CCE-PROFICIENCE
Centre for Continuing Education
Indian Institute of Science

INFORMATION HANDBