Indian Institute of Science(IISc) CCE PROFICIENCE COURSES SUMMER TERM Aug-Dec 2025 INFORMATION HANDBOOK

भारतीय विज्ञान संस्थान

Contact

Centre for Continuing Education

Indian Institute of Science, Bengaluru 560 012, India

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Introduction

Indian Institute of Science (IISc) established in 1909, is a Deemed University and Centrally Funder Technical Institution under the Department of Higher Education, Ministry of Human Resources Development, Government of India. Rapid strides in science and technology make it imperative that the education of professionals be continued over their entire career rather than be confined to a single stretch. What is needed is a complete integration of education with work during their productive life span, which will be adequate to help them cope with new demands. Continuing Education embraces all the processes of education that one undergoes throughout one's working life and which have a relevance to the practical problems likely to be encountered in one's career. It may be realized through formal and informal modes of teaching, or through mass media.

In recent years, there has been a growing awareness on the part of universities that imparting knowledge to people beyond their boundaries is an equally important part of their service to the community. With this broad perspective of their function in society, Universities have begun to seek ways of reaching out to professionals. The IISc has evolved several mechanisms to make the expertise and facilities available to qualified technical people in industries, Universities and research establishments. The need for forging links between academic institutions and industries and R&D organizations has been a goal set for the IISc by its illustrious founder, J.N. Tata. CCE-PROFICIENCE was established with the objective of providing a sustained and rigorous continuing education program offering courses on subjects of topical interest to scientists and engineers in and around Bangalore. sustained and rigorous continuing education program offering courses on subjects of topical interest to scientists and engineers in and around Bangalore.

This program, believed to be the first of its kind in the country, is a joint venture between IISc and several Professional Institutions/Societies in Bangalore. The program name signifies the coming together of Professional Institutions and the Indian Institute of Science. It was started on an experimental basis in 1980 and has proved to be extremely popular and has attracted wide attention in academic and professional circles. The demand for some courses, especially on computers, microprocessors and management is so overwhelming that it has not been possible to admit all the eligible applicants. Every year, there has been a steady increase in the number of students as well as the types of courses offered indicative of the growing popularity of this Program. IISc is the custodian of the academic standards of all CCE-PROFICIENCE courses. It has the responsibility of evolving appropriate teaching norms, providing the venue and facilities for conducting courses, organizing the tests and examinations and issuing certificates to the successful participants. These tasks are coordinated by the Centre for Continuing Education (CCE).

Instructions

HOW TO APPLY:

Details of the courses are available online at cce.iisc.ac.in. Essential qualifications for courses vary from course to course. Each participant will be admitted for a maximum of two courses. Applying to courses is strictly through the online portal of CCE. Please read all the instructions provided at our portal before applying. The course fee is Rs. 5000/- per credit and registration fee is Rs. 300/- per course. Any other gateway charges must be borne by the participant during online payment. (Class conduction: Weekdays 5:30 P.M.. to 10:00 P.M.) & (Saturday and Sunday 10 A.M. to 10 P.M.)

Fees

FEES: THE COURSE FEE IS RS. 5000/- PER CREDIT. SOME OF THE COURSES INCLUDE A LIMITED EXPOSURE TO COMPUTER OPERATION AND PROGRAMMING / LAB FEE (C). THE ADDITIONAL FEES OF THIS ARE RS. 5,000/- THE COURSE FEE AND LABORATORY FEE SHOULD BE PAID IN FULL AT THE TIME OF JOINING THE COURSE.

REFUND OF COURSE FEES

A REFUND OF THE COURSE FEE WILL NOT BE MADE, UNLESS THE COURSE IS WITHDRAWN OFFICIALLY, IN WHICH CASE, THE COURSE FEE PAID WILL BE REFUNDED IN FULL. APPLICATION REGISTRATION FEE ONCE PAID WILL NOT BE REFUNDED UNDER ANY CIRCUMSTANCE. REFUND OF FEES IN CASE OF DROPPED COURSES WILL TAKE A MINIMUM OF 4-6 WEEKS.

Classes

Offline Classes will be held in the department lecture halls, for which venue details will be shared after the last date of admissions and before the class starts. Lectures will be between 6.00 P.M. and 10.00 P.M. Monday through Friday and between 10 A.M. to 10 P.M. on Saturdays and Sundays. Online classes will be conducted via MS Teams and links to join the first class will be shared after the last date of admissions and before the first class.

Laboratory Classes

THE TIMINGS AND DAYS FOR LABORATORY CLASSES WILL BE FIXED IN THE SECOND WEEK OF THE RESPECTIVE MONTHS OF COURSE AFTER THE COMPLETE REGISTRATION IS KNOWN. THIS WILL BE DONE, KEEPING IN VIEW THE CONVENIENCE OF THE FACULTY AND ALL THE STUDENTS OF THE COURSES WITH LABORATORY COMPONENT.

Courses

Continuing education program organized under CCE-PROFICIENCE offers semester-long courses in areas of topical interest. The courses are organized during evening hours so that working professionals can participate without getting their normal work affected. All courses are normally at the postgraduate level and many of these are in fact offered to the IISc students regularly. Participants in certain selected courses are provided practical training in computer and other laboratories, as appropriate. The course contents are regularly upgraded on the basis of feedback from the faculty and the participants. To cater to the diverse needs of working professionals and provide more flexible learning opportunities, CCE-PROFICIENCE now offers courses in three terms: Aug-Dec, Jan-May, and a short summer term. Around 15-20 courses are scheduled during the Aug-Dec and Jan-May terms, with a new selection offered during the summer term from 2025-26. Each course has lectures at the rate of two or three hours per week depending upon the number of course credits. Tests and examinations are conducted according to the IISc norms. A series of courses leading to different specializations are offered in a sequential manner, especially in the area of Computer Science and Engineering. This would enable the participants who start with the entry-level courses to progress towards more advanced ones and specialize in one of the streams.

Evaluation

THE TOTAL MARKS FOR ASSESSMENT WILL BE EQUALLY DISTRIBUTED BETWEEN THE SEASONAL WORK AND END SEMESTER EXAMINATION. THE SEASONAL WORK CONSISTS OF CLASS TESTS, MID SEMESTER EXAMINATION, AND HOMEWORK ASSIGNMENTS ETC. AS DETERMINED BY THE INSTRUCTOR. THE PARTICIPANTS WHO MAINTAIN A MINIMUM OF 75% ATTENDANCE BOTH IN THE THEORY AND COMPUTER/LABORATORY CLASSES WILL BE EVALUATED BASED ON THE COMBINED PERFORMANCE IN THE END SEMESTER EXAMINATION AND SEASONAL WORK AND ASSIGNED A LETTER GRADE.
NO RE-EXAMINATION SHALL BE CONDUCTED UNDER ANY CIRCUMSTANCES. THE LETTER GRADES CARRY A 10-POINT GRADING ASSESSMENT AS INDICATED BELOW.

