoring

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 8

Students Certified: 8

****

Course: Data Structure And Algorithms Using Java

Course Code: noc23-cs85 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Debasis Samanta

Curriculum of the Course:

Week 1: 1D array, list and vector, 2D matrices and tables of objects

Week 2: Java implementation of 1D and 2D arrays and its operations

Week 3: Linked lists and its various operations, stack and queue

Week 4: Java implementation of linked lists, stack and queue

Week 5: Binary trees: Representation and operations. Variations of binary tree: Binary search tree, Height balanced search tree, Heap tree

Week 6: Java implementation of binary trees and its variations

Week 7: Graph : Structure, representation and operations

Week 8: Java implementations of graph data structures

Week 9: Algorithms (Part-I): Searching and sorting algorithms

Week 10: Java implementation of Part-I algorithms

Week 11: Algorithms (Part-II): Greedy algorithms, shortest path algorithms

Week 12: Java implementation of Part-II algorithms

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 19

Students Certified: 18

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Course: Introduction To Machine Learning - IITKGP

Course Code: noc23-cs87 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Sudeshna Sarkar

Curriculum of the Course:

Week 1: Introduction: Basic definitions, types of learning, hypothesis space and inductive bias, evaluation, cross-validation

Week 2: Linear regression, Decision trees, overfitting

Week 3: Instance based learning, Feature reduction, Collaborative filtering based recommendation

Week 4: Probability and Bayes learning

Week 5: Logistic Regression, Support Vector Machine, Kernel function and Kernel SVM

Week 6: Neural network: Perceptron, multilayer network, backpropagation, introduction to deep neural network

Week 7: Computational learning theory, PAC learning model, Sample complexity, VC Dimension, Ensemble learning

Week 8: Clustering: k-means, adaptive hierarchical clustering, Gaussian mixture model

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

****

Course: Introduction To Algorithms And Analysis

Course Code: noc23-cs88 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Sourav Mukhopadhyay

Curriculum of the Course:

Week 1: Sorting problem, time complexity, asymptotic analysis.

Week 2: Solving recurrence, Divide-and-Conquer.

Week 3: Quicksort and Heap Sort, Decision Tree.

Week 4: Linear time Sorting, Order Statistics.

Week 5: Hash Function, Binary Search Tree (BST) Sort.

Week 6: Randomly build BST, Red Black Tree, Augmentation of data structure.

Week 7: Van Emde Boas, Amortized analysis, Computational Geometry.

Week 8: Dynamic Programming, Graphs, Prim's Algorithms.

Week 9: BFS & DFS, Shortest path problem, Dijktra, Bellman Ford.

Week 10: All pairs shortest path, Floyd-Warshall, Johnson Algorithm.

Week 11: More amortized analysis, disjoint set data structure.

Week 12: Network flow, computational complexity.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 1

****

Course: Cloud Computing

Course Code: noc23-cs89 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Soumya Kanti Ghosh

Curriculum of the Course:

Week 1: Introduction to Cloud Computing

Week 2: Cloud Computing Architecture

Week 3: Service Management in Cloud Computing

Week 4: Data Management in Cloud Computing

Week 5: Resource Management in Cloud

Week 6: Cloud Security

Week 7: Open Source and Commercial Clouds, Cloud Simulator

Week 8: Research trend in Cloud Computing, Fog Computing

Week 9: VM Resource Allocation, Management and Monitoring

Week 10: Cloud-Fog-Edge enabled Analytics

Week 11: Serverless Computing and FaaS Model

Week 12: Case Studies and Recent Advancements

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 11

Students Certified: 9

****

Course: Google Cloud Computing Foundations

Course Code: noc23-cs90 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Soumya Kanti Ghosh

Curriculum of the Course:

Week 0 : Introduction to the course

Week 1 : So, What's the Cloud anyway? Start with a Solid Platform

Week 2 : Use GCP to build your Apps

Week 3 : Where do I store this stuff?

Week 4 : There's an API for that! You can't secure the Cloud right?

Week 5 : It helps to network!

Week 6 : It helps to network (continued)

Week 7 : Let Google keep an eye on things. You have the data, but what are you doing with it?

Week 8 : Let machines do the work

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 3

Students Certified: 2

****

Course: C Programming And Assembly Language

Course Code: noc23-cs93 **Duration: 4 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Janakiraman Viraraghavan

Curriculum of the Course:

WEEK 1: Introduction to Microprocessors and Assembly language Programming Microprocessor Architecture Machine Language Execution sequence in a mup memory in a microprocessor instruction set addressing schemes mov arithmetic and logical instructions flag register stack instructions call and ret hardware loops

WEEK 2: Introduction to C and Inline Assembly Data types and their sizes Simple examples of Inline assembly ALU operations String length Multiplication using repeated addition Swap two variables in C Swap two variables in inline Assembly Function to swap two variable in C Inline code to swap the two variables using a function

WEEK3: Compiling C to Assembly Language Compiling a simple program to Assembly – first order Passing parameters Prologue Epilogue Local variables

WEEK4: C++ and Some special Functions C and C++ at assembly language level Recursion vs Loops with factorial as example Special functions memcpy strlen

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 1

****

Course: Programming, Data Structures And Algorithms Using Python

Course Code: noc23-cs95 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Madhavan Mukund

Curriculum of the Course:

Week 1: Informal introduction to programmin, algorithms and data structures viagcd, Downloading and installing Python, gcd in Python: variables, operations, control flow - assignments, condition-als, loops, functions,

Week 2: Python: types, expressions, strings, lists, tuples Python memory model: names, mutable and immutable values List operations: slices etc Binary search Inductive function denitions: numerical and structural induction Elementary inductive sorting: selection and insertion sort In-place sorting

Week 3: Basic algorithmic analysis: input size, asymptotic complexity, O() notation Arrays vs lists Merge sort Quicksort Stable sorting

Week 4: Dictionaries More on Python functions: optional arguments, default values Passing functions as arguments Higher order functions on lists: map, lter, list comprehension

Week 5: Exception handling Basic input/output Handling files String processing

Week 6: Backtracking: N Queens, recording all solutions Scope in Python: local, global, nonlocal names Nested functions Data structures: stack, queue Heaps

Week 7: Abstract datatypes Classes and objects in Python "Linked" lists: find, insert, delete Binary search trees: find, insert, delete Height-balanced binary search trees

Week 8: Effcient evaluation of recursive definitions: memoization Dynamic programming: examples Other programming languages: C and manual memory management Other programming paradigms: functional programming

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 13

Students Certified: 8

****

Course: Design And Analysis Of Algorithms

Course Code: noc23-cs96 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Madhavan Mukund

Curriculum of the Course:

Week 1 Module 1: Introduction Module 2: Examples and motivation Module 3: Examples and motivation Module 4: Asymptotic complexity: informal concepts Module 5: Asymptotic complexity: formal notation Module 6: Asymptotic complexity: examples Assignments MCQ/Fill in blanks (unique answer)

Week 2 Module 1: Searching in list: binary search Module 2: Sorting: insertion sort Module 3: Sorting: selection sort Module 4: Sorting: merge sort Module 5: Sorting: quicksort Module 6: Sorting: stability and other issues Assignments MCQ/Fill in blanks, programming assignment

Week 3 Module 1: Graphs: Motivation Module 2: Graph exploration: BFS Module 3: Graph exploration: DFS Module 4: DFS numbering and applications Module 5: Directed acyclic graphs Module 6: Directed acyclic graphs Assignments MCQ/Fill in blanks, programming assignment

Week 4 Module 1: Shortest paths: unweighted and weighted Module 2: Single source shortest paths: Dijkstra Module 3: Single source shortest paths: Dijkstra Module 4: Minimum cost spanning trees: Prim's algorithm Module 5: Minimum cost spanning trees: Kruskal's Algorithm Module 6: Union-Find data structure Assignments MCQ/Fill in blanks, programming assignment

Week 5 Module 1: Divide and conquer: counting inversions Module 2: Divide and conquer: nearest pair of points Module 3: Priority queues, heaps Module 4: Priority queues, heaps Module 5: Dijstra/Prims revisited using heaps Module 6: Search Trees: Introduction Assignments MCQ/Fill in blanks, programming assignment

Week 6 Module 1: Search Trees: Traversals, insertions, deletions Module 2: Search Trees: Balancing Module 3: Greedy : Interval scheduling Module 4: Greedy : Proof strategies Module 5: Greedy : Huffman coding Module 6: Dynamic Programming: weighted interval scheduling Assignments MCQ/Fill in blanks, programming assignment

Week 7 Module 1: Dynamic Programming: memoization Module 2: Dynamic Programming: edit distance Module 3: Dynamic Programming: longest ascending subsequence Module 4: Dynamic Programming: matrix multiplication Module 5: Dynamic Programming: shortest paths: Bellman Ford Module 6: Dynamic Programming: shortest paths: Floyd Warshall Assignments MCQ/Fill in blanks, programming assignment

Week 8 Module 1: Intractability: NP completeness Module 2: Intractability: reductions Module 3: Intractability: examples Module 4: Intractability: more examples Module 5: Misc topics Module 6: Misc topics Assignments MCQ/Fill in blanks

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 5

Students Certified: 2

****

Course: Python For Data Science

Course Code: noc23-cs99 **Duration: 4 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Ragunathan Rengasamy

Curriculum of the Course:

Week 1: Basics of python spyder (tool)

Week 2: Sequence data types and associated operations

Week 3: Pandas dataframe and dataframe related operations on Toyota Corolla dataset

Week 4: CASE STUDY

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 9

Students Certified: 7

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Course: Control Systems

Course Code: noc23-de10 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Design Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. C.S.Shankar Ram

Curriculum of the Course:

Week 1 : Introduction to Control, Classification of Dynamic Systems, Closed Loop Control System with Feedback,Mathematical Preliminaries – Complex Variables, Laplace Transform.

Week 2 : Standard Inputs, Free and Forced Response, Transfer Function, Poles and Zeros.

Week 3 : Response to various Inputs, Effect of Poles, Notion of Bounded Input Bounded Output (BIBO) stability.

Week 4 : Effect of Zeros, Closed Loop Transfer Function, Dynamic Performance Specification, First Order Systems.

Week 5 : Second Order Systems, Unit Step Response of Underdamped Second Order Systems, Concepts of Rise Time,Peak Time, Maximum Peak Overshoot and Settling Time.

Week 6 : Controllers – Proportional (P), Integral (I) and Derivative (D) Blocks, Examples of PID controller design.

Week 7 : Routh's Stability Criterion, Use in Control Design, Incorporation of Performance Specifications in Controller Design, Analysis of Steady State Errors.

Week 8 : Root Locus and its Application in Control Design.

Week 9 : Frequency Response, Bode Plots, Nyquist Plots.

Week 10 : Nyquist Stability Criterion, Relative Stability – Gain and Phase Margins.

Week 11 : Control System Design via Frequency Response – Lead, Lag and Lag-Lead Compensation.

Week 12 : Case Studies.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 4

Students Certified: 2

****

Course: Understanding Incubation And Entrepreneurship

Course Code: noc23-de16 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Design Engineering **Coordinating Institute: IITB**

Name of Course Instructor: Prof. B.K. Chakravarthy

Curriculum of the Course:

Week 1: Introduction to Entrepreneurship, What is Entrepreneurship GDC Program

Week 2: Hand holding for Entrepreneurship GDC start-up stories

Week 3: Entrepreneurship Types, Team Building

Week 4: Innovation and Entrepreneurship, Solar Oven case-study Paradigm shift from Design to Entrepreneurship

Week 5: Bio- Med Innovation and Entrepreneurship

Week 6: New-age Entrepreneurship

Week 7: Business Model Canvas

Week 8: Technology led Entrepreneurship

Week 9: Entrepreneurship as Academic Program - IITH case study

Week 10: Creativity and Generating Product Ideas, From Idea to Proof of Concept, Network Entrepreneurship

Week 11: Learning from examples Start-up PITCHES - Using Lean Canvas Model Part 1

Week 12: Learning from examples Start-up PITCHES - Using Lean Canvas Model Part 2

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 1

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Course: Digital Circuits

Course Code: noc23-ee115 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Electrical and Electronics Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Santanu Chattopadhyay

Curriculum of the Course:

Week 1 : Introduction,Number System

Week 2 : Boolean Algebra

Week 3 : Combinational function minimization – K Map, Boolean identities

Week 4 : Logic Gates

Week 5 : Arithmetic circuits, Code converters

Week 6 : Multiplexers, Decoders, PLA

Week 7 : Sequential Circuits – Latches and Flip-flops

Week 8 : Counters, Shift Registers, Finite State Machines

Week 9 : Data Converters – Sample and hold circuits, ADCs, DACs

Week 10 : Semiconductor Memories – ROM, SRAM, DRAM

Week 11 : Microprocessor 8085 – Part I

Week 12 : Microprocessor 8085 – Part II

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 8

Students Certified: 5

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Course: Analog Communication

Course Code: noc23-ee117 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Electrical and Electronics Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Goutam Das

Curriculum of the Course:

Week 1: Introduction to Fourier Series and Fourier Transform (4 hours)

Week 2: Energy and Power Spectral Densities (3 hours)

Week 3: Modulation Theory (2 hours)

Week 4: Amplitude Modulation – AM and DSB-SC (3 hours)

Week 5: SSB-SC and VSB (3 hours)

Week 6: Angle Modulation – FM, PM (3 hours)

Week 7: Sampling Theorem (2 hours)

Week 8: Pulse Modulation and PCM (2 Hours)

Week 9: Introduction to Random Process (2 Hours)

Week 10: Spectral Analysis of Random Process (2 Hours)

Week 11: Characteristics of Band-pass noise (2 Hours)

Week 12: Performance Analysis of AM, DSB-SC with Noise (2 Hours)

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Digital Image Processing

Course Code: noc23-ee118 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Electrical and Electronics Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Prabir Kumar Biswas

Curriculum of the Course:

Week 1: Introduction and signal digitization

Week 2: Pixel relationship

Week 3: Camera models & imaging geometry

Week 4: Image interpolation

Week 5: Image transformation

Week 6: Image enhancement I

Week 7: Image enhancement II

Week 8: Image enhancement III

Week 9: Image restoration I

Week 10: Image restoration II & Image registration

Week 11: Colour image processing

Week 12: Image segmentation

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 1

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Course: Power System Protection And Switchgear

Course Code: noc23-ee125 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Electrical and Electronics Engineering **Coordinating Institute: IITR**

Name of Course Instructor: Prof. Bhaveshkumar R. Bhalja

Curriculum of the Course:

Week 1: Fundamentals of Protective Relaying

Week 2: Current based Relaying Scheme

Week 3: Protection of Transmission Lines using Distance Relays

Week 4: Carrier Aided Schemes for Transmission Lines and Auto-reclosing and Synchronizing

Week 5: Protection of Generators, Transformers, Induction Motors and Busbars

Week 6: Protection against Transients and Surges along with System Response to Severe Upsets

Week 7: Arc Interruption Theory in Circuit Breaker, Types of Circuit Breakers and their Testing

Week 8: Testing, Commissioning and Maintenance of Relays

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 4

Students Certified: 4

****

Course: Deep Learning

Course Code: noc23-ee131 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Electrical and Electronics Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Prabir Kumar Biswas

Curriculum of the Course:

Week 1: Introduction to Deep Learning, Bayesian Learning, Decision Surfaces

Week 2: Linear Classifiers, Linear Machines with Hinge Loss

Week 3: Optimization Techniques, Gradient Descent, Batch Optimization

Week 4: Introduction to Neural Network, Multilayer Perceptron, Back Propagation Learning

Week 5: Unsupervised Learning with Deep Network, Autoencoders

Week 6: Convolutional Neural Network, Building blocks of CNN, Transfer Learning

Week 7: Revisiting Gradient Descent, Momentum Optimizer, RMSProp, Adam

Week 8: Effective training in Deep Net- early stopping, Dropout, Batch Normalization, Instance Normalization, Group Normalization

Week 9: Recent Trends in Deep Learning Architectures, Residual Network, Skip Connection Network, Fully Connected CNN etc.

Week 10: Classical Supervised Tasks with Deep Learning, Image Denoising, Semanticd Segmentation, Object Detection etc.

Week 11: LSTM Networks

Week 12: Generative Modeling with DL, Variational Autoencoder, Generative Adversarial Network Revisiting Gradient Descent, Momentum Optimizer, RMSProp, Adam

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

****

Course: Control Engineering

Course Code: noc23-ee143 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Electrical and Electronics Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Ramkrishna Pasumarthy

Curriculum of the Course:

Week 1: Mathematical Modelling of Systems

Week 2: Laplace Transforms, transfer functions, block diagram representation.

Week 3: Block diagram reduction, Time response characteristics.

Week 4: Introduction to stability, Routh Hurwitz stability criterion.

Week 5: Root locus plots, stability margins.

Week 6: Frequency response analysis: Nyquist stability criterion, Bode plots and stability margins in frequency domain.

Week 7: Basics of control design, the proportional, derivative and integral actions.

Week 8: Design using Root Locus

Week 9: Design using Bode plots

Week 10: Effects of zeros, minimum and non-minimum phase systems.

Week 11: State space analysis

Week 12: Design using State space

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

****

Course: Basic Electrical Circuits

Course Code: noc23-ee81 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Electrical and Electronics Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Gajendranath Chowdary

Curriculum of the Course:

Week 1 : Preliminaries; Current and voltage; Electrical elements and circuits; Kirchhoff's laws,Basic elements: Voltage and current sources, R, L, C, M; Linearity of elements

Week 2 : Elements in series and parallel,Controlled sources

Week 3 : Power and energy in electrical elements, Circuit Analysis Methods

Week 4 : Nodal analysis, Extending nodal analysis with different sources

Week 5 : Mesh analysis, Circuit theorems

Week 6 : More circuit theorems, Two port parameters

Week 7 : Two port parameters continued, Reciprocity in resistive networks

Week 8 : Opamp and negative feedback, Opamps cont'd: Example circuits and additional topics

Week 9 : First Order Circuits, First Order Circuits cont'd

Week 10 : First order circuits with time-varying inputs, Sinusoidal steady state response and total response

Week 11 : Second order system-Natural response, Second order system-Cont'd

Week 12 : Direct calculation of steady state response from equivalent components, Magnitude and Phase plots; Maximum power transfer theorem

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 7

Students Certified: 1

****

Course: Electromagnetic Theory

Course Code: noc23-ee97 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Electrical and Electronics Engineering **Coordinating Institute: IITK**

Name of Course Instructor: Prof. Pradeep Kumar K

Curriculum of the Course:

Week 1 : Coulomb's law and electric fields

Week 2 : Gauss's law, potential and energy, conductors and dielectrics

Week 3 : Laplace and Poisson equations, solution methods, and capacitance

Week 4 : Biot-Savart and Ampere's laws, inductance calculation

Week 5 : Magnetic materials, Faraday's law and quasi-static analysis

Week 6 : Maxwell equations and uniform plane waves

Week 7 : Wave propagation in dielectrics and conductors, skin effect, normal incidence

Week 8 : Oblique incidence, Snell's law, and total internal reflection

Week 9 : Transmission lines, Smith chart, impedance matching

Week 10 : Transients and pulse propagation on transmission line

Week 11 : Waveguides: Metallic and Dielectric

Week 12 : Antenna fundamentals

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

****

Course: Ecology And Environment

Course Code: noc23-ge33 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Multidisciplinary **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Abhijit Deshpande
Prof. R. Ravi Krishna

Curriculum of the Course:

Week 1 : Dr. B.S. Murty -Introduction (1),Sustainability Definition / Goals, Climate Change (2),Case Studies (3) (Eg: Dams, Chemicals, e-waste, IOT, Landfill siting etc)

Week 2 : Dr. Sudhir Chella Rajan-Sustainability and Economics (3),Sustainability and Ethics (3)

Week 3 : Dr. Ligy Philip-(Water Quality/ Waste Management),Water Quality and Treatment (3),Waste Management and Treatment (3)

Week 4 : Dr. B. S. Murty (Water Management/ Resources),Urban Drainage, Water Resource Management, Impact of Climate Change

Week 5 : Dr. Srinivas Jayanti (Energy)-Energy Demand / Resources (1),Pollution from Energy generation (1),Energy and Climate Change (Global Warming) (1),Energy and Sustainability (1),Long Range and Short Range Solutions (1)(Global vs. India)

Week 6 : Dr. R. Ravi Krishna-Risk Assessment Definition (1),Pollutant Pathways / Safety/ Exposure (1),Liability /Examples (1),Life Cycle Assessment (2),Environmental Management and LCA (1)

Week 7 : Dr. Sudhir Chella Rajan-Urban Planning / Sprawl (1),Challenges in Urban Planning, Transport (1),Energy (Smart Grid) (1),Waste (1),Governance (1)

Week 8 : Dr. Susy Varughese / Dr. Parag Ravindran-Ecology – definitions / Systems (1),Biodiversity (1),Examples of Historical Impact of economy on Ecology, Restoration / Ecological Engineering

Week 9 : Dr. Ligy Philip / Dr. Ravi Krishna -Solid Waste Management, Hazardous Waste Management

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 3

Students Certified: 2

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Course: Introduction To Research New title: Research Methodology

Course Code: noc23-ge36 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Multidisciplinary **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Edamana Prasad
Prof. Prathap Haridoss

Curriculum of the Course:

Week 1 : A group discussion on what is research; Overview of research;

Week 2 : Literature survey , Experimental skills;

Week 3 : Data analysis, Modelling skills;

Week 4 : Technical writing; Technical Presentations; Creativity in Research

Week 5 : Creativity in Research; Group discussion on Ethics in Research

Week 6 : Design of Experiments

Week 7 : Intellectual Property

Week 8 : Department specific research discussions

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 2

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Course: Technical English For Engineers

Course Code: noc23-hs115 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Aysha Iqbal

Curriculum of the Course:

Listening: Listening/Reading Comprehension

Dictation

Notemaking

Speaking: Using words in context

Use of formal expressions and usages

Formal presentations (organizing data and slide preparation)

Reading: Skimming through the text

Scanning

Writing: Grammar

Introduction to elements of academic writing

Report Writing

Resume writing

Project Proposal writing

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 30

Students Certified: 30

****

Course: Developing Soft Skills And Personality

Course Code: noc23-hs116 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITK**

Name of Course Instructor: Prof. T Ravichandran

Curriculum of the Course:

Week 1: Introduction: A New Approach To Learning, Planning And Goal-Setting, Human Perceptions: Understanding People, Types Of Soft Skills: Self-Management Skills, Aiming For Excellence: Developing Potential And Self-Actualisation, Need Achievement And Spiritual Intelligence

Week 2: Lecture 7: Conflict Resolution Skills: Seeking Win-Win Solution, Inter-Personal Conflicts: Two Examples, Inter-Personal Conflicts: Two Solutions, Types Of Conflicts: Becoming A Conflict Resolution Expert , Types Of Stress: Self-Awareness About Stress , Regulating Stress: Making The Best Out Of Stress

Week 3: Habits: Guiding Principles Habits: Identifying Good And Bad Habits , Habits: Habit Cycle, Breaking Bad Habits, Using The Zeigarnik Effect For Productivity And Personal Growth , Forming Habits Of Success

Week 4: Communication: Significance Of Listening, Communication: Active Listening, Communication: Barriers To Active Listening , Telephone Communication: Basic Telephone Skills , Telephone Communication: Advanced Telephone Skills , Telephone Communication: Essential Telephone Skills

Week 5: Technology And Communication: Technological Personality, Technology And Communication: Mobile Personality?, Topic: Technology And Communication: E-Mail Principles, Technology And Communication: How Not To Send E-Mails!, Technology And Communication: Netiquette, Technology And Communication: E-Mail Etiquette

Week 6: Communication Skills: Effective Communication, Barriers To Communication: Arising Out Of Sender/Receiver's Personality, Barriers To Communication: Interpersonal Transactions, Barriers To Communication: Miscommunication, Non-Verbal Communication: Pre-Thinking Assessment-1, Non-Verbal Communication: Pre-Thinking Assessment-2

Week 7: Nonverbal Communication: Introduction and Importance, Non-Verbal Communication: Issues and Types, Non-Verbal Communication: Basics And Universals, Non-Verbal Communication: Interpreting Non-Verbal Cues, Body Language: For Interviews, Body Language: For Group Discussions

Week 8: Presentation Skills: Overcoming Fear, Presentation Skills: Becoming A Professional, Presentation Skills: The Role of Body Language, Presentation Skills: Using Visuals, Reading Skills: Effective Reading, Human Relations: Developing Trust and Integrity

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 44

Students Certified: 42

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Course: Brief Introduction To Psychology

Course Code: noc23-hs117 **Duration: 4 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITK**

Name of Course Instructor: Prof. Braj Bhushan

Curriculum of the Course:

Week 1 : Perception

Week 2 : Learning

Week 3 : Memory

Week 4 : Emotion

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 1

****

Course: Introduction To Japanese Language And Culture

Course Code: noc23-hs120 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITK**

Name of Course Instructor: Prof. Vatsala Misra

Curriculum of the Course:

Week 1: Introduction to Japanese scripts and particles; Introducing oneself

Week 2: Interrogative words; Demonstrative pronouns and adjectives; Time; Hobbies

Week 3: Conversation with time expressions and simple verbs

Week 4: Negative form of verb; Locational nouns

Week 5: Simple conversation on phone; Conjunctions; Volitional form of verb

Week 6: Types of Adjectives – 'i' and 'na' adjectives

Week 7: Negative form of adjectives; Plain form of verbs

Week 8: Negative forms of verbs; Expressions for giving or receiving things, gifts, etc.

Week 9: Potential form of verbs; Some proverbs and expressions

Week 10: Expressing intent or purpose; Examples from Japanese way of life

Week 11: Permission and seeking approval; Basic Kanji

Week 12: Filling out simple forms; Conditional form of verbs; Kanji(*Contd..*)

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 4

Students Certified: 1

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Course: The Psychology Of Language

Course Code: noc23-hs129 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITG**

Name of Course Instructor: Prof. Naveen Kashyap

Curriculum of the Course:

Week 1: Communication and Language

Week 2: The Science of Language

Week 3: Speech Perception

Week 4: Speech Production

Week 5: Words

Week 6: Sentences

Week 7: Discourse

Week 8: Reading and Writing

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 1

****

Course: Science, Technology And Society

Course Code: noc23-hs131 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITG**

Name of Course Instructor: Prof. Sambit Mallick

Curriculum of the Course:

Week 1: Science, Technology and Society: Cognitive and Ethical Dimensions

Week 2: Science, Technology and Society: Methodological Dimensions I

Week 3: Science, Technology and Society: Methodological Dimensions II

Week 4: Science, Technology and Society: Methodological Dimensions III

Week 5: Inequalities in Science I

Week 6: Inequalities in Science II

Week 7: Technology as Knowledge

Week 8: Social Shaping of Technology I

Week 9: Social Shaping of Technology II

Week 10: Social Shaping of Technology III

Week 11: Information Society

Week 12: Science and Technology in India

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 9

Students Certified: 3

****

Course: Environment And Development

Course Code: noc23-hs133 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITG**

Name of Course Instructor: Prof. Ngamjahao Kipgen

Curriculum of the Course:

Week-1: Introduction: Development, economic growth and sustainable development, Basic ecosystem ecology

Week-2: Environmentalism, Environmental Movement, Environmentalism in the global south

Week-3: Approaches to environment: Ecofeminism, Feminist political ecology, Marxism and ecology

Week-4: Debates on environmental ethics: Deep ecology, Gandhi and ecology, Social ecology

Week-5: Religion, environment and conservation: Religion, environment and historical roots of ecological crisis, Biodiversity conservation ethics in Buddhism and Hinduism, Christian religion in the age of ecological crisis

Week-6: Natural resource management, Common property vs. private property, Livelihoods, forests, and conservation

Week-7: Displacement, dispossession and development: Conservation-induced displacement, Environment impact assessment and national rehabilitation & resettlement policy, Dispossession and land acquisition

Week-8: Mainstream development trajectory: Strengthening or weakening of indigenous peoples: Mining, development, and indigenous people, Competing visions of development along the Narmada, Dams, development, and resistance: case studies

Week-9: Gender and development: Development theory and gendered approach to development, Gender, environment & sustainable development

Week-10: Environment and climate change: Climate change interventions and policy framework, Eastern Himalayas and climate change

Week-11: Belief and knowledge systems, biodiversity conservation and sustainability: Ecological knowledge, biodiversity conservation and sustainability, Traditional religion and conservation of nature in Northeast India: Case study

Week-12: Local knowledge in the environment-development discourse: Indigenous knowledge, environment and development, Relevance of indigenous knowledge: case study

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 4

Students Certified: 4

****

Course: Stress Management

Course Code: noc23-hs138 **Duration: 4 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Rajlakshmi Guha

Curriculum of the Course:

Week 1 : Scientific Foundations Of Stress

Week 2 : Stress Psychophysiology

Week 3 : Developing Resilience To Stress

Week 4 : Strategies For Relieving Stress

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 1

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Course: Introduction To Basic Spoken Sanskrit And Intermediate Level Of Spoken Sanskrit

Course Code: noc23-hs139 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Anuradha Choudry

Curriculum of the Course:

Week 1 : Introduction: Some Unique characteristics of Sanskrit -Basic introduction of oneself -Simple verbs Daily vocabulary

Week 2 : Introducing different declensions and tenses - 1

Week 3 : Introducing different declensions and tenses - 2

Week 4 : Practice with various verbs in different moods and tenses Summary of the Sentence structure with different questions

Week 5: Introduction: Some Unique characteristics of Sanskrit, Revision of the main features of Part 1 of Introduction to Basic Spoken Sanskrit, Different verb forms, Daily vocabulary

Week 6,7: Introduction of different declensions in the plural and tenses – 1, Daily Vocabulary, Poetic verses, conversations and stories

Week 8: Practice with various verbs in different moods and tenses, Summary of the Sentence structures using the plural with different questions

Week 9: Introduction of a few more words ending with consonants and their declensions, An Alternative Conjugation of verbs, Daily vocabulary, Poetic verses, conversations and stories

Week 10: Introduction to their different declensions in singular, dual and plural, New verb forms, Daily Vocabulary, Poetic verses, conversations and stories

Week 11: Introduction to Sandhi, Vowel with vowel / Vowel with consonant / Consonant with consonant / Aspirant with vowel or consonant, Poetic verse, reading and comprehension, conversations

Week 12: Practice with a variety of word endings, various verbs in different moods and tenses, Summary of the Sentence structures using the plural with different questions

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Human Resource Development

Course Code: noc23-hs141 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Kbl Srivastava

Curriculum of the Course:

Week 1: Introduction to Human Resource Development: Emergent of HRD, Critical HRD roles, challenges for HRD

Week 2: HRD in global perspective, HRD- Performance link, Strategic perspective of HRD

Week 3: HRD Process Model: identification of HRD needs and Design and development of HRD programmes

Week 4: HRD Process Model: Methods of Implantation, Evaluation of HRD programmes

Week 5: Employee coaching and performance management: Coaching to improve poor performance, coaching analysis, coaching discussion, coaching skills

Week 6: HRD interventions: Mentoring for employee development: Role of mentoring in development, understanding the role and responsibilities of mentor, mentee, implementing the mentoring process, mentoring relationship,

Week 7: Employee counselling for HRD: Overview of counselling programmes, employee assistance programme, stress management, employee wellness and health promotion

Week 8: Competency framework of HRD: why competency mapping? Understanding the competency mapping framework, steps in competency mapping

Week 9: Career Planning, management, and development: Career development stages and activities, role of individual and organization in career planning, Issues in career management

Week 10: Intellectual capital (IC), its measurement and management: Components of IC, measurement models of IC, IC index and challenges for HR

Week 11: HRD, Organizational Learning, and learning organizations

Week 12: The future of HRD and HRD Ethics: Research, practice and education of HRD for innovation and talent development and management, Role of HRD in developing ethical attitude and behavior and development, Ethical problems with HRD roles

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 4

Students Certified: 3

****

Course: Soft Skills

Course Code: noc23-hs145 **Duration: 12 weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITR**

Name of Course Instructor: Prof. Binod Mishra

Curriculum of the Course:

Week 1: Introduction to Soft Skills, Aspects of Soft Skills, Effective Communication Skills, Classification of Communication, Personality Development

Week 2: Positive Thinking, Telephonic Communication Skills, Communicating without Words, Paralanguage

Week 3: Proxemics, Haptics: The Language of Touch, Meta-communication, Listening Skills, Types of Listening

Week 4: Negotiation Skills, Culture as Communication, Organizational Communication

Week 5: Communication Breakdown, Advanced Writing Skills, Principles of Business Writing

Week 6: Business Letters, Business Letters: Format and Style, Types of Business Letter

Week 7: Writing Reports, Types of Report, Strategies for Report Writing, Evaluation and Organization of Data

Week 8: Structure of Report, Report Style, Group Communication Skills

Week 9: Leadership Skills, Group Discussion, Meeting Management, Adaptability & Work Ethics

Week 10: Advanced Speaking Skills, Oral Presentation, Speeches & Debates, Combating Nervousness, Patterns & Methods of Presentation, Oral Presentation: Planning & Preparation

Week 11: Making Effective Presentations, Speeches for Various Occasions, Interviews, Planning & Preparing: Effective Résumé,

Week 12: Facing Job Interviews, Emotional Intelligence & Critical Thinking, Applied Grammar

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 55

Students Certified: 52

****

Course: Public Speaking

Course Code: noc23-hs151 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITR**

Name of Course Instructor: Prof. Binod Mishra

Curriculum of the Course:

Week 1: Introduction to the Course

Week 2: Prerequisites for Public Speaking

Week 3: Converting Ideas into Action

Week 4: Public Speaking as a Performative Act

Week 5: Use of Non-verbal in Public Speaking

Week 6: Types of Public Speaking

Week 7: Speeches: Types and Demonstrations

Week 8: Interviews

Week 9: Meetings and Conferences

Week 10: Oral/Professional Presentation

Week 11: Creative Use of Language in Public Speaking

Week 12: Etiquettes and Mannerism in Public Speaking

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 39

Students Certified: 38

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Course: Environmental Science

Course Code: noc23-hs155 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Multidisciplinary **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Samik Chowdhury & Prof. Sudha Goel

Curriculum of the Course:

Week 1: Environmental Concerns, Population Growth, and Resource Consumption

Week 2: Principles of Sustainable Development

Week 3: Understanding Air Pollution

Week 4: Climate Change: Scientific Basis, Mitigation & Adaption

Week 5: Renewable Energy – I (Solar Energy & Wind Energy)

Week 6: Renewable Energy – II (Geothermal Energy, Ocean Energy, Hydroelectricity, Bioenergy)

Week 7: Industrial Ecology & Circular Economy

Week 8: Water Quality, Reuse and Recycling

Week 9: Solid Waste Management (including E-waste Management)

Week 10: Noise Pollution

Week 11: Ecology and Soil Pollution

Week 12: Environmental Policies and Legislation

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 4

Students Certified: 3

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Course: The Science of Happiness and Wellbeing

Course Code: noc23-hs158 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Priyadarshi Patnaik
Prof. Manas K Mandal

Curriculum of the Course:

Week 1: Operationalizing happiness: Defining happiness

Week 2: Understanding the construct of happiness: The science of happiness These five modules would introduce the key concepts that make up the science of happiness, and create the basic ground for the sessions to follow. It would also include pretests to assess current happiness and other related parameters.

