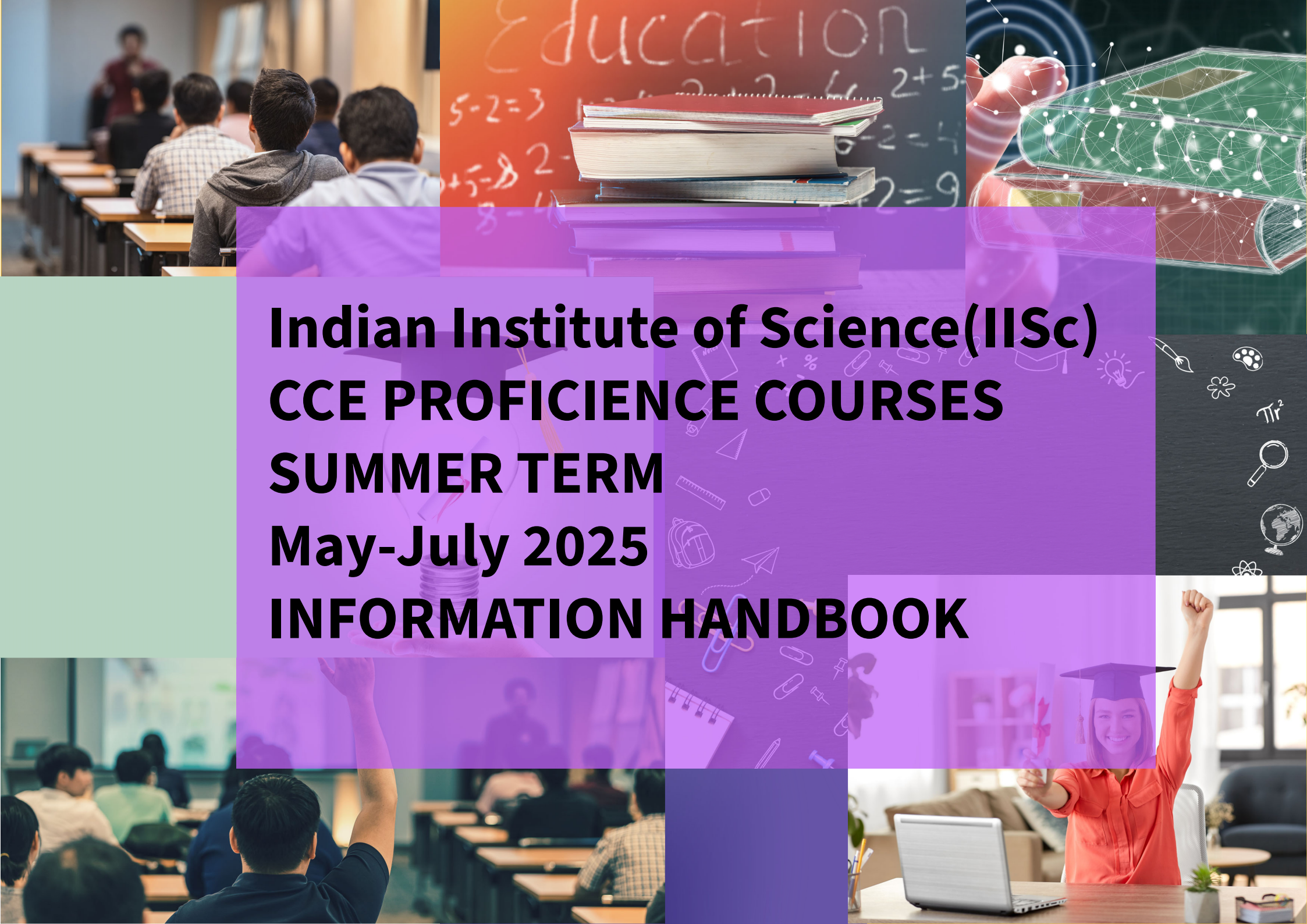


Indian Institute of Science(IISc)
CCE PROFICIENCE COURSES
SUMMER TERM
May-July 2025
INFORMATION HANDBOOK

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: 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 3-4 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.