Certification

Certificates will be issued only to those who get at least a 'D' grade. Attendance certificates shall not be issued to anyone. This being a continuing education program meant especially for self-improvement, the credits accumulated cannot be equated with the credits earned through formal education. There shall be no claims for CCE-PROFICIENCE credits being counted towards partial fulfillment of credit requirements towards any degree/diploma or other formal recognitions offered by IISc. Formal Course completion certificates will not be issued under any circumstances to any candidate.

Faculty

The instructors for the courses are mostly Institute Faculty. However, competent professionals from other R&D organizations and industries are also involved in teaching some of the courses.

Results

Results of the courses will be announced typically around the 1st week of January for August-December term, 1st week of May for January-May term and 3rd week of September for the summer term. Certificates will be issued on or after the date of announcement of results and against surrendering the Identity Card.

Identity Card

Participants will be issued identity cards (only for Offline courses) which should be shown on demand. The participants who have completed the course should surrender the ID card at the time of receiving the certificate, failing which the certificate(s) will not be issued to him/her. In the event of a lost identity card, the participant must immediately report the matter in writing to the Officer-in-Charge, CCE-PROFICIENCE. To obtain a duplicate ID, a police complaint must be lodged, and a request must be submitted to the Section Officer, CCE, along with the police complaint and a penalty of Rs. 100/-.

Fee Structure at Glance

REGULAR COURSES PER CREDIT - RS.5,000/-
COMPUTER LAB FEE - RS.5,000/-
1. COURSE WITH 1 CREDIT # RS. 5000/-
2. COURSE WITH 2 CREDITS # RS.10,000/-
3. COURSE WITH 2+C CREDITS # RS.15,000/-
4. COURSE WITH 3+0 CREDITS # RS.15,000/-
5. L STANDS WITH 2+L CREDITS # RS.15,000/-
 # CREDITS STANDS FOR LECTURE HOURS PER WEEK
$C STANDS FOR COMPUTER LABORATORY
$L STANDS FOR ASSIGNMENTS/SIMULATION SESSION
IN ADDITION 18% GST WILL BE LEVIED ON ALL THE FEE

Important Dates

S No	Schedule	Commencement date
1	Opening of the Application Portal	11 June 2025
2	Receipts of application along with fees (up to)	27 July 2025
3	Classes Commence	4 August 2025
4	Final Exams	8 December 2025

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Analysis and Design of Composite Structures

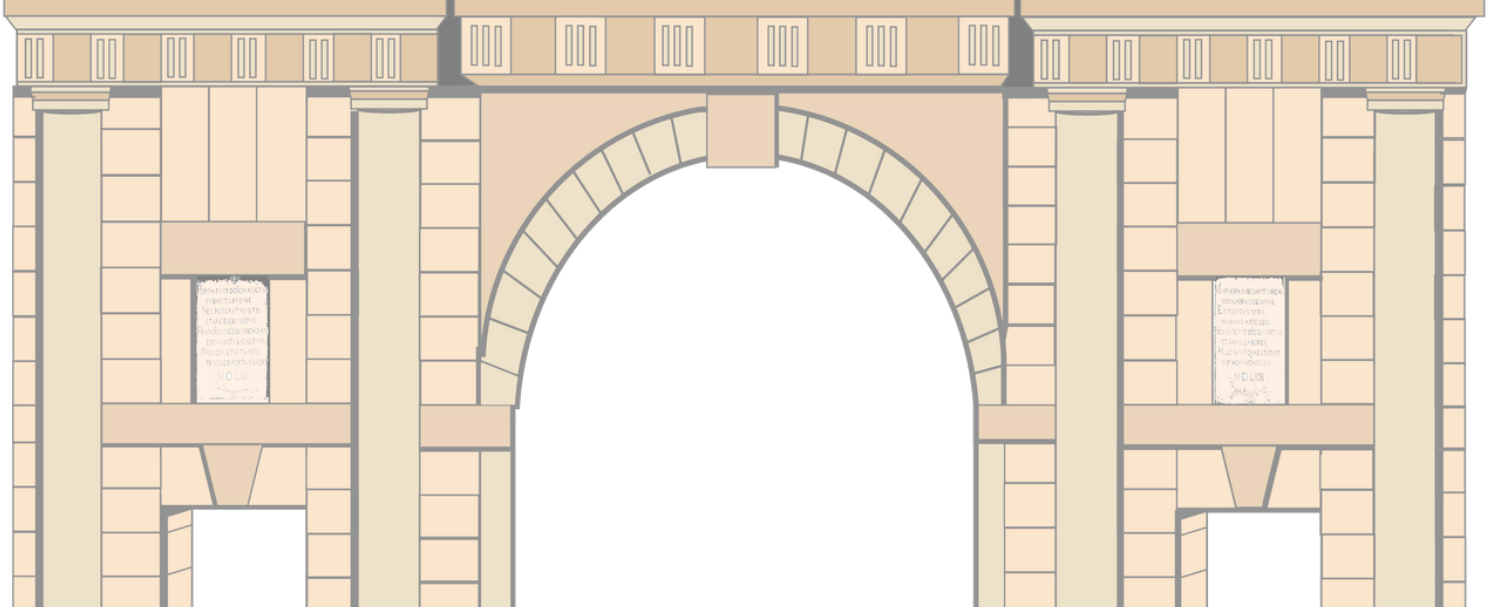
G. Narayana Naik Principal Research Scientist
Dept of Aerospace Engineering Indian Institute of Science

Objectives

Composites are future materials and have been finding applications in all fields of Engineering (Aero, Civil, Mechanical, Automobile, Marine). Many FEM software packages like ANSYS, MSC-NASTRON, PATRAN, ABACUS, LS-DYNA, etc are available for Analysis & Design Optimization. One should first understand the Mechanical behavior of the Composite Structures before using FEM packages. After the completion of this course one can use the FEM software packages for better quality of professional work and optimum usage of time, computing and human resources.

Syllabus

Introduction: Basic Concepts and Terminology, different types of fibers and matrices, their properties and applications. Micromechanics of Composites: Prediction of properties etc. Macromechanics of Lamina: The theory of elasticity, Constitutive equations of a lamina, transformations, Numerical examples. Failure theories for composite lamina, Numerical examples. Mechanics of Laminated Composites: ABD matrices, etc. Hygrothermal Analysis, Numerical examples. Bending Analysis of Beams: Theory, Numerical examples. Analysis of Laminated composite plates: Classical and first order theories, Energy Method, numerical examples. Buckling analysis of plates: Theory, Numerical examples. Design of laminates using Carpet plots, AML plots, Design of laminates with Numerical examples.