Week 3: Factors influencing happiness: Biological, psychological & socio-cultural factors These modules would focus on the key components influence happiness through talks, case studies and self-learning tasks.

Week 4: Unanswered questions: What makes us happy? The modules in this week would focus on the myths as well as the simple secrets of happiness and how to make the act successful through understanding and practice. Happiness: The dynamics within: Key ingredients of happiness These modules would address the key ingredients with scientific evidence, case studies and online assignments and assessments.

Week 5: Train yourself in Happiness: Two short modules on Mindfulness These sessions would take us through the science as well as the art of mindfulness through online practice sessions and training aids. Happiness in the social context: Three modules on Emotional Intelligence. Emotions play a key role in happiness and need to be addressed in their various ways in response to people and society. Tests, assessments and training sessions to hone skills would be included.

Week 6: Happiness at work: Getting rid of daily hassles Happiness and efficiency, happiness and creativity, and various other key components like innovation and follow would be addressed in these units. Fine tuning work-life balance: Strategies to develop happiness Through units as well as assessment tools participants would be guided through techniques to hone their work-life balance – a key component of success as well as happiness.

Week 7: Becoming happier: State & trait of happiness This week would focus on sustaining and enhancing what has been learnt so far through both theoretical as well as training inputs.

Week 8: Creating happiness: Making a difference for others Happiness needs to spread. These units would focus on networking and sustaining what has been learnt by sharing with others. Post-test assessments would also be used to tests changes that have been brought about during the 12 weeks of the course.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 1

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Course: Soft Skill Development

Course Code: noc23-hs80 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Priyadarshi Patnaik
Prof. V. N. Giri
Prof. D. Suar

Curriculum of the Course:

Week 1:

Communication skills 1: The basics

Week 2:

Communication skills 2 : Presentation and interaction

Week 3:

Communication skills 3: Visual, nonverbal and aural communication

Week 4:

Interpersonal communication 1: Individuals, groups and cultures

Week 5:

Interpersonal communication 2: Emotional and social skills

Week 6:

Developing key traits 1: Creativity, critical thinking and problem solving

Week 7:

Developing key traits 2: Motivation, persuasion, negotiation and leadership

Week 8:

Essential and vocational skills: survival strategies

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 4

Students Certified: 4

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Course: Advance Course In Social Psychology

Course Code: noc23-hs82 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITR**

Name of Course Instructor: Prof. Pooja Garg

Curriculum of the Course:

Week 1 : Introduction to Social Psychology: Its historical background; its scope, and major features of contemporary social psychology.

Week 2 : Methods Adopted in Social Psychology: Experimental and non-experimental approaches, Qualitative research methods Grounded theory and Focused group.

Week 3 : Interpersonal attraction: Attraction, similarity, and liking, Measurement issues- Sociometry.

Week 4 : Prosocial Behavior: Helping behavior and recipient reactions- Determinants and major models-Reciprocal altruism, negative state relief model, empathy-altruism model, and social exchange theory.

Week 5 : Attitudes: Attitude and its components; Attitude formation theories; Persuasion.

Week 6 : Social influence: Social facilitation, Social loafing, Conformity, and compliance; Impression Management- tactics of impression management, self-presentation.

Week 7 : Distributive, Procedural and Interactional Justice: Meaning, definition, and types; Antecedents and outcomes.

Week 8 : Conflicting Behavior: Cooperation and competition; Conflict resolution strategies.

Week 9 : Communication: Process, formal and informal communication, verbal and non-verbal patterns of communication, social networks, rumors, and grapevine.

Week 10 : Group Behavior: Defining and Classifying Groups; Stages of group development; Group Properties-Roles, Norms, Status, and Cohesiveness; Groupthink and Group shift; Approaches used for different types of group work.

Week 11 : Group Leadership: Conceptualizing leadership; Leadership styles, Contemporary theories of leadership- Leader-member Exchange, Charismatic Leadership, Transactional and Transformational Leadership.

Week 12 : Interactive Behavior: Transactional analysis, JOHARI window.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 1

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Course: Psychology Of Learning

Course Code: noc23-hs85 **Duration: 12 weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Atasi Mohanty

Curriculum of the Course:

Week 1: Part-I: Learning Principles Unit - I: Introduction to Psychology of Learning Learning: Theories and Applications a) Behavioral Learning theories b) Cognitive-, Bruner, Gagne c) Constructivist-, Piaget, Vygotsky

Week 2: Motivation: Concept, Theories and types a) Maslow's Need Hierarchy theory(Humanistic Approach) b)Achievement Motivation & Goal Orientations c)Learners' Academic Self-regulation

Week 3: a) Sustainable Learning Habits of Mind b)Prominent Theories of Motivation c)Learners' Engagement & Self-Efficacy

Week 4: Unit-II: Memory & Cognition Information Processing Model of Memorya) Sensory Memory, Working Memory, Long-term Memory b)Cognitive load & Meta-cognition

Week 5: c) Critical & Reflective thinking, Problem solving and Concept- mapping

Week 6: Unit-III: Learners' Diversity & Inclusive Education I) Learners' diversity in the classroom II)Different Learning styles & approaches III)Meeting the Learners' Diverse Needs

Week 7: IV. Advantages of Inclusive education for individuals and society Part-II: Learning in Practice Unit-IV: Learning Sciences I. Transformative Learning-(TL)

Week 8: a) Transformative Learning Theory b) Facilitating TL :Engaging Emotions c)Simulated Learning d) Critical Pedagogy

Week 9: II. Experiential Learning-(EL) a) Theoretical Foundations of EL b) Dynamic Debriefing c) EL Methodologies d) Applications of EL e) Learning Styles

Week 10: III. Multimedia Learning-(ML) a) Theoretical Foundations of ML b) Basic Principles of ML c) Applications in E-learning Contexts d) Virtual Learning e) Online Learning f) Hybrid Learning

Week 11: IV. Social Interaction and Collaborative Learning a) Web-based Learning (WBL) b) Integrated E-Learning (IEL) c) Blended Learning with Flipped Instruction d) Project-based Learning (PL) e) Problem-based Learning (PBL) f) Cyber-Physical-Social Learning

Week 12: V. Personalized Learning- (PL) a) Game-based Learning (GBL) b) Self-directed Online Learning (SOL) c) Mobile Learning (ML) d) Cognitive & Affective Tutoring e) Contemplative Learning.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 2

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Course: Applied Linguistics

Course Code: noc23-hs95 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITM**

Name of Course Instructor: Prof.Rajesh Kumar

Curriculum of the Course:

Week 1: Applied Linguistics

Week 2: Introduction to Language

Week 3: Structure of Language

Week 4: Language and Society

Week 5: Multilingualism and Language Learning

Week 6: First Language Acquisition

Week 7: Second Language Acquisition

Week 8: Language and Cognition

Week 9: Disabilities

Week 10: Cohesion and Coherence

Week 11: Behaviorism and Language Teaching

Week 12: Sapir-Whorf Hypothesis

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 2

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Course: German - I

Course Code: noc23-hs98 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Milind Brahme

Curriculum of the Course:

Week 1: Themes: Introducing oneself and others; Grammar: W questions, personal pronouns, simple sentence, verb conjugation

Week 2: Themes: hobbies, the week, numbers, the alphabet, months, seasons /Grammar : articles , plural, the verbs to have and to be

Week 3: Theme: In the city / naming places and buildings, means of transport, basic directions / Grammar : definite and indefinite articles; negation - kein and nicht; imperative

Week 4: Themes: food, drink, family / groceries and meals / Grammar : the accusative

Week 5: Theme: Everyday life, telling time, making appointments / Grammar :prepositions am, um, vonbis; modal verbs, possessive articles

Week 6: Leisure activity, celebrations / Grammar: separable verbs, the accusative, past tense of to have and to be

Week 7: Contacts, writing letters / Grammar: dative

Week 8: My apartment, rooms, furniture, colours / Grammar: changing prepositions

Week 9: Professions / Grammar : perfect tense

Week 10: Clothes / Grammar: perfect tense and dative

Week 11: Health and the body / Grammar: the imperative and modal verbs

Week 12: Holiday and weather

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 4

Students Certified: 1

****

Course: Calculus Of One Real Variable

Course Code: noc23-ma64 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Mathematics **Coordinating Institute: IITK**

Name of Course Instructor: Prof. Joydeep Dutta

Curriculum of the Course:

Week 1: Introduction to Numbers, Countability and Uncountability, Examples of Irrational numbers, Functions, Limits of Functions-I

Week 2: Limit of Functions-II, Continuous Functions, Intermediate Value Theorem, Maximum Value Theorem, Supremum & Infimum

Week 3: Derivative of a Function,: Rules of Differentiation, Derivatives maxima & minima, Rolle's Theorem and Lagrange MVT(Mean-Value Theorem), Monotonic Functions and Inverse Function

Week 4: Newton's Method for solving Equations, Optimization Problems, Integration-I : In the style of Newton and Leibnitz, Integration-II : In the spirit of Newton and Leibnitz, Integration-III : Newton and Leibnitz Style

Week 5: Indefinite Integrals, Integration by Parts, Integration of Rational Functions, Trapezoidal Rule for evaluating definite integral, Simpson's Rule for evaluating definite integral

Week 6: Applications of Definite Integral-I, Applications of Definite Integral-II, Applications of Definite Integral-III, Applications of Definite Integral-IV, Transcendental Functions-I

Week 7: Transcendental Functions-II, Taylor's Expansion-I, Taylor's Expansion-II, Infinite Sequence-I, Infinite Sequence-II

Week 8: Infinite series and their convergence, Tests for Convergence of a series, Absolute and conditional convergence, Power Series, Historical Development of the Calculus

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Advanced Calculus For Engineers

Course Code: noc23-ma86 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Mathematics **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Jitendra Kumar & Prof. Somesh Kumar

Curriculum of the Course:

Week 1: Differential calculus of one variable

Week 2: Limit, continuity, partial derivatives of functions of two or more variables

Week 3: Differentiability of functions of two or more variables

Week 4: Differentiation of Homogeneous and Implicit Functions, Taylors theorem of functions of two variables

Week 5: Maxima and Minima

Week 6: First order ODEs

Week 7: Higher order ODEs

Week 8: Improper integrals

Week 9: Double integrals

Week 10: Triple Integrals

Week 11: Vector and scalar field, gradient, divergence and curl

Week 12: Line and surface integrals. Green, Stokes and Gauss divergence theorems

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Automation In Manufacturing

Course Code: noc23-me105 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Mechanical Engineering **Coordinating Institute: IITG**

Name of Course Instructor: Prof. Shrikrishna N. Joshi

Curriculum of the Course:

Week 1: Introduction: Importance of automation in the manufacturing industry. Use of mechatronics. Systems required.

Week 2: Design of an automated system: Building blocks of an automated system, working principle and examples.

Week 3: Fabrication: Fabrication or selection of various components of an automated system. Specifications of various elements. Use of design data books and catalogues.

Week 4: Sensors: study of various sensors required in a typical automated system for manufacturing. Construction and principle of operation of sensors.

Week 5: Microprocessor Technology: signal conditioning and data acquisition, use of microprocessor or micro controllers. Configurations. Working.

Week 6: Drives: electrical drives – types, selection criteria, construction and operating principle.

Week 7: Mechanisms: Ball screws, linear motion bearings, cams, systems controlled by camshafts.

Week 8: Mechanisms: Electronic cams, indexing mechanisms, tool magazines, and transfer systems.

Week 9: Hydraulic systems: hydraulic power pack, pumps, valves.

Week 10: Hydraulic systems: designing of hydraulic circuits.

Week 11: Pneumatic systems: configurations, compressors, valves, distribution and conditioning.

Week 12:CNC technology: basic elements, interpolators and programming.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Fundamentals Of Additive Manufacturing Technologies

Course Code: noc23-me112 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Mechanical Engineering **Coordinating Institute: IITG**

Name of Course Instructor: Prof. Sajan Kapil

Curriculum of the Course:

Week 1 :Introduction to Additive Manufacturing

Week 2 :Computer Aided Process Planning for Additive Manufacturing

Week 3 :Computer Aided Process Planning for Additive Manufacturing

Week 4 :Liquid Additive Manufacturing

Week 5 :Liquid Additive Manufacturing

Week 6 :Sheet Additive Manufacturing

Week 7 :Wire Additive Manufacturing

Week 8 :Wire Additive Manufacturing

Week 9 :Wire Additive Manufacturing

Week 10 :Powder Additive Manufacturing

Week 11 :Powder Additive Manufacturing

Week 12 :Powder Additive Manufacturing

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Fundamentals Of Manufacturing Processes

Course Code: noc23-me131 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Mechanical Engineering **Coordinating Institute: IITR**

Name of Course Instructor: Prof. D. K. Dwivedi

Curriculum of the Course:

Week 1 : Understanding Manufacturing, Fundamental approaches of manufacturing, Manufacturing process specific advantages and limitation, Materials and manufacturing processes, Classification of manufacturing processes

Week 2 : Selection of manufacturing processes , Application of manufacturing processes , Effect of manufacturing processes on properties of metals, Break-even point analysis in manufacturing processes, Metal Casting: Introduction & Suitability

Week 3 : Metal Casting: Steps of casting processes, Metal Casting: Terminology, Metal Casting: Pattern allowances I, Metal Casting: Pattern allowances II, Metal Casting: Sand Moulding I

Week 4 : Metal Casting: Sand Moulding II, Metal Casting: Core & Core Prints , Metal Casting: Gating System , Metal Casting: Yield , Metal Casting: Riser Design

Week 5 : Metal Casting: Cleaning of casting, Metal Casting: Casting defects & their prevention, Metal Casting: Shell molding Metal Casting: Investment and permanent mould casting, working processes: Hot and cold working

Week 6 : Metal working processes: Rolling, Metal working processes: Forging , Metal working processes: Extrusion, Metal working processes: Wire Drawing, Metal working processes: Press

Week 7 : Metal working processing: Sheet metal operations (Shearing), Metal working processing: Sheet metal operations II,Metal working processing: Sheet metal operations III, Metal working processing: Dies and die set, Material removal processes: Machining

Week 8 : Material removal processes: Mechanism of the metal cutting, Material removal processes: Chip Formation, Material removal processes: Types of chips and power consumption, Material removal processes: Heat generation, Material removal processes: Tool failure and tool life

Week 9 : Material removal processes: Tool materials, Material removal processes: Cutting fluids, Material removal processes: Grinding I, Material removal processes: Grinding II, Material removal processes: Grinding III

Week 10 : Material removal processes: Grinding operations, Joining of metals: Fundamentals I, Joining of metals: Fundamentals II, Joining of metals: Welding processes I, Joining of metals: Brazing, soldering and weldability

Week 11 : Joining of metals: Weldability and welding defects, Heat treatment: Fundamentals , Heat treatment: Fundamentals II, Heat treatment: Fundamentals III, Heat treatment: Normalizing and hardening

Week 12 : Heat treatment: Tempering, Improving surface properties: Introduction, Improving surface properties: Surface modification processes I, Improving surface properties: Changing chemical composition, Improving surface properties: Coating

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 16

Students Certified: 13

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Course: Rapid Manufacturing

Course Code: noc23-me82 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Mechanical Engineering **Coordinating Institute: IITK**

Name of Course Instructor: Prof. J. Ramkumar
Prof. Amandeep Singh

Curriculum of the Course:

Week 1 : Introduction to Rapid Manufacturing (RM)

Week 2 : Product Design Process

Week 3 : Design for Modularity

Week 4 : Reverse Engineering

Week 5 : 3D measurement: laboratory demonstration

Week 6 : Polymerization, and Powder based RM processes

Week 7 : Liquid based, and Sheet stacking RM processes

Week 8 : 3D printing RM processes and laboratory demonstration

Week 9 : Beam Deposition RM processes, and materials in RM

Week 10 : Post-processing and costing in RM

Week 11 : Rapid Product Development (CAD/CAE/CIM)

Week 12 : Rapid Product Development (Software demonstration), and case studies on RM

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Engineering Metrology

Course Code: noc23-me83 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Mechanical Engineering **Coordinating Institute: IITK**

Name of Course Instructor: Prof. J. Ramkumar / Prof. Amandeep Singh

Curriculum of the Course:

Week 1 : Introduction to Engineering Metrology

Week 2 : Introduction to Engineering Metrology

Week 3 : Statistics in Metrology

Week 4 : Linear Measurements

Week 5 : Angular and rotation measurements

Week 6 : Comparators

Week 7 : Optical measurements, and temperature measurements

Week 8 : Screw threads metrology, and gears metrology

Week 9 : Transducers

Week 10: Flow and Pressure measurements, and strain measurements

Week 11: Surface finish metrology, and mechatronics

Week 12: Nano-metrology, and Quality control

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 5

Students Certified: 5

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Course: Yoga And Positive Psychology For Managing Career And Life

Course Code: noc23-mg125 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Management **Coordinating Institute: IITB**

Name of Course Instructor: Prof. Ashish Pandey

Curriculum of the Course:

Week 1 I. Need for the Course on Managing Self

II. Why Positive Psychology and Yoga in this Course?

III. Positive Psychology: First and Second Wave

Week 2 I. Yoga from the Lens of Positive Psychology

II. Yogic Perspective of Positive Events and Positive Institutions

III. Yogic Perspective of Governance and Micro Macro Integration of Life

Week 3 I. Health and Wellbeing: Perspectives from Positive Psychology, Yoga and Ayurveda

II. Human Self and Ladder of Joy: Yogic, Sankhya and Vedantic Perspective

Week 4 I. Tattva Bodh and Indriyajaya: Ways of Attaining Wellbeing

II. Dharmah Kriya and Sukhayu-Hitayu: Ways of Attaining Wellbeing

Week 5 I. Kleshas: The Obstacles on the Way of Attaining Wellbeing

II. Shat Sampatti: The Means to Surpass the Obstacles on the Way of Attaining Wellbeing

Week 6 I. Realms and Types of Interventions for Managing Self and Career

II. Food as the First Intervention for Managing Self

III. Asanas as the Intervention for Managing Self and Career

Week 7 I. Prana and Types of Pranayam

II. Pranayams as the Intervention for Managing Self and Career

III. Pratyahara as the Intervention for Managing Self and Career

Week 8 I. Yogic Intervention for Managing Emotions

II. Yogic Intervention for Making Mind a Friend

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Entrepreneurship

Course Code: noc23-mg74 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Management **Coordinating Institute: IITM**

Name of Course Instructor: Prof. C Bhaktavatsala Rao

Curriculum of the Course:

Module 1: Entrepreneurial Journey

Module 2: Entrepreneurial Discovery

Module 3: Ideation and Prototyping

Module 4: Testing, Validation and Commercialisation

Module 5: Disruption as a Success Driver

Module 6: Technological Innovation and Entrepreneurship – 1

Module 7: Technological Innovation and Entrepreneurship – 2

Module 8: Raising Financial Resources

Module 9: Education and Entrepreneurship

Module 10: Beyond Founders and Founder-Families

Module 11: India as a Start-up Nation

Module 12: National Entrepreneurial Culture

Module 13: Entrepreneurial Thermodynamics

Module 14: Entrepreneurship and Employment

Module 15: Start-up Case Studies

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 2

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Course: Strategic Management - The Competitive Edge

Course Code: noc23-mg85 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Management **Coordinating Institute: IISc**

Name of Course Instructor: Prof. R Srinivasan

Curriculum of the Course:

Week 1: Introduction to Strategic Management; Concept of Corporate Strategy; Strategic Management Process

Week 2: Board of Directors - Role and Functions; Top Management - Role and Skills; Board Functioning - Indian Context

Week 3: Environmental Scanning; Industry Analysis; Synthesis of External Factors; External Factors Analysis Summary (EFAS) Internal Scanning; Value Chain Analysis; Synthesis of Internal Factors; Internal Factors Analysis Summary (IFAS)

Week 4: Strategy Formulation; Strategic Factors Analysis Summary (SFAS) Business Strategy; Corporate Strategy Functional Strategy Strategic Choice

Week 5: Strategy Implementation Organization Structure; Corporate Culture ;Diversification; Mergers and Acquisitions

Week 6: Evaluation and Control; Strategic Information Systems

Week 7: Other Strategic Issues; R&D, IT

Week 8: KM, Technology; Strategic Risk and other issues

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Ethics In Engineering Practice

Course Code: noc23-mg97 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Management **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Susmita Mukhopadhyay

Curriculum of the Course:

Week 1 : Introduction to Ethical Reasoning and Engineer Ethics

Week 2 : Professional Practice in Engineering

Week 3 : Ethics as Design - Doing Justice to Moral Problems

Week 4 : Central Professional Responsibilities of Engineers

Week 5 : Computers, Software, and Digital Information

Week 6 : Rights and Responsibilities Regarding Intellectual Property

Week 7 : Workplace Rights and Responsibilities

Week 8 : Responsibility for the Environment

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Introduction to Aircraft Control System

Course Code: noc24-ae05 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Aerospace Engineering **Coordinating Institute: IITK**

Name of Course Instructor: Prof. Dipak Kumar Giri

Curriculum of the Course:

Week 1: Why control system in Aircraft? Automatic control to Aerospace Systems. Elements of Closed-loop Control System. Linear Time Invariant System. Equilibrium Points, Static and Dynamic Stability.

Week 2: Stability Analysis with Respect to Equilibrium points, Example on Nonlinear System, Linearization method, State-space model, Laplace transform and Transfer Function, Examples.

Week 3: Linearization to Aircraft's Rotational Motion. Linear state model of aircraft attitude motion. Transfer function of aircraft attitude motion with respect to reference attitude, disturbance, and noise. Effect of controller in closed-loop transfer function. Typical control laws- Proportional, Proportional plus Derivative, and Proportional-Integral- Derivative.

Week 4: Transient and steady state Response, Standard 2nd order System, Effect of Damping Ratio on system's closed-loop poles. Time Domain Specifications for modifying the transient response. Steady State Specifications.

Week 5: Effect of Disturbance on steady state performance, Examples. Stability Analysis for Autopilot Design: Routh Stability Criteria, Marginal Stability, Root Locus.

Week 6: Rules to find the stability margins for autopilot design using Root Locus, Examples, Effect of Addition of Poles and Zeros to the autopilot system, Compensators.

Week 7: Gain Tuning method, PID control for the design of autopilot using Root Locus, Examples, Review on Aircraft Equation of motion, Aircraft Reference Model, Small perturbation to Aircraft Equation.

Week 8 & 9: Linearized State-Space Model of Longitudinal and Lateral / Directional Equations of Motion for the Aircraft Autopilot Design. Longitudinal motion approximation. Short period approximation.

Week 10: Spiral mode, Roll mode and Dutch Roll approximations. Examples for longitudinal and lateral approximations for the Aircraft Autopilot Design.

Week 11 & 12: Lateral flying qualities. Aircraft Transfer Function in terms of Phugoid and Short Period Dynamics for Autopilot Design.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Environmental Impact Assessment

Course Code: noc24-ar03 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Architecture and Planning **Coordinating Institute: IITR**

Name of Course Instructor: Prof. Harshit Sosan Lakra

Curriculum of the Course:

Week 1: Introduction to Environment Management & EIA

Week 2: Legal, Policy & Regulatory Framework

Week 3: EIA Procedure - Scoping & Screening and Establishing Baseline Conditions

Week 4: EIA Methodologies

Week 5: Connectedness: connected spaces and subspaces, Connectedness of the real line, Intermediate value theorem

Week 6: EIA Methods, Tools and Techniques

Week 7: Public Involvement in EIA

Week 8: Impact Management - Mitigation & Preparation of Environment Management Plans (EMP)

Week 9: EIA Reporting & Review of EIA Quality

Week 10: Decision Making & Project Management

Week 11: Implementation & Follow up

Week 12: EIA Case Examples

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Air pollution and Control

Course Code: noc24-ce03 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Civil Engineering **Coordinating Institute: IITR**

Name of Course Instructor: Prof. Bhola Ram Gurjar

Curriculum of the Course:

Week 1 : Air Pollution: Introduction and Impacts of air pollution on human health, vegetation, animals, building materials, structures, and atmosphere, soil and water bodies.

Week 2 : Sources, classification and formation/transformation of air pollutants: Meteorology and Atmospheric Stability.

Week 3 : Lapse Rate, Plume Behaviour, and Air Quality Monitoring, Air Quality Index (AQI)

Week 4 : Air Quality Modelling, Gaussian dispersion models: point, line and area source models

Week 5 : Emissions Inventory: Transport, Industrial, Agricultural, Residential and Commercial sectors

Week 6 : Application of Remote sensing/Satellite based data in emission inventory, Source apportionment using receptor modelling.

Week 7 : Indoor air pollution: sources, types and health impacts. Sampling, assessment and evaluation of Indoor air quality.

Week 8 : Global and regional environmental issues of air pollution: Ozone depletion, Climate change, Global warming, Acid rain.

Week 9 : Air pollution control devices, equipment and their design.

Week 10 : Air pollution emission standards, National and international policies, acts, rules and regulations.

Week 11 : Emerging technologies and strategies to mitigate air pollution, Current challenges and way forward.

Week 12 : Lab-based measurements of air pollutants.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 13

Students Certified: 11

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Course: Hydraulic Engineering

Course Code: noc24-ce20 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Civil Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Mohammad Saud Afzal

Curriculum of the Course:

Week 1 : Basics of Fluid Mechanics 1

Week 2 : Basics of Fluid Mechanics 2

Week 3 : Laminar and Turbulent Fluid Flow

Week 4 : Boundary Layer Analysis

Week 5 : Dimensional Analysis and Hydraulic Similitude

Week 6 : Introduction to Open Channel Flow and Uniform Flow

Week 7 : Non-Uniform Flow and Hydraulic Jump

Week 8 : Pipe flow

Week 9 : Pipe Networks

Week 10 : Viscous Fluid Flow

Week 11 : Computational Fluid Dynamics

Week 12 : Introduction to Wave Mechanics (Inviscid Flow)

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 5

Students Certified: 3

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Course: Water and waste water treatment

Course Code: noc24-ce39 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Civil Engineering **Coordinating Institute: IITR**

Name of Course Instructor: Prof. Bhanu Prakash Vellanki

Curriculum of the Course:

Week 1 : Introduction, Overview of water and waste water systems, Urban water system, Treatment plans, Design process, Review of fundamentals, Concentrations

Week 2: Review of fundamentals, Material flows, Material balances, General approach, Applications, Waste water treatment, General conditions, Quantities, Quality, Treatment objectives, Types of plants, Head works, Goal, Pump station, Flow measurement, Bar racks and screens, Grit removal

Week 3 : Waste water treatment, Primary sedimentation, Goal, Flocculent sedimentation, Primary design variables, Secondary design values, BOD Removal, Biological treatment, Introduction, Activated sludge process, Introduction, Biological processes,

Week 4: Waste water treatment, Biological treatment, Activated sludge, Analysis (material balance), Design, Activated sludge variations, Nutrient removal in activates sludge, Attached growth, Trickling filter, Rotating biological contactors,

Week 5 : Waste water treatment, Disinfection / Disinfectant removal, Goal, Chlorine disinfection, UV light disinfection, Other treatment process,

Week 6 : Water treatment, General considerations, Quantities, Quality, Water treatment plants, Preliminary treatment, Coagulation and flocculation, Rapid mix, Flocculation basin,

Week 7 : Water treatment, Sedimentation, Filtration,

Week 8 : Water treatment, Filtration, Disinfection and disinfection by products,

Week 9: Water treatment, Lime softening, Ion exchange softening,

Week 10 : Water treatment, Nano filtration softening, Desalination, Residual management, Overview, Types of residuals, Sources, Conventional residual management systems,

Week 11 : Residual management, Concentration, Stabilization,

Week 12 : Residual management, Conditioning, Dewatering

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Construction management ke Siddhant

Course Code: noc24-ce41 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Civil Engineering **Coordinating Institute: IITK**

Name of Course Instructor: Prof. Sudhir Misra

Curriculum of the Course:

Week 1: General overview and project organization

Week 2: Estimation of project cost

Week 3: Construction Economics

Week 4: Planning and scheduling: part-1

Week 5: Planning and scheduling: part-2

Week 6: Quality management

Week 7: Legal aspects of a construction project

Week 8: Safety Management

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Concrete Technology

Course Code: noc24-ce46 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Civil Engineering **Coordinating Institute: IITD**

Name of Course Instructor: Prof. B. Bhattacharjee

Curriculum of the Course:

Week 1 : Introduction concrete as a material, ingredients, Production, composition, and properties; cement chemistry..

Week 2 : Types of cements; special cements, aggregates :properties, tests and standard

Week 3 : Water reducers, air entrainers, set controllers, specialty admixtures – structure properties, and effects on concrete properties; Introduction to supplementary cementing materials and pozzolans.

Week 4 : Fly ash, blast furnace slag, silica fume, and metakaolin – their production, properties, and effects on concrete properties; other reactive and inert mineral additives.

Week 5 : Basic principles; IS method; ACI method; new approaches based on rheology and particle packing.

Week 6 : Batching of ingredients; mixing, transport, and placement; consolidation, finishing, and curing of concrete; initial and final set – significance and measurement; workability of concrete and its measurement

Week 7 : Compressive strength and parameters affecting it; Tensile strength – direct and indirect; Modulus of elasticity and Poisson's ratio; Stress strain response of concrete.

Week 8 : Modulus of elasticity and Poisson's ratio; Stress strain response of concrete. Creep and relaxation – parameters affecting; Shrinkage of concrete – types and significance; parameters affecting shrinkage; measurement of creep and shrinkage

Week 9 : Introduction to durability; relation between durability and permeability;

Week 10 : Chemical attack of concrete corrosion of steel rebars; other durability issues

Week 11 : Properties and applications of: High strength – high performance concrete, reactive powder concrete; Lightweight, heavyweight, and mass concrete;

Week 12 : Self-compacting concrete, fibre reinforced concrete; self-compacting concrete; other special concretes.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 9

Students Certified: 8

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Course: Matlab Programming for Numerical Computation

Course Code: noc24-ch36 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Chemical Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Niket Kaisare

Curriculum of the Course:

Week 1: **Introduction to MATLAB Programming:** This module will introduce the students to MATLAB programming through a few examples. Students who have used MATLAB are still recommended to do this module, as it introduces MATLAB in context of how we use it in this course

Week 2: **Building your Code with MATLAB:** This module covers MATLAB Script and Function files, loops, execution control, best-practices for MATLAB functions and tips on how to debug a MATLAB code.

Week 3: **Approximations and Errors:** Taylor's / Maclaurin series expansion of some functions will be used to introduce approximations and errors in computational methods

Week 4: **Linear Equations:** The focus of this module is to do a quick introduction of most popular numerical methods in linear algebra, and use of MATLAB to solve practical problems.

Week 5: **Nonlinear Equations:** After introduction to bisection rule, this module primarily covers Newton-Raphson method and MATLAB routines fzero and fsolve.

Week 6: **Numerical Differentiation and Integration:** Methods of numerical differentiation and integration, trade-off between truncation and round-off errors, error propagation and MATLAB functions for integration will be discussed.

Week 7: **Ordinary Differential Equations (ODE):** Explicit ODE solving techniques in single variable will be covered in this module.

Week 8: **ODE-IVP in Multiple Variables:** This module will cover ODE solving in multiple variables, stiff systems, and practical problems. The importance of ODEs in engineering is reflected by the fact that two modules are dedicated to ODEs.

Week 9: **Regression and Interpolation:** The focus will be practical ways of using linear and nonlinear regression and interpolation functions in MATLAB.

Week 10: **ODE-BVP and DAE:** ODE-Boundary Value Problems; Differential Algebraic Equations

Week 11: **Partial Differential Equations (PDEs):** Practical ways of solving Hyperbolic and Parabolic PDEs

Week 12: **Bringing it all together:** Optimization andSolving interesting computational problems by bringing together multiple concepts

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 3

Students Certified: 3

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Course: Introduction to programming in C

Course Code: noc24-cs02 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITK**

Name of Course Instructor: Prof.Satyadev Nandakumar

Curriculum of the Course:

Week 1 : Introduction. Straight-Line Code. Variables, Operators, Expressions and Conditionals.

Week 2 : Loops

Week 3 : Functions

Week 4 : One-Dimensional Arrays and Pointers

Week 5 : Recursion

Week 6 : Multi-dimensional Arrays, Linked Lists.

Week 7 : Operating on Files

Week 8 : Organizing C projects, working with multiple source directories, makefiles.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 34

Students Certified: 13

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Course: Privacy and Security in Online Social Media

Course Code: noc24-cs04 **Duration: 12 weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Ponnurangam Kumaraguru

Curriculum of the Course:

Week 1: What is Online Social Networks, data collection from social networks, challenges, opportunities, and pitfalls in online social networks, APIs

Week 2: Collecting data from Online Social Media.

Week 3: Trust, credibility, and reputations in social systems

Week 4: Trust, credibility, and reputations in social systems

Week 5: Online social Media and Policing

Week 6: Information privacy disclosure, revelation and its effects in OSM and online social networks

Week 7: Phishing in OSM & Identifying fraudulent entities in online social networks

Week 8: Refresher for all topics

Week 9 to 12: Research paper discussion

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 2

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Course: Cloud Computing and Distributed Systems

Course Code: noc24-cs09 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITK**

Name of Course Instructor: Prof. Rajiv Misra

Curriculum of the Course:

Week 1: Introduction to Clouds, Virtualization and Virtual Machine

Week 2: Network Virtualization and Geo-distributed Clouds

Week 3: Leader Election in Cloud, Distributed Systems and Industry Systems

Week 4: Classical Distributed Algorithms and the Industry Systems

Week 5: Consensus, Paxos and Recovery in Clouds

Week 6: Cloud Storage: Key-value stores/NoSQL

Week 7: P2P Systems and their use in Industry Systems

Week 8: Cloud Applications: MapReduce, Spark and Apache Kafka

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 2

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Course: Advanced Computer Networks

Course Code: noc24-cs11 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Neminath Hubballi
Prof. Sameer Kulkarni

Curriculum of the Course:

Week 1: High Performance Switching and Routing: Introduction, performance considerations, IP address lookup

Week 2: Algorithms for IP address lookup and optimization, hardware implementation of address lookup

Week 3: Packet Classification: Need for packet classification and methods for packet classification.

Week 4: Differentiated Service, Quality of Service, Traffic Polishing, Traffic Shaping

Week 5: Network Softwarization - Introduction

Week 6: Software Defined Networking (SDN) - Deep Dive (Northbound and Southbound interface) , Working with Mininet + Lab Exercises with Mininet

Week 7: Network Function Virtualization (NFV) - Architecture and Concepts

Week 8: Programmable Networks - Introduction to P4, SmartNICS and P4 switches. + Lab Exercise with Mininet and BMV2 switches.

Week 9: Data Center Networking (DCN) - Introduction

Week 10: DCN - Deep Dive (Network topologies, Container Network Interfaces)

Week 11: Content Distribution on the Internet, Architectures for Information Centric Networking

Week 12: Content Naming, Routing and Caching, Security in Named Data Networking

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 1

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Course: Blockchain and its Applications

Course Code: noc24-cs15 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Sandip Chakraborty
Prof. Shamik Sural

Curriculum of the Course:

Week 1: Introduction to Blockchain Technology and its Importance

Week 2: Basic Crypto Primitives I – Cryptographic Hash

Week 3: Basic Crypto Primitives II – Digital Signature

Week 4: Evolution of the Blockchain Technology

Week 5: Elements of a Blockchain

Week 6: Blockchain Consensus I – Permissionless Models

Week 7: Blockchain Consensus II – Permissioned Models

Week 8: Smart Contract Hands On I – Ethereum Smart Contracts (Permissionless Model)

Week 9: Smart Contract Hand On II – Hyperledger Fabric (Permissioned Model)

Week 10: Decentralized Identity Management

Week 11: Blockchain Interoperability

Week 12: Blockchain Applications

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Cloud Computing

Course Code: noc24-cs17 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Soumya Kanti Ghosh

Curriculum of the Course:

Week 1: Introduction to Cloud Computing

Week 2: Cloud Computing Architecture

Week 3: Service Management in Cloud Computing

Week 4: Data Management in Cloud Computing

Week 5: Resource Management in Cloud

Week 6: Cloud Security

Week 7: Open Source and Commercial Clouds, Cloud Simulator

Week 8: Research trend in Cloud Computing, Fog Computing

Week 9: VM Resource Allocation, Management and Monitoring

Week 10: Cloud-Fog-Edge enabled Analytics

Week 11: Serverless Computing and FaaS Model

Week 12: Case Studies and Recent Advancements

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 21

Students Certified: 18

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Course: Compiler Design

Course Code: noc24-cs18 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Santanu Chattopadhyay

Curriculum of the Course:

Week 1 : Introduction

Week 2 : Lexical Analysis

Week 3 : Parsing – Part I

Week 4 : Parsing – Part II

Week 5 : Parsing – Part III

Week 6 : Syntax Directed Translation

Week 7 : Type Checking and Symbol Tables

Week 8 : Runtime Environment Management – Part I

Week 9 : Runtime Environment Management – Part II

Week 10 : Intermediate Code Generation – Part I

Week 11 : Intermediate Code Generation – Part II

Week 12 : Intermediate Code Generation – Part III

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 2

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Course: Computer Networks And Internet Protocol

Course Code: noc24-cs19 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Soumya Kanti Ghosh
Prof. Sandip Chakraborty

Curriculum of the Course:

Week 1 : Introduction to Computer Networks – History, Circuit Switching and Packet Switching

Week 2 : TCP/IP Protocol Stack – Basic Overview

Week 3 : Application Layer Services (HTTP, FTP, Email, DNS)

Week 4 : Transport Layer Primitives – Connection Establishment and Closure

Week 5 : Flow Control and Congestion Control at the Transport Layer

Week 6 : Transmission Control Protocol – Basic Features, TCP Congestion Control

Week 7 : Network Layer Primitives – IP Addressing

Week 8 : IP Routing – Intra Domain Routing Protocols, Inter Domain Routing Protocols (BGP)

Week 9 : IP Services – SNMP, ARP

Week 10 : Data Link Layer Service Primitives – Forwarding, Flow Control, Error Control

Week 11 : Media Access Control - Channel Access Protocols, Framing

Week 12 : End to End Principles of Computer Networks

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 20

Students Certified: 18

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Course: Data Analytics with Python

Course Code: noc24-cs20 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITR**

Name of Course Instructor: Prof. A Ramesh

Curriculum of the Course:

Week 1 : Introduction to data analytics and Python fundamentals

Week 2 : Introduction to probability

Week 3 : Sampling and sampling distributions

Week 4 : Hypothesis testing

Week 5 : Two sample testing and introduction to ANOVA

Week 6 : Two way ANOVA and linear regression

Week 7 : Linear regression and multiple regression

Week 8 : Concepts of MLE and Logistic regression

Week 9 : ROC and Regression Analysis Model Building

Week 10 : c^2Test and introduction to cluster analysis

Week 11 : Clustering analysis

Week 12 : Classification and Regression Trees (CART)

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 15

Students Certified: 12

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Course: Data Base Management System

Course Code: noc24-cs21 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Partha Pratim Das
Prof. Samiran Chattopadhyay

Curriculum of the Course:

Week 1: Course Overview. Introduction to RDBMS

Week 2: Structured Query Language (SQL)

Week 3: Relational Algebra. Entity-Relationship Model

Week 4: Relational Database Design

Week 5: Application Development. Case Studies. Storage and File Structure

Week 6: Indexing and Hashing. Query Processing

Week 7: Query Optimization. Transactions (Serializability and Recoverability)

Week 8: Concurrency Control. Recovery Systems. Course Summarization.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 53

Students Certified: 40

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Course: Data Mining

Course Code: noc24-cs22 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Pabitra Mitra

Curriculum of the Course:

Week 1: Introduction, Data Preprocessing

Week 2: Association Rule Mining, Classification Basics

Week 3: Decision Tree, Bayes Classifier, K nearest neighbor

Week 4: Support Vector Machine, Kernel Machine

Week 5: Clustering, Outlier detection

Week 6: Sequence mining

Week 7: Evaluation, Visualization.

Week 8: Case studies

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 2

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Course: Getting Started with Competitive Programming

Course Code: noc24-cs29 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Neeldhara Misra

Curriculum of the Course:

Week 1: Sorting and Searching Algorithms

Week 2: Greedy Algorithms - I

Week 3: Greedy Algorithms - II

Week 4: Disjoint Set Union with Path Compression

Week 5: Minimum Spanning Tree

Week 6: Shortest Paths: Dijkstra and Beyond

Week 7: Network Flows - I

Week 8: Network Flows - II, Divide and Conquer

Week 9: Dynamic programming - I

Week 10: Dynamic programming - II

Week 11: Dynamic programming - III

Week 12: Dynamic programming - IV

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 3

Students Certified: 1

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Course: Information Security - 5 - Secure Systems Engineering

Course Code: noc24-cs31 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Chester Robeiro

Curriculum of the Course:

Week 1 : Introduction / gdb / buffer overflow

Week 2 : Preventing buffer overflow based malware

Week 3 : Integer overflow and buffer overread and heap overflow

Week 4 : More on heap overflow; Access Control

Week 5 : Confinement

Week 6 : SGX and Trustzone

Week 7 : Micro-architectural Attacks

Week 8 : Hardware Security.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 5

Students Certified: 1

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Course: Introduction to Automata, Languages and Computation

Course Code: noc24-cs32 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Sourav Mukhopadhyay

Curriculum of the Course:

Week 1 : Finite automata and regular languages

Week 2 : Regular expressions

Week 3 : Equivalence of DFA and NFA

Week 4 : Minimization of finite automata

Week 5 : Pumping lemma and its application

Week 6 : Context-free grammars and context-free languages

Week 7 : Chomsky normal form, closure properties

Week 8 : Push down automata

Week 9 : Computability

Week 10 : Turing machines and variants

Week 11 : Time complexity of Turing machines

Week 12 : P and NP, NP- completeness

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 1

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Course: Introduction to Embedded System Design

Course Code: noc24-cs33 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITD**

Name of Course Instructor: Prof. Dhananjay V. Gadre
Prof. Badri N Subudhi

Curriculum of the Course:

Week 1: Introduction to Embedded Systems and Computer Systems Terminology. Modular approach to Embedded System Design using Six-Box model: Input devices, output devices, embedded computer, communication block, host and storage elements and power supply.

Week 2: Microcontroller Based Embedded System Design. Salient Features of Modern Microcontrollers. Elements of Microcontroller Ecosystem and their significance.

Week 3: Design of Power Supply for Embedded Systems. Linear Regulator Topologies. Switching Power Supply Topologies. Power Supply Design Considerations for Embedded Systems.

Week 4: Introduction to MSP430 Microcontroller. MSP430 CPU Architecture. Programming Methods for MSP430. Introduction to Lunchbox Platform.

Week 5: Fundamentals of Physical Interfacing. Connecting Input Devices:Switches, Keyboard and Output devices: LEDs, Seven Segment Displays(SSD). Assignment: MCQ/MSQ

Week 6: Advanced Physical Interfacing: Driving load - high side, low side and H-bridge. Multiplexing displays including Charlieplexing. Shaft encoder.

Week 7: Programming the MSP430. Basics of version control system - Git. Installing and using Code Composer Studio(CCS). Introduction to Embedded C. Interfacing LEDs and Switches with MSP430 using Digital Input and Output.

Week 8: MSP430 Clock and Reset System. MSP430 Clock sources and distribution. Types of Reset sources. Handling Interrupts in MSP430. Writing efficient Interrupt Service Routine (ISR).

Week 9: Interfacing Seven Segment Displays and Liquid Crystal Displays with MSP430. Low Power Modes in MSP430. Introduction to MSP430 Timer Module and it's Modes of Operation.

Week 10: Generating Pulse Width Modulation (PWM) using Timer Capture Mode. ADC operation in MSP430. Interfacing analog inputs. Generating random numbers using LFSR and other methods. Adding DAC to MSP430. Custom Waveform generation using MSP430.

Week 11: Timer Capture Modes. Measuring frequency and time period of external signals and events. Serial Communication Protocols: UART, SPI, I2C. Interfacing Universal Serial Communication Interface (USCI) Module of the MSP430 for UART Communication. Advanced Coding Exercises based on Interrupt driven Programming. Building an Electronics Project.

Week 12: Circuit Prototyping techniques. Designing Single Purpose Computers using Finite State Machine with Datapath (FSMD) approach. MSP430 Based Project Design and Implementation. Recap of Course Coverage.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Introduction To Industry 4.0 And Industrial Internet Of Things

Course Code: noc24-cs34 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Sudip Misra

Curriculum of the Course:

Week 1 : Introduction: Sensing & actuation, Communication-Part I, Part II, Networking-Part I, Part II

Week 2 : Industry 4.0: Globalization and Emerging Issues, The Fourth Revolution, LEAN Production Systems, Smart and Connected Business Perspective, Smart Factories

Week 3 : Industry 4.0: Cyber Physical Systems and Next Generation Sensors, Collaborative Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artifical Intelligence, Big Data and Advanced Analysis

Week 4 : Cybersecurity in Industry 4.0, Basics of Industrial IoT: Industrial Processes-Part I, Part II, Industrial Sensing & Actuation, Industrial Internet Systems.

Week 5 : IIoT-Introduction, Industrial IoT: Business Model and Referece Architerture: IIoT-Business Models-Part I, Part II, IIoT Reference Architecture-Part I, Part II.

Week 6 : Industrial IoT- Layers: IIoT Sensing-Part I, Part II, IIoT Processing-Part I, Part II, IIoT Communication-Part I.

Week 7 : Industrial IoT- Layers: IIoT Communication-Part II, Part III, IIoT Networking-Part I, Part II, Part III.

Week 8 : Industrial IoT: Big Data Analytics and Software Defined Networks: IIoT Analytics - Introduction, Machine Learning and Data Science - Part I, Part II, R and Julia Programming, Data Management with Hadoop.

Week 9 : Industrial IoT: Big Data Analytics and Software Defined Networks: SDN in IIoT-Part I, Part II, Data Center Networks, Industrial IoT: Security and Fog Computing: Cloud Computing in IIoT-Part I, Part II.

Week 10 : Industrial IoT: Security and Fog Computing - Fog Computing in IIoT, Security in IIoT-Part I, Part II, Industrial IoT- Application Domains: Factories and Assembly Line, Food Industry.

Week 11 : Industrial IoT- Application Domains: Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management.

Week 12 : Industrial IoT- Application Domains: Oil, chemical and pharmaceutical industry, Applications of UAVs in Industries, Real case studies :

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Introduction To Internet Of Things

Course Code: noc24-cs35 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Sudip Misra

Curriculum of the Course:

Week 1: Introduction to IoT: Part I, Part II, Sensing, Actuation, Basics of Networking: Part-I

Week 2: Basics of Networking: Part-II, Part III, Part IV, Communication Protocols: Part I, Part II

Week 3: Communication Protocols: Part III, Part IV, Part V, Sensor Networks: Part I, Part II

Week 4: Sensor Networks: Part III, Part IV, Part V, Part VI, Machine-to-Machine Communications

Week 5: Interoperability in IoT, Introduction to Arduino Programming: Part I, Part II, Integration of Sensors and Actuators with Arduino: Part I, Part II

Week 6: Introduction to Python programming, Introduction to Raspberry Pi, Implementation of IoT with Raspberry Pi

Week 7: Implementation of IoT with Raspberry Pi (contd), Introduction to SDN, SDN for IoT

Week 8: SDN for IoT (contd), Data Handling and Analytics, Cloud Computing

Week 9: Cloud Computing(contd), Sensor-Cloud

Week 10: Fog Computing, Smart Cities and Smart Homes

Week 11: Connected Vehicles, Smart Grid, Industrial IoT

Week 12: Industrial IoT (contd), Case Study: Agriculture, Healthcare, Activity Monitoring

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 12

Students Certified: 11

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Course: Machine Learning for Engineering and science applications

Course Code: noc24-cs38 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Balaji Srinivasan and Prof. Ganapathy

Curriculum of the Course:

Week 1: Mathematical Basics 1 – Introduction to Machine Learning, Linear Algebra

Week 2: Mathematical Basics 2 - Probability

Week 3: Computational Basics – Numerical computation and optimization, Introduction to Machine learning packages

Week 4: Linear and Logistic Regression – Bias/Variance Tradeoff, Regularization, Variants of Gradient Descent, MLE, MAP, Applications

Week 5: Neural Networks – Multilayer Perceptron, Backpropagation, Applications

Week 6: Convolutional Neural Networks 1 – CNN Operations, CNN architectures

Week 7: Convolutional Neural Networks 2 – Training, Transfer Learning, Applications

Week 8: Recurrent Neural Networks RNN, LSTM, GRU, Applications

Week 9: Classical Techniques 1 – Bayesian Regression, Binary Trees, Random Forests, SVM, Naïve Bayes, Applications

Week 10: Classical Techniques 2 – k-Means, kNN, GMM, Expectation Maximization, Applications

Week 11: Advanced Techniques 1 – Structured Probabilistic Models, Monte Carlo Methods

Week 12: Advanced Techniques 2 – Autoencoders, Generative Adversarial Network

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Natural Language Processing

Course Code: noc24-cs39 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Pawan Goyal

Curriculum of the Course:

Week 1: Introduction and Basic Text Processing

Week 2: Spelling Correction, Language Modeling

Week 3: Advanced smoothing for language modeling, POS tagging

Week 4: Models for Sequential tagging – MaxEnt, CRF

Week 5: Syntax – Constituency Parsing

Week 6: Dependency Parsing

Week 7: Distributional Semantics

Week 8: Lexical Semantics

Week 9: Topic Models

Week 10: Entity Linking, Information Extraction

Week 11: Text Summarization, Text Classification

Week 12: Sentiment Analysis and Opinion Mining

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Problem Solving Through Programming In C

Course Code: noc24-cs42 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Anupam Basu

Curriculum of the Course:

Week 1 : Introduction to Problem Solving through programs, Flowcharts/Pseudo codes, the compilation process, Syntax and Semantic errors, Variables and Data Types

Week 2 : Arithmetic expressions, Relational Operations, Logical expressions; Introduction to Conditional Branching

Week 3 : Conditional Branching and Iterative Loops

Week 4 : Arranging things : Arrays

Week 5 : 2-D arrays, Character Arrays and Strings

Week 6 : Basic Algorithms including Numerical Algorithms

Week 7 : Functions and Parameter Passing by Value

Week 8 : Passing Arrays to Functions, Call by Reference

Week 9 : Recursion

Week 10 : Structures and Pointers

Week 11 : Self-Referential Structures and Introduction to Lists

Week 12 : Advanced Topics

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 163

Students Certified: 58

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Course: Programming In Java

Course Code: noc24-cs43 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Debasis Samanta

Curriculum of the Course:

Week 1 : Overview of Object-Oriented Programming and Java

Week 2 : Java Programming Elements

Week 3 : Input-Output Handling in Java

Week 4 : Encapsulation

Week 5 : Inheritance

Week 6 : Exception Handling

Week 7 : Multithreaded Programming

Week 8 : Java Applets and Servlets

Week 9 : Java Swing and Abstract Windowing Toolkit (AWT)

Week 10 : Networking with Java

Week 11: Java Object Database Connectivity (ODBC)

Week 12: Interface and Packages for Software Development

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 77

Students Certified: 63

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Course: Programming in Modern C++

Course Code: noc24-cs44 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Partha Pratim Das

Curriculum of the Course:

Week 1: Programming in C++ is Fun.

Week 2: C++ as Better C.

Week 3: OOP in C++.

Week 4: OOP in C++.

Week 5: Inheritance.

Week 6: Polymorphism.

Week 7: Type Casting.

Week 8: Exceptions and Templates.

Week 9: Streams and STL.

Week 10: Modern C++.

Week 11: Lambda and Concurrency.

Week 12: Move, Rvalue and STL Containers.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 22

Students Certified: 12

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Course: Programming, Data Structures And Algorithms Using Python

Course Code: noc24-cs45 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Madhavan Mukund

Curriculum of the Course:

Week 1: Informal introduction to programmin, algorithms and data structures viagcd, Downloading and installing Python, gcd in Python: variables, operations, control flow - assignments, condition-als, loops, functions

Week 2: Python: types, expressions, strings, lists, tuples, Python memory model: names, mutable and immutable values, List operations: slices etc, Binary search, Inductive function denitions: numerical and structural induction, Elementary inductive sorting: selection and insertion sort, In-place sorting

Week 3: Basic algorithmic analysis: input size, asymptotic complexity, O() notation, Arrays vs lists, Merge sort, Quicksort, Stable sorting

Week 4: Dictionaries, More on Python functions: optional arguments, default values, Passing functions as arguments, Higher order functions on lists: map, lter, list comprehension

Week 5: Exception handling, Basic input/output, Handling files, String processing

Week 6: Backtracking: N Queens, recording all solutions, Scope in Python: local, global, nonlocal names, Nested functions, Data structures: stack, queue, Heaps

Week 7: Abstract datatypes, Classes and objects in Python, "Linked" lists: find, insert, delete, Binary search trees: find, insert, delete, Height-balanced binary search trees

Week 8: Effcient evaluation of recursive definitions: memoization, Dynamic programming: examples, Other programming languages: C and manual memory management, Other programming paradigms: functional programming

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 5

Students Certified: 1

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Course: Theory of Computation

Course Code: noc24-cs49 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Subrahmanyam Kalyanasundaram

Curriculum of the Course:

Week 1: Introduction to the course, DFAs, Regular Languages, Regular operations, Closure under union

Week 2: NFAs, Equivalence of DFAs and NFAs, Closure properties, regular expressions, Equivalence of Regular expressions and DFAs.

Week 3: Pumping Lemma for regular languages, Myhill-Nerode Theorem, Context-free grammars

Week 4: Chomsky Normal Form, CYK Algorithm, Closure properties of CFLs, Pushdown Automata

Week 5: Equivalence of PDAs and CFGs, Pumping Lemma for CFLs, Introduction to Turing machines

Week 6: Decidable (recursive) languages, Turing-Recognizable (recursively enumerable) languages, Multi-tape TMs, NTMs, Equivalence, Church Turing thesis

Week 7: Decidable languages from regular and context-free languages, Countable and uncountable sets, Halting Problem and undecidability.

Week 8: Reductions. Decidable and undecidable languages using reductions. Rice's theorem. Computation Histories.

Week 9: Post Correspondence Problem (PCP) is undecidable, Introduction to Complexity Theory. Asymptotic notation, Classes P and NP.

Week 10: Verifier model for NP, Polynomial Time reductions, NP Completeness, Cook-Levin Theorem

Week 11: NP Complete problems like Vertex Cover, Hamiltonian Path, Subset Sum, ILP

Week 12: Space Complexity, Relation with time bounded complexity classes, introduction to classes like L, NL, PSPACE and overview of results in space complexity

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 1

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Course: Introduction to Machine Learning

Course Code: noc24-cs51 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Balaraman Ravindran

Curriculum of the Course:

Week 0: Probability Theory, Linear Algebra, Convex Optimization - (Recap)

Week 1: Introduction: Statistical Decision Theory - Regression, Classification, Bias Variance

Week 2: Linear Regression, Multivariate Regression, Subset Selection, Shrinkage Methods, Principal Component Regression, Partial Least squares

Week 3: Linear Classification, Logistic Regression, Linear Discriminant Analysis

Week 4: Perceptron, Support Vector Machines

Week 5: Neural Networks - Introduction, Early Models, Perceptron Learning, Backpropagation, Initialization, Training & Validation, Parameter Estimation - MLE, MAP, Bayesian Estimation

Week 6: Decision Trees, Regression Trees, Stopping Criterion & Pruning loss functions, Categorical Attributes, Multiway Splits, Missing Values, Decision Trees - Instability Evaluation Measures

Week 7: Bootstrapping & Cross Validation, Class Evaluation Measures, ROC curve, MDL, Ensemble Methods - Bagging, Committee Machines and Stacking, Boosting

Week 8: Gradient Boosting, Random Forests, Multi-class Classification, Naive Bayes, Bayesian Networks

Week 9: Undirected Graphical Models, HMM, Variable Elimination, Belief Propagation

Week 10: Partitional Clustering, Hierarchical Clustering, Birch Algorithm, CURE Algorithm, Density-based Clustering

Week 11: Gaussian Mixture Models, Expectation Maximization

Week 12: Learning Theory, Introduction to Reinforcement Learning, Optional videos (RL framework, TD learning, Solution Methods, Applications)

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 9

Students Certified: 2

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Course: Data Science for Engineers

Course Code: noc24-cs53 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Ragunathan Rengasamy
Prof. Shankar Narasimhan

Curriculum of the Course:

Week 1: Course philosophy and introduction to R

Week 2: Linear algebra for data science

1. Algebraic view - vectors, matrices, product of matrix & vector, rank, null space, solution of over-determined set of equations and pseudo-inverse)
2. 2. Geometric view - vectors, distance, projections, eigenvalue decomposition

Week 3: Statistics (descriptive statistics, notion of probability, distributions, mean, variance, covariance, covariance matrix, understanding univariate and multivariate normal distributions, introduction to hypothesis testing, confidence interval for estimates)

Week 4: Optimization

Week 5: 1. Optimization

2. Typology of data science problems and a solution framework

Week 6: 1. Simple linear regression and verifying assumptions used in linear regression

2. Multivariate linear regression, model assessment, assessing importance of different variables, subset selection

Week 7: Classification using logistic regression

Week 8: Classification using kNN and k-means clustering

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 1

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Course: Python for Data Science

Course Code: noc24-cs54 **Duration: 4 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Ragunathan Rengasamy

Curriculum of the Course:

Week 1: Basics of python spyder (tool): Introduction Spyder, Setting working Directory, Creating and saving a script file, File execution, clearing console, removing variables from environment, clearing environment, Commenting script files, Variable creation, Arithmetic and logical operators, Data types and associated operations,

Week 2: Sequence data types and associated operations: • Strings, • Lists, • Arrays, • Tuples, • Dictionary, • Sets, • Range, , **NumPy**, • ndArray

Week 3: Pandas dataframe and dataframe related operations on Toyota Corolla dataset

1. Reading files
2. Exploratory data analysis
3. Data preparation and preprocessing

Data visualization on Toyoto Corolla dataset using matplotlib and seaborn libraries, Control structures using Toyota Corolla dataset, Functions

Week 4: CASE STUDY

Regression: Predicting price of pre-owned cars

Classification: Classifying personal income

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Introduction to Database Systems

Course Code: noc24-cs55 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Sreenivasa Kumar

Curriculum of the Course:

Week 1 : Introduction and part of E/R Model Module

Week 2 : ER Model Module

Week 3 : Relational Model Module

Week 4 : Relational Model Module

Week 5 : TRC Module and part of SQL Module

Week 6 : SQL Module

Week 7 : Indexes Module

Week 8 : Indexes Module + Query Processing Module

Week 9 : Normal Forms Module

Week 10 : Normal Forms Module

Week 11 : Transaction Processing Module

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 19

Students Certified: 11

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Course: The Joy of Computing using Python

Course Code: noc24-cs57 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Sudarshan Iyengar

Curriculum of the Course:

- Motivation for Computing
- Welcome to Programming!!
- Variables and Expressions : Design your own calculator
- Loops and Conditionals : Hopscotch once again
- Lists, Tuples and Conditionals : Lets go on a trip
- Abstraction Everywhere : Apps in your phone
- Counting Candies : Crowd to the rescue
- Birthday Paradox : Find your twin
- Google Translate : Speak in any Language
- Currency Converter : Count your foreign trip expenses
- Monte Hall : 3 doors and a twist
- Sorting : Arrange the books
- Searching : Find in seconds
- Substitution Cipher : What's the secret !!
- Sentiment Analysis : Analyse your Facebook data
- 20 questions game : I can read your mind
- Permutations : Jumbled Words
- Spot the similarities : Dobble game
- Count the words : Hundreds, Thousands or Millions.
- Rock, Paper and Scissor : Cheating not allowed !!
- Lie detector : No lies, only TRUTH
- Calculation of the Area : Don't measure.
- Six degrees of separation : Meet your favourites
- Image Processing : Fun with images
- Tic tac toe : Let's play
- Snakes and Ladders : Down the memory lane.
- Recursion : Tower of Hanoi
- Page Rank : How Google Works !!