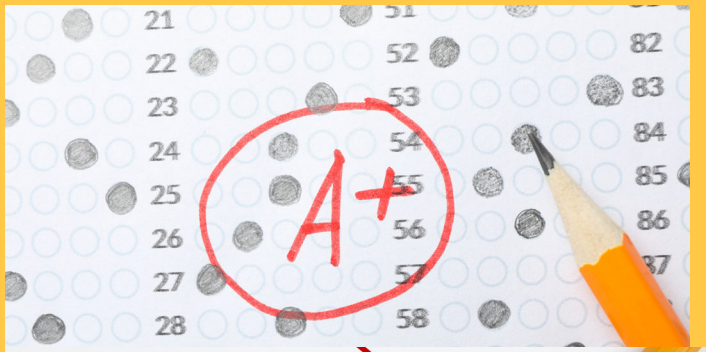
Evaluation

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.

Grade:	A^+	A	B^+	B	C	D	F (Fail)
Grade Points:	10	9	8	7	6	5	0



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.

Regular Courses

Computer Lab: A Computer Laboratory with adequate computer machines and a Silicon Graphics workstation with a variety of latest software have been set up for the CCEPROFICIENCE program. All these machines have been locally networked. A good collection of video cassettes pertaining to several courses is also available for viewing at the Centre for the participants.

Library: CCE-PROFICIENCE participants of offline courses can avail themselves of the facility of IISc Main Library and they can also make use of the books in CCE. The books at both the IISc Main Library and CCE are meant only for reference. The participants can avail themselves of this facility by producing their ID card issued by CCE-PROFICIENCE.

Timings: IISc. Library – 8.00 AM - 9.00 PM

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

Important Dates

Opening of the Application Portal	**4 April 2025**
Receipts of application along with fees (up to)	**4 April 2025 to 30 April 2025**
Classes Commence	**1 May 2025**
Final Exams	**25 July 2025 to 31 July 2025**

Minimum Qualification required
ME/MTech, BE/BTech and Masters in Business Administration, Management, Operations Research, Computer Science, Computer Applications, Mathematics, Statistics, Commerce, Economics

Prescriptive Analytics

Schedule: 1 May to 31 July 2025
Tuesday and Saturday
8 pm to 10 pm

WHO SHOULD LEARN

Any personal who are working in any Business, Industry and Government (BIG) organizations as well as academic who needs the basic knowledge of “Prescriptive Analytics” through applications of Prescriptive Analytics

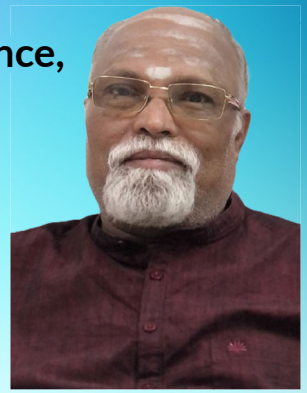
Objective

To provide business practitioners and those who are interested in Prescriptive Analytics with a selected set of Management Science and optimization techniques and discusses the fundamental concepts, methods, and models needed to understand prescriptive-analytics and implement these techniques in the era of Big Data.

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.

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



Minimum Qualification required
Any science or biotech graduate: BSc/Btech/BPharm etc.

Peptide Engineering for Therapeutics

Objective

To train and equip students/professionals with the fundamentals and strategies to design and engineer peptides for therapeutic purposes.