Eligibility

B.E / B.Tech. / M.Tech. / Ph.D. / AMIE / AMAeSI (Engg.) (Mechanical, Aero, Civil, Automobile, Marine, Ocean) OR equivalent.

Schedule

Wednesday 8.00P.M. to 10.00P.M.

No. of credits

2:0

Mode of Instruction

Online

Course Fees

12154 INR

Who will benefit

1. Technologists/ Engineers/ Scientists/ Trainees/ Project Staff/ etc. from Industries, R & D Organizations, Institutions, Colleges etc.

Faculty of Engineering/ Diploma Institutions etc.

Fresh Graduates, Postgraduates, Ph.D. Students, Research Fellows, SRFs, JRFs, etc.

Reference Books

1. Madhujit Mukhopadhyay, Mechanics of Composite Materials and Structures- Universities Press- Engg. 2004.
2. Robert M Jones, Mechanics of Composite Materails – Second Edition; Taylor and Francis 1999
3. N.Reddy, Mechanics of Laminated Composite Plates and Shells Theory and Analysis – CRC Press – 2004.
4. Zafer Gurdal, Raphael T Haftka, Design and Optimization of Laminated Composite Materials, John Wiley & Sons, INC – 1999.

Fundamental of electromagnetic compliance: Development to deployment for electrical product design

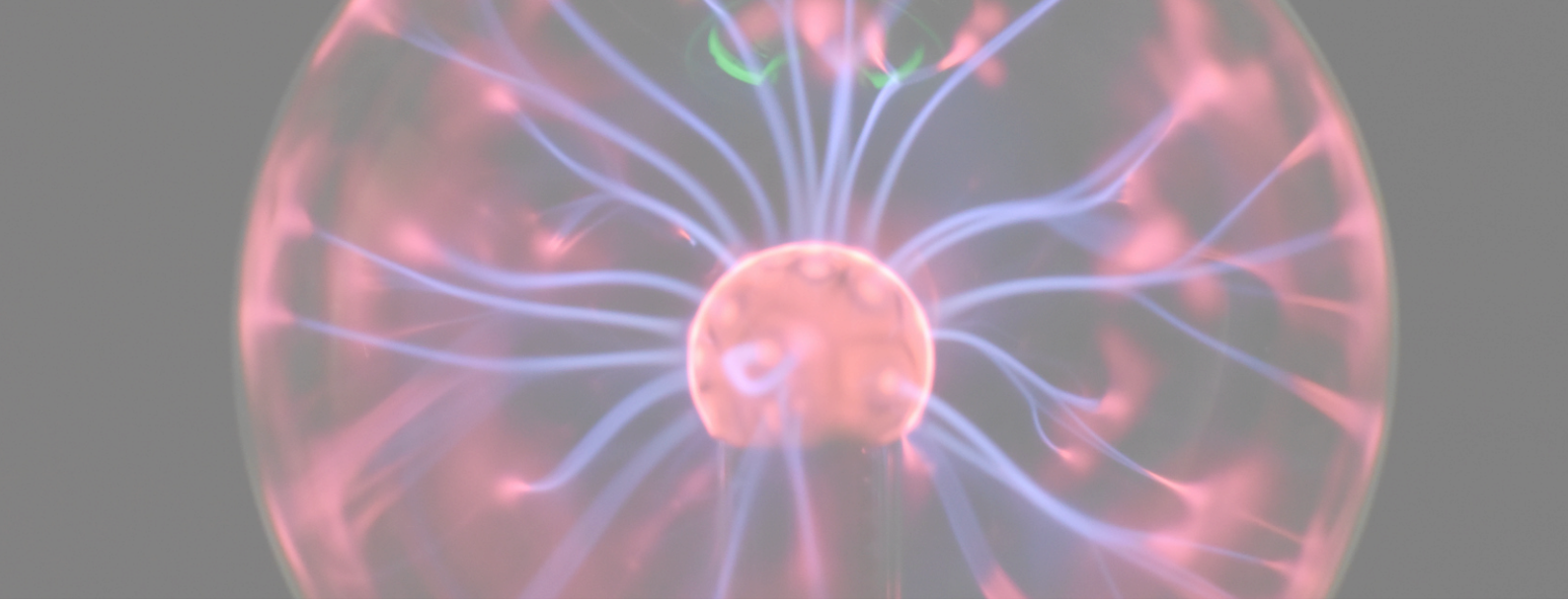
Yoginder Kumar Negi SERC, Indian Institute of Science Bangalore
Rajiv Panigrahi RF&EMC engineer, Telco & Network division, Intel, Bangalore

Objectives

The course focuses on understanding the basics of electromagnetic compatibility & immunity (EMC/EMI) and its compliance standards like FCC, CISPR requirements. In this course, introducing the EMC design concept at an early stage to final product design will be discussed, including early EMC concept, troubleshooting and modeling using EDA tools like Ansys, ComplianceScope (SIMYOG), and CST EDA tools. It will cover case studies on radiated & conducted emissions, immunity, and electrostatic discharge at the system level. Other failure issues will be mentioned briefly. In addition, the issue of radio frequency interference at the system level will be discussed.

Syllabus

Introduction to EMC & EMI.
Electrical analysis at system level: Basics of E and H fields.
Basics of PCB layout design for signal & power.
Basics of EMI/EMC, Tools & Measurement setup.
Grounding & System design analysis: Checklist.
Components selection for EMC design & understanding system-level EMC design.



Eligibility

B Tech EEE/EC/Power Electronics/Electrical

Prerequisites

Basic understanding of electromagnetics, signal integrity, voltage regulator, and system-level design.

Schedule

Saturday 10 A.M. to 1 P. M.

No. of credits

3:1

Mode of Instruction

Online

Course Fees

23954 INR

Who will benefit

INTEL, Qualcomm, AMD, SAMSUNG, BOSCH, APTIV, MERCEDES-BENZ, CISCO, Broadcom, ISRO, DRDO, Academia

Reference Books

1.. Electromagnetic Compatibility Engineering Hardcover - Illustrated, 11 September 2009 by H Ott (Author).

2. Introduction to Electromagnetic Compatibility 2nd Edition by Clayton R. Paul (Author).

3. Design for Electromagnetic Compatibility—In a Nutshell, Theory and Practice, 2023.

Principles and Advances in Genetic Engineering

Dr. N. Ravi Sundaresan
Dept of Microbiology and Cell BiologyIndian Institute of Science Bangalore

Objectives

Genetic Engineering is the direct manipulation of an organism's genes using biotechnological tools. Genetic engineering has been applied in numerous fields, including research, medicine, industrial biotechnology, and agriculture. This course is proposed for those who wish to develop a strong background in principles of recombinant DNA technology, Genetic Engineering, Genome Editing, transgenic technology, and its applications in biotechnology. I will also focus on the creation of genetically modified organisms, from bacteria to monkeys, for laboratory research and industrial applications.

Syllabus

Syllabus Growth and maintenance of recombinant bacterial strains. Transformation and transfection methods. Vectors used in molecular cloning and expression of genes. DNA, RNA, and protein isolation, purification, and fractionation methods. Enzymes used in genetic engineering. Radioactive and non-radioactive labeling of nucleic acids and proteins and their detection. Nucleic acid hybridization methods. Gene and cDNA cloning methods. Construction of genomic DNA and cDNA libraries. Detection and characterization methods for genes and chromosomes. Nucleic acid sequencing methods, including Next-Generation Sequencing. Methods for protein analysis, protein-nucleic acid, and protein-protein interactions. Sitespecific mutagenesis. Polymerase chain reaction, Real-time Quantitative PCR., and

applications. Antisense technology and RNA silencing techniques. Recombinant protein production in bacteria, yeast, and mammalian cells, Genome editing approaches such as Cas9/CRISPR technology. Exome Sequencing- ChIP Sequencing. Generation of Lentiviral, retroviral and Adenoviral vectors, and Gene therapy, Genetic Engineering of mammalian stem cells, Generation of induced pluripotent stem (iPS) cells, Mitochondrial genome editing,Somatic cell nuclear transfer, Generation of transgenic and mutant Caenorhabditis elegans –Generation of knock-out mice (isolation and culture of embryonic stem (ES) cells, Gene is targeting construct design, Transfection, Homologous recombination in ES Cells, Positive and negative selection; Breeding of germ-line chimeras Cre/lox and Flp/FRT system for inducible transgenic mice – Chemically inducible transgene expression systems. Use of transgenic technology in modeling human diseases, including cardiovascular disease, diabetes, obesity, cancer, atherosclerosis, neurodegenerative diseases, muscle degeneration, and aging

Eligibility

Students either studying or completed, BSc (research), MSc, B.Tech, B.Pharam., BVSc., MBBS, B.Pharm., MS (Biotech), or Equivalent

Schedule

Saturday 10 A.M. to 12:00 P.M.

No. of credits

2:0

Mode of Instruction

Online

Course Fees

12154 INR

Who will benefit

Biotechnology students and professionals, Microbiology specialists, pharma sector companies

Reference Books

1. Molecular Cloning: A Laboratory Manual, Sambrook and D.W. Russell, ed., Cold Spring Harbor Laboratory Press
2. S. B. Primrose and R. M. Twyman. Principles of Gene Manipulationand Genomics, 7th Edn, Blackwell Publishing.
3. J. J. Greene and V. B. Rao. Recombinant DNA Principles and Methodologies. CRC Press

Introduction to High-Performance Computing (HPC) and parallel Programming

Dr. Yoginder Kumar Negi
SUPERCOMPUTER EDUCATION AND RESEARCH CENTRE, IISc Bangalore

Objectives

The objective of the course is to acquaint working professionals and graduate students with parallel Programming and High-Performance Computing (HPC) terminology and concepts. It aims to explain how parallelization can enable high-performance computing, familiarize them with issues in developing parallel applications, and help them decide on an approach for developing a parallel version of an application.

Syllabus

Why HPC?

Profiler: NVPROF, GPROF (GNU GCC Profiling Tool)

OpenMP: MPMD model, F
ork joins model, Thread scheduling, Load Balancing, Sync and critical section

Distributed Computing MPI: Multi-processing computing, Message Passing Basics, Collectives

Accelerated Computing (GPU): GPU Programming, CUDA, OpenACC

Hybrid programming (MPI+OpenMP)

Eligibility

Graduation with basic knowledge of Computer Programming.

Prerequisites

Familarity with programming in C/Fortran/C++/Python using editors or IDE's

Schedule

Tuesday and Thursday 6 P.M. to 7 : 30 P.M.

No. of credits

3:1

Mode of Instruction

Online

Course Fees

23954 INR

Who will benefit

Corporate employees, Government/defense research labs, or fresh graduates interested in computational science.

Reference Books

1.. Parallel Programming. Techniques and Applications Using Networked Workstations and Parallel Computers by Barry Wilkinson and Michael Allen, Pearson Prentice Hall, second edition, 2005.

2. Programming Massively Parallel Processors. A Hands-on Approach by David B. Kirk and Wen-mei W. Hwu, Elsevier/Morgan Kaufmann Publishers, 2010; second edition, 2013.

3. Introduction to Parallel Computing by Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar Publisher: Addison Wesley: (2003).

MACHINE LEARNING FOR 5G AND 6G WIRELESS COMMUNICATION

Prof. Sudhan Majhi
Associate Professor, Indian Institute of Science (IISc), Bangalore

Objectives

AI/ML has several applications in physical layer communication. It brings adaptive-ness to the transmitter as well as the receiver and improves the performance and latency of the communication system. The 3GPP standards already adopted AI/ML as a study material for 5G and 6G wireless communications. 6G AI Native radio also requires a solid knowledge of AI/ML for wireless communication; having this knowledge may help them find a job in these companies

Syllabus

Introduction to Python: Basic of Python programming. Introduction to Machine Learning: Overview of supervised, semisupervised and unsupervised, Regression Model, SVM, KNN, CNN, DNN, RNN, LSTM, GANs, Transfer learning, RL. Introduction to Wireless: Python code on Single carrier system, OFDM, MIMO, OTFS system. Wireless Communications: Source channel coding, channel coding, LDPC code decoding, Modulation classification, channel estimation, Classification of wireless signals Autoencoder (based on 3GPP Standard), CSI compression and feedback (based on 3GPP Standard), Beamforming and beam Management (based on 3GPP Standard), PAPR reduction, Spectrum sensing, successive inference cancellation for NOMA Signal Estimation and Detection: AL/ML based Parameter estimation, IF estimation, symbol rate estimation, STO and CFO estimation, MIMO/OFDM/OTFS detectors, Denoising signals. Spectrum sharing and resource allocation: Resource allocation, Spectrum sharing, Power allocation using reinforcement learning (RL) and deep RL.

Eligibility

Suitable for B.Tech, M.Tech and PhD students, (4th year B.Tech in ECE are eligible)

Prerequisites

Familarity with Wireless Communication

Schedule

Every Monday and Wednesday 8PM to 9:30 PM

No. of credits

3:0

Mode of Instruction

Online

Course Fees

18054 INR

Who will benefit

Students from all IIT's and Universities, Working professionals working in wireless communication domains specifically from Samsung, Qualcomm, Nokia, Mediatek, Mavenir, Tejas Networks.

Reference Books

I. Goodfellow, Y. Bengio, and A. Courville, Deep Learning, MIT Press, 2016

2. Y. C. Eldar, A. Goldsmith, D. Gündüz, and H. V. Poor, Machine Learning and Wireless Communications, Cambridge University Press, 1st edition, 2022.

3. F.-L. Luo, Machine Learning for Future Wireless Communications, Wiley-IEEE Press, 2020.

Turbomachinery I

Prof. O N Ramesh Dept. of Aerospace Engineering Indian Institute of Science

Objectives

To introduce Turbomachinery fundamentals in a rational framework so as to bolster the Aerothermodynamics of turbomachinery in general and Aeroengines in particular. This is expected to be followed up by a second course in Aeroengine turbomachinery.

Syllabus

Introduction
Dimensional Anlaysis and Simillitude
Cascade flows
Axial Flow Turbines
Axial Flow Compressors
Centifugal pumps and compressors
Aerothermodynamics of Jet propulsion

Eligibility

B E Mechanical or Aerospace Engineering

Prerequisites

Basic courses in Fluid Mechanics Gas Dynamics and Thermodynamics

Schedule

Every Tuesday and Thursday 6:30 to 8 PM

No. of credits

3:0

Mode of Classes

Online

Course Fees

18054 INR

Who will benefit

Gas Turbine and Turbomachinery design Engineers and Academics

Reference Books

1.Fluid Mechanics and Thermodynamics of Turbo machinery S L Dixon and C A Hall

2.Jet Propulsion N Cumpsty, Cambridge University Press

3. Introduction to Turbo machinery D Japikse and N Baines, Comcepts ETI

4. Axial Flow Compressors J H Horlock

Structural Analysis and Design Optimization: Theory and Practice

Prof. S.B. Kandagal Department of Aerospace Engineering Indian Institute of Science Bangalore India

Objectives

Advanced research in material science to enhance the life of structures with reduced cost resulted in metal alloys, plastics, composites and nano materials. Structural design and optimization of components with unusual shapes became possible with FEM software tools such as ANSYS, COMSOL, NASTRON, ABACUS, SYSNOISE, LSDYNA and MATLAB etc. The fundamental knowledge of stress, strain, shear and torsion in relation to the structures and S-N curves in relation to material fatigue life and failure analysis becomes important. The interpretation of the FEM software results necessitates for the knowledge of structural system analysis and design optimization. This course essentially trains engineers/scientists/entrepreneurs/instructors in the industries/institutes/universities to optimally design various structural systems for technically superior and commercially viable value-added product to achieve “EMPOWER INDIA WITH SKILL AND Knowledge” for “ AATMANIRBHARA BHARAT ABHIYAN”

Syllabus

Applied mechanics. Strength of materials. SFD, BMD, AFD, solid mechanics, concept of stress, strain and fatigue. Constitutive laws, Mohr's Circle. Engineering materials and their properties. Structural analysis concepts for tension, compression, shear, torsion, coupled systems, and S-N curves. Design of beams, torsion, compression

members and fasteners (Pins, bolts, rivets and weld). Stability and failure theories for structures. Composite materials and their importance and importance in structural analysis design optimization. Design methods with practical structures and examples. Procedures for product design, development and testing for static and dynalysis (crash, shock and vibration) loading of structures. Design principles for sealed rigid and Aeroelastic models. Principles of optimization, formulation of objective function and design constraints, classification of optimization problem. Single and multivariable optimization. Optimization with equality and inequality constraints. Practical examples of optimal design of various structures and subsystems. Practical case studies discussion: Design optimization of brake drum, DWR Tracking ground and ship borne Antenna (Indian Patent), Sluice valve, Cup anemometer, Hydraulic crawler drilling machine, Car window regulator, Metal-composite sprocket, Super insulated thermal box, Impeller, Box culverts (US Patent), Failure analysis of Turbine blades, power plant bed plate, Piston drill bit, raiser arm and induction ladle, Field audit of 275 multi-flue chimney, Impact/collision analysis of Vehicles, Stability analysis of 250 cc bike, trainer aircraft model, Aeroelastic model studies for Reusable launch vehicles, Chimney, Crew modules, Bonnel spring with coir for mattress design, 6-DOF internal/external force balance design, TDEM underslung system design, Antivibration Mounts (AVMs) design optimization for large blast hole drill equipment, washing machines, and engines, CG estimation rig for UAV, MAV and drones.

Eligibility

BE, ME, MSc, AMIE or equivalent

Course Fees

12154 INR

Schedule

Saturday 12 P.M. - 2 P.M.

No. of credits

2:0

Mode of Instruction

Online

Who will benefit

Mechanical, Aerospace, Automotive, Industrial engineers, Civil, R & D Labs, Construction technologists, New product design and development groups, Entrepreneurs and Engineering college instructors. Professionals to pursue postgraduate and higher studies.

Reference Books

- Beer FP and Johnson, E.R. "Vector Mechanics for Engineers- Statics and Dynamics". Tata-McGraw hill, 12th Edison. 2019.
- Shigley, J.E and Mischke. C.R.. "Mechanical engineering design" Tata-McGraw hill, 10th Edison, 2015.
- Rothwell. Optimization methods in Structural Design". Wiley, John & Sons, 2017.

Water/Wastewater Treatment and Management

Lakshminarayana Rao Associate Professor, Center for Sustainable Technologies, Indian Institute of Science Bangalore India

Objectives

Gain a deep understanding of the fundamental principles of water and wastewater treatment, to equip participants with the knowledge and skills necessary to design, operate, and manage effective water and wastewater treatment systems. This will include understanding the physical, chemical, and biological processes involved, as well as the regulatory frameworks governing water quality and wastewater discharge. The course aims to foster proficiency in ensuring optimal performance, efficiency, and compliance with environmental standards, while also exploring sustainable practices and technological advancements in the field.

Syllabus

Unit I: Type and sources of water pollutants; types of wastewaters; water quality: physical, chemical and biological; general principles of sample collection and data analysis. Unit II: Design of treatment units. Unit III: Steps of water and wastewater treatment under primary & secondary and tertiary treatment; sludge handling & treatment. Unit IV: Microbiology of domestic water and wastewater. Unit V: Industrial wastewater treatment and Advanced oxidation processes. Unit VI: Standards and policy aspects for water and wastewater management.

Eligibility

Bachelor's/Master's/Diploma degree in Science and Engineering

Course Fees

12154 INR

Schedule

Saturday: 2.30 pm to 6.30 pm Total 9 weeks (40 hrs): 8 weeks (32 hrs)- Theory and 1 week (8 hrs)- Laboratory

No. of credits

2:L

Mode of Instruction

Online

Who will benefit

BWSSB-Staff; KSPCB- Staff; CGWB-Staff; Operators of decentralized STPs (Society STPs); Participants from academic institutes and industries as well.