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 28

Students Certified: 26

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Course: Discrete Mathematics

Course Code: noc24-cs58 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Computer Science and Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Sudarshan Iyengar
Prof. Anil Shukla

Curriculum of the Course:

Week 1: Counting

Week 2: Set Theory

Week 3: Logic

Week 4: Relations

Week 5: Functions

Week 6: Mathematical Induction and Pegionhole Principle

Week 7: Graph Theory - 01

Week 8: Graph Theory - 02

Week 9: Graph Theory - 03 and Generating Functions

Week 10: Principle of Inclusion-Exclusion

Week 11: Recurrence relations

Week 12: Advanced Topics

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 1

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Course: Fundamentals of Automotive Systems

Course Code: noc24-de03 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Design Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. C. S. Shankar Ram

Curriculum of the Course:

Week 1 : Course Overview, Classification of Internal Combustion Engines, Engine Components, Operation of Four Stroke Engines

Week 2 : Two Stroke Engines, Engine Cycles

Week 3 : Engine Performance, Supercharging, Combustion in Spark Ignition Engines

Week 4 : Combustion in Compression Ignition Engines, Carburetion, Fuel Introduction Systems

Week 5 : Engine Emissions, Emission Control Systems, Automotive Powertrain

Week 6 : Automotive Clutch, Transmission, Powertrain Analysis

Week 7 : Transmission Matching and Introduction to Brake System

Week 8 : Components of Brake System, Hydraulic Brake

Week 9 : Air Brake, Antilock Brake System

Week 10 : Braking Analysis, Introduction to Steering System, Manual Steering System

Week 11 : Power Steering System, Wheel Alignment, Introduction to Suspension System

Week 12 : Components of Suspension System, Dependent and Independent Suspension, Introduction to Electric and Hybrid Powertrain, Tyres.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 2

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Course: Indian Economy: Some Contemporary Perspectives

Course Code: noc24-ec04 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Economic Sciences **Coordinating Institute: IITK**

Name of Course Instructor: Prof. Wasim Ahmad

Curriculum of the Course:

Week 1: Indian economy since independence, analysis of the pre- and post-reform periods of India's economic growth and development

Week 2: Assessment of agriculture sector reforms, industrial reforms in a mixed economic set-up and tracing the contours of liberalization and self-reliance

Week 3: Socio-economic development and tax reforms

Week 4: Financial sector reforms and financial inclusion

Week 5: Indian banking sector crisis and recent developments

Week 6: India and WTO regulations: Inward and outward analysis

Week 7: Structural shocks and analysis of recent policy initiatives

Week 8: Indian economy: Recent outlook and challenges

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 2

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Course: Control engineering

Course Code: noc24-ee15 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Electrical and Electronics Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Ramkrishna Pasumarthy

Curriculum of the Course:

Week 1: Mathematical Modelling of Systems

Week 2: Laplace Transforms, transfer functions, block diagram representation.

Week 3: Block diagram reduction, Time response characteristics.

Week 4: Introduction to stability, Routh Hurwitz stability criterion.

Week 5: Root locus plots, stability margins.

Week 6: Frequency response analysis: Nyquist stability criterion, Bode plots and stability margins in frequency domain.

Week 7: Basics of control design, the proportional, derivative and integral actions.

Week 8: Design using Root Locus

Week 9: Design using Bode plots

Week 10: Effects of zeros, minimum and non-minimum phase systems.

Week 11: State space analysis

Week 12: Design using State space

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 4

Students Certified: 1

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Course: Digital System Design

Course Code: noc24-ee17 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Electrical and Electronics Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Neeraj Goel

Curriculum of the Course:

Week 1: Introduction of digital systems. Number system

Week 2: Number representation: BCD, floating point numbers

Week 3: Boolean algebra, application of Boolean algebra in minimization of Boolean expressions

Week 4: Boolean minimization using K-map and Quine McCluskey method. Introduction to Verilog

Week 5: MSI Logic: Multiplexer, encoder, decoder

Week 6: Arthimetic circuits: Adder, subtractor, multiplier, comparator

Week 7: Latches and flipflop (SR, JK, T, D), counters

Week 8: Sequential logic like Registers, introduction to behavior modeling in Verilog

Week 9: Finite state machine, state graphs and tables.

Week 10: Reduction of state table and state assignments. Arithmetic circuits using sequential design.

Week 11: Register transfer level (RTL) design, RTL design examples

Week 12: FPGA, VLSI design flow using HDL, introduction to behavior, logic and physical synthesis.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 4

Students Certified: 1

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Course: Signals and Systems

Course Code: noc24-ee28 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Electrical and Electronics Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Hitesh Shrimali
Prof. Kushal K. Shah

Curriculum of the Course:

Week 1 : Mathematical Preliminaries

Week 2 : Types of Signals and Transformations

Week 3 : Fourier Transform of Continuous-Time Signals

Week 4 : Properties of Fourier Transforms

Week 5 : LTI Systems

Week 6 : Convolution and LTI System Properties

Week 7 : Laplace Transform

Week 8 : Laplace Transform Properties

Week 9 : Fourier Series of Continuous-Time Periodic Signals and Properties

Week 10 : Discrete-Time LTI Systems and Sampling

Week 11 : Discrete-Time Fourier Transform (DTFT)

Week 12 : Z-Transform

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Sensors and Actuators

Course Code: noc24-ee45 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Electrical and Electronics Engineering **Coordinating Institute: IISc**

Name of Course Instructor: Prof. Hardik Jeetendra Pandya

Curriculum of the Course:

Week 1: Basics of Energy Transformation: Transducers, Sensors and Actuators

Week 2: Understanding of thin film physics: Application in MOSFET and its variants

Week 3: Thin Film Deposition Techniques: Chemical Vapor Deposition (APCVD, LPCVD, UHVCVD, PECVD, ALCVD, HPCVD, MOCVD)

Week 4: Thin Film Deposition Techniques: Physical Vapor Deposition (Thermal Deposition, E-beam Evaporation, Sputtering, Pulsed Laser Deposition)

Week 5: Basics understanding of Photolithography for pattering layer. Detailed overview of Etching methods.

Week 6: Understanding various gas sensors: Optical gas sensor, Metal oxide semiconductor gas sensor, Field effect transistor gas sensor, Piezoelectric gas sensor, Polymer gas sensor, Nano-structured based gas sensors

Week 7: Design and fabrication process of Microsensors: Force Sensors, Pressure Sensors, Strain gauges and practical applications

Week 8: Explain working principles of Actuators. Piezoelectric and Piezoresistive actuators, micropumps and micro actuators with practical applications

Week 9: Understanding basics of microfluidics to assist Photomask design using Clewin Software, pattern transfer techniques, PDMS moulding and degassing, device bonding techniques.

Week 10: Simulation, Optimization and characterization of various sensors using COMSOL Multiphysics

Week 11: Understanding of Sensor Interfacing with Microprocessor to build electronic system

Week 12: Static and Dynamic Characteristic Parameters for Sensors and Actuators, Calibration of Sensor based electronics systems.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 2

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Course: Network Analysis

Course Code: noc24-ee58 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Electrical and Electronics Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Tapas Kumar Bhattacharya

Curriculum of the Course:

Week 1 : Introduction to Network, circuit elements & sources. KVL & KCL

Week 2 : Solution of linear differential equation with different excitation.

Week 3 : Deeper look into energy storing elements :inductor and capacitor.

Week 4 : Ideal and practical voltage & current sources.

Week 5 : Mesh and nodal analysis of networks.

Week 6 : Transforming voltage to current source and vicr-versa.Thevenin / Norton's equivalent circuit.

Week 7 : Tellegen Theorem and its implication. Theory of reciprocity.Network function.

Week 8 : Two-port network: Z-parameters, Y-parameters, h-parameters & ABCD parameters.

Week 9 : Definition of graph & tree of a network. Cut-set matrix.

Week 10: [A],[B] & [Q] matrices : Relationship among them

Week 11: Tutorial -1

Week 12: Tutorial-2

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 11

Students Certified: 3

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Course: Power System Engineering

Course Code: noc24-ee61 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Electrical and Electronics Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Debapriya Das

Curriculum of the Course:

Week 1: Overhead Line Insulators

Week 2: Underground Cables

Week 3: Transient Overvoltages and Insulation Coordination

Week 4: Corona

Week 5: Sag and Tension

Week 6: Distribution System Load Flow and Voltage Stability

Week 7: Approximate Method of Distribution System Analysis

Week 8: Application of Capacitors for Radial Distribution Systems

Week 9: Load Frequency Control

Week 10: Load Frequency Control

Week 11: Unit commitment

Week 12: Unit Commitment

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Introduction To Environmental Engineering And Science - Fundamental And Sustainability Concepts

Course Code: noc24-ge19 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Multidisciplinary **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Brajesh K Dubey

Curriculum of the Course:

Week 1 : Sustainability Concepts – Innovations and Challenges

Week 2 : Environmental Measurements from Different Disciplines

Week 3 : Ecology, Population & Environmental Chemistry

Week 4 : Physical Process in Environment

Week 5 : Environmental Biological Concepts

Week 6 : Environmental Risk Assessments with Concepts of EIA and LCA

Week 7 : Water – Quantity and Quality

Week 8 : Water Treatment Basics

Week 9 : Basics of Wastewater Collection, Treatment & Resource Recovery

Week 10 : Basics of Solid Waste, Soil and Noise Pollution

Week 11 : Basics of Air Pollution Issues – Global and Local

Week 12 : Case Studies and Course Wrap-up

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Research Methodology

Course Code: noc24-ge21 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Multidisciplinary **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Edamana Prasad
Prof. Prathap Haridoss

Curriculum of the Course:

Week 1 : A group discussion on what is research; Overview of research;

Week 2 : Literature survey , Experimental skills;

Week 3 : Data analysis, Modelling skills;

Week 4 : Technical writing; Technical Presentations; Creativity in Research

Week 5 : Creativity in Research; Group discussion on Ethics in Research

Week 6 : Design of Experiments

Week 7 : Intellectual Property

Week 8 : Department specific research discussions

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Non-conventional energy Resources

Course Code: noc24-ge24 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Multidisciplinary **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Prathap Haridoss

Curriculum of the Course:

Week 1 : Scale of quantities, Impact of current energy usage, Conventional sources of energy

Week 2 : Overview of non-conventional energy resources, Consumption by sector

Week 3 : Solar energy incident on earth, solar spectrum

Week 4 : Overview of solar energy technologies, Solar Thermal devices

Week 5 : Solar Photovoltaic devices, Performance and durability of solar devices

Week 6 : Wind energy, technology and geographical aspects

Week 7 : Geothermal and Biomass

Week 8 : Battery basics, types

Week 9 : Testing, performance of batteries

Week 10 : Fuel cell types, Fuel processing, concept to product.

Week 11 : Characterization and durability of fuel cells

Week 12 : Flywheels and super capacitors

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Education for Sustainable Development

Course Code: noc24-hs04 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Atasi Mohanty

Curriculum of the Course:

Week 1 : 1: Introduction to ESD, a) Introduction to UNESCO 17 Sustainable Development Goals (SDG)

Week 2 : b) SD Goal-4- Quality Education for all, c) Education for Sustainable Development (ESD)

Week 3 : 2: ESD & SDGs ESD for achieving SDG- 4.7, a)Sustainable lifestyle

b) Human rights

Week 4 : c) Gender equality, d) Promotion of peace & non-violence, e) Global citizenship

Week 5 : f) Leveraging cultural diversity for SDGs, 3. ESD & Sustainability ESD for achieving SDG-4.4, a) Technical & vocational skills for employability

Week 6 : b) 21st Century competencies for global & decent jobs c) Sustainable entrepreneurship

Week 7 : d) Promoting good mental health & wellbeing, e) Inclusive education & social transformation

Week 8 : 4: ESD & Social Transformation ESD for promotion of, a) Responsible consumption & production , b) Peace & justice in the society

Week 9 : c) Sustainable cities & communities, d) Sustainable health practices & social wellbeing

Week 10 : 5: ESD & Sustainable education Sustainable education & global partnership,

a) Educational policy & curriculum, b) Pedagogical practices & ICT

Week 11 : c) Educational research & social benefits, d) Educational ecosystem & management

Week 12 : Guest Lecture by International Faculty

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 2

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Course: Emotional Intelligence

Course Code: noc24-hs06 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Rabindra Kumar Pradhan

Curriculum of the Course:

Week 1: Introduction to emotion, intelligence & wisdom

Week 2: Concept, theory, measurement and applications of intelligence

Week 3: Emotional intelligence: concept, theory and measurements

Week 4: Correlates of emotional intelligence

Week 5: Emotional intelligence, culture, schooling and happiness

Week 6: For enhancing emotional intelligence EQ mapping

Week 7: Managing stress, suicide prevention, through emotional intelligence, spirituality and meditation

Week 8: Application of emotional intelligence at family, school and workplace

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 5

Students Certified: 5

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Course: Speaking Effectively

Course Code: noc24-hs09 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Anjali Gera Roy

Curriculum of the Course:

Week 1: Introduction The Art of Speaking, Encoding Meaning Using Verbal and Nonverbal Symbols, Cross Cultural Communication, Verbal Communication, Encoding Meaning Using Verbal Symbols, How Words Work and How to Use Words

Week 2: Nonverbal Communication, Encoding Meaning Using Nonverbal Symbols, How to Improve Body Language, Eye Communication, Facial Expression, Dress and Appearance, Posture and Movement, Gesture, Paralanguage, Role Plays and Activities

Week 3: Phonetics, Standard Language and Queen's English, Phonemes of English: Vowels, Phonemes of English: Diphthongs and Consonants, Stress and Rhythm, Intonation,

Week 4: Voice and Delivery, Voice and Personality, How to Improve Voice, How to Improve Delivery, Pace,Pause,Pitch, Volume, Modulation, Resonance,

Week 5: Basic Conversational Skills, Greetings and making introductions, Asking for information and giving instructions, Making requests, Agreeing and disagreeing, Making recommendations,

Week 6: Appearing in Interviews and taking Interviews, Interviewing Skills, appearing in an Interview, Conducting an Interview, Analysis of a bad interview, Analysis of a good interview

Week 7: Making and Assessing Presentations, How to Make Successful Presentations, How to Make Successful Presentations, Analysis of a Bad Presentation, Analysis of a Good Presentation,

Week 8: Group Discussions and Meetings, Participating in a Meeting, Chairing a Meeting, Analysis of an ill conducted meeting, Analysis of a well conducted meeting

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 30

Students Certified: 29

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Course: Strategic Performance Management

Course Code: noc24-hs10 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Kbl Srivastava

Curriculum of the Course:

Week 1: Introduction to Performance Management and Performance Management Process, Role of PM in employee development

Week 2: Performance Management and Strategic Planning: Planning for performance effectiveness

Week 3: Approaches to Performance Measurement: Measuring behavior and results, Issues in performance management

Week 4: Implementing performance management systems: Self-appraisal, Team appraisal and 360 feedback system

Week 5: Performance management skills, Increasing self-awareness

Week 6: Performance review, analysis and discussion, use of performance management data for HR decision making

Week 7: Potential Appraisal, Linking performance with reward systems and legal issues

Week 8: Performance Management Practices: Select case studies of Indian Organizations, Future of performance management systems

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

****

Course: Training and Development

Course Code: noc24-hs12 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Susmita Mukhopadhyay
Prof. S. Srinivasan

Curriculum of the Course:

Week 1: Introduction to Employee Training and Development

Week 2: Strategic Training

Week 3: Training needs assessment

Week 4: Learning and Transfer of Training

Week 5: Program Design

Week 6: Training Evaluation

Week 7: Traditional Training Methods

Week 8: Technology Based Training Methods

Week 9: Employee Development and Career Management

Week 10: Social Responsibility: Legal issues, Managing diversity, and Career challenges

Week 11: Future of Training and Development

Week 12: Managing Disruption in organizations through Training

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Soft Skill Development

Course Code: noc24-hs15 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Priyadarshi Patnaik
Prof. V. N. Giri
Prof. D. Suar

Curriculum of the Course:

Week 1: Communication skills 1: The basics, , **Topics to be covered:** i. Understanding the communicative environment-I, ii. Understanding the communicative environment-II, iii. What to listen for and why, iv. When to speak and how, v. Starting and sustaining a conversation

Week 2: Communication skills 2 : Presentation and interaction, **Topics to be covered:** i. What to present and how – I, ii. What to present and how – II, iii. Multimedia presentation: Understanding the basics, iv. Communication styles, v. Speaking in groups

Week 3: Communication skills 3: Visual, nonverbal and aural communication, **Topics to be covered:** i. The world of visual culture, ii. Visual perception, ii. The aural: Its relevance and impact, iv. The body and the way it communicates, v. The face, its expressions and what it says

Week 4: Interpersonal communication 1: Individuals, groups and cultures Building Relationships Understanding Group Dynamics- I, Understanding Group Dynamics- II, Groups, Conflicts and their Resolution, Social Network, Media and Extending Our Identities

Week 5: Interpersonal communication 2: Emotional and social skills

Week 6: Developing key traits 1: Creativity, critical thinking and problem solving

Week 7: Developing key traits 2: Motivation, persuasion, negotiation and leadership, i. Motivating oneself, ii.The art of persuasion-I, iii.The art of persuasion-II, iv. From persuasion to negotiation, v. Leadership and motivating others

Week 8: Essential and vocational skills: survival strategies, i. Managing time, ii. Managing stress, iii. Resilience, iv. Work-life balance, v. Applying soft-skills to workplace

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 31

Students Certified: 23

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Course: The Science of Happiness and Wellbeing

Course Code: noc24-hs16 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Priyadarshi Patnaik
Prof. Manas K Mandal

Curriculum of the Course:

Week 1: Operationalizing happiness: Defining happiness

Week 2: Understanding the construct of happiness: The science of happiness These five modules would introduce the key concepts that make up the science of happiness, and create the basic ground for the sessions to follow. It would also include pretests to assess current happiness and other related parameters.

Week 3: Factors influencing happiness: Biological, psychological & socio-cultural factors These modules would focus on the key components influence happiness through talks, case studies and self-learning tasks.

Week 4: Unanswered questions: What makes us happy? The modules in this week would focus on the myths as well as the simple secrets of happiness and how to make the act successful through understanding and practice. Happiness: The dynamics within: Key ingredients of happiness These modules would address the key ingredients with scientific evidence, case studies and online assignments and assessments.

Week 5: Train yourself in Happiness: Two short modules on Mindfulness These sessions would take us through the science as well as the art of mindfulness through online practice sessions and training aids. Happiness in the social context: Three modules on Emotional Intelligence. Emotions play a key role in happiness and need to be addressed in their various ways in response to people and society. Tests, assessments and training sessions to hone skills would be included.

Week 6: Happiness at work: Getting rid of daily hassles Happiness and efficiency, happiness and creativity, and various other key components like innovation and follow would be addressed in these units. Fine tuning work-life balance: Strategies to develop happiness Through units as well as assessment tools participants would be guided through techniques to hone their work-life balance – a key component of success as well as happiness.

Week 7: Becoming happier: State & trait of happiness This week would focus on sustaining and enhancing what has been learnt so far through both theoretical as well as training inputs.

Week 8: Creating happiness: Making a difference for others Happiness needs to spread. These units would focus on networking and sustaining what has been learnt by sharing with others. Post-test assessments would also be used to tests changes that have been brought about during the 12 weeks of the course.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 31

Students Certified: 23

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Course: Basics of language Science

Course Code: noc24-hs19 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Rajesh Kumar

Curriculum of the Course:

Lecture 1 - Introduction of the Course
Lecture 2 - What is linguistics? What is language? How do we study language?
Lecture 3 - Language and arbitrariness, and language and dialect
Lecture 4 - E vs I language, Language as a rule-governed system
Lecture 5 - Language faculty, Language in human mind
Lecture 6 - How do we learn language?
Lecture 7 - Language acquisition
Lecture 8 - Innateness: Some essential concepts
Lecture 9 - Structure of language at the level of sounds
Lecture 10 - Sounds (vocal apparatus)
Lecture 11- Places and manners of articulation
Lecture 12 - Word formation / phonotactic rules
Lecture 13 - Rules of word formation (singular – plural)
Lecture 14 - Sentence: An introduction
Lecture 15 - Making of a sentence (components)
Lecture 16 - Grammaticality and acceptability
Lecture 17 - Subject and verb in a sentence
Lecture 18 - Sentence: Objects and verbs
Lecture 19 - Phrase structure
Lecture 20 - X-bar theory
Lecture 21 - Specifier and complement
Lecture 22 - Compliments and adjuncts
Lecture 23 - VP components
Lecture 24 - Category selections, Selectional restrictions on verbs
Lecture 25 - Thematic relations
Lecture 26 - Case
Lecture 27 - Morphological and abstract case
Lecture 28 – Structural case
Lecture 29 - Exceptional Case Marking
Lecture 30 - Movement
Lecture 31 - Motivations for movement
Lecture 32 - Questions and movement
Lecture 33 - Passives and NP movement
Lecture 34 - Movement and raising
Lecture 35 – Binding theory and NP interpretations
Lecture 36 - Principles of binding theory
Lecture 37 - Constraints on movements
Lecture 38 - Structure of language and negation
Lecture 39 - Negation and negative polarity items
Lecture 40 - Structure, language, cognition and pragmatics
Lecture 41 - History of generative paradigm in the study of language
Lecture 42 - Language in society, education, and culture

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 3
Students Certified: 2

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Course: Economic Growth And Development

Course Code: noc24-hs22 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITG**

Name of Course Instructor: Prof. Rajshree Bedamatta

Curriculum of the Course:

Week 1: Concepts of economic growth & development; The Global North & Global South Divide

Week 2: Indices of economic development and contemporary controversies

Week 3: Strategies of economic development-I

Week 4: Strategies of economic development-II

Week 5: Growth and Inequality

Week 6: Introduction to Human Development

Week 7 :Human Development Indices

Week 8: MDGs, SDGs & gender budgetin

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Enhancing Soft Skills and Personality

Course Code: noc24-hs26 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITK**

Name of Course Instructor: Prof. T. Ravichandran

Curriculum of the Course:

Week 1 : Highlights of Developing Soft Skills and Personality Course-1-24, Highlights of Developing Soft Skills and Personality Course-25-48, Definitions and Types of Mindset, Learning Mindsets, Secrets of Developing Growth Mindsets

Week 2 : Importance of Time and Understanding Perceptions of Time Using Time Efficiently, Understanding Procrastination , Overcoming Procrastination , Don't Say "Yes" to Make Others Happy!

Week 3 : Types of People , How to Say "No", Controlling Anger, Gaining Power from Positive Thinking-1, Gaining Power from Positive Thinking-2,

Week 4 : What Makes Others Dislike You?, What Makes Others Like You?-1, What Makes Others Like You?-2, Being Attractive-1, Being Attractive-2,

Week 5 : Common Errors-1, Common Errors-2, Common Errors-3, Common Errors-4, Common Errors-5,

Week 6 : Humour in Communication , Humour in the Workplace, Function of Humour in the Workplace, Money and Personality, Managing Money,

Week 7 : Health and Personality, Managing Health-1: Importance of Exercise, Managing Health-2: Diet and Sleep, Love and Personality , Managing Love,

Week 8 : Ethics and Etiquette, Business Etiquette, Managing Mind and Memory, Improving Memory, Care for Environment, Highlights of the Course

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 91

Students Certified: 68

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Course: Human Behaviour

Course Code: noc24-hs35 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITG**

Name of Course Instructor: Prof. Naveen Kashyap

Curriculum of the Course:

Week 1 : Introduction to the science of human behavior

Week 2 : Sensation & Perception-I

Week 3 : Perception-II, Learning

Week 4 : Memory and Language-I

Week 5 : Language-II and Emotion

Week 6 : Intelligence

Week 7 : Personality

Week 8 : Social influence and cognition

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 11

Students Certified: 7

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Course: Introduction To Cognitive Psychology

Course Code: noc24-hs39 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITG**

Name of Course Instructor: Prof. Naveen Kashyap

Curriculum of the Course:

Week 1: History, Theory and Research in Human Cognition

Week 2: Object Perception and Recognition

Week 3: Attentional Processes and cognition

Week 4: Memory Introduction

Week 5: Long Term Memory

Week 6: Memory of general knowledge

Week 7: Concept Formation

Week 8: Visual and Spatial Memory

Week 9: Human language skills

Week 10: Thought process and Problem Solving

Week 11: Reasoning

Week 12: Decision Making

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Introduction to Psychology

Course Code: noc24-hs46 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITK**

Name of Course Instructor: Prof. Braj Bhushan

Curriculum of the Course:

Week 1: Why Psychology? Major milestones in psychology, Major areas of psychology, Major methods used in psychology, Redefining boundaries of the discipline

Week 2:Perception

Week 3:Learning

Week 4:Memory

Week 5:Emotion

Week 6:Genetic and Environmental bases of behaviour

Week 7:Personality

Week 8:Lab session: Perception

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 4

Students Certified: 4

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Course: Psychology of Emotion: Theory and Applications

Course Code: noc24-hs64 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITG**

Name of Course Instructor: Prof. Dilwar Hussain

Curriculum of the Course:

Week 1 : The nature of emotions, **Lecture 1 -** Emotions: concepts and categories and measurement, **Lecture 2 -** Historical background and theories, **Lecture 3 -** Measuring and Communicating emotions

Week 2 : Culture and Emotions, **Lecture 4 -** Universals and cultural differences in emotions 1, **Lecture 5** - Universals and cultural differences in emotions 2

Week 3 : Physiology of emotions, **Lecture 6 -** Emotions and the body, **Lecture 7 -** Emotions and the brain

Week 4 : Self-conscious Emotions, **Lecture 8 -** Self-evaluative emotions: Guilt, shame, Embarrassment, and pride, **Lecture 9 -** Social comparison Emotions: Envy and jealousy

Week 5 : Positive emotions and happiness, **Lecture 10 -** Positive emotions, **Lecture 11 -** Happiness and Subjective well-being 1, **Lecture 12 -** Happiness and Subjective well-being 2

Week 6 : Group Emotions, **Lecture 13 -** Emotions in groups 1, **Lecture 14 -** Emotions in groups 2

Week 7 : Emotions and cognitions, **Lecture 15 -** Emotions and cognitions, **Lecture 16 -** Effects of emotions on cognitive functions 1, **Lecture 17** - Effects of emotions on cognitive functions 2

Week 8 : Emotion based disorders, **Lecture 18 -** Depression, **Lecture 19 -** Anxiety disorders

Week 9 : Emotion regulation and coping, **Lecture 20** - Emotion regulation: Introduction, **Lecture 21** - Emotion regulation strategies 1, **Lecture 22 -** Emotion regulation strategies 2

Week 10 : Emotional Intelligence 1, **Lecture 23 -** What is Emotional intelligence? Why it is important?, **Lecture 24 -** Skills of EI-Self awareness, **Lecture 25 -** Skills of EI-Self regulation

Week 11 : Emotional Intelligence 2, **Lecture 26 -** Skills of EI-Self-motivation, **Lecture 27 -** Skills of EI-Empathy, **Lecture 28 -** Skills of EI-Social Skills

Week 12 : Some applied aspects of emotions and EI, **Lecture 29** - EI and workplace, **Lecture 30 -** EI, health, and well-being, **Lecture 31** - How to increase EI? Some general pointers

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Psychology Of Stress, Health And Well-Being

Course Code: noc24-hs65 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITG**

Name of Course Instructor: Prof. Dilwar Hussain

Curriculum of the Course:

Week 1:Stress, health and well-being: Overview; Nature and physiology of stress

Week 2:Stress, trauma and health: Mind-body connections; Stress and non-infectious diseases; Stress and infectious diseases; Stress and psychological disorder

Week 3: Positive aspects of stress and trauma: Stress, trauma and posttraumatic growth; Factors influencing stress tolerance

Week 4:Coping processes and strategies 1 : Types of coping strategies; Coping strategies of limited value; Unconscious mind and defensive coping; Characteristics of constructive coping; physical ways of coping

Week 5:Coping processes and strategies 2: Mind-body strategies; Mental ways of coping; Coping with social support and meaning in life; Mindfulness and acceptance

Week 6:Beyond stress and recovery: Positive mental health and well-being

Week 7: Psychology of happiness: What is happiness? What makes us happy? Socio-economic factors and happiness; Positive emotions

Week 8:Can we become happier? Genetic set-point and hedonic adaptation; Sustainable happiness model and intentional activities

Week 9:Happiness Activities 1: Expressing gratitude and positive thinking; Love and kindness; Avoiding overthinking and social comparison

Week 10:Happiness Activities 2: Identifying signature strengths; Achieving happiness with “Flow”.