Syllabus

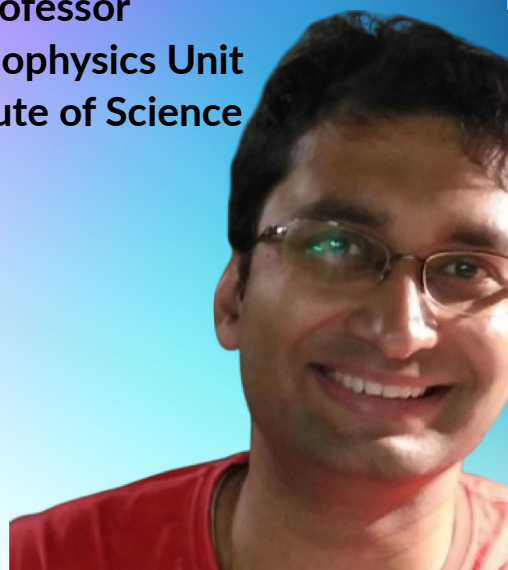
1. Basic reaction mechanisms
2. Conformation of peptides and proteins
3. Conventional and contemporary methods of peptide and protein synthesis
4. Peptidomimetics (Amide bond isosteres, Peptoids, Turn mimetics, Helix mimetics) design, synthesis, properties and use as therapeutic targets
5. Cell-penetrating peptides
6. Macrocyclic peptides

Schedule: 1 May to 31 July 2025
Tuesdays and Thursdays
6 P.M. to 7 P.M.

WHO SHOULD LEARN

Students in Core Sciences i.e. Physics, Chemistry, Biology, Zoology, Botany and Applied Sciences i.e. Genomics, Biotechnology, Microbiology, Biochemistr, Biophysics. Working professionals from Pharmaceuticals and life sciences

Jayanta Chatterjee
Associate Professor
Molecular Biophysics Unit
Indian Institute of Science
Bangalore



Brain Behavior and Neuroscience of Learning and Memory

Minimum Qualification required
School level biology and mathematics.

Objective

This will provide crash course introduction to the field of learning and memory . Starting with historical perspective of how these functions were discovered originally, we will be studying the neurological basis of behavior. The rules governing learning, the different types of learning, neural basis of memory across various scales will be discussed.

Syllabus

Different phases of Memory, Memory engrams, Case study of HM, Consolidation, classical conditioning, reinforcement learning, Cognitive vs Reflexive learning : Thorndike's findings, molecular basis of complex behavior, modern techniques and unanswered questions in the field of learning and memory.

Schedule: 1 May to 31 July 2025
Tuesday and Thursday
9:00 to 10:30 P.M.

WHO SHOULD LEARN

School and college teachers, HR personnel, UG or PG students or Engineers wanting to foreray into Neuroscience

Prof. Balaji Jayprakash
Center for Neuroscience, Indian Institute of Science, Bangalore

Reinforcement Learning

Minimum Qualification required
B.Tech in any discipline or B.Sc/BA in Physics/Chemistry/Maths/Statistics/Computer Science/Economics

Objective

The objective of the course will be to provide both a rigorous foundation in Reinforcement Learning through the various tools, techniques and algorithms used as well as cover some state-of-the-art algorithms in Deep Reinforcement Learning involving simulation-based neural network methods.

Syllabus

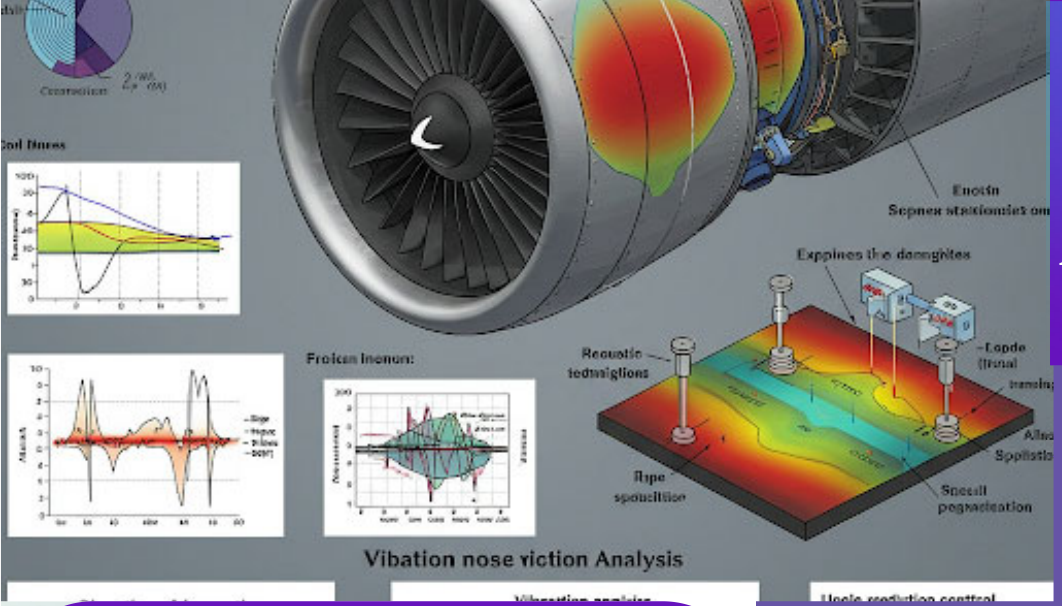
Introduction to Reinforcement Learning, Multi-armed bandits, Markov decision processes, Dynamic Programming - Value and Policy Iteration Methods, Model-Free Learning Approaches, Monte-Carlo Methods, Temporal Difference Learning, Q-learning, SARSA, Double Q-learning, Value Function Approximation Methods - TD Learning with Linear Function Approximation, Neural Network Architectures, Deep Q-Network Algorithm, Policy Gradient Methods, Actor-Critic Algorithms.