Reference Books

1. Tchobanoglous, G., Stensel, H. D., Tsuchihashi, R., Burton, F., Abu-Orf, M., Bowden, G., & Pfrang, W. (2014). Wastewater engineering: treatment and resources recovery. Metcalf and Eddy Inc, 848-860.
2. Henze, M., van Loosdrecht, M. C., Ekama, G. A., & Brdjanovic, D. (Eds.). (2008). Biological wastewater treatment. IWA publishing.
3. Weber Jr, W. J. (1972). Physicochemical processes for water quality control. John Willey and Sons. Inc., New York, 200-282.

Prescriptive Analytics

Dr M. Mathirajan, Chief Research Scientist, Department of Management Studies, Faculty of Engineering, Indian Institute of Science, Bengaluru

Objectives

To provide, business practitioners and those who are interested in Prescriptive Analytics, exposure on a selected set of Management Science and optimization techniques; To make to understand the fundamental concepts, methods, and models needed to explore prescriptive-analytics; And To implement the techniques learned in the course in the real life situations.

Syllabus

Introduction to Business Analytics, Linear/Integer/Non-Linear Optimization, Optimization of Network Models, Dynamic Programming, Heuristic Programming, Goal Programming, Multi-Attribute Decision Making Methods, and Monte Carlo Simulation, which are believed to be among the most popular Prescriptive Analytics tools to solve a majority of business optimization problems, with case studies from Business, Industry, and Government (BIG) applications using LINDO/LINGO/CPLEX optimization package.

Eligibility

ME/MTech, BE/BTech and Masters in Business Administration, Management, Operations Research, Computer Science, Data Science, Data Analytics, Business Analytics, Computer Applications, Mathematics, Statistics, Commerce, Economics, Econometrics.

Course Fees

18,054 INR

Schedule

Saturday 7 P.M.-10 P.M

No. of credits

3:0

Mode of Instruction

Online

Who will benefit

Every Business, Industry, Educational Institute, and Government Organization that has an "Analytics" group to address various problems associated with Prescriptive Analytics.

Reference Books

1. Wayne L Winston. Operations Research: Applications and Algorithms (Latest Edition). Duxbury Press. An Imprint of Wadsworth Publishing Company, Belmont, California, USA.
2. Anderson, Sweeney and Williams. An Introduction to Management Science: Quantitative Approaches to Decision Making (Latest Edition). South-Western College Publishing.
3. U Dinesh Kumar. Business Analytics: The Science of Data-Driven Decision Making. Wiley India (Latest Edition).
4. Ravindra A., Philips D.T., and Solberg J.J.. Operations Research Principles and Practice (Latest Edition), John Wiley and Sons.

Vibration and Noise Control: Theory and Practice

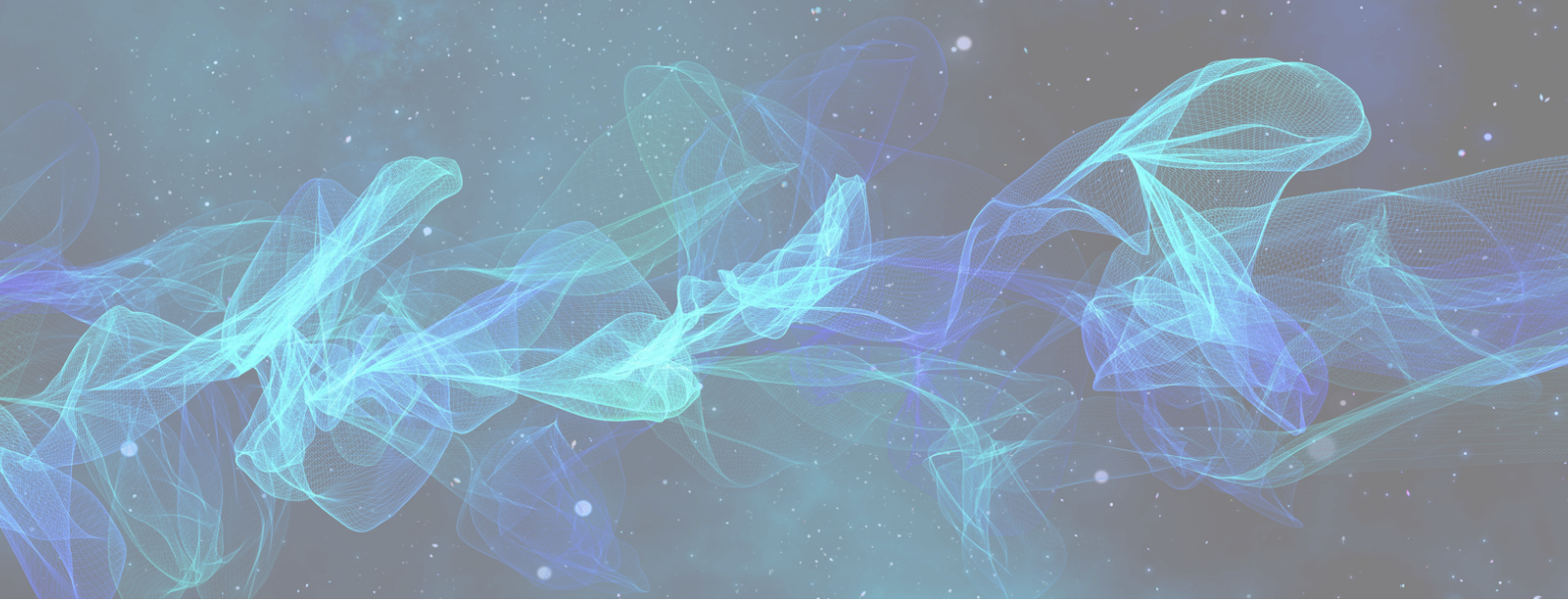
Prof. S.B. Kandagal
Department of Aerospace Engineering
Indian Institute of Science Bangalore India

Objectives

Growing awareness of NVH (Noise, Vibration and Harshness) has necessitated the valid design of aircrafts, machines, automobiles, buildings, industrial facilities and home appliances. With the increasing number of standard regulations and human ride comfort associated with NVH, it is mandatory to control vibration and noise, leading to quieter technology in pumps, engines, compressors, chillers, and other consumer products. OEM companies stress products without NVH problems. AI & ML achieve structural condition health monitoring of machinery in industries. Analytical, MATLAB and FEM based tools such as ANSYS, COMSOL, NASTRON, ABACUS, SYSNOISE and Modal Analysis software tools such as LMS, Mescope help to achieve these goals. This course is for engineers/scientists/entrepreneurs/instructors in industries/institutes/universities to learn the analytical and experimental skills to tackle problems related to noise, vibration and harshness (NVH) during design and manufacturing stages for technically superior and commercially viable products to achieve "EMPOWER INDIA WITH SKILL AND Knowledge for "AATMANIRBHARA BHARAT ABHIYAN"