Week 11: Is happiness sufficient? The concept of eudaimonic well-being; Self-determination and motivation

Week 12:Meaning and purpose in life: The concept of meaning in life and logo-therapy; Life goals

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 17

Students Certified: 16

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Course: English Language for Competitive Exams

Course Code: noc24-hs73 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Aysha Viswamohan

Curriculum of the Course:

Week 1: Introduction/Practice Tests
Week 2: Advanced Grammar
Week 3: Advanced Grammar for Competitive Exams
Week 4: Advanced Vocabulary for Competitive Exams
Week 5: Advanced Vocabulary
Week 6: Advanced Reading for Competitive Exams
Week 7: Advanced Reading for Competitive Exams
Week 8: Advanced Writing for Competitive Exams
Week 9: Conclusion

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 14

Students Certified: 12

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Course: Learning English in Hindi

Course Code: noc24-hs74 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Humanities and Social Sciences **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Rajesh Kumar

Curriculum of the Course:

Week 1: Sounds & Writing Symbols in Engish ; Speech Sounds in English ; Consonants and Consonant Clusters in English ; Syllables and Words ; Some Features of English Words ; Plural Words in English

Week 2: Parts of speech 1 ; Parts of Speech 2 ; Parts of Speech 3 ; Words and Phrases in English ; Fundamentals of Learning English for Accuracy, Fluency and Communicative Confidence

Week 3: Sentences in English ; Direct and Indirect Objects ; Verb-be (is, are, am) in English ; Imperative sentences in English (command or request) ; Questions in English (Interogative sentences) ; Negative Sentences in English ; Agreement in English Sentences

Week 4: Participles in English ; Relaive Clauses in English ; Functions of Modals ; Passives in English ; Mood and Modal Verbs

Week 5: Modal verb 1 ; Modal verb 2 ; Modal verb 3 ; Modal verb 4 ; Telephone English

Week 6: Illustrating Clauses and Sentences ; Describing Clauses and Sentences ; Sentence, Clause and Complex Sentences ; Adjectival (Relative) Clause ; Adverbs ; Agreement in English Sentences (Subject and Verb in Sentences)

Week 7: Question Tags in English Sentences ; Questions in English (Interrogative sentences) ; Learning Softening (Knowing vs Using) ; Rhythm and Pitch in English ; Terminal Punctuations ; Punctuation 1 ; Punctuation 2

Week 8: Advanced Vocabulary ; Innovation in Vocabulary ; Metaphors ; Phrases & Idioms You Must Know ; Make your expressions impressive

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 37

Students Certified: 35

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Course: Constitution Law and Public Administration in India

Course Code: noc24-lw05 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Law **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Sairam Bhat

Curriculum of the Course:

Week 1: Introduction to Constitution and Constitutional Law, , Constitution, Constitutionalism and Constitutional Law, Difference between Constitutional law and other laws, Types of Constitution, Salient Features of the Constitution of India, Preamble to the Constitution of India: Its Role, Vision, Interpretation and Amendment,

Week 2: Fundamental Rights and Directive Principles of State Policy, , Concept of Fundamental Rights vis a vis Directive Principles of State Policy, Definition of State and Instrumentalities of State, Enumerated Fundamental Rights, Enforceability of Fundamental Rights vis -a -vis Directive Principles of State Policy, Primacy of Fundamental Rights and Directive Principles of State Policy, Constitutional Remedies to derogation of Fundamental Rights,

Week 3: Legislature of Union and States, , Parliamentary democracy and Bicameral Legislatures, Federalism and Quasi-Federal Structure, Role of Prime Minister & Council of Ministers; Chief Minister and Council of Ministers, Composition of the House of People and Council of States, Sessions and Functions of the Parliament and State Legislatures, Procedure in case of (i) Finance Bills, (ii) Money Bills, (iii) Bills other than Money Bills, Division of Legislative powers: Union List, State List, Concurrent List Interpretation of Schedule VII: Doctrine of Pith and Substance; Doctrine of Colorable Legislation, Doctrine of Eclipse, and Waiver,

Week 4: Governance II: Executive of Union and States, , Understanding Legislative and Executive Functions, Constitutional Role of President, Vice President and Governors, Executive Functionaries: Powers and Functions, Governance through ordinance & Emergency Provisions, Contracting for Government, Executive privilege, promissory estoppel, legitimate expectation, Right to information, official secrecy, security of state and control on information;, Tortious liability; contractual liability; personal accountability, and evolution of compensatory reliefs,

Week 5: Constitutional Judiciary & the power of Judicial Review, , Judicial Setup in India; Difference between Constitutional Courts, Courts and Tribunals, Constitutional Courts- Supreme Court & High Courts - Jurisdiction and power, Independence of Judiciary under Indian Constitution, Judicial Appointments etc., Judicial Review: Growth and Development,, Judicial Activism and Judicial restraint., Growth of Public interest Litigation,

Week 6: Amendment to the Constitution of India, , Powers of Amendment, Amendment of the Preamble, Judicial Review of Amendments, Schedule IX Legislations, Theory of Basic Structure to the Constitution of India,

Week 7: Constitutional Authorities & Local Self Governance, , Comptroller and Auditor General (CAG), Office of Attorney General, Solicitor General, Advocate General, Election Commission, Union Public Service Commission and State Public Service Commissions, 73rd and 74th Constitutional Amendment; Panchayati Raj System & Urban Local Bodies, Initiatives towards E-Governance,

Week 8: Regulation of Administrative Actions, , Expansion of Administration and Growth of Administrative Law, Classification of Administrative Functions: Illustrations and Examples Legislative Functions; Judicial Functions; Executive or Administrative Functions, Nature and Scope of Administrative Law, Judicial Review of Administrative Action,

Week 9: Delegated Legislations, , Administrative process, nature and scope;, Growth of Delegated Legislation;, Control of delegated legislation: Legislative Controls, Judicial Controls, Executive

Control;, Administrative discretion;, Excessive Delegation and Procedural Fairness, Ouster of Jurisdiction Clauses,

Week 10: Growth of Administrative Tribunals, , Growth of Administrative Tribunals, Clauses of Finality of Orders of Tribunals, Test to determine exercise of Quasi-Judicial Power, Principle of natural justice: Audi Alteram Partem, Doctrine of Bias, Reasoned Decisions,

Week 11: Role of Public Policy in Administration, Statutory Corporations and Public Sector Undertakings, , Nature, Scope and Importance of Public Policy, The distinction and interface between public policy and Fiscal, Monetary, Defense, development, Environment, Social welfare policies etc., Statutory Corporations, Government Companies, Joint Ventures, etc, Transparent governance and prevention of corruption,

Week 12: Regulatory Authorities: Checks and balances on governance, , Commission of Inquiry; The CBI, Inquiries by Legislative Committees, Judicial inquiries, etc, Central Vigilance Commission, Information Commissions, Reserve Bank of India, Ombudsman, Lokpal and Lokayukta;, Planning Commission and Niti Ayog, Disaster Management Authority,

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 5

Students Certified: 4

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Course: Advanced Engineering Mathematics

Course Code: noc24-ma03 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Mathematics **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. H S Mahato

Curriculum of the Course:

Week 1: Differentiability, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorem. Functions of several variables: Limit, continuity, partial derivatives and their geometrical interpretation, total differential and differentiability, Derivatives of composite and implicit functions, implicit function theorem, derivatives of higher order and their commutativity, Euler's theorem on homogeneous functions, Taylor's expansion of functions, maxima and minima, constrained maxima/minima problems using Lagrange's method of multipliers

Week 2: Convergence of improper integral, test of convergence, Gamma and Beta functions, their properties, differentiation under the integral sign, Leibnitz rule of differentiation Double and triple integral, change of order of integration, change of variables, Jacobian transformation, Fubini theorem, surface, area and volume integrals, integral dependent on parameters applications, Surface and Volume of revolution. Calculation of center of gravity and center of mass.

Week 3: Differential Equations – first order, solution of first order ODEs, Integrating factor, exact forms, second order ODEs, auxiliary solutions

Week 4: Numerical analysis: Iterative method for solution of system of linear equations, Jacobi and Gauss-Seidal method, solution of transcendental equations: Bisection, Fixed point iteration, Newton-Raphson method.

Week 5: Finite differences, interpolation, error in interpolation polynomials, Newton's forward and backward interpolation formulae, Lagrange's interpolation, Numerical integration: Trapezoidal and Simpson's 1/3rd and 3/8th rule.

Week 6: Vector spaces, basis and dimension, Linear transformation, linear dependence and independence of vectors, Gauss elimination method for system of linear equations for homogeneous and nonhomogeneous equations

Week 7: Rank of a matrix, its properties, solution of system of equations using rank concepts, Row and Column reduced matrices, Echelon Matrix, properties,

Week 8: Hermitian, Skew Hermitian and Unitary matrices, eigenvalues, eigenvectors, its properties, Similarity of matrices, Diagonalization of matrices,

Week 9: Scalar and vector fields, level surface, limit, continuity and differentiability of vector functions, Curve and arc length, unit vectors, directional derivatives,

Week 10: Divergence, Gradient and Curl, Some application to Mechanics, tangent, normal, binormal, Serret-Frenet Formulae, Application to mechanics

Week 11: Line integral, parametric representations, surface integral, volume integral, Gauss divergence theorem, Stokes theorem, Green's theorem.

Week 12: Limit, continuity, differentiability and analyticity of functions, Cauchy-Riemann equations, line integrals in complex plane Cauchy's integral formula, derivatives of analytic functions, Cauchy's integral theorem, Taylor's series, Laurent series, zeros and singularities, residue theorem, evaluation of real integrals

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2
Students Certified: 1

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Course: Mechatronics

Course Code: noc24-me13 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Mechanical Engineering **Coordinating Institute: IITR**

Name of Course Instructor: Prof. Pushparaj Mani Pathak

Curriculum of the Course:

Week 1 : Introduction to Mechatronics : Introduction, Examples of Mechatronic systems, Electric circuits and components, Semiconductor Electronics, Transistor Applications

Week 2 : Sensors and transducers : Performance terminology of sensors, Displacement, Position & Proximity Sensors-I, Displacement, Position & Proximity Sensors-II, Force, Fluid pressure, Liquid flow sensors, temperature, light sensor, Acceleration and Vibration measurement, Semiconductor sensor and MEM, SAW

Week 3 : Actuators and mechanisms : Mechanical Actuation System, Hydraulic & Pneumatic Actuation System, Electrical Actuation System-I, Electrical Actuation System-II, Data Presentation system

Week 4 : Signal conditioning: Introduction to signal processing & Op-Amp, Op-Amp as signal conditioner, Analogue to Digital Converter, Digital to Analogue Converter, Artificial intelligence

Week 5 : Microprocessors and microcontrollers: Digital circuits-I, Digital circuits-II, Microprocessor Micro Controller, Programming of Microcontrollers

Week 6 : Modeling and system response: Mechanical system model, Electrical system model, Fluid system model, Dynamic response of systems, Transfer function and frequency response.

Week 7 : Closed loop controllers: P,I, PID Controllers, Digital Controllers, Program Logic Controllers, Input/output & Communication systems, Fault findings

Week 8 : Design and mechatronics: Project using Microcontroller-Atmega 16, Myoelectrically Controlled, Robotic Arm, Robocon-Part I, Robocon-Part II, Design of a Legged Robot

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 2

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Course: Operations Management

Course Code: noc24-me15 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Mechanical Engineering **Coordinating Institute: IITR**

Name of Course Instructor: Prof. Inderdeep Singh

Curriculum of the Course:

Week 1: Introduction to Course, Operations Management: Objectives, Operations Management: Functions and Scope,Types of Production Systems, Operations Strategy.

Week 2: Product Life – Cycle, Value Engineering Concepts, Design for X (DFX), Ergonomics in Product Design, Rapid Prototyping: Concept, Advantages.

Week 3: Sales Forecasting, Forecasting System, Qualitative Methods of Forecasting, Quantitative Methods - I, Quantitative Methods – I.

Week 4: Facility Planning, Factors Affecting Plant Location, Plant Location: Case Study on Uttarakhand, Location Evaluation Methods-I, Location Evaluation Methods-II.

Week 5: Facility Layout and Planning-I, Facility Layout and Planning-II, Factors Influencing Plant Layout, Material Flow Patterns, Tools and Techniques used for Plant Layout Planning.

Week 6: Production Planning and Control, Process Planning, Aggregate Production Planning, Capacity Planning: Introduction, Capacity Planning: Examples.

Week 7: Project Scheduling, Network Diagrams, Critical Path Method (CPM), Critical Path Method: Problems, Critical Path Method: Problems.

Week 8: Program Evaluation and Review Technique (PERT), PERT Problems, PERT Problems, Time Cost Trade Off (Crashing), Project Network: Crashing Problems.

Week 9: Production Control, Sequencing, Sequencing Problems-I, Sequencing Problems-II, Master Production Scheduling (MPS).

Week 10: Concept of Quality, Total Quality Management (TQM), Total Productive Maintenance (TPM), Statistical Quality Control (SQC), Six Sigma.

Week 11: Materials Management, Inventory Control, Economic Order Quantity (EOQ) Models, Economic Order Quantity (EOQ): Problems, Production Quantity Model.

Week 12: Just in Time (JIT), Kanban System, Materials Requirement Planning (MRP)-I, Materials Requirement Planning (MRP)-II, Enterprise Resource Planning (ERP).

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Computer Integrated Manufacturing

Course Code: noc24-me27 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Mechanical Engineering **Coordinating Institute: IITK**

Name of Course Instructor: Prof. J. Ramkumar
Prof. Amandeep Singh

Curriculum of the Course:

Week 1 : Introduction to Computer Integrated Manufacturing (CIM)

Week 2 : Computer Aided Design

Week 3 : Computer Aided Manufacturing

Week 4 : Computer Numerical Control

Week 5 : Computer Aided Process Planning (CAPP)

Week 6 : CIM interfaces: CAD vs CAM

Week 7 : Data and information in CIM

Week 8 : Manufacturing Systems and their design

Week 9 : Simulation of Manufacturing Systems

Week 10 : Computer Aided Maintenance

Week 11 : Computer Integrated Additive Manufacturing

Week 12 : Advanced CIM techniques

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: IC Engines And Gas Turbines

Course Code: noc24-me38 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Mechanical Engineering **Coordinating Institute: IITG**

Name of Course Instructor: Prof. Pranab K. Mondal,
Prof. Vinayak N. Kulkarni

Curriculum of the Course:

Week 1 : Engine

Week 2 : IC engines

Week 3 : Air-standard cycles

Week 4 : Carburation

Week 5 : Fuel injection systems

Week 6 : Combustion in S.I. and C.I. engines

Week 7 : Introduction to Gas Turbines

Week 8 : Performance analysis of Bryton Cycle

Week 9 : Aircraft propulsion

Week 10 : Compressors

Week 11 : Compressors and Turbines

Week 12 : Nozzles and Diffusers

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 5

Students Certified: 3

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Course: Introduction To Fluid Mechanics

Course Code: noc24-me40 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Mechanical Engineering **Coordinating Institute: IITKGP**

Name of Course Instructor: Prof. Suman Chakraborty

Curriculum of the Course:

Week 1: Introduction and Basic Principles

Week 2: Properties of Fluids

Week 3: Properties of Fluids and Fluid Statics

Week 4: Fluid Statics

Week 5: Fluid Kinematics (Part I)

Week 6: Fluid Kinematics (Part II)

Week 7: Dynamics of Inviscid Flows (Part I)

Week 8: Dynamics of Inviscid Flows (Part II)

Week 9: Integral Forms of Control Volume Conservation Equations (Part I)

Week 10: Integral Forms of Control Volume Conservation Equations (Part II)

Week 11: Integral Forms of Control Volume Conservation Equations (Part III); Dynamics of Viscous Flows (Part I)

Week 12: Dynamics of Viscous Flows (Part II)

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 11

Students Certified: 4

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Course: Introduction to Machining and Machining Fluids

Course Code: noc24-me41 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Mechanical Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Mamilla Ravi Sankar

Curriculum of the Course:

Week 1: 1.1 Introduction and Importance of Machining: Introduction to manufacturing, Top-down and bottom-up approaches, Machining and Various Machining Processes. 1.2 Principles of Metal Cutting: Shear zone, Chip formation, chip thickness measurements, machining mechanics of ductile and brittle materials.

Week 2: 2.1 Cutting tool: Tool Geometry, Tool signature. 2.2 Cutting forces and Cutting velocities : Cutting forces, Merchant Circle, Empirical Models, Chip thickness ratio, Cutting velocities, Strain rates, Mathematical formulations.

Week 3: 3.1 Tribology, Surface roughness in Machining: Chip-tool tribology, tool-workpiece tribology, Sticking and sliding zone, types of lubrication, Surface roughness, Materials removal rate, Machinability. 3.2 Thermal Aspects of Machining: Cutting temperature, Measurement of temperature, heat generation, heat distribution, metallurgical and microstructural study.

Week 4: 4.1 Tool Wear and Tool life: Carter wear, flank wear, nose wear, other tool wears, tool life criteria. 4.2 Tool Materials and Coatings: Coating materials, PVD, CVD, RF, Laser coatings, Tool texturing.

Week 5: 5.1 Cutting Fluids: Classification, Functions, Types of lubrication, Cutting fluid additives, Emissions, Health Hazards, Rheology and Biodegradability. 5.2 Cutting fluid application: Standoff distance, angle of impingement, contact angle, area of cooling, Solid lubricants. 5.3 Eco-friendly cutting fluids: Development of eco-friendly cutting fluids, bio degradation of these fluids, COD, BOD, HRT, Advantages of sustainable cutting fluids over mineral oil based cutting fluids.

Week 6: 6.1 Multipoint Machining Processes: Milling, Drilling, Broaching, Tapping, Sawing, Gear Cutting.

Week 7: 7.1 Abrasive machining processes: Grinding wheel specification, classification, Thermal aspects, Lapping, Honing, Super finishing, Drag finishing, vibratory finishing, Applications. 7.2 Cutting fluids for abrasive machining processes: Cutting fluids in grinding, honing, super-finishing.

Week 8:8.1 Machining of Advanced Materials: Machining of Biomaterials, Aero Space materials, Smart Materials. 8.2 Advances in Metal Cutting: Hard Machining, High Speed Machining, Diamond Turning, Double tool Machining, Machining with rotary tools, Thin wall machining, Laser Assisted Machining. 8.3 Cutting fluids machining advanced materials: Cutting fluids for machining advanced materials, high speed machining, hard machining.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 1

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Course: Manufacturing Process Technology I & II

Course Code: noc24-me48 **Duration: 12 weeks** **Session: 2023-24**

Discipline: Mechanical Engineering **Coordinating Institute: IITK**

Name of Course Instructor: Prof.Shantanu Bhattacharya

Curriculum of the Course:

Week 1: Manufacturing properties of materials

Week 2 and 3: Casting processes

Week 4 and 5: Machining processes and Tool life estimation

Week 6: Joining processes

Week 7 : Metal Forming Processes

Week 8: Introduction micromanufacturing and microsystems fabrication technology

Week 9, 10 and 11: Advanced machining processes (AJM, USM, ECM, EDM, LBM and EBM)

Week 12: Additive manufacturing

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 2

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Course: Noise Management & Control

Course Code: noc24-me53 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Mechanical Engineering **Coordinating Institute: IITK**

Name of Course Instructor: Prof. Nachiketa Tiwari

Curriculum of the Course:

Week 1 : Intro and terminology

Week 2 : Concept Review

Week 3 : Wave Mechanics

Week 4 : 1-D Waves

Week 5 : Spherical Waves

Week 6 : Noise Measurement

Week 7 : Noise Sources

Week 8 : Noise Sources

Week 9 : Acoustic Criteria & Room Acoustics

Week 10 : Room Acoustics & Silencers

Week 11 : Silencers & Vibration Isolation

Week 12 : Vibration isolation & Case Studies

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Product Design and Manufacturing

Course Code: noc24-me58 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Mechanical Engineering **Coordinating Institute: IITK**

Name of Course Instructor: Prof. J.Ramkumar
Prof. Amandeep Singh

Curriculum of the Course:

Week 1 : Introduction to Product Design and Manufacturing

Week 2 : Product Design Morphology

Week 3 : Visual Design, and Quality Function Deployment (QFD)

Week 4 : Value Engineering

Week 5 : Material, and Manufacturing process selection

Week 6 : Design for Manufacturing, Assembly, and Maintenance

Week 7 : Design for Environment, and Quality Control

Week 8 : Patenting, and Creativity

Week 9 : Rapid Prototyping

Week 10 : Plant Layout Design

Week 11 : Computer Integrated Manufacturing

Week 12 : Reverse Engineering, and Managing Competitiveness

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 4

Students Certified: 4

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Course: Advanced Machining Processes

Course Code: noc24-me72 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Mechanical Engineering **Coordinating Institute: IITK**

Name of Course Instructor: Prof. Shantanu Bhattacharya

Curriculum of the Course:

Week 1 : Introduction to Advanced Manufacturing Processes: Overview of non-conventional machining processes with (USM, AJM/AWJM, ECM, EDM, EBM, LBM etc.). Mechanical Material Removal Processes (USM, AJM) Ultrasonic Machining (USM):Basics of USM processes, Mechanics of USM. Process parameters of USM, Shaw's model of USM mechanics, Compressed grain modelling and direct throw modelling and comparison

Week 2 : Dependence of process parameters in estimation of MRR, Numerical approach to USM, Ultrasonic machining setup, Design of acoustic ultrasonic head and feed mechanism in USM.

Week 3 : Introduction to abrasive jet machining (AJM), Mechanics of AJM, AJM process parameters, Components of AJM (Abrasive, Gas, Setup), Mixing and Mass ratio and Material removal rate, Numerical approach to AJM, Modelling of Material Removal Rate (MRR). AJMM, Mask materials of AJMM and applications. Basics of Electro-chemical Machining: Electrochemistry basics, Debye Huckel theory of Ion transport,

Week 4 : Electrochemical Machining Process (ECM) Finding out of potential on the electrode surface, Basic Principle of Electrochemical Machining, Estimation of MRR in ECM, Electrode potential in ECM, MRR in multiphase alloys,

Week 5 : Modelling of Kinematics and Dynamics for ECM process, Numerical approach to ECM, Tool shape determination in ECM, Design for electrolyte flow velocity, Electrolyte flow dynamics and design of electrode for electrolyte flow, Insulation design in ECM,

Week 6 : Defects in ECM and reasons, Basics of Electrochemical drilling, Basics of Electrochemical Grinding, Basics of Electro stream drilling, Process parameters from Electro stream drilling and Electrochemical Grinding

Week 7 : Applications of Machining (miscellaneous), Thermal Material Removal Processes (EDM, EBM, LBM) Electro-discharge machining: Electro-discharge machining (EDM), Process parameters of EDM, Mechanics of EDM, Theoretical estimation of MRR in EDM, Heat source modelling of spark in EDM, Mathematical modelling of depth of melting temperature, Calculation of crater volume in EDM, Role of cavitation in material removal in EDM, Role of melting temperature of the work-piece material, EDM circuits and operating principles,

Week 8 : Mathematical modelling of the resistance-capacitance relaxation circuit, Numerical modelling of MRR from RC relaxation circuit output, Process parameters of RC relaxation circuit and MRR variation with different parameters, Rotary impulse generator and control pulse circuit for process modelling of MRR in EDM, Surface finishing and machining accuracy in EDM, Taper and overcut in EDM, Effect of EDM on surface hardness, Electrode and dielectric fluid. Electron Beam Machining (EBM): Introduction to electron beam machining.

Week 9 : Comparison of E-beam machining with other thermal processes, Setup for EBM, Power requirement in E-Beam, Mechanics of EBM process, Numerical model for heat transfer in EBM and estimation of MRR, Derivation of functional characteristics in EBM by using Buckingham's Pie theorem, Comparison of outcome of functional characteristics with empirical model, Power requirements for different work-piece materials in EBM Laser Beam Machining (LBM): Introduction to Lasers and Laser beam machining, Types of lasers and feedback mechanisms in Lasers, Mechanics of material removal in Laser machining, Heat conduction model and temperature rise in LBM,

Numerical modelling of LBM on semi-infinite surface and LBM with circular beams, Numerical estimation of time of machining in both the semi-infinite and circular beam cases, Steady state hole penetration model in LBM, Dependence of heat input in cutting speed of laser beam, Introduction to Plasma Arc Machining.

Week 10 : Overview of micro-fabrication (Silicon/ glass processes). Overview of soft lithography processes for polymer micro-fabrication Introduction to use of non-conventional processes for micromachining.

Week 11 : Advanced Finishing Processes: Basics of Abrasive flow finishing (AFF) and Magneto-rheological abrasive flow finishing processes (MRAF), Physics of MRAF, Process parameters of AFF and MRAF. Lab sessions: WAJM, EDM

Week 12 : Lab sessions: EDM, Photolithography

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 4

Students Certified: 4

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Course: Project Management

Course Code: noc24-mg01 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Management **Coordinating Institute: IITR**

Name of Course Instructor: Prof. Ramesh Anbanandam

Curriculum of the Course:

Week 1: , Part-I Project Initiation, Lecture 1 - Introduction to project management - I, Lecture 2 - Introduction to project management -II, Lecture 3 - Agile project management, Lecture 4 - Project Selection Models, Lecture 5 - Examples of Project Selection Models,

Week 2: , Part-I Project Initiation, Lecture 6 - Project manager, Lecture 7 - Attributes of Effective Project Manager, Lecture 8 - Managing for stakeholders, Lecture 9 - Resolving Conflicts, Lecture 10 - Negotiation

Week 3: , Part-I Project Initiation, Lecture 11 - Project in the organization structure, Lecture 12- Human factors and the project team, , **Part-II Project Planning**, Lecture 13 - Traditional project activity planning, Lecture 14 - Agile project planning, Project charter, Lecture 15 - Coordination through integration management

Week 4: , Part-II Project Planning, Lecture 16 - Project feasibility analysis, Lecture 17 - Estimating project budgets, Lecture 18 - Project risk management, Lecture 19 - Quantitative risk assessment methodologies, Lecture 20 - Critical path method (CPM)

Week 5: , Part-II Project Planning, Lecture 21 - Programme evaluation and review technique (PERT), Lecture 22 - Risk analysis with simulation for scheduling, Lecture 23 - Gantt Chart, Scheduling with scrum, Lecture 24 - Crashing a project, Lecture 25 - Resource loading

Week 6: , Part-II Project Planning, Lecture 26 - Resource levelling, Lecture 27 - Goldratt's critical chain, , **Part-III Project Execution**, Lecture 28 - Planning-monitoring-controlling cycle, Lecture 29 - Earned value analysis, Lecture 30 - Agile tools for tracking project

Week 7: , Part-III Project Execution, Lecture 31 - Three types of project-controlling, Lecture 32 - Control of change scope and scope creep, Lecture 33 - Project audit, Lecture 34 - Essentials of an audit/evaluation, Lecture 35 - When to close a project

Week 8: , Part-III Project Execution, Lecture 36 - Benefits realisation, Case study on the success of Chandrayan-3, , **Part-IV IT for Project Management**, Lecture 37 - Software for project management, Lecture 38 - Demo on project management software, Lecture 39 - Simulations software for project management, Lecture 40 - Course Summary

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 1

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Course: Integrated Marketing Communication

Course Code: noc24-mg26 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Management **Coordinating Institute: IITR**

Name of Course Instructor: Prof. Vinay Sharma

Curriculum of the Course:

Week 1: What is IMC?

Week 2: Current Trends and Design Thinking Outlook in IMC

Week 3: Consumer Behaviour

Week 4: Objectives, Budgeting, and IMC as a Strategic Tool

Week 5: Historical Perspective of IMC

Week 6: Research Methods and IMC Planning

Week 7: Advertising

Week 8: Creativity: Planning and Execution

Week 9: Sales Promotion & Personal Selling

Week 10: Direct Marketing & Public Relations

Week 11: The Internet: Digital Marketing and Social Media Advertising

Week 12: Measurement & Ethical and Social Perspective of IMC

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Leadership and Team Effectiveness

Course Code: noc24-mg35 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Management **Coordinating Institute: IITR**

Name of Course Instructor: Prof. Santosh Rangnekar

Curriculum of the Course:

Week 1: Introduction to Leadership & Team Management; Leadership Myths; Interactional Framework for analyzing leadership; Leadership Development: The First 90 Days as a Leader; Leader Development- The Action-Observation-Reflection Model

Week 2:LMX Theory and Normative Decision Model; Situational Leadership Model; Contingency Model and Path Goal Theory; Emotional Approach Charismatic and Transformational Leadership; Leadership for Tomorrow

Week 3: Leadership Attributes; Personality Traits and Leadership; Personality Types and Leadership; Intelligence and Leadership; Emotional Intelligence and Leadership

Week 4: Power and Leadership; The art of influence in leadership; Leadership and "Doing the Right Things; Character-Based Approach to Leadership; Role of Ethics and Values in Organisational Leadership

Week 5: Leadership Behaviour; Leadership Pipeline; Assessing Leadership Behaviors: Multi-rater Feedback Instruments; The Dark Side of; Leadership- Destructive Leadership; Managerial Incompetence and Derailment Conflict Management

Week 6: Negotiation and Leadership; Leadership under a crisis situation; The Situation and the Environment; Culture and Leadership; Global Leadership

Week 7: Motivation and Leadership; Introduction to Groups and Teams; Characteristics of Leader, Follower and Situation; Group Dynamics; Team Formation

Week 8: Delegation and Empowerment; Leading teams: Enhancing teamwork within a group; The leader's role in team-based organizations; Leader actions that foster Teamwork Effectiveness; Offsite training and team development

Week 9: Understanding Team processes and Team Coaching; Team decision making and conflict management; Virtual teams; Managing Multicultural teams; Building great teams

Week 10: Experiential Learning; Action Learning; Development Planning: GAP Analysis; Coaching and Mentoring; Women in Leadership Roles

Week 11: Building Effective Relationship with subordinates and peers; Fostering Followers satisfaction; The Art of Communication; Setting Goals and Providing Constructive Feedback; Enhancing Creativity problem solving skills

Week 12: Building High-Performance Teams: The Rocket Model; Building Credibility and Trust; Skills for Developing.Others; Team Building at the Top; Community Leadership

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 6

Students Certified: 5

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Course: Leadership for India Inc: Practical Concepts and Constructs

Course Code: noc24-mg36 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Management **Coordinating Institute: IITM**

Name of Course Instructor: Prof. C Bhaktavatsala Rao

Curriculum of the Course:

Week 1: INTRODUCTION TO LEADERSHIP Introduces the course. Discusses various aspects of leadership and management as important domains of study. Multiple thought streams of management and related thought leaders are presented.

Week 2: LEADERSHIP THEORIES Reviews the important theories of leadership that have had chronological evolution and recognition in management literature.

Week 3: LEADERSHIP FOR SUSTAINABLE GROWTH Discusses the role of leadership in contemporaneous and futuristic contexts, defining roles and responsibilities for a new world socio-economic order of sustainable growth. The connect leadership has with technology, business and sustainability is established.