Schedule: 1 May to 31 July 2025
Every Tuesday and Thursday
9:00 to 10:15 P.M.

WHO SHOULD LEARN

Any person from the industry or academic institutions should benefit.

Shalabh Bhatnagar
Professor
Dept of Computer Science and Automation
Indian Institute of Science
Bangalore



Vibration and Noise Control: Theory and Practice

Minimum Qualification required
B.E / B.Tech. / AMIE / M.Sc. (Engg.)/ AMAeSI (Engg.) (Mechanical, Aero, Civil, Automobile, Marine, Ocean) OR equivalent.

Objective

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 makes it mandatory to control vibration and noise leading to quieter technology in pumps, engines, compressors, chillers and other consumer products consumer for OEM companies to stress upon the products without NVH problems. AI & ML achieves 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 helps to achieve these goals. This course is for engineers/ scientists/ entrepreneurs/instructors in the industries/institutes/universities to learn t analytical and experimental skills to tackle the problems related noise, vibration and harshness (NVH) during design and manufacturing stage for technically superio and commercially viable product .

Schedule: 17 May to 31 July 2025
Every Sunday
12 P.M. to 2 P.M.

WHO SHOULD LEARN

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

Dr. S B KANDAGAL
Dept of Aerospace Engineering, Indian Institute of Science, Bangalore - 560012
e-mail: ksb@iisc.ac.in

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 evel meter, microphones. Order analysis, Campell diagrams, water fall diagrams, Vibration transfer function (VTF) and noise transfer function (NTF).
Structural Vibration control elements: Vibration isolation, damping, balancing, resonators, absorption. Vibration and noise

Istandards. 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.
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 for measurement tools and techniques. 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&ML 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.

Essentials of Preclinical Research

Minimum Qualification required
B.Sc.,/B.Pharma/BVSc.

Objective

Preclinical studies are undertaken to identify a lead candidate and to select the best formulation; determine the route, frequency, and duration of exposure; and support

clinical trial design. This course provides essential information on the OECD Principles of GLP, test guidelines and requirements by various regulatory authorities while conducting Preclinical studies.

Syllabus

The syllabus includes History and OECD Principles of GLP, GLP Consensus Documents, Guidance Documents for Compliance Monitoring Authorities, Advisory Documents of the Working Group o GLP, Position Papers, Regulatory authorities, Introduction to Toxicology, Toxicology studies, Ecotoxicology studies, Genetic Toxicology studies, Developmental & Reproductive Toxicology studies, OECD test guidelines and Biocompatibility studies.

Schedule: 1 May to 31 July 2025
Every Wednesday
07.00 to 09.00 PM

WHO SHOULD LEARN

1. Biomedical Research Institutes, 2. R&D units, 3. Pharmaceutical industries, 4. Contract Research Organizations. Students , professionals and faculties from life sciences domains.