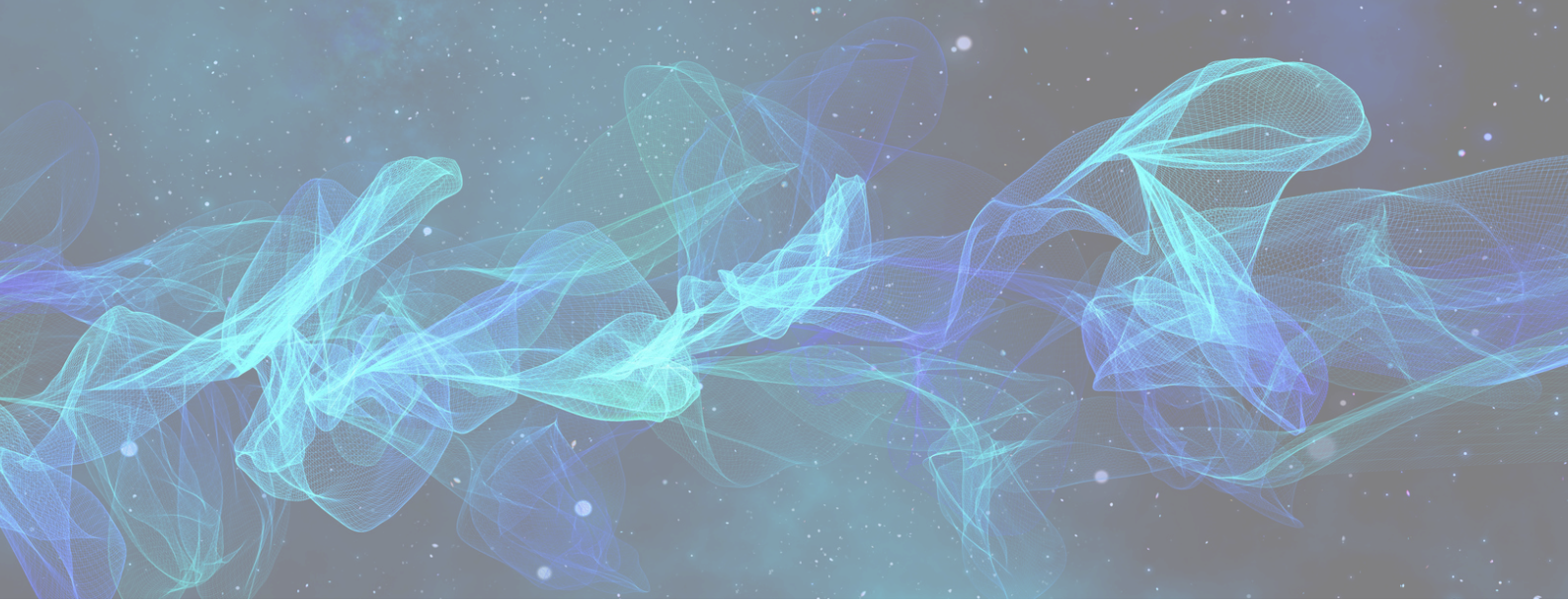
Syllabus

Vibration of structural systems. Dynalysis of SDOF, 2-DOF, MDOF and continuous vibration systems, eigen values and vectors estimation methods.



Free and Forced vibration, Rotodynamic Analysis. NVH measurement tools and techniques for Experimental modal (Natural frequency, mode shape and damping) analysis. Exciters, sensors, DAQ system, signal and system analysis. Modal Assurance Criteria, mode participation factor. Damping estimation methods. Demonstration of vibration and noise experiments: beam, plates, shells, propeller blade and aircraft model with impulse excitation, electrodynamic shaker excitation. FFT analyzer, stroboscope and mode shape animation, sound level meter, microphones. Order analysis, Campell diagrams, water fall diagrams. Vibration transfer function (VTF) and noise transfer function (NTE). Structural Vibration control elements: Vibration isolation, damping, balancing, resonators, absorption. Vibration and noise standards. Noise and its effects.

Acoustic and sound field. Enclosures, shields and barriers-design. Silencer and suppression systems. Noise level interpolation and mapping. Harshness effects and measurements and solutions. NVH parameters related to vehicle dynamics and Practical Case studies discussion. Vibration diagnosis for electric transformers, chain whipping in 2-wheelers, spark plugs, fuel injection pumps, tractor canopy, torsional dampers, steering wheels, engine-compressor assembly, cooling water pumps, side bumpers of car, exhaust pipe (silencer), newspaper printing machine, building oscillation, filter bracket, steam turbine generator and 200 MW power plant. Aeroelastic model design of missiles. Crew module. Reusable Launch vehicles, chimney and aerodynamic damping estimation. AVM (Antivibration mount) design for cars/heavy machines and electronic equipment. Rotodynamic analysis of DWR/Tracking Antenna/EV motor/PTO shafts/engine test



bed. Deicing of aircraft wings with PZTs. Optimal compaction of concrete pipes and Box culverts with vibration. Dynamic stiffness for engine intermediate casing. Modal analysis of bike for ride comfort. AI&MI, application for bearing fault identification. Noise Diagnosis for fuel pressure regulator, bike drive sprockets, passenger car and tractor cabin, kitchen mixer grinder, seat retractor, gear pumps and electric vehicle.

Eligibility

BE, ME, MSc, AMIE or equivalent

Course Fees

12154 INR

Schedule

Sunday 12 P.M. - 2 P.M.

No. of credits

2:0

Mode of Instruction

Online

Who will benefit

Mechanical, Mechatronics, Aerospace, Automotive, Industrial engineers. Civil, construction technologists. R & D Labs. New product design and development groups, startup companies. Entrepreneurs and Engineering college instructors. Professionals to pursue postgraduate and higher studies.

Reference Books

- Harris, C.W. "Shock and vibration handbook" McGraw Hill, New York. 2012.
- Peter Avitable. "Modal Testing: A practitioner's guide" Wiley & Sons 2017.
- Beranek.L.L. "Noise and Vibration Control engineering". Wiley & Sons, 2008.

From Data to Decisions: Machine Learning & AI for Real World Science & Engineering

Dr. L.N. Rao, Center for Sustainable Technologies, Indian Institute of Science Bangalore India

Objectives

This course is aimed at participants interested in learning to use tools from data analysis, machine learning, and artificial intelligence for solving real world problems in science and engineering. The emphasis is on identifying and modelling problems, collecting and curating data, building models and interpreting the results, in various domains.

Syllabus

Introduction to data driven problem solving; Data types, collection and curation; Introduction and relevance of Data Analysis (DA), exploratory DA, visualization. Foundational statistics; Introduction to machine learning; types and models of learning. Neural networks and deep learning; Modern AI systems; Real-world case studies.

Eligibility

Bachelor of Engineering or Science.