Week 4: COMPETENCY LEADERSHIP Reviews various leadership qualities including traits, skills and attributes, and identifies certain common essential qualities. The apex leadership competency framework is unique to this course.

Week 5: LEADERSHIP PROCESSES Focusses on processes and methodologies for developing leaders in organisations, including through self-development.

Week 6:LEADERSHIP STRUCTURES Discusses the importance of reinforcing as well as disrupting established product and service structures, and leveraging organizational structures to create new growth niches.

Week 7: LEADERSHIP DEVELOPMENT AND SUCCESSION Examines the critical aspects of leadership transitions and CEO successions, based on Indian and global case studies.

Week 8:Functional Leadership Models Functional leadership, being a prerequisite for organizational leadership, is discussed in terms of five key domain-specific leadership models.

Week 9:Transformational Leadership Models – 1 Discusses unique aspects of transformational leadership models, with examples based on specific organizational and business contexts.

Week 10:Transformational Leadership Models – 2 Presents additional transformational leadership models, with examples based on specific people development approaches.

Week 11: Leadership Philosophies Identifies and analyses various philosophical conundrums involved in leadership and presents ways to resolve such dilemmas and paradoxes for individual and organisational effectiveness.

Week 12:Legendary Leadership Studies five leaders from the fields of public eminence, academic excellence, industrial competitiveness, pharmaceutical innovation and conglomerate development for unique Indian leadership models. The Course concludes with a tribute to Mahatma Gandhi, a leader who defies any comparison, nationally and internationally. The lecture builds a model of authentic leadership drawing ten instructive lessons from his life, relevant for leadership in any organization.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Principles of Management

Course Code: noc24-mg47 **Duration: 12 Weeks** **Session: 2023-24**

Discipline: Management **Coordinating Institute: IITR**

Name of Course Instructor: Prof. Usha Lenka

Curriculum of the Course:

Week 1: Introduction to Management: Management – An Emerging Profession, Definition, Nature, Scope, Purpose, and characteristics of Management, Functions, roles, skills of an effective Manager

Week 2: Evolution of Management Thought : Classical Theory, Scientific Management , Management Process or Administrative Management, Bureaucracy, Behavioural Science Approach, Quantitative Approach, Systems Approach, Contingency Approach, Operational Approach

Week 3: Planning: Types of Plans, Planning Process, Introduction to Strategic Management, Types of Strategies, Understanding environment of business: Environmental appraisal – Industry Analysis - Porter's Model of competitive advantage, analysis of organisational resources and capabilities

Week 4: Forecasting and Premising : Introduction to Forecasting, Essential Components in Business Forecasting, Determinants of Business Forecasts, Benefits of Forecasting, Techniques of Forecasting, Limitations of Forecasting

Week 5: Decision-making : Introduction, Components of Decision-making, Decision-making Process, Group Decision-making, Creativity Problem-solving

Week 6: Management by Objectives and Styles of Management : Core Concepts of MBO, Characteristics of Management by Objectives, Process of MBO, Defining the Goal, Action Plan, Final Review, Benefits of Management by Objectives, Limitations of Management by Objectives, Styles of Management, American Style of Management, Japanese Style of Management, Indian Style of Management

Week 7: Organizing and Directing: Introduction, Organizational Design, Hierarchical Systems , Organization Structure, Types of Organization Structure, Formal and Informal Organization, Factors Determining Span of Management, Centralization and Decentralization, Span of control, Understanding authority and responsibility, Principles of Delegation, Authority, Developing a culture of Innovation and performance

Week 8: Staffing and Coordination: Introduction, Human Resource Management, Recent Trends in HRM, Technology in HRM, Economic Challenges, Workforce Diversity, Concept of Coordination, Need for Coordination, Importance of Coordination, Principles of Coordination, Coordination Process, Types of Coordination, Issues and Systems Approach to Coordination, Techniques of Coordination

Week 9: Career Development Strategy: Introduction, Concept and Elements of Career, Overview of Career Development, Significance and Advantages of Career Development, Objectives of Career Development, Types of Career Development Programmes, Different Stages or Cycles of Career Development Process, Career Anchors, Steps in the Career Planning Process

Week 10: Leadership styles of Managers: Leadership Concept, Nature, Importance, Attributes of a leader, Role of a leader in demonstrating awareness of legal, personnel, and strategic issues relating to globalization, culture and gender diversity in an organization, Role of leader in conflict resolution and negotiations

Week 11: Organizational Communication: Communication in Organizations: Introduction, Importance of Communication in the Workplace; Understanding Communication Process, Barriers to Communication, Use of tone, language and styles in Communication, Role of Perception in influencing communication, Role of culture in communication

Week 12: Change management: Concept of change, change as a natural process, Importance & Causes of change – social, economic, technological, organizational, Developing a climate for learning, Concept of learning organizations

Challenges of Contemporary Business: Role of Ethics, Corporate social responsibility, and environmental issues

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 3

Students Certified: 1

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Course: Yoga and Positive Psychology for Managing Career and Life

Course Code: noc24-mg63 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Management **Coordinating Institute: IITB**

Name of Course Instructor: Prof. Ashish Pandey

Curriculum of the Course:

Week 1

I. Need for the Course on Managing Self

II. Why Positive Psychology and Yoga in this Course?

III. Positive Psychology: First and Second Wave

Week 2

I. Yoga from the Lens of Positive Psychology

II. Yogic Perspective of Positive Events and Positive Institutions

III. Yogic Perspective of Governance and Micro Macro Integration of Life

Week 3

I. Health and Wellbeing: Perspectives from Positive Psychology, Yoga and Ayurveda

II. Human Self and Ladder of Joy: Yogic, Sankhya and Vedantic Perspective

Week 4

I. TattvaBodh and Indriyajaya:Ways of Attaining Wellbeing

II. DharmahKriya and Sukhayu-Hitayu:Ways of Attaining Wellbeing

Week 5

I. Kleshas: The Obstacles on the Way of Attaining Wellbeing

II. Shat Sampatti: The Means to Surpass the Obstacles on the Way of Attaining Wellbeing

Week 6

I. Realms and Types of Interventions for Managing Self and Career

II. Food as the First Intervention for Managing Self

III. Asanas as the Intervention for Managing Self and Career

Week 7

I. Prana and Types of Pranayam

II. Pranayams as the Intervention for Managing Self and Career

III. Pratyahara as the Intervention for Managing Self and Career

Week 8

I. Yogic Intervention for Managing Emotions

II. Yogic Intervention for Making Mind a Friend

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Theory and Practice of Non Destructive Testing

Course Code: noc24-mm14 **Duration: 8 Weeks** **Session: 2023-24**

Discipline: Metallurgical and Materials Engineering **Coordinating Institute: IITM**

Name of Course Instructor: Prof. Ranjit Bauri

Curriculum of the Course:

Week 1: Introduction to NDT, Visual Optical methods, Dye penetrant testing, Basic principle, Types of dye and methods of application, Developer application and Inspection.

Week 2: Magnetic particle testing, Basic theory of magnetism, Magnetization methods,Field indicators, Particle application, Inspection.

Week 3: Eddy current testing, Basic principle; Faraday's law, Inductance, Lenz's law,Self and Mutual Inductance, Impedance plane, Inspection system and probes,System calibration.

Week 4: Ultrasonic testing: Basics of ultrasonic waves, Pulse and beam shapes,Ultrasonic transducers.

Week 5: Test method, Distance and Area calibration, Weld inspection by UT.

Week 6: Acoustic emission testing: Basic principle, Sources of acoustic emission, Source parameters, Kaiser-Felicity theory, Equipment and Data display, Source location schemes.

Week 7: Radiography: X-rays and their properties, X-ray generation, X-ray absorption and atomic scattering.

Week 8: Image formation, Image quality, Digital Radiography, Image interpretation,Radiation Shielding. Comparison and selection of NDT methods, Concluding remarks.

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 2

Students Certified: 2

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Course: Quantum Entanglement: Fundamentals, measures and applications

Course Code: noc24-ph14 **Duration: 4 Weeks** **Session: 2023-24**

Discipline: Physics **Coordinating Institute: IITG**

Name of Course Instructor: Prof. Amarendra Kumar Sarma

Curriculum of the Course:

Week 1: Introduction; Review of quantum mechanics

1. Introduction
2. Postulates of Quantum Mechanics; Quantum mechanics of two-level systems
3. Density matrix formalism

Week 2: Physics of Quantum Entanglement

1. Bell's inequalities and theorem; Einstein-Podolsky-Rosen gedanken experiment;
2. Schrödinger's notion of "entanglement"; Bohm's spin version of the EPR experiment
3. Schmidt decomposition and entanglement

Week 3: Measures of Quantum entanglement; continuous variable quantum systems, Gaussian states

1. Introduction to continuous variable quantum systems; quantum phase-space representation
2. Gaussian states
3. Logarithmic negativity as a measure

Week 4: Applications of Quantum Entanglement; Quantum teleportation, Super dense coding, optomechanical entanglement

1. Quantum teleportation; Super dense coding; quantum cryptography
2. Optomechanical entanglement-I
3. Optomechanical entanglement-II

Assessment Procedure: Weekly Assignment (25%) + proctored certification Exam (75%)

Students Enrolled: 1

Students Certified: 1

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Course: Cpp

Course Code: Cpp

Session: 2023-24

Duration: 4 months

Assessment procedures: Proctored certification Exam (100%)

Curriculum of the Course:

Basic Level

1) **First C Program**

- -Header Files
    - example: #include <stdio.h>
- main()
- Curly braces { }
- printf()
- semicolon ;

- Compiling a C program
    - example: gcc filename.c -o output parameter
- Executing a C program
    - example: ./output parameter
- Errors

2) **First C++ Program**

- Header files
    - --example: #include <iostream>
- main()
- Curly braces { }
- -cout<<
- semicolon ;

- Compiling a C++ program

        - example: g++ filename.cpp -o output parameter
    - Executing a C program
        - example: ./output parameter

3) **Tokens in C and C++**

- Data types, constants, identifiers
- Keywords
    - example: if, break, else
- Constants
- Data types
    - example: int, float, char, double
- Format specifiers
    - example: %d, %f, %c, %lf
- Range of data types
- Variables
- Identifier
- Errors

4) **Functions in C and C++**

- What is a function
- Syntax for declaration of a function
- Function with arguments
    - example: return-type function-name(parameter);
- Function without arguments
    - example: return-type function-name;
- Calling a function
- Errors

5) **Scope of Variables in C and C++**

- Introduction
- Syntax of declaring a variable
    - example: data-type var-name;
- Syntax for initializing a variable
    - example: data-type var-name = value;
- Scope of variables

- Global variable
- Local variable
- Error

6) **If And Else If statement in C and C++**

- What are Statements.
- Syntax for if and
- If-else Statement
- Errors

7) **Nested if and switch statement in C and C++**

- Nested if statement.
- Switch statement.
- Syntax for nested-if statement
- Syntax for switch statement
- break statement
- Comparison between nested if-else and switch statement
- Errors

8) **Increment and Decrement Operators in C and C++**

- Increment Operator
    - example: ++
- Postfix increment
    - example: a++
- Prefix increment
    - example: ++a
- Decrement Operator
    - example: --
- Postfix decrement
    - example: a--
- Prefix decrement
    - example: --a
- Typecasting
- Errors

9) **Arithmetic Operators in C and C++**

- Arithmetic Operators
- Addition Operator
    - example: a + b
- Subtraction Operator
    - example: a - b
- Multiplication Operator
    - example: a * b
- Division Operator
    - example: a \ b
- Modulus Operator
    - example: a % b
- Errors

10) **Relational Operators in C and C++**

- Double Equal to
    - example: a == b
- Not Equal to
    - example: a != b
- Greater Than
    - example: a > b
- Less Than
    - example: a < b
- Greater than Equal To
    - example: a >= b
- Less Than Equal To
    - example: a <= b
- Errors

11) **Logical Operators in C and C++**

- And &&
- Or ||
- Not !
- Errors

Intermediate level

12) **Loops in C and C++**

- Loops
- Syntax for while and do-while loop
- Comparison of while and do-while loop
- Syntax for
- for loop
- Errors

13) **Arrays in C and C++**

- What are arrays
- 1-D Arrays
- Syntax for Declaration of arrays
    - example: data type array_name [size];
- Syntax for Initialization of arrays
    - example: data type array_name [size]=value;
- Accepting values from the user
- Errors

14) **Working with 2-D Arrays in C and C++**

- What are 2-D Arrays.
- Range of arrays
- Syntax for Declaration of 2-D arrays
    - example: data type array_name[row][column];
- Syntax for initialization of 2-D arrays
    - example: data type array_name[row][column]=

{
{row-val},{col-val}
};

- Errors

15) **Strings in C and C++**

- What is a string
- Syntax for declaring a string

- Syntax for initializing a string
- To read a string from keyboard
- Errors

16) **String Library Functions in C and C++**

- What are string library functions.
- Types of string library functions
    - Strcpy
    - Strlen
    - Strcmp
    - Strcat
- Errors

Advanced level

17) **Working with Structures in C and C++**

- Introduction
- Syntax of structures
- Declaration and initialization
- Declaration of structure variable
- Accessing structure variables

18) **Understanding Pointers in C and C++**

- Introduction
- Syntax of Pointer
    - example: int *iptr;
- Declaration
    - example:

int a; (integer a) int *aptr; (pointer to an integer *aptr) aptr = &a; (aptr set to address of a) Address Pointer

- Errors

19) **Function call in C and C++**

- types of function calls
- function pass by value
- function pass by reference

20) **File Handling in C**

- File handling functions
- Opening a File closing a file
    - example: fopen, fclose
- Reading data from a File

Course: Arduino

Session: 2023-24

Duration: 4 Month

Assessment procedures: Certification Exam (Qualifying score >=40%)

Curriculum of the Course:

1. **Overview of Arduino**
   - Learning objectives of Arduino
   - Prerequisites for learning Basic level Arduino tutorials
   - Prerequisites for learning Intermediate level Arduino tutorials
   - Who can use Arduino?
   - Glimpse of Spoken Tutorials available on Arduino series
2. **Electronic components and connections**
   - Breadboard and its internal connections
   - LED and its connections
   - Tri-color LED
   - Resistor
   - Simple circuit using LED, resistor and breadboard
   - Common mistakes when using breadboard to make connections
   - Pushbutton and its connections
   - Common mistakes when using pushbutton to make connections
   - Seven segment display and its connections
   - Demonstration of all the above components
3. **Introduction to Arduino**
   - About Arduino device
   - Features of Arduino
   - Components of Arduino board
   - Description of Microcontrollers
   - Few examples where a Microcontroller is used
   - Installation of Arduino IDE on Ubuntu Linux OS
   - Run the arduino executable file
   - The Arduino IDE window
4. **Arduino components and IDE**
   - Set up a physical connection between Arduino and a computer
   - Connect the Arduino board to the computer using the USB cable
   - Various components available in Arduino hardware
     - ATMEGA 328 microcontroller chip
     - About Arduino BootLoader
     - Digital Pins

- Analog Pins
- Blinking LEDs that are helpful for troubleshooting
- Ground Pins
- External power adapter
- Arduino programming language

5. **First Arduino Program**
   - Write an Arduino program to blink an LED
   - Arduino program is saved as Sketch
   - Default program environment with two empty functions -
     - setup - function for setting up a micro-controller
     - loop - infinite loop
   - Program to turn on the LED
   - Compile the program into binary format
   - Program to turn off the LED
6. **Arduino with Tricolor LED and Push button**
   - Tricolor LED - Common Cathode Tricolor LED
   - Other external devices that are required for this experiment
   - Understand the connection circuit details
   - Connect a tricolor LED to Arduino board
   - Write a program to blink tricolor LED
   - Use Pushbutton to control the blinking
   - How to reduce the delay of the blink
7. **Arduino with LCD**
   - Connect an LCD to Arduino board
   - See the details of the circuit connection
   - See how to do the soldering
   - Setup the components as per the circuit diagram
   - The aim is to write two strings on the LCD display
   - Write a program to display a text message on the LCD
8. **Display counter using Arduino**
   - Connect an LCD and a Push button to Arduino board.
   - Add a pushbutton and make a simple counter
   - Write a program in the Arduino IDE
   - See that pushbutton is working successfully
   - Modify the program to set a counter
   - Output: count is increased whenever the button is pressed
9. **Seven Segment Display**
   - Connect a seven segment display to Arduino board
   - Types of seven segment display
   - Connection details of common cathode seven segment display

- Connection details of common anode seven segment display
- Circuit connection explanation
- Live setup of the connection
- Program to blink LEDs in seven segment display
- High and low state of LED's in the seven segment
- Program to display digits 0 to 4 in seven segment display
- Compile and upload the program

10. Pulse Width Modulation

- About Pulse Width Modulation
- About duty cycle and frequency
- Formula to calculate the duty cycle
- Experiment to control the brightness of LED by varying the duty cycle
- Experiment to control the speed and direction of a DC motor
- Circuit connection explanation of the above experiments
- Source code for the above experiments
- Demonstration of the output

11. Analog to Digital Conversion

- About DHT11 sensor
- Arduino resolution concepts
- Circuit connection details of DHT11 sensor and Arduino
- Features of DHT11
- Download the DHT11 Arduino library to run this program.
- Code to detect the temperature and humidity using DHT11 sensor
- Display the output in the Serial Monitor screen
- Display the output in the Serial Plotter screen

12. **Wireless Connectivity to Arduino**

- About ESP8266-01 WiFi module
- Various pins of ESP8266-01 WiFi module
- Circuit connection of ESP8266 - 01 module with Arduino
- Setup the read-write permission to the USB port
- Download and install ESP8266 WiFi module in Arduino IDE
- Establish a connection between WiFi module and a laptop or a mobile phone
- Source code for the above experiment
- Demonstration of the output

Intermediate Level

1. **Assembly of Robot**
   - Components required to build a Robot
   - About soldering DC motors
   - Acrylic Robot Chassis with screws and nuts

- Steps to mount the motor on the Chassis
- Fixing the wheels of the Robot
- Assembled Robot
- About .apk file
- About MIT App inventor to build an app
- Code file for Car Bluetooth RC.apk
- Steps to install the app on the Android phone

2. **Robot Control using Bluetooth**
   - Components required for Bluetooth communication
   - About Bluetooth communication
   - About Data Mode and AT Command Mode
   - Circuit connection details of Arduino board and HC-05 Bluetooth module
   - Actual setup of the connections
   - Program to control the movement of the Robot
   - Configure the Bluetooth in Android phone
   - Working of the Car Bluetooth RC App
   - Working of the Robot
   - Control the movement of the Robot using Bluetooth communication
3. **Introduction to IoT**
   - About IoT
   - IoT system components
   - About Thingspeak platform
   - Create an account in Thingspeak
   - Login to the account and create a new channel
   - Enter the channel information
   - Show the graph outline
   - Generate the API keys
   - Importance of Write API key and Read API key
   - Copy the Write API key
4. **Sending data to the cloud using IoT devices**
   - External components required for sending data to the cloud
   - About MQTT Protocol
   - Circuit connection of DHT11 and WiFi module with Arduino
   - Setup the MB102 module on Breadboard
   - Circuit connections required for the experiment
   - Configure the ESP8266 module to communicate
   - Download a DHT sensor library
   - Program in Arduino IDE for interfacing WiFi module and DHT11 sensor
   - Working of ThingSpeak channel

- Graph of temperature and humidity values from the DHT11 sensor in ThingSpeak platform
- Data Import/Export option to download the data as CSV file

Advance Level

1. **Assembly programming through Arduino**
   - Write an assembly program to display a digit on seven segment display
   - Arduino - Assembly code reference
   - Arduino ATmega328 Pin mapping
   - Connection circuit details
   - Installing AVRA and AVRDUDE assembler
   - How to connect and check the port number of Arduino
   - Assembly program to glow the dot LED on the seven segment display
   - Assembly program to display digit two on the seven segment display
   - Assembly program to display digit five on the seven segment display using decoder
   - How to save the file, assemble and upload to the Arduino
2. **Digital Logic Design with Arduino**
   - Write an assembly to verify the logical AND operation
   - Use the m328Pdef.inc file that is available in the code files link of this tutorial.
   - Explanation of the Source code for logical AND operation
   - Save the file and generate the.hex file
   - Upload the code to the Arduino
   - Displaying the output on the Seven segment display
   - Replace the program with or to perform logical OR operation
   - Replace the program with xor to perform logical XOR operation
   - Implement and verify the below combinational logics:
     - A = W′
     - B = WX′Z′ + W′X
     - C = WXY′ + X′Y + W′Y
     - D = WXY + W′Z
3. **AVR-GCC programming through Arduino**
   - Write an assembly program to display a digit on seven segment display
   - Arduino - Assembly code reference
   - Arduino ATmega328 Pin mapping
   - Connection circuit details
   - Installing AVRA and AVRDUDE assembler
   - How to connect and check the port number of Arduino
   - Assembly program to glow the dot LED on the seven segment display
   - Assembly program to display digit two on the seven segment display
   - Assembly program to display digit five on the seven segment display using decoder
   - How to save the file, assemble and upload to the Arduino

4. **Interfacing LCD through AVR-GCC programming**
    - Interface a LCD to Arduino board
    - Pin connections details of the Arduino and LCD
    - Image showing the connections
    - Live set up of the connections
    - Write an AVR-GCC program to display a digit on LCD
    - Using avr/io.h, util/delay.h, stdlib.h libraries in the program
    - Using ClearBit() and SetBit() function
    - Various functions used to excute the output
    - Using make FNAME command to compile and upload to Arduino
    - Displaying the output digit 5 on the LCD
5. **Mixing Assembly and C programming**
    - Combining Assembly and C programming
    - Explanation of the circuit connections
    - Live setup of the connection
    - Assembly routine program which initialises and sets pin 13 of Arduino as output
    - Call that Assembly routine in AVR-GCC program to blink the Dot LED of the Seven Segment display
    - Use the Makefile that is available in the code files link of this tutorial.
    - Explanation of the Source code of the subroutine and main program
    - Save the file and generate the .hex file
    - Upload the code to the Arduino
    - Display the output on the Seven segment display
6. **Getting Ready for Arduino FLOSS**
    - About FLOSS Arduino website
    - Download the e-book and code files from the FLOSS Arduino website
    - About Arduino Shield
    - About tools and user code
    - About various experiments used in the e-book
    - Upload a program in Arduino IDE to check the working of the shield
    - About FLOSS Firmware
    - Why do we need FLOSS Firmware?
    - Upload the FLOSS firmware to the Arduino Uno board
    - Important points to remember
7. **Arduino Programming with Scilab and Xcos**
    - About Getting ready for Arduino FLOSS tutorial
    - Refer to chapter 3 of the e-book for installation of Arduino IDE and Scilab
    - Points to be noted before proceeding
    - Interfacing Arduino with Scilab
    - About Arduino-Scilab toolbox

- Set the Scilab working directory to the toolbox folder
- Run the scilab script to check whether the firmware is properly installed or not
- Scilab program to read the status of the pushbutton and display it on the GUI
- Xcos program to turn the LED on or off, depending on the pushbutton status
- Important points to remember

8. Arduino Programming with Python

- About Getting ready for Arduino FLOSS tutorial
- Refer to chapter 3 of the e-book for installation of Arduino IDE and Python
- Points to be noted before proceeding
- Interfacing Arduino with Python
- About Arduino-Python toolbox
- Run the Python script to check whether the firmware is properly installed or not
- Python program for Interfacing a Light Emitting Diode.
- Program to turn on blue LED
- Output of the experiment
- Important points to remember

9. Arduino Programming with Julia

- About Getting ready for Arduino FLOSS tutorial
- Refer to chapter 3 of the e-book for installation of Arduino IDE and Julia
- Points to be noted before proceeding
- Interfacing Arduino with Python
- About Arduino-Julia toolbox
- How to execute Julia test_firmware.jl
- Julia program for Interfacing a Potentiometer
- Program to turn on LEDs depending on the potentiometer threshold
- Output of the experiment
- Important points to remember

10. Arduino Programming with OpenModelica

- About Getting ready for Arduino FLOSS tutorial
- Refer to chapter 3 of the e-book for installation of Arduino IDE and OpenModelica
- Points to be noted before proceeding
- Interfacing Arduino with OpenModelica
- About Arduino-OpenModelica toolbox
- Load the Arduino OpenModelica toolbox
- OpenModelica program for interfacing a thermistor
- Program to read and display the thermistor values
- Output of the experiment

Course: C

Session: 2023-24

Duration: 4 Month

Assessment procedures: Certification Exam (Qualifying score >=40%)

Curriculum of the Course:

1) **First C Program**

- -Header Files example: #include <stdio.h>
- main()
- Curly braces { }
- printf()
- semicolon ;
- Compiling a C program example: gcc filename.c -o output parameter
- Executing a C program example: ./output parameter
- Errors

2) **First C++ Program**

- Header files --example: #include <iostream>
- main()
- Curly braces { }
- -cout<<
- semicolon ;
- Compiling a C++ program example: g++ filename.cpp -o output parameter
- Executing a C program example: ./output parameter

3) **Tokens in C and C++**

- Data types, constants, identifiers
- Keywords example: if, break, else
- Constants
- Data types example: int, float, char, double
- Format specifiers example: %d, %f, %c, %lf
- Range of data types
- Variables
- Identifier
- Errors

4) **Functions in C and C++**

- What is a function
- Syntax for declaration of a function
- Function with arguments example: return-type function-name(parameter);
- Function without arguments example: return-type function-name;

- Calling a function
- Errors

5) **Scope of Variables in C and C++**
- Introduction
- Syntax of declaring a variable example: data-type var-name;
- Syntax for initializing a variable example: data-type var-name = value;
- Scope of variables
- Global variable
- Local variable
- Error

6) **If And Else If statement in C and C++**
- What are Statements.
- Syntax for if and
- If-else Statement
- Errors

7) **Nested if and switch statement in C and C++**
- Nested if statement.
- Switch statement.
- Syntax for nested-if statement
- Syntax for switch statement
- break statement
- Comparison between nested if-else and switch statement
- Errors

8) **Increment and Decrement Operators in C and C++**
- Increment Operator example: ++
- Postfix increment example: a++
- Prefix increment example: ++a
- Decrement Operator example: --
- Postfix decrement example: a--
- Prefix decrement example: --a
- Typecasting
- Errors

9) **Arithmetic Operators in C and C++**
- Arithmetic Operators
- Addition Operator example: a + b
- Subtraction Operator example: a - b
- Multiplication Operator example: a * b
- Division Operator example: a \ b

- Modulus Operator example: a % b
- Errors

10) **Relational Operators in C and C++**

- Double Equal to example: a == b
- Not Equal to example: a != b
- Greater Than example: a > b
- Less Than example: a < b
- Greater than Equal To example: a >= b
- Less Than Equal To example: a <= b
- Errors

11) **Logical Operators in C and C++**

- And &&
- Or ||
- Not !
- Errors

Intermediate level

---

12) **Loops in C and C++**

- Loops
- Syntax for while and do-while loop
- Comparison of while and do-while loop
- Syntax for
- for loop
- Errors

13) **Arrays in C and C++**

- What are arrays
- 1-D Arrays
- Syntax for Declaration of arrays example: data type array_name [size];
- Syntax for Initialization of arrays example: data type array_name [size]=value;
- Accepting values from the user
- Errors

14) **Working with 2-D Arrays in C and C++**

- What are 2-D Arrays.
- Range of arrays
- Syntax for Declaration of 2-D arrays example: data type array_name[row][column];
- Syntax for initialization of 2-D arrays example: data type array_name[row][column]=

{

{row-val},{col-val}

};

- Errors

15) **Strings in C and C++**

- What is a string
- Syntax for declaring a string
- Syntax for initializing a string
- To read a string from keyboard
- Errors

16) **String Library Functions in C and C++**

- What are string library functions.
- Types of string library functions
    - Strcpy
    - Strlen
    - Strcmp
    - Strcat
- Errors

Advanced level

---

17) **Working with Structures in C and C++**

- Introduction
- Syntax of structures
- Declaration and initialization
- Declaration of structure variable
- Accessing structure variables

18) **Understanding Pointers in C and C++**

- Introduction
- Syntax of Pointer example: int *iptr;
- Declaration example:

int a; (integer a) int *aptr; (pointer to an integer *aptr) aptr = &a; (aptr set to address of a) Address Pointer

- Errors

19) **Function call in C and C++**

- types of function calls
- function pass by value
- function pass by reference

20) **File Handling in C**

- File handling functions
- Opening a File closing a file example: fopen, fclose
- Reading data from a File

Course: C and Cpp

Course Code: C and Cpp

Session: 2023-24

Duration: 4 months

Assessment procedures: Proctored certification Exam (100%)

Curriculum of the Course:

- 1 Introduction to C
- 2 Basic Level
- 3 Intermediate level
- 4 Advanced level

Basic Level

1) **First C Program**
   - -Header Files
     - example: #include <stdio.h>
   - main()
   - Curly braces { }
   - printf()
   - semicolon ;
   - Compiling a C program
     - example: gcc filename.c -o output parameter
   - Executing a C program
     - example: ./output parameter
   - Errors
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   - Header files
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   - main()
   - Curly braces { }
   - -cout<<
   - semicolon ;
   - Compiling a C++ program
     - example: g++ filename.cpp -o output parameter
   - Executing a C program
     - example: ./output parameter
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   - Keywords

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    - Data types
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    - Syntax for switch statement
    - break statement

- Comparison between nested if-else and switch statement
- Errors

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   - Postfix decrement
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   - Less Than
     - example: a < b
   - Greater than Equal To

        - example: a >= b
    - Less Than Equal To
        - example: a <= b
    - Errors

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Intermediate level

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        - example: data type array_name[row][column]=

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    - Errors
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Advanced level

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    - example:

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Course: CSS

Session: 2023-24

Duration: 4 Month

Assessment procedures: Certification Exam (Qualifying score >=40%)

Curriculum of the Course:

Basics

CSS Overview

- About CSS
- The content available in various tutorials in this series
- First CSS file
- Dimensions and Measuring units in CSS
- Box Model in CSS
- Background in CSS
- Text Properties in CSS
- Font Properties in CSS
- Display Property in CSS
- Float and Overflow in CSS
- Link in CSS
- List in CSS
- Table in CSS
- Advanced Table Design in CSS
- Forms in CSS
- Counters in CSS
- Multi-column Layout in CSS
- Web Layout in CSS

First CSS File

- Create a CSS file
- Syntax of CSS to write a style
- Types of Selectors
- About Declaration
- Save the CSS file in a folder
- Link a CSS file with an HTML file
- Descendant Selector with example
- Grouping Selector with example

- Universal Selector with example
- Id Selector with example
- Class Selector with example

Dimensions and Measuring Units in CSS

- What are measuring Units
- What are relative Units
- What are absolute Units
- Setting width using percentage
- Setting font size using percentage
- Setting font size using points
- Setting height using centimeter
- Setting properties for paragraph
- Setting properties for heading
- What are heading tag sizes

Box Model in CSS

- What is Box Model
- Setting border using properties:
- -Style
- -Width
- -Color
- Setting different border styles for each side
- Setting margin
- Setting different margins for each side
- Setting Padding
- Setting properties for division tag