Ramachandra S G
Central Animal Facility
Indian Institute of Science
Bangalore 560012

Minimum Qualification required
B.E / B.Tech. / AMIE / M.Sc. (Engg.)/ AMAeSI (Engg.) (Mechanical, Aero, Civil, Automobile, Marine, Ocean) OR equivalent.

of professional work and optimum usage of time, computing and human resources.

Analysis and Design of Composite Structures

Objective

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

Schedule: 1 May to 31 July 2025
Every Thursday
7:30 to 10 P.M.

WHO SHOULD LEARN

1.Technologists/ Engineers/ Scientists/ Trainees/ Project Staff/ etc. from Industries, R & D Organizations, Institutions, Colleges etc. 2. Faculty of Engineering/ Diploma Institutions etc. 3. Fresh Graduates, Postgraduates, Ph.D. Students, Research Fellows, SRFs, JRFs, etc.

G. Narayana Naik
Principal Research Scientist
Structures & Materials
Department of Aerospace Engineering
Indian Institute of Science

Syllabus

Introduction: Basic Concepts and Terminology, different types of fibers and matrices, their properties and applications. Micromechanics of Composites: Prediction of properties etc. Micromechanics 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.

Minimum Qualification required
B.Sc.,/B.Pharma/BVSc.

Biostatistics

Objective

This course introduces key statistical concepts in biological research, including data types, descriptive statistics, probability, hypothesis testing, and regression analysis. Through hands-on exercises participants learn to analyze real-world biological data. The course builds a solid foundation for applying and interpreting biostatistics in health and life sciences.

Syllabus

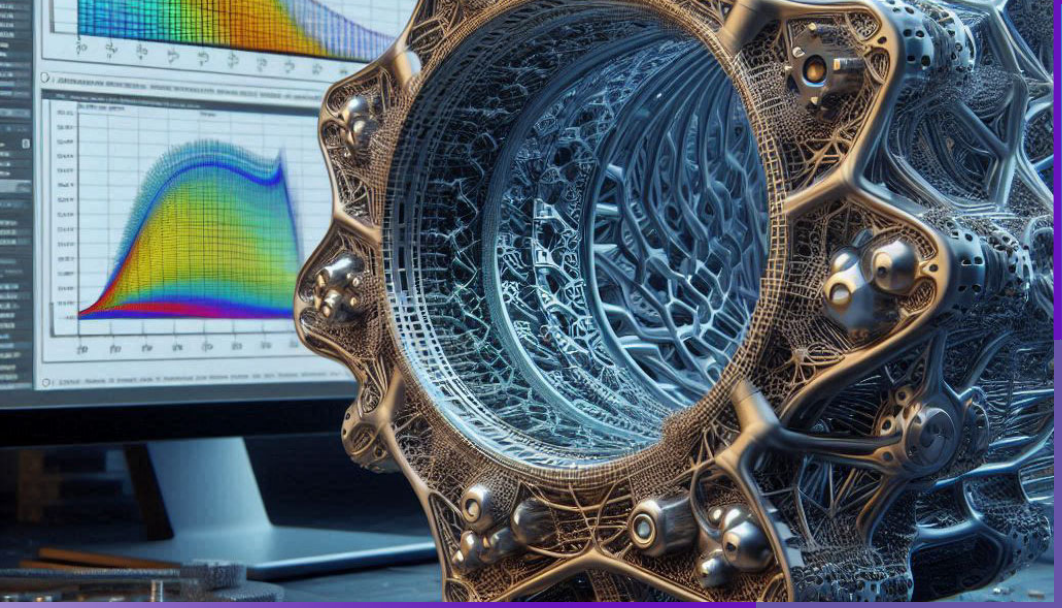
The course covers biostatistical fundamentals: data types, measurement scales, and study designs; descriptive statistics and data visualization; probability and distributions; hypothesis testing including p-values and statistical tests; and correlation versus causation with linear regression.

Schedule: 1 May to 31 July 2025
Thursday and Friday
8:00 P.M.