Prerequisites

Inclination to learn mathematical aspects of ML and AI; Python programming

Course Fees

12154 INR

Schedule

Every Saturday between 10 AM to 2 PM for 8 successive working weeks

No. of credits

2:0

Mode of Instruction

Online

Who will benefit

Corporate employees willing to up-skill or re-skill Fresh graduates Government employees working on big data analysis.

Reference Books

1. Rabczuk, T., & Bathe, K.-J. (2023). Machine Learning in Modeling and Simulation: Methods and Applications. Springer Cham. 2. Brunton, S. L., & Kutz, J. N. (2022). Data-Driven Science and Engineering: Machine Learning, Dynamical Systems, and Control (2nd ed.). Cambridge University Press. 3. Zhang, A., Lipton, Z. C., Li, M., & Smola, A. J. (2023). Dive into Deep Learning. Cambridge University Press. 4. Douglas C. Montgomery, Design and Analysis of Experiments (2012), John Wiley and Sons, Inc

Appendix ‘A’ PROFORMA NAME OF THE COLLEGE PROVISIONAL CERTIFICATE

This is to certify that Sri/ Smt. ..... was a student of this college studying in .....* Course ..... ** Branch during the Session ..... to ..... He / She have Successfully Completed the course as prescribed by the ..... University with regard to course of study, attendance, sessional requirements etc. He / She has passed the final .....* examination held during ..... securing .....class as per the results announced by the University. He / She will be awarded the ....degree during the next convocation of the university.

College Seal
Date:
PRINCIPAL

***Appropriate course to be filled in (B.E., B.Tech., M.E., M.Tech., M.Sc., and M.Com. MBBS. Etc.) **Mention Civil, Electrical, Electronics, Chemistry, Biology, Etc.**

Appendix ‘B’ Terms and Conditions- Course Registration Agreement & No-Refund Policy

This agreement outlines the terms and conditions for registration in courses offered by Centre for Continuing Education (CCE), Indian Institute of Science (IISc), Bengaluru. By completing the registration process and submitting payment, the candidate acknowledges and agrees to all terms and conditions set forth below.

1.Course Content and Expectations

a.Course Content Overview: CCE provides a general overview of the course content on its website and/or promotional materials. This overview outlines the primary topics intended to be covered. While our instructors strive to adhere to this overview, the actual delivery may be adjusted to optimize the learning experience. This means that additional relevant topics may be introduced, or certain topics may be covered in more or less detail based on classroom dynamics, student engagement, and time constraints.

b.Clarification of Doubts: We encourage prospective candidates to clarify any doubts regarding course content, structure, or any other aspect before registration. You can reach us by phone at +91 080 2293 2055/2491/2247 during office hours or by email at **office.cce@iisc.ac.in**. In case of course content delivery doubts and clarifications please reach out to the faculty concerned by keeping us in the loop. Our team is available to answer your questions and provide further clarification to help you make an informed decision.

c.No Guarantee of Specific Outcomes: While our courses are designed to provide valuable knowledge and skills, CCE does not guarantee specific academic results, career advancements, or personal achievements. The effectiveness of the course is also dependent on the individual student's engagement and effort.

d.Responsibility for Understanding: It is the candidate's sole responsibility to ensure that the chosen course aligns with their learning objectives and expectations before registration. Claims of misunderstanding course content after registration will not be considered for refunds.

2. Fees and Payment

a. Nominal Fees for Accessibility: The fees charged for our courses are nominal and primarily cover administrative costs, coordination efforts, and resources. These fees are structured to make high-quality education accessible to students.

b. Breakdown of Fees: Fees collected may be allocated towards various heads, including but not limited to, administrative overhead, technology infrastructure, instructor coordination, marketing, and certificate processing.

c. Payment Due Date: All course fees must be paid in full by the stipulated deadline to confirm registration. Failure to do so may result in forfeiture of the spot in the course.

3. No-Refund Policy

a. Fees Are Non-Refundable Post-Course Commencement: Once the course has officially commenced (even if the candidate has not attended the first session), all fees paid are strictly non-refundable. This policy is in place due to the administrative and coordination efforts involved in course planning, allocation of resources, and commitment to instructors.

Appendix ‘B’ Terms and Conditions- Course Registration Agreement & No-Refund Policy

b. No Refunds for Discontinuation: No refunds will be issued for any reason, including but not limited to: * Personal dissatisfaction with course content or teaching methodology. * Inability to continue due to personal reasons (e.g., illness, financial difficulties, work commitments, relocation). * Disciplinary action leading to removal from the course. * Lack of perceived value from the course.
c. No Refunds for Classroom Disruption: Students who are found to be disruptive, disrespectful, or engaging in behavior that negatively impacts the learning environment for others, and who are subsequently removed from the course, will not be eligible for a refund.
d. Acknowledgment of Commitment: By registering, the candidate acknowledges their commitment to completing the course and understands that their decision to discontinue for any reason will not result in a refund.
4. Exceptions to the No-Refund Policy (Course Cancellation by Center)

a. Course Cancellation by CCE: In the unlikely event that a course is cancelled by CCE before its commencement, registered candidates will be offered the following options: * Full Refund: A full refund of the course fees paid. * Fee Transfer: Transfer of the paid fees to another available course of equivalent value offered by CCE. If the new course fee is higher, the candidate will pay the difference; if lower, the difference will be refunded.
b. Notification of Cancellation: Candidates will be notified promptly of any course cancellation via their registered email address and/or phone number.
5. Candidate Conduct and Disciplinary Action
a. Respectful Learning Environment: All candidates are expected to maintain a respectful and conducive learning environment. Disruptive behavior, harassment, or any action that impedes the learning of other students or the instructor will not be tolerated.
b. Consequences of Misconduct: Centre for Continuing Education reserves the right to take appropriate disciplinary action, including but not limited to, warning, suspension, or permanent removal from the course, for any candidate violating the code of conduct. No refunds will be issued in such cases.
6. Dispute Resolution
a. Initial Contact: Any concerns or disputes regarding course content, administration, or this policy should first be addressed in writing to Centre for Continuing Education at office.cce@iisc.ac.in
b. Final Decision: The decision of Centre for Continuing Education regarding refunds or any other dispute under this agreement shall be final and binding.
7. Acknowledgment and Agreement
By completing the registration process and submitting payment, the participant acknowledges that He/she has read, understood, and agrees to all the terms and conditions outlined in this Course Registration Agreement and No-Refund Policy. You understand that your fees are non-refundable once the course commences, except in the specific case of course cancellation by CCE.

For more information contact:

CCE-PROFICIENCE Coordinator, Indian Institute of Science,
Bangalore - 560 012
Phone: + 91 080 22932508
E-mail: prof.cce@iisc.ac.in
URL: www.cce.iisc.ac.in/proficience
Working Hours: Monday through Friday: 09.30 hrs. to 19.00 hrs.
Saturdays': 10.00 hrs. to 16.00 hrs.