Background in CSS

- What are background properties
- How to style background
- Setting background-color using:
- -Color names
- -Hexadecimal values
- -RGB values
- Setting background image
- Setting background-repeat property
- Setting background-attachment property

- Setting background-position property
- Styling background using shorthand

Text Properties in CSS

- Format and style text elements
- Use of color names, hexadecimal values and RGB values to set the text color
- Align the text horizontally using left, right, center and justify options
- Indent the text using the length values - cm, px, and %
- Change the letter spacing and word spacing of the text
- Set the line height of the text
- Set the direction property using ltr and rtl values
- Transform the text using values
- Decorate the text
- Apply shadow effect on the text

Font Properties in CSS

- Set the font-family property of the text
- Style text font using the font-style property
- Use of font-style values - normal, italic & oblique
- Specify the thickness of the font
- Use of font-weight values - keywords & numeric
- Vary the font text using the font-variant values - small caps and normal
- Set the font-size using points
- Use of font-size values - length , keywords & percentage
- Set the font properties using shorthand method

Display Property in CSS

- Set the display property to present an element on the webpage
- Use of display property values
- Set the display property using - Block, Inline, None values
- Create elements using an id selector.
- Set height, width and background for the elements
- Style the paragraphs
- Remove the display property
- Undo the changes in the files

Intermediate

Float and Overflow in CSS

- About float property

- Use of float property values - left, right, none, initial & inherit
- Add an image
- Set float property for an image
- About clear property
- Use of clear property values - left, right, both, none, initial & inherit
- Set clear property for a paragraph
- About overflow property
- Use of overflow property values - visible, scroll, auto, hidden, initial & inherit
- Set overflow property for a div block

Link in CSS

- About styling link
- Add links to the webpage
- About default property of link:
- Underline
- Color
- About link states - link, visited, hover & active
- Set color of the link
- Set background color of the link
- Set text decoration of the link
- Remove underline of the link

List in CSS

- About list properties
- Add an ordered list to the webpage
- Add an unordered list to the webpage
- Set the style of the marker for the ordered list
- Set the shape of the marker for the unordered list
- Set background color for the lists
- Set background color for the list-items
- Set an image as a marker for the unordered list
- Set position of the marker for the lists
- Set list properties using shorthand

Table in CSS

- About table properties
- Add a table to the webpage
- Set border for the table

- Set width of the table
- Set height of the table
- Set horizontal alignment for the text inside the table
- Set vertical alignment for the text inside the table
- Set padding for the text inside the table
- Set text color and background color for the table
- Set position of the caption of table

Advanced Table Design in CSS

- About table design
- About different ways to design tables
- Set horizontal border divider for the table
- Set background to a particular color on hovering mouse
- Set an image as a background for the table
- Set zebra stripe design for the table
- Decorate table column-wise
- Set background color for the column of table
- Set layout property for the table
- Create responsive table

Forms in CSS

- About properties used for styling forms
- Design input text
- Set border and border-radius property
- Set width
- Set padding
- Set text color and background color
- Use of focus selector
- Set background image
- Set text-indentation property
- Set transition property
- Design label
- Design Select Menu
- Design textarea
- Design input buttons
- Create responsive form using media rule

Advanced

Counters in CSS

- About counters
- About counters properties:
- counter-reset property
- counter-increment property
- counter-reset property
- counter() or counters() function
- Set headings
- Set counter for the headings
- About nested counters
- Set nested counter for the headings

Multi-column Layout in CSS

- About multi-column layout
- About column properties
- Add some text to the webpage
- Set column-width property for the text
- Set column-count property for the text
- Set column-gap property for the text
- Set column-rule-style property for the text
- Set column-rule-color property for the text
- Set column-rule property for the text
- Set column-span property for the text

Web Layout in CSS

- About web layout
- About header
- Set heading as a header
- Set CSS properties for header
- About menu bar
- Set links as menu bar
- Set CSS properties for menu bar
- About content
- Set paragraphs as content
- Set CSS properties for content
- About footer

- Set some text as footer
- Set CSS properties for footer

Course: HTML

Session: 2023-24

Duration: 4 Month

Assessment procedures: Certification Exam (Qualifying score >=40%)

Curriculum of the Course:

Basics

HTML Overview

- About HTML
- My First HTML Program
- Elements, Tags and Attributes
- Formatting Tags
- Styles and CSS
- Lists
- Tables
- Phrase Tags
- Doctype and Head Section
- Embedding Images
- Embedding Audio and Video
- Block Elements and Layouts
- Forms

My First HTML Program:

- Structure of an html document
- Write a sample html program
- html, head & body sections
- title tag
- H1 heading tag
- Save the html program
- .html and .htm file extensions
- Run the html program
- View in a web browser

Elements, Tags and Attributes in HTML:

- Elements
- Empty elements
- Nested elements

- Tags
- Self Closing Tags
- Attributes
- Common Attributes
- Single and Double Quoted Attributes
- Break tag
- Paragraph tag
- background color attribute

Formatting Tags

- Text Formatting Tags
- -Paragraph
- -Heading
- -Bold
- -Italic
- -Small
- -Underline
- -Delete
- -Insert
- -Super Script
- -Sub Script
- Break Tag
- Horizontal Ruler
- Anchor

Styles and CSS

- Inline style,
- Style Attribute,
- Style tag,
- CSS,
- Common Style Attributes:
- text align,
- font-family,
- font-size,
- colour,
- Background Colour,

Lists in HTML

- What is list?
- Types of List:
- Ordered List
- Unordered List
- Description List
- List Attributes
- Ordered List Types
- Unordered List styles
- Nested Lists

Tables in HTML

- Tables
- Table Elements:
- caption
- table row
- table heading
- table definition
- Table Attributes:
- Spacing
- Padding
- Border
- Width
- Row Span
- Column Span

Phrase Tags in HTML

- Comments
- Single line comment
- Multiline comment
- Phrase tags
- Strong
- Emphasised
- Marked
- Abbreviation
- Quote
- Cite
- Code

- Pre
- HTML Entities

DOCTYPE and Head Section

- DOCTYPE
- Doctype Declaration
- Head Section
- Title tag
- Style tag
- Script tag
- Meta tag
- Link tag
- Base tag
- Keywords
- CSS
- JavaScript

Embedding Images in HTML

- How to embed an image using img tag
- Image Source attribute
- Alternative text for the image
- Downloading image from the internet
- Searching reusable image
- Creating image as a link
- Customising the width of an image
- Customising the height of an image
- Image Maps
- Link to image map

Embedding Audio and Video in HTML

- Embed an audio file using audio tag
- Embed a video file using video tag
- HTML5 supported audio formats
- HTML5 supported video formats
- Provide multiple sources
- Cross verify the source media file
- Firefox browser and HTML5 audio video support
- Safari browser and HTML5 audio video support

- Player playback controls
- Modify video player dimensions

Block Elements and Layouts

- Block level elements
- Inline elements
- div tag
- span tag
- HTML5 layouts
- Header tag
- Footer tag
- Navigation tag
- Article tag
- aside tag

Forms in HTML

- About Forms
- Creating a simple form
- Form elements
- Input tag
- Label tag
- Button tag
- Input types
- Text type
- Email type
- Password type

More on Forms in HTML

- Form Input types
- Date type
- Radio button type
- Number type
- Form Elements
- Select
- Datalist
- Fieldset
- Form Methods
- GET method

Course: Java

Course Code: Java

Session: 2023-24

Duration: 4 months

Assessment procedures: Proctored certification Exam (100%)

Curriculum of the Course:

Basic Level

Introduction to Java

1. Getting started with Java – installation
    - Install jdk from Synaptic Package Manager
    - Choose openjdk-6-jdk from the list of packages available
    - Mark it for installation
    - The installation will take a few seconds
    - Verify the installation
    - At the command prompt type java -version, so the version number of the jdk will be displayed
    - Run a simple java program and see if it works
    - Type javac TestProgram.java for compiling the code and java TestProgram for executing the code
2. Java - First program
    - write simple java program
    - print “My First Java Program!” on Console
    - save the file
    - file name given to the java file
    - compile the file
    - run the file
    - correct the errors
    - naming conventions for class
    - naming conventions for method

- naming conventions for variable

Eclipse

3. Installing Eclipse
    - Install Eclipse on Ubuntu on the Terminal
    - Set up the proxy on the Terminal
    - Then fetch the list of all the available softwares
    - Type sudo apt-get update
    - Then install eclipse on the Terminal
    - Type sudo apt-get install eclipse
    - Verify if Eclipse is installed on the system
    - Installing Eclipse on Debian,Kubuntu,Xubuntu
    - Installing Eclipse on Redhat
    - Installing Eclipse on Fedora,centos and suse linux
4. Getting started with Eclipse
    - Eclipse is an Integrated Development Environment
    - It is a tool on which one can write, debug and run java programs easily
    - Open Dash Home and type Eclipse in the search box.
    - We get Workspace Launcher
    - On clicking on Workbench we get the Eclipse IDE
    - Go to File->New->Project and select Java Project
    - Create a project named EclipseDemo and create a class inside DemoClass
    - Learn about Package Explorer and Editor portlet
5. Hello World Program
    - Open Eclipse
    - Create a Java Project named DemoProject
    - Create a class named DemoClass
    - Class name and file name will be the same
    - Eclipse suggests various possibilities as we type a command
    - Eclipse also completes the parentheses by automatically adding the closing parentheses
    - Include the statement that we want to print
    - Eclipse also completes the quotes by adding the closing quote

- Compile and execute the program
- Change the code to print

6. Errors and Debugging
    - When writing a Java Program, here is a list of typical errors:
    - Missing semicolon(;)
    - Missing double quotes(".")
    - Mis-match of filename and classname
    - Typing the print statement n lower case
    - The line which has the error will be indicated with a red cross mark on the left margin
    - The list of errors is displayed by hovering the mouse over the cross mark
    - Create a class ErrorFree with Errors, debug the code and run it
    - Eclipse also offers intelligent fixes
7. Programming features of Eclipse
    - Auto completion
    - Sets the corresponding closing brace when we open the brace
    - Provides a drop-down list of methods when you start typing the code.
    - Syntax highlighting
    - Classname is highlighted in pink color and method in blue color.
    - Keyboard shortcuts
    - F11 to debug a program and Ctrl plus H to search a specific file.
    - Error highlighting
    - Cross symbol in the program denotes errors
    - Remove semicolon and error details are displayed when mouse is hovered over cross symbol.

Fundamental Programming Structures in Java

8. Numerical datatypes
    - Define datatypes and numerical datatypes
    - int
    - float
    - byte
    - short

- long
- double
- range of each numerical datatypes
- declaration and initializationof numerical datatypes.
- valid and invalid declaration

9. Arithmetic Operations
    - Define an operator
    - Define arithmetic operators
    - addition
    - subtraction
    - multiplication
    - division
    - modulo
    - simple program to demonstrate arithmetic operators
    - appropriate datatypes for appropriate values
    - save, compile and run the program
10. Strings
    - char datatype
    - letter, digit, punctuation marks, **tab**, or a space are all characters.
    - Program explaining the variable and the character data.
    - Introduction to strings
    - Creating string by Direct Initialization
    - Creating string by using new operator
    - String length()
    - String concat()
    - String toUpperCase()
    - String toLowerCase()
11. Primitive type conversions
    - define type conversion or type casting
    - higher order integer to lower order integer- Explicit type casting
    - program to show explicit type casting
    - common mistake in explicit type casting.
    - program to show common mistake in explicit type casting
    - lower order integer to higher order integer – Implicit type casting
    - program to show implicit type casting

- char to integer
- integer to char
- program to show char to int type casting.

Control flow

12. Relational Operations
    - boolean datatype
    - equal to and not equal to
    - less than and less than or equal to
    - greater than and greater than or equal to
13. Logical Operations
    - use of logical operators
    - and (&&) operator
    - example to explain **and** operator
    - program to demonstrate **and** operator
    - or (||) operator
    - example to explain **or** operator
    - program to demonstrate **or** operator
    - not (!) operator
    - program to demonstrate **or** operator
    - save, compile and run the programs
14. if else construct
    - Conditional Statements and types of Conditional Statements
    - Use of if statement
    - Syntax for if statement
    - Program using if statement
    - Use of if else statement
    - Syntax for if else statement
    - Program using if else statement
    - Use of if else if statement
    - Syntax for if else if statement
    - Program using if else if statement
15. nested if and ternary operator
    - explain nested if
    - nested if syntax

- program to demonstrate nested if
- explain the control flow of the program
- explain ternary operator
- syntax for ternary operator
- explain the syntax
- program to demonstrate ternary operator
- comparison between ternary operator and nested if
- save, compile and run the program

16. switch statement
    - define switch case statement
    - compare switch and nested if
    - switch case syntax
    - working of a switch case statement
    - use of keyword switch
    - valid and invalid use of keyword **case**
    - use of keyword default
    - use of keyword break
    - program to demonstrate switch case statement
    - save, compile and run the program to check the output
17. while loop
    - Loop control statement
    - types of loop control statements
    - Introduction to while loop
    - syntax of while loop
    - Program using while loop
    - Check the output.
    - Introduction to infinite loop
    - loop variable modification
    - Check the output
    - How to terminate the infinite loop
18. for loop
    - syntax
    - introduction to for loop
    - for loop syntax
    - loop vaiable
    - loop condition

- loop variable increment or decrement
- loop block
- flow of loop
- advantage of using loop

19. do while loop
    - define do while
    - do while syntax
    - working of do while loop
    - example of do while loop
    - explain the do while programming
    - save, compile and run the program to check the output
    - how different is it from the while loop
    - program to demonstrate the differences

Arrays

20. Introduction to Arrays
    - About Arrays
    - Declare an Array
    - Initialize an array
    - Intilalization using for loop
    - Index of an array elements
    - change values of an array
    - print the value of an array
    - Advantage of an array.
21. Array operations
    - import java.util.Arrays
    - use methods from class Arrays
    - toString() method
    - sort() method
    - fill() method
    - copyof() method
    - copyofRange() method
    - about parameters for each method.

Classes & Objects

22. Creating class

- Whatever we can see in this world are all objects
- Objects can be categorized into groups known as class
- This is class in real world
- Human Being is an example of class in real world
- Class in java is the blue print from which individual objects are created
- Class consists defines a set of properties called variables and a set of behaviors called methods
- Syntax for creating class
- Create a simple class Student using Eclipse
- The Student class can contain properties

23. Creating Object
    - An object is an instance of a class
    - Each object consist of state and behavior
    - Object stores it state in fields or variables
    - It exposes its behavior through methods
    - Reference variables
    - Create a class named TestStudent
    - Create an object of the Student class
    - Use new operator
    - Check what the reference variable contains
    - Create one more object of the Student class and check what the reference variable contains
24. Instance fields
    - Also known as non-static fields
    - Open the TestStudent class which we have created
    - Access the fields roll_number and name using dot operator
    - See the output
    - Initialize the field and see the output
    - Change the modifier of the fields to private
    - Debug the error that you get
    - Change the modifier to protected
    - Each object of a class will have unique values
    - Create two objects of the Student class
25. Methods
    - method definition

- write simple method
- method returning value
- call a method in another method
- flow of the program
- call a static method
- call a method from another class
- method signature
- method body

Constructors

26. Default constructor
    - what is a constructor?
    - what is a default constructor?
    - when is it called?
    - define a constructor
    - initialize the variables
    - call the constructor
    - difference between constructor and method
27. Parameterized constructors
    - What is a parameterized constructor?
    - create constructor without parameter
    - create a constructor with parameter
    - assign values to the variables in the constructor
    - pass arguments during the constructor call
    - working of parameterized constructor
    - show common errors
    - resolve the errors
    - create another parameterized constructor
    - why to use constructor?
28. Using this keyword
    - this is a reference to the current object
    - helps to avoid name conflicts
    - we can use this keyword inside a constructor to call another one
    - the constructors must be in the same class
    - explicit constructor invocation

- Explain it using the parameterized constructor code
- Make this statement the last one in the constructor
- You will get an error
- this statement should be the first one inside a constructor

29. Non-static block
    - Non-static block
    - Any code written between two curly brackets
    - Executed for each object that is created
    - Executes before constructor's execution
    - can initialize instance member variables of the class
    - create a class named NonStaticTest
    - Create a non-static block and a constructor inside it
    - Check the output
    - Include multiple non-static blocks
    - they will be executed in the sequence in which they appear in the class
    - Check the output
    - Non-static block is not a substitute for constructor
30. Constructor Overloading
    - define multiple constructor
    - what is constructor overloading?
    - constructor with different number of parameters.
    - parameters with different datatypes.
    - how is constructor overloaded?
    - flow of overloading process.
    - advantage of constructor overloading.
31. Method Overloading
    - define multiple methods.
    - methods with same name.
    - methods with different number of parameters.
    - methods with different datatypes of parameter.
    - what is method overloading?
    - example for overloadin method
    - how to overload method?
    - advantage of method overloading.
    - error in method overloading.

32. Taking user input in Java
    - What is BufferedReader?
    - Importing three classes from Java.io package
    - How to take the input from the user?
    - Syntax to implement BufferedReader
    - What is InputStreamReader?
    - Create object of InputStreamReader
    - Create object of BufferedReader
    - About IOException
    - About throws keyword
    - Typecasting

Intermediate Level

1. Subclassing and Method Overriding
    - Definition of subclassing
    - Demo of subclassing using an Employee and Manager class
    - Single inheritance
    - Use of extends keyword
    - Private members in a super class
    - Definition of method overriding
    - Annotation
    - @Override Annotation
2. Calling methods of the superclass
    - super keyword
    - Call methods of the super class
    - Constructor of the super class
    - Demo of super keyword using an Employee and Manager class
    - Single inheritance
    - Use of extends keyword
    - Private members in a super class
3. Using final keyboard
    - final keyword
    - What is final keyword and its application?
    - Where final keyword can be declared?
    - final variable
    - final static variables

- static block
- final variable as parameter
- final method
- private final method
- final class

4. Polymorphism
    - Polymorphism in Java
    - Run-time polymorphism
    - Virtual Method Invocation
    - Compile-time polymorphism
    - Role of JVM
    - IS-A test
    - Static binding
    - Dynamic binding
5. Abstract Classes
    - Abstract Classes in Java
    - What are Abstract Methods
    - What are Concrete Methods
    - Properties of Abstract Methods and Abstract Classes
    - How to use Abstract Methods
6. Java Interfaces
    - Java Interfaces
    - Implementing Interface
    - Implementation Classes
    - Interfaces Vs Abstract classes
    - Implementing Multiple Interfaces
    - Usage of Interfaces with an example
7. Static Variables
    - What is Static Variable in Java?
    - Usage of Static Variables with Example
    - Static Variables Vs Instance Variables
    - Final Static Constants
8. Static Methods
    - What is static method in Java?
    - Static methods Vs Instance methods
    - Usage of static method with example

- Passing object variables in a static method

9. Static Blocks
    - What is a static block
    - Declaring and defining a static block
    - How static blocks are invoked and executed
10. Exception Handling
    - What is an Exception
    - Types of Exceptions
        - Checked Exceptions
        - Unchecked Exceptions
    - Explaining *ArrayIndexOutOfBoundsException*
    - Demonstrating Checked Exceptions with example
    - Handling Exceptions using try-catch blocks
    - Explaining *ArithmeticException*
    - Demonstrating Unchecked Exceptions with example
    - Explaining *FileNotFoundException*
    - Usage of finally block
    - Explaining *NullPointerException*
11. Custom Exceptions
    - What is a Custom Exception
    - Demonstration of custom exception
    - Custom exception example - "InvalidMarkException"
    - Usage of "throw" keyword
    - How to resolve errors in custom exceptions
    - Resolve error using "Add throws declaration" option
    - Usage of "throws" keyword
    - Example for "FileNotFoundException"
    - How to handle multiple exceptions
    - How to use "surround with try/catch" option

Course: Latex

Course Code: Latex

Session: 2023-24

Duration: 4 months

Assessment procedures: Proctored certification Exam (100%)

Curriculum of the Course:

Basic Level LaTeX

1. LaTeX on Windows using TeXworks
    - Installing MikTeX on Windows
    - Writing basic LaTeX document using TeXworks editor
    - Configuring MikTeX to download missing packages
2. Report Writing
    - report style having chapter, section and subsection
    - article style having section, subsection and subsubsection
    - Automatic generation of table of contents
    - toc file to store the information that goes into the table of contents
    - Automatic numbering of section numbers
    - Appendix; its appearance in report and article style
    - exiting from LaTeX when a compilation error occurs
3. Letter Writing
    - Letter document class
    - From address
    - Automatic generation and format of date
    - Starting a new line with double slash
    - To address
    - Starting a new paragraph with a blank line
    - itemize environment for bullet points
    - enumerate environment for numbered points
    - Closing statement
    - Signature

- Carbon copy

4. Mathematical Typesetting
    - $ sign to begin and end mathematical expressions
    - Creating alpha, beta, gamma and delta
    - Space being used as a terminator of symbols
    - Creating spaces in mathematical formulae
    - Difference in font of text and formula
    - Difference in the minus sign in text and in formula
    - frac command to create fractions
    - Subscripts and superscripts
    - Use of braces {} to demarcate arguments
    - Not equal to, greater than or equal to, less than or equal to, much less than
    - Right arrow, left arrow, left right arrow, up arrow
    - Integral sign, limits of an integral
    - Matrices of different rows and columns
5. Equations
    - amsmath package and align and align* environments to create equations
    - Matrix differential equation
    - aligning two equations using &, with and without intervening text
    - Automatic numbering of equations using align
    - Labeling equations with the label command
    - Cross referencing equation numbers through the ref command
    - Inserting text between two aligned equations through the intertext command
    - Automatic generation of equation numbers at run time allows insertion and removal of an equation from a set of equations
    - Labeling sections and subsections for easy and fool-proof cross referencing
    - Breaking an equation into more than one line
    - Suppression of equation numbers in the align environment using the nonumber command
    - Use of backslash (\) to make braces appear as braces
    - left[, right] and also left[. (i.e. left bracking fullstop)
    - Blank lines in the align environment is not permissible
6. Numbering Equations
        - amsmath
        - numbering equations
        - align environment

- nonumber command
- labelling equations with the label command
- cross referencing equations with the ref command
- case dependence of variables in label command
- taking help from stackexchange
- learning from ltx-primer.pdf
- typing if-else with cases command

7. Tables and Figures
    - Creating tables and figures in Latex
8. Beamer
    - Creating a presentation using a Beamer
9. Bibliography
    - Creaing Bibliography in Latex

Intermediate Level

1. Feedback diagram with Maths
    - Open the .fig file saved in the feedback control tutorial
    - Put $G(z) = \frac z{z-1}$ in the second block diagram
    - Choose the special flag
    - Save and export it as combined tex and pdf
    - Show that if "special" is not chosen, we get only text
    - Change /frac into /dfrac
    - Show that at the time of compilation, dfrac unknown error
    - Include \usepackage{amsmath} in the tex file
    - Recompile it and show that the equation is now coming properly
    - Use pdfcrop to trim the pdf file, mention Briss
2. newcommand in LaTeX
    - What is a command?
    - Different types of commands with examples
    - Defining a new command
    - Defining short commands for long repeated input.
    - Commands with parameter
    - Passing parameters to the commands defined
    - Renew command
    - Redefining the existing commands to the required output
3. New environment in LaTeX

- What is an environment?
- Defining a new environment
- Defining environments with parameters
- Renew environment
- Redefining an existing environment to the required output

4. Writing Style Files in LaTeX
    - About LaTeX Styles files.
    - Writing a Style file for LaTeX.
    - Importing a Style file in LaTeX.
    - Defining a standard Style file for LaTeX.
    - New command in LateX.new environment in LaTeX.
    - Require Package command in LaTeX.
    - usepackage command in LaTeX.
    - Style file identification.
    - Preliminary declarations of a Style file.
    - NeedsTeXFormat.
    - ProvidesPackage.
5. Indic Language Typesetting in LaTeX
    - Typeset a document in Indic language using XeLaTeX.
    - Indic language fonts bundle.
    - Installing Indic language Fonts.
    - Installing Nirmala UI Fonts.XeLaTeX Compiler.
    - Using Fontspec package.
    - Using Polyglossia package.
    - Select language command.
    - Set default language in LaTeX.
    - Set other language in LaTeX.

Course: Linux

Course Code: Linux

Session: 2023-24

Duration: 4 months

Assessment procedures: Proctored certification Exam (100%)

Curriculum of the Course:

1. Ubuntu desktop
    - Ubuntu Desktop
    - Main Menu
    - System Tray
    - Trash Bin icon (RHS corner)
    - Desktop icon (LHS corner), pen-drive
2. Synaptic package manager
    - Synaptic Package Manager
    - How to install packages
3. Ubuntu software system
    - Ubuntu-Software-Center
    - Installing softwares through Ubuntu Software Center
4. Basic Commands
    - Commands with example
    - Command interpreter
    - Shell
    - Using man
    - Apropos
    - Whatis
    - Using --help option
5. General Purpose Utilities in Linux
    - echo
    - uname
    - who
    - passwd
    - date
    - cal
    - Brief overview on Files and directories

- pwd
- ls
- cat

6. File System
    - File
    - Directory
    - File Inode
    - Types of Files
    - Home directory and Current directory
    - Change Directory(cd)
    - mkdir,rmdir
7. Working with Regular Files
    - cat
    - rm
    - cp
    - mv
    - cmp
    - wc
8. File Attributes
    - chown, chmod, chmod -R, displaying files with ls -l
    - chmod u+, chmod a-w, chmod g+w, chmod -r, chgrp
    - inode, hard link, symbolic link
9. Redirection Pipes
    - Input,output and error stream
    - Redirection : > and >>
    - Pipes : |
10. Working with Linux Process
    - Process
    - Shell process
    - Process spawning - parent and child process
    - Process attributes - pid, ppid
    - Init Process
    - User process & System process
    - ps with options
11. The Linux Environment
    - Environment variable vs Local variables

- set command
- env command
- SHELL, HOME, PATH, LOGNAME, PS1, PS2
- history
- ! and ~
- alias

12. Basics of System Administration
    - Root login-su
    - User management - UID, GID, useradd, usermod, userdel
    - Discs – Du, df
13. Simple filters
    - Head
    - tail
    - sort
    - cut
    - paste

Introduction to Linux - Intermediate

1. The grep command
    - To see the content of a file
    - To list the entries of a particular stream
    - To ignore cases
    - Lines that do not match the pattern
    - To list the line numbers with the entries
    - To store the result in another file
    - To know the count
2. More on grep command
    - Search using grep
    - To match more than one pattern
    - To check a word that has different spelling
    - Character class
    - The use of *
    - To match any one character using dot
    - To match a pattern at the beginning of the file
    - To match a pattern at the end of the file
3. The sed command

- sed
- To print using sed
- Line Addressing
- Context Addressing

4. More on sed command
    - substitute
    - insert
    - delete

Course: PHP and MySQL (XAMPP)

Course Code: PHP and MySQL (XAMPP)

Session: 2023-24

Duration: 4 months

Assessment procedures: Proctored certification Exam (100%)

Curriculum of the Course:

PHP Basics: Level 1

Installing a Webserver with PHP and MySQL (XAMPP)

1. XAMPP in Windows
    - Installing XAMPP in Windows
    - XAMPP is a cumulative package consisting of Apache, PHP and MySQL Packages is available for Windows
    - In this tutorial the XAMPP will be installed and the default Webserver directory will be **"htdocs"**.
2. XAMPP in Linux
    - Installing XAMPP in Linux
    - XAMPP is a cumulative package consisting of Apache, PHP and MySQL Packages is available for Linux
    - In this tutorial the XAMPP will be installed and the default Webserver directory will be **"opt"**.

Echo PHP Function, PHP Variables, If and Switch Statements

3. Echo Function
    - The echo() function outputs one or more strings.
    - Syntax: echo(strings);
    - Ex. echo "Hello World!";
4. Variables in PHP
    - Variables are used for storing values, like text strings, numbers or arrays.
    - When a variable is declared, it can be used over and over again in your script.
    - All variables in PHP start with a $ sign symbol.

- The correct way of declaring a variable in PHP: $var_name = value;

5. If Statement
    - if statement - use this statement to execute some code only if a specified condition is true.
    - if...else statement - use this statement to execute some code if a condition is true and another code if the condition is false.
    - if...elseif....else statement - use this statement to select one of several blocks of code to be executed.
6. Switch Statement
    - switch statement - use this statement to select one of many blocks of code to be executed

PHP Operators

7. Arithmatic Operators
    - Ex. +,-,*,/,%,++,--
8. Comparison Operators
    - Ex. ==,!=,<>,>,<,>=,<=
9. Logical Operators
    - Ex. && (AND),|| (OR),! (NOT)

Arrays in PHP

10. Arrays
    - An array stores multiple values in one single variable.
    - Numeric array - An array with a numeric index.
    - Associative array - An array where each ID key is associated with a value.
    - Ex. Numeric Array: $fruits=array("Apple","Mango","Banana","Grapes");
11. Multi-Dimensional Arrays
    - In a multidimensional array, each element in the main array can also be an array. And each element in the sub-array can be an array, and so on.

Loops in PHP

- Loops execute a block of code a specified number of times, or while a specified condition is true.

12. Loops - While Statement
    - The while loop executes a block of code while a condition is true.

```
while (condition)
{
code to be executed;
}
```

13. Loops - Do-While Statement
    - The do...while statement will always execute the block of code once, it will then check the condition, and repeat the loop while the condition is true.

```
do
{
code to be executed;
}while (condition);
```

14. Loops - For Statement
    - The for loop is used when you know in advance how many times the script should run.
    - Syntax:

```
for (init; condition; increment)
{
code to be executed;
}
```

15. Loops - Foreach Statement
    - The foreach loop is used to loop through arrays.

```
foreach ($array as $value)
{
code to be executed;
}
```

16.
17. **Functions in PHP**

18. Functions (Basic)

- To keep the script from being executed when the page loads, you can put it into a function.
- A function will be executed by a call to the function.
- You may call a function from anywhere within a page.
- Syntax:

function functionName()

{

code to be executed;

}

19. Functions (Advanced)
    - We can also pass parameters to functions during both the declaration and calling time.
    - function functionName($param1,$param2); //during function call.
    - function functionName($param1,$param2)

{

code to be executed

}

20.
21. **PHP Special Variables**
    22. GET Variable
        - The built-in $_GET function is used to collect values from a form sent with method="get".
        - Information sent from a form with the GET method is visible to everyone (it will be displayed in the browser's address bar)
        - It has limits on the amount of information to send.
    23. POST Variable
        - The built-in $_POST function is used to collect values from a form sent with method="post".
        - Information sent from a form with the POST method is invisible to others and has no limits on the amount of information to send.

PHP and HTML

24. Embedding PHP

- We can embed our PHP code anywhere in the webpage, by enclosing our script within the <?php..... //SCRIPT.....?>

25. Common Way to Display HTML
    - We can also use the HTML Code within the PHP Script. Almost each of the HTML Tags can be used within a PHP Script.

Common Errors

- The PHP Engine in the webserver also displays the user the error in case there is something wrong in the code along with the tentative line number where the fault may have occurred. Thus, in this way we can eradicate errors.

26. Common Errors (Part 1)
    - Learn how to spot errors and how to fix them
    - Common Parse errors
    - Parse errors due to missing comma or semicolon
    - Parse errors due to not ending single or double quotes correctly
27. Common Errors (Part 2)
    - Parse error due to missing or extra brackets
    - Matching brackets during complex mathematical operations
    - Purpose and usefulness of correct indentation
    - Errors due to missing or extra characters
    - Undefined variable and undefined index errors
28. Common Errors (Part 3)
    - "Cannot modify header information - headers already sent by..." errors when using header() function
    - Using ob_start() to turn on output buffering
    - "Failed to open stream; no such file or directory in..." errors when including a invalid file
    - Using a @ symbol to suppress errors

MYSQL Tutorials: Level 2

MySQL is a Relational Database Management System (RDBMS) that runs as a server providing multiuser access to a number of databases. A third party open source software "phpMyAdmin" will be used as a web-based front end for managing MySQL databases easily and efficiently. It is widely installed by Web hosts worldwide, since it is developed in PHP and is included in the convenient LAMP stack, MAMP, and WAMP software bundle installers.

1. MySQL (Part 1)
    - An Introduction to the PHPMyAdmin Interface.

- Creating a New Database
- Creating a new Table and entering the value of the field with the requisite datatype.
- SQL Query displayed in the PHPMyAdmin window.

2. MySQL (Part 2)
    - Connecting to the database and inserting dummy data into the database.
    - mysql_connect("server_addr", "username", "password") - Connect to the Database Server with the authorised user and password.
    - mysql_select_db("database_name") - Selecting a database within a connected database server.
3. MySQL (Part 3)
    - Writing some data into the database (INSERT and UPDATE Queries).
    - mysql_query('TYPE_HERE_YOUR_MYSQL_QUERY') - This function is used to run specific queries on our database.
    - INSERT QUERY - INSERT into *table* values ('att1', 'att2' , 'att3', 'att4' ,'att5') //Inserts Data into the table
    - UPDATE QUERY - UPDATE *table_name* SET att1='xyz' //Updates the Existing values stored in the table of the database.
4. MySQL (Part 4)
    - Getting data from the database table and displaying it.
    - SELECT QUERY - SELECT * FROM table_name WHERE att1='abc' // Query returns the value from the database where att1 = abc
    - mysql_num_rows() - Gives us the number of rows there are in the query we have just given out.
    - ORDER BY - Helps to order the output result as when selecting the values form the database. {Use of DESC for Descending ordering / ASC for Ascending ordering}
5. MySQL (Part 5)
    - mysql_fetch_assoc — Fetch a result row as an associative array.
    - array mysql_fetch_assoc (resource $result) //Returns an associative array that corresponds to the fetched row and moves the internal data pointer ahead. mysql_fetch_assoc() is equivalent to calling mysql_fetch_array() with MYSQL_ASSOC

for the optional second parameter. It only returns an associative array.

6. MySQL (Part 6)
    - Getting data from the database with the help of an HTML form.
    - Creating a FORM where a user can specify a name and selecting the appropriate value from the database.
7. MySQL (Part 7)
    - Changing the existing values of the databse table using HTML Forms.
    - Update unique records using the id than individual values.
8. MySQL (Part 8)
    - DELETE QUERY - To Delete the specific or all the entries of the Database.
    - DELETE FROM table_name WHERE field='xyz' // Deletes the entry from the database where the field = xyz.

PHP Advanced: Level 3

1. Name Splitter(Part 1)
    - We Input a fullname into a form and then splitting it into firstname and lastname
    - Use of : strlen(string) - This function counts total no of characters, including numbers and white spaces in the string
    - Use of: mb_substr(string,starting_position,no_of_characters) - This function takes a specific character from a string and a range of no of characters preceeding it.
2. Name Splitter(Part 2)
    - Divided the string into 2 halves through searching space, first half is stored as firstname and second half as lastname.
    - Use of : substn(string,starting_position,length) - This function results a substring starting from specified position to no of characters required.
3. PHP Dynamic Pages (Part 1)
    - We learn to create website with standard template and when on clicking the link changes only the content of page ,new page is not loaded.
    - Use of : include(variable) - This function is used to brought up all the content of variable page onto the current page.So that by

changing the variable content of the website can be altered without reloading a similar page content everytime.

4. PHP Dynamic Pages (Part 2)
    - Making the dynamic linking user-friendly in case an error is obtained by include() function, i.e. checking if the file connected exists or not.
    - Use of : file_exists(variable) ->This function is results boolean value true(1) if the file exists and false(0) if not.
5. Simple Visitor Counter
    - Counts how many users have viewed your page as per count of refresh button clicked
    - fopen("file_name","parameter") opens a file (Creates it if not exists).parameter assigns the mode, w for writting mode, a for append mode
    - file_get_contents("file_name")- This function is used to obtain content from the file.
    - fwrite("file_name",variable) - This function writes into the file value present in variable.
6. Unique Visitor Counter (Part 1)
    - Counts how many users visiting based on their IP addresses. It obtains IP addresses stored in ip-file to match with user's IP
    - count() - This function is used to count no of lines in the file.
    - $_SERVER[*] - This is an array containing information such as headers, paths and script locations.*
    - $_SERVER['REMOTE_ADDR'] - It informs about the IP address from which the user is viewing the current page.
7. Unique Visitor Counter (Part 2)
    - Retrieves IP addresses stored and compares them with IP of user viewing the current page.
    - fopen("file_name","parameter") opens a file (Creates it if not exists).parameter assigns the mode, w for writing mode, a for append mode
    - fwrite("file_name",variable) - This function writes into the file value present in variable.
    - intval(string) -This function converts an string value into a integer value.
8. Unique Visitor Counter (Part 3)

- In this video errors have been corrected. Here counter keeps on increases

9. PHP String Functions (Part 1)
    - strlen(string) - This function counts total no of characters, including numbers and white spaces in the string
    - mb_substr(string,starting_position,no_of_characters) - This function takes a specific character from a string and a range of no of characters preceeding it.
    - explode("delimiter",string) -This function breaks down the string into a array. Delimiter is used to know from where to break string.
    - implode(string,"delimiter") -This function joins the array into a string. Delimiter is used to know how to join array elements.
    - nl2br() -This function prints the content in exactly same form as written. Used in case for breaking lines.
10. PHP String Functions (Part 2)
    - strrev(string) -This function is used to reverse the inputed string
    - strtolower(string) -This function is used to convert all alphabatic characters in string to thier small/lower case form.
    - strtoupper(string) -This function is used to convert all alphabatic characters in string to thier capital/upper case form.
    - substr_count(string,sub_string,) -This counts the no of substrings matching the particular value in string. It retuns an integer value.
    - substr_replace(original_string,string_to_replace) -This function replaces the cuntent of substring into original string.
11. Basic PHP Proxy
    - Providing the proxy to our page of a url.
    - foreach() - this loop looks through a block of code for each element in an array.
    - erag_replace(current_content, altered content,page) - This function is used to manipulate content of a proxy page.
12. Basic Advert Rotation (Part 1)
13. Basic Advert Rotation (Part 2)
14. Find and Replace
15. Date and Time (Part 1)
16. Date and Time (Part 2)
17. Creating Images with PHP

18. File Upload (Part 1)
    - Setup html form for file uploading
    - Upload file and get file related information like file name, file size, etc
    - Check for error messages after uploading file
19. File Upload (Part 2)
    - Move file from temporary area to user specified location
    - Restrict uploading to only specific file type
    - Restrict uploading to a maximum file size
20. Cookies (Part 1)
    - What are cookies
    - Set cookies using setcookie function
    - Understaing how to set expiry time of cookies
    - Read and print values from existing cookies
    - Print every cookie that we have stored
21. Cookies (Part 2)
    - Check if a cookie exists or not using isset
    - Unset a cookie when no longer required
    - Change the value of a existing cookie
22. Sessions
    - A PHP session variable is used to store information about, or change settings for a user session.
    - Session variables hold information about one single user, and are available to all pages in one application.
    - session_start() - Starting a PHP Session
    - $_SESSION['variable_name']=value - Stores the value in the Session variable.
    - session_stop() - Stopping a PHP Session
23. Search Engine Crawler Detection
24. Swear Word Filter (Part 1)
25. Swear Word Filter (Part 2)
26. Rename Function
27. SQL Injection (Part 1)
28. SQL Injection (Part 2)
29. MD5 Encryption

- Calculates the MD5 hash of str using the RSA Data Security, Inc.'s MD5 Message-Digest Algorithm, and returns that hash (Its a one way encrypting technique).
- Syntax : string md5 (string $str [, bool $raw_output = false])
- Used in encrypting passwords and storing them in a database.

30. Sending Email (Part 1)
    - Create HTML form for getting email subject and message from the user
    - Using the mail() function to send email
31. Sending Email (Part 2)
    - Validating whether the name and message have been entered by the user
    - Check the length of the string using the strlen() function.
    - Set up the to, subject and message field of the mail() function
    - Send email and check for any errors
32. Sending Email (Part 3)
    - Fix the "Sendmail from not set in php dot ini" error
    - Create the mail "From:" header
    - Using a local or external mail server to send email
    - Using the ini_set() and ini_get() functions to set and read internal php configuration options respectively
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45. Display Images from a Directory
    - Using opendir() to open a directory handle
    - Using readdir() to read a directory that is already opened

- Printing the directory listing

46. Pagination (Part 1)
47. Pagination (Part 2)
48. Language Chooser
49. PHP/ MYSQL Based Project - Basic Register and Login Module

1. User Login
    1. User Login Part 1
        - Collecting information from user in a form & connecting to authorized database.
        - mysql_connect("hostname", "username", "password") - Connect to the Database Server with the authorized user and password.
        - mysql_select_db("database_name") - This selects a database within a connected database server
    2. User Login Part 2
        - retrieves information about inputed username and checks whether given password matches with the password in database.
        - mysql_query('TYPE_HERE_YOUR_MYSQL_QUERY') - It is used to run specific queries on our database.Here it collects information from field username from specified table.
        - mysql_num_rows('query') - This function is user to counts no of rows retrieved from the query given to the database.
        - mysql_fetch_assoc('query')- This function fetches required information from the database in the form of array.
    3. User Login Part 3
        - Creating session for holding value and destroying that value by destroying session.
        - start_session() - Starts session to hold information from one pages to other until the session exists.
        - $_SESSION['variable_name']=value - Stores the value in the session variable.
        - session_destroy() - destroys the value present in session variable.
2. User Password Change

1. User Password Change Part 1
    - We learn to obtain old existing password and new password from the user.
    - start_session() - Hold information from previous pages to session page.
    - $variable_name=$_SESSION['value'] - to retrieve value containing in PHP variable.
2. User Password Change Part 2
    - Checking whether encrypted old password matches with the database password and new password is same as confirm password.
    - md5("parameter")- encrypts parameter into irreversible logical code.
    - mysql_connect("hostname", "username", "password") - Connect to the Database Server with the authorized user and password.
    - mysql_select_db("database_name") - This selects a database within a connected database server
    - mysql_query('TYPE_HERE_YOUR_MYSQL_QUERY') - It is used to run specific queries on our database.Here it retrieves password of user logged in.
3. User Password Change Part 3
    - updating the new password in database.
    - mysql_query('TYPE_HERE_YOUR_MYSQL_QUERY') - It is used to run specific queries on our database. Here it updates new password into database.

3. User Registration
    1. User Registration Part 1
        - Creating a form which allows user to input values in page
    2. User Registration Part 2
        - Striping tags of inputed strings and converting password into md5 encryption.
        - Use of : strip_tags(strigs) - cuts down unnecessary spaces,html tags and queries from string.
    3. User Registration Part 3

- Checking whether the username and password provided meet the required length sizes.
- Use of : strlen("string") - counts th character length of the string.

4. User Registration Part 4
    - Inserting inputed information from the user into the database table through query.
    - mysql_connect("hostname", "username", "password") - Connect to the Database Server with the authorized user and password.
    - mysql_select_db("database_name") - This selects a database within a connected database server
    - mysql_query('TYPE_HERE_YOUR_MYSQL_QUERY') - It is used to run specific queries on our database. Here it inserts different fields into the database table.
5. User Registration Part 5
    - Converting the password inputed from user to md5 encrypt form.
    - md5("parameter")- encrypts parameter into irreversible logical code.
6. User Registration Part 6
    - Checking the username provided so that condition for duplicate username can be avoided.
    - mysql_query('TYPE_HERE_YOUR_MYSQL_QUERY') - This is used to run specific queries on our database. Here it checks if username already exists in database.
    - mysql_num_rows('query') - This function is used to counts no of rows retieved from the query.
    - strtolower(string) - converts all characters of string into lower case.

Course: Python

Course Code: Python

Session: 2023-24

Duration: 4 months

Assessment procedures: Proctored certification Exam (100%)

Curriculum of the Course:

PHP Basics: Level 1

Installing a Webserver with PHP and MySQL (XAMPP)

1. XAMPP in Windows
- Installing XAMPP in Windows
- XAMPP is a cumulative package consisting of Apache, PHP and MySQL Packages is available for Windows
- In this tutorial the XAMPP will be installed and the default Webserver directory will be **"htdocs"**.
2. XAMPP in Linux
- Installing XAMPP in Linux
- XAMPP is a cumulative package consisting of Apache, PHP and MySQL Packages is available for Linux
- In this tutorial the XAMPP will be installed and the default Webserver directory will be **"opt"**.

Echo PHP Function, PHP Variables, If and Switch Statements

3. Echo Function
- The echo() function outputs one or more strings.
- Syntax: echo(strings);
- Ex. echo "Hello World!";
4. Variables in PHP
- Variables are used for storing values, like text strings, numbers or arrays.
- When a variable is declared, it can be used over and over again in your script.
- All variables in PHP start with a $ sign symbol.
- The correct way of declaring a variable in PHP: $var_name = value;
5. If Statement
- if statement - use this statement to execute some code only if a specified condition is true.

- if...else statement - use this statement to execute some code if a condition is true and another code if the condition is false.
- if...elseif....else statement - use this statement to select one of several blocks of code to be executed.

6. Switch Statement

- switch statement - use this statement to select one of many blocks of code to be executed

PHP Operators

7. Arithmatic Operators

- Ex. +,-,*,/,%,++,--

8. Comparison Operators

- Ex. ==,!=,<>,>,<,>=,<=

9. Logical Operators

- Ex. && (AND),|| (OR),! (NOT)

Arrays in PHP

10. Arrays

- An array stores multiple values in one single variable.
- Numeric array - An array with a numeric index.
- Associative array - An array where each ID key is associated with a value.
- Ex. Numeric Array: $fruits=array("Apple","Mango","Banana","Grapes");

11. Multi-Dimensional Arrays

- In a multidimensional array, each element in the main array can also be an array. And each element in the sub-array can be an array, and so on.

Loops in PHP

- Loops execute a block of code a specified number of times, or while a specified condition is true.

12. Loops - While Statement

- The while loop executes a block of code while a condition is true.

```
while (condition)
{
code to be executed;
}
```

13. Loops - Do-While Statement

- The do...while statement will always execute the block of code once, it will then check the condition, and repeat the loop while the condition is true.

```
do
{
code to be executed;
}while (condition);
```

14. Loops - For Statement

- The for loop is used when you know in advance how many times the script should run.
- Syntax:

```
for (init; condition; increment)
{
code to be executed;
}
```

15. Loops - Foreach Statement

- The foreach loop is used to loop through arrays.

```
foreach ($array as $value)
{
code to be executed;
}
```

16.
17. **Functions in PHP**
18. Functions (Basic)

- To keep the script from being executed when the page loads, you can put it into a function.
- A function will be executed by a call to the function.
- You may call a function from anywhere within a page.
- Syntax:

```
function functionName()
{
code to be executed;
}
```

19. Functions (Advanced)

- We can also pass parameters to functions during both the declaration and calling time.

- function functionName($param1,$param2); //during function call.
- function functionName($param1,$param2)

  {
  code to be executed
  }

20.
21. **PHP Special Variables**
22. GET Variable

- The built-in $_GET function is used to collect values from a form sent with method="get".
- Information sent from a form with the GET method is visible to everyone (it will be displayed in the browser's address bar)
- It has limits on the amount of information to send.

23. POST Variable

- The built-in $_POST function is used to collect values from a form sent with method="post".
- Information sent from a form with the POST method is invisible to others and has no limits on the amount of information to send.

PHP and HTML

24. Embedding PHP

- We can embed our PHP code anywhere in the webpage, by enclosing our script within the <?php..... //SCRIPT.....?>

25. Common Way to Display HTML

- We can also use the HTML Code within the PHP Script. Almost each of the HTML Tags can be used within a PHP Script.

Common Errors

- The PHP Engine in the webserver also displays the user the error in case there is something wrong in the code along with the tentative line number where the fault may have occurred. Thus, in this way we can eradicate errors.

26. Common Errors (Part 1)

- Learn how to spot errors and how to fix them
- Common Parse errors
- Parse errors due to missing comma or semicolon
- Parse errors due to not ending single or double quotes correctly

27. Common Errors (Part 2)

- Parse error due to missing or extra brackets

- Matching brackets during complex mathematical operations
- Purpose and usefulness of correct indentation
- Errors due to missing or extra characters
- Undefined variable and undefined index errors

28. Common Errors (Part 3)

- "Cannot modify header information - headers already sent by..." errors when using header() function
- Using ob_start() to turn on output buffering
- "Failed to open stream; no such file or directory in..." errors when including a invalid file
- Using a @ symbol to suppress errors

MYSQL Tutorials: Level 2

MySQL is a Relational Database Management System (RDBMS) that runs as a server providing multiuser access to a number of databases. A third party open source software "phpMyAdmin" will be used as a web-based front end for managing MySQL databases easily and efficiently. It is widely installed by Web hosts worldwide, since it is developed in PHP and is included in the convenient LAMP stack, MAMP, and WAMP software bundle installers.

1. MySQL (Part 1)

- An Introduction to the PHPMyAdmin Interface.
- Creating a New Database
- Creating a new Table and entering the value of the field with the requisite datatype.
- SQL Query displayed in the PHPMyAdmin window.

2. MySQL (Part 2)

- Connecting to the database and inserting dummy data into the database.
- mysql_connect("server_addr", "username", "password") - Connect to the Database Server with the authorised user and password.
- mysql_select_db("database_name") - Selecting a database within a connected database server.

3. MySQL (Part 3)

- Writing some data into the database (INSERT and UPDATE Queries).
- mysql_query('TYPE_HERE_YOUR_MYSQL_QUERY') - This function is used to run specific queries on our database.
- INSERT QUERY - INSERT into *table* values ('att1', 'att2' , 'att3', 'att4' ,'att5') //Inserts Data into the table
- UPDATE QUERY - UPDATE *table_name* SET att1='xyz' //Updates the Existing values stored in the table of the database.

4. MySQL (Part 4)

- Getting data from the database table and displaying it.

- SELECT QUERY - SELECT * FROM table_name WHERE att1='abc' // Query returns the value from the database where att1 = abc
- mysql_num_rows() - Gives us the number of rows there are in the query we have just given out.
- ORDER BY - Helps to order the output result as when selecting the values form the database. {Use of DESC for Descending ordering / ASC for Ascending ordering}

5. MySQL (Part 5)

- mysql_fetch_assoc — Fetch a result row as an associative array.
- array mysql_fetch_assoc (resource $result) //Returns an associative array that corresponds to the fetched row and moves the internal data pointer ahead. mysql_fetch_assoc() is equivalent to calling mysql_fetch_array() with MYSQL_ASSOC for the optional second parameter. It only returns an associative array.

6. MySQL (Part 6)

- Getting data from the database with the help of an HTML form.
- Creating a FORM where a user can specify a name and selecting the appropriate value from the database.

7. MySQL (Part 7)

- Changing the existing values of the databse table using HTML Forms.
- Update unique records using the id than individual values.

8. MySQL (Part 8)

- DELETE QUERY - To Delete the specific or all the entries of the Database.
- DELETE FROM table_name WHERE field='xyz' // Deletes the entry from the database where the field = xyz.

PHP Advanced: Level 3

1. Name Splitter(Part 1)

- We Input a fullname into a form and then splitting it into firstname and lastname
- Use of : strlen(string) - This function counts total no of characters, including numbers and white spaces in the string
- Use of: mb_substr(string,starting_position,no_of_characters) - This function takes a specific character from a string and a range of no of characters preceeding it.

2. Name Splitter(Part 2)

- Divided the string into 2 halves through searching space, first half is stored as firstname and second half as lastname.
- Use of : substn(string,starting_position,length) - This function results a substring starting from specified position to no of characters required.

3. PHP Dynamic Pages (Part 1)

- We learn to create website with standard template and when on clicking the link changes only the content of page ,new page is not loaded.
- Use of : include(variable) - This function is used to brought up all the content of variable page onto the current page.So that by changing the variable content of the website can be altered without reloading a similar page content everytime.

4. PHP Dynamic Pages (Part 2)

- Making the dynamic linking user-friendly in case an error is obtained by include() function, i.e. checking if the file connected exists or not.
- Use of : file_exists(variable) ->This function is results boolean value true(1) if the file exists and false(0) if not.

5. Simple Visitor Counter

- Counts how many users have viewed your page as per count of refresh button clicked
- fopen("file_name","parameter") opens a file (Creates it if not exists).parameter assigns the mode, w for writting mode, a for append mode
- file_get_contents("file_name")- This function is used to obtain content from the file.
- fwrite("file_name",variable) - This function writes into the file value present in variable.

6. Unique Visitor Counter (Part 1)

- Counts how many users visiting based on their IP addresses. It obtains IP addresses stored in ip-file to match with user's IP
- count() - This function is used to count no of lines in the file.
- $_SERVER[*] - This is an array containing information such as headers, paths and script locations.*
- $_SERVER['REMOTE_ADDR'] - It informs about the IP address from which the user is viewing the current page.

7. Unique Visitor Counter (Part 2)

- Retrieves IP addresses stored and compares them with IP of user viewing the current page.
- fopen("file_name","parameter") opens a file (Creates it if not exists).parameter assigns the mode, w for writing mode, a for append mode
- fwrite("file_name",variable) - This function writes into the file value present in variable.
- intval(string) -This function converts an string value into a integer value.

8. Unique Visitor Counter (Part 3)

- In this video errors have been corrected. Here counter keeps on increases

9. PHP String Functions (Part 1)

- strlen(string) - This function counts total no of characters, including numbers and white spaces in the string
- mb_substr(string,starting_position,no_of_characters) - This function takes a specific character from a string and a range of no of characters preceeding it.

- explode("delimiter",string) -This function breaks down the string into a array. Delimiter is used to know from where to break string.
- implode(string,"delimiter") -This function joins the array into a string. Delimiter is used to know how to join array elements.
- nl2br() -This function prints the content in exactly same form as written. Used in case for breaking lines.

10. PHP String Functions (Part 2)

- strrev(string) -This function is used to reverse the inputed string
- strtolower(string) -This function is used to convert all alphabatic characters in string to thier small/lower case form.
- strtoupper(string) -This function is used to convert all alphabatic characters in string to thier capital/upper case form.
- substr_count(string,sub_string,) -This counts the no of substrings matching the particular value in string. It retuns an integer value.
- substr_replace(original_string,string_to_replace) -This function replaces the cuntent of substring into original string.

11. Basic PHP Proxy

- Providing the proxy to our page of a url.
- foreach() - this loop looks through a block of code for each element in an array.
- erag_replace(current_content, altered content,page) - This function is used to manipulate content of a proxy page.

12. Basic Advert Rotation (Part 1)
13. Basic Advert Rotation (Part 2)
14. Find and Replace
15. Date and Time (Part 1)
16. Date and Time (Part 2)
17. Creating Images with PHP
18. File Upload (Part 1)

- Setup html form for file uploading
- Upload file and get file related information like file name, file size, etc
- Check for error messages after uploading file

19. File Upload (Part 2)

- Move file from temporary area to user specified location
- Restrict uploading to only specific file type
- Restrict uploading to a maximum file size

20. Cookies (Part 1)

- What are cookies
- Set cookies using setcookie function
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1. User Login

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- retrieves information about inputed username and checks whether given password matches with the password in database.

- mysql_query('TYPE_HERE_YOUR_MYSQL_QUERY') - It is used to run specific queries on our database.Here it collects information from field username from specified table.
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1. User Password Change Part 1

- We learn to obtain old existing password and new password from the user.
- start_session() - Hold information from previous pages to session page.
- $variable_name=$_SESSION['value'] - to retrieve value containing in PHP variable.

2. User Password Change Part 2

- Checking whether encrypted old password matches with the database password and new password is same as confirm password.
- md5("parameter")- encrypts parameter into irreversible logical code.
- mysql_connect("hostname", "username", "password") - Connect to the Database Server with the authorized user and password.
- mysql_select_db("database_name") - This selects a database within a connected database server
- mysql_query('TYPE_HERE_YOUR_MYSQL_QUERY') - It is used to run specific queries on our database.Here it retrieves password of user logged in.

3. User Password Change Part 3

- updating the new password in database.
- mysql_query('TYPE_HERE_YOUR_MYSQL_QUERY') - It is used to run specific queries on our database. Here it updates new password into database.

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1. User Registration Part 1

- Creating a form which allows user to input values in page

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- Use of : strip_tags(strigs) - cuts down unnecessary spaces,html tags and queries from string.

3. User Registration Part 3

- Checking whether the username and password provided meet the required length sizes.
- Use of : strlen("string") - counts th character length of the string.

4. User Registration Part 4

- Inserting inputed information from the user into the database table through query.
- mysql_connect("hostname", "username", "password") - Connect to the Database Server with the authorized user and password.
- mysql_select_db("database_name") - This selects a database within a connected database server
- mysql_query('TYPE_HERE_YOUR_MYSQL_QUERY') - It is used to run specific queries on our database. Here it inserts different fields into the database table.

5. User Registration Part 5

- Converting the password inputed from user to md5 encrypt form.
- md5("parameter")- encrypts parameter into irreversible logical code.

6. User Registration Part 6

- Checking the username provided so that condition for duplicate username can be avoided.
- mysql_query('TYPE_HERE_YOUR_MYSQL_QUERY') - This is used to run specific queries on our database. Here it checks if username already exists in database.
- mysql_num_rows('query') - This function is used to counts no of rows retieved from the query.
- strtolower(string) - converts all characters of string into lower case.

Course: QCAD

Session: 2023-24

Duration: 4 Month

Assessment procedures: Certification Exam (Qualifying score >=40%)

Curriculum of the Course:

Basics

Introduction to QCAD

- Menu Items and Toolbar
- Drawing Objects
- Snapping Tools
- Using Layers

Drawing Methods in QCAD

- Cartesian Coordinate System
- Using Command line to Draw Objects
- Drawing Methods

Using Modification Tools

- Trim
- Copy
- Move
- Rotate

Using Modification Tools to Stretch and Mirror in QCAD

- Stretch
- Mirror

Using Modification Tools to Scale and Rotate in QCAD

- Scale
- Rotate Two

Course: SCILAB

Session: 2023-24

Duration: 4 Month

Assessment procedures: Certification Exam (Qualifying score >=40%)

Curriculum of the Course:

Basics

HTML Overview

- About HTML
- My First HTML Program
- Elements, Tags and Attributes
- Formatting Tags
- Styles and CSS
- Lists
- Tables

Introduction to Scilab and its benefits

- What is FOSS?
- Why FOSS ?
- About Scilab and its benefits
- Scilab is reliable
- Use of Scilab in CNES
- Use of Scilab for space mission analysis and flight dynamics
- Industrial application of Scilab
- Matrix calculation in Scilab

Self learning of Scilab through Spoken Tutorials

- About Spoken Tutorial
- Created for self learning
- Dubbed in all 22 languages
- Scilab spoken tutorials
- 25 spoken tutrials on Scilab
- Side by side learning
- Spoken tutorial used as MOOCS in many universities
- Certificates based on online tests

The amazing resource of Scilab Textbook Companion

- Opensource software problem, no good documentation for FLOSS

- Solution: Textbook companion project
- Scilab code for standard textbooks
- Demo of Textbook companion
- Download Scilab code from scilab website
- Use of TBC
- Demo of Scilab on Cloud
- Scilab code search

Scilab Lab migration, Toolboxes and Forums

- Lab migration
- Demo of Lab migration on FOSSEE Scilab website
- Download PDF for lab solution
- Scilab Toolboxes
- FOSSEE Optimisation toolbox available on atoms website
- IEEE paper on Scilab toolbox
- Demo of Xcos on cloud
- FOSSEE forums for general Scilab queries
- Spoken tutorial forum for timed queries on Scilab spoken tutorial
- Scilab on Rs. 10,000/- laptop
- FOSSEE website

Installing

- Show where to download from and how to decide which version to choose (OS and 32/64bit) (www.scilab.org/download)
- Windows installation (Internet Connection is necessary)
- Linux installation (using package manager- show only Debian/Ubuntu as example (sudo apt-get install scilab) as well as generic binary)
- Mac
- Compilation from source can come as a part of a more advanced tutorial

Getting Started

- Expressions: Show mathematical expressions with numbers
- Variables
- Diary command
- Define symbolic constants.
- Basic functions
- suppressing output(;)
- help,clc

Vector Operations

- Define vector
- Calculate length of a vector.
- Perform mathematical operations on Vectors such as addition,subtraction and multiplication.
- Define a matrix.
- Calculate size of a matrix.
- Perform mathematical operations on Matrices such as addition, subtraction and multiplication.

Matrix Operations

- Access the elements of Matrix
- Determine the determinant, inverse and eigen values of a matrix.
- Define special matrices.
- Perform elementary row operations.
- Solve the system of linear equations.

Conditional Branching

- 'if' and 'then' with the example
- use of the 'else' keyword
- use of the 'elseif' keyword
- example for select

Iteration

- Explain syntax of 'for' statement- tell that the variable iterates over a list/vector/matrix (or an expression that evaluates to any of these).
- Give example: for i = 1:5, disp (i), end
- Then explain break condition. Use example: for i = 1:10, disp(i), if (i==5), break, end, end
- Then explain continue condition. Use example: for i = 1:10, if (i<=5) then continue, else disp(i), end, end
- Explain while condition.
- Give example: i = 0; while(i <=5), i = i + 1; d

Scripts and Functions

- Introduction to the file formats in Scilab.
- SCRIPT files.
- sce versus .sci
- Inline functions.

Plotting 2D graphs

- About linspace: linspace is a linearly spaced vector.
- Plot a simple graph: x=linspace(12,34,10), y=linspace(-.1,2,10), plot(x,y)

- plot2d
- Using clf() clear the graphic window.
- Configure the title for the plot
- Configure a legend
- Divide a graphic window into a matrix of sub-windows using subplot(mnp)

Xcos Introduction

- What is XCOS.
- What is palette.
- To collect the blocks from the palette and connect them to construct the block diagram.
- Set the parameters of different blocks.
- To setup the simulation parameters.
- Simulate the constructed block diagram.