WHO SHOULD LEARN

All biology students, and bio R&D units

Samay Pande,
MCB department, Division of Biological sciences, IISc, Bangalore



Minimum Qualification required
BE, ME, MSc, AMIE or equivalent

Structural Analysis and Design Optimization: Theory and Practice

Schedule: 17 May to 31 July 2025
Every Saturday
12 P.M. To 2 P.M.

WHO SHOULD LEARN

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

Objective

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”

Dr. S. B. KANDAGAL
Dept of Aerospace Engineering, Indian Institute of Science, Bangalore

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 scaled 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.

Solid-State Nuclear Magnetic Resonance Spectroscopy for Materials Science and Pharmaceuticals

Schedule: 1 May to 31 July 2025
10.00AM to 11.30AM
Saturday

WHO SHOULD LEARN

1.Technologists/ Engineers/ Scientists/ Trainees/ Project Staff/ etc. from Industries, R & D Organizations, Institutions, Colleges etc. 2. Faculty of Engineering/ Diploma Institutions etc. 3. Fresh Graduates, Postgraduates, Ph.D. Students, Research Fellows, SRFs, JRFs, etc.

Minimum Qualification required
Masters in chemistry, physics and biology

Objective

The objective of the course are as follows:

1. Understand Fundamental Principles
2. Apply SSNMR to Pharmaceuticals and Different Material Classes
3. Employ Key Experimental Techniques: 1D, 2D and Relaxation Measurements
4. Interpret SSNMR Spectra for Structural Insights
5. Analyze Real-World Case Studies and Research Applications
6. Develop Practical Skills in SSNMR Experimentation

Syllabus

This course covers the principles and applications of solid-state nuclear magnetic resonance spectroscopy. Topics include spin interactions, chemical shifts, quadrupolar nuclei, relaxation studies, and advanced techniques such as dipolar recoupling and dynamic nuclear polarization. Applications focus on pharmaceuticals, battery materials, and porous materials. Case studies explore material characterization, degradation analysis, and structural insights. The course also discusses the integration of nuclear magnetic resonance with complementary techniques.

Prof.Sheetal Kumar Jain
Solid State and Structural Chemistry Unit
B204, Chemical Sciences Building
Indian Institute of Science
Bangalore

Minimum Qualification required
Graduation in Science and engineering

Energy Transition - decarbonisation, transport and industrial sector.

Schedule: 1 May to 31 July 2025
7 P.M. to 8:30 P.M.
3 Days a week

WHO SHOULD LEARN

'- All industries, consultancy firms, academic institutions - Energy Professionals & Engineers – Working in power generation, oil & gas, and renewable energy sectors looking to adopt low-carbon technologies. - Policy Makers & Government Officials – Engaged in energy policy, climate regulations, and sustainable evelopment planning. - Researchers & Academics – Interested in climate change mitigation, energy efficiency, and decarbonization strategies. - Corporate Sustainability Managers – Responsible for implementing carbon reduction strategies industries. - Consultants & Analysts – Wo in energy consulting, carbon footprint assessments, and environmental impact analysis. - Students & Early Career Professionals – Studying or aspiring to work in energy, environmental sciences, or climate policy. - Investors & Financial Experts – Involved in climate finance, green bonds, and sustainable energy investments.

Objective

Climate change impact is a major global concern, particularly in the energy sector and several initiatives to reduce the carbon intensity are being addressed. This course provides insight into the possible technological options, resources and policy intervention—examples in India and elsewhere for a range of sectors, including challenges and results.

Syllabus

'- Introduction to energy portfolio and its impact on climate change.
- Possible scenarios to reduce carbon intensity in the industrial, power, residential and transport sectors.
- Estimation of emissions, Carbon intensity calculations.
- Global and international Standards for Carbon reporting
- Scopes of emissions through life cycle analysis
- Techno- Economics related to decarbonisation technologies.

Prof. S Dasappa,
Centre for Sustainable Technologies/ABETS, CGPL
Indian Institute of Science
Bangalore

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**

For more information

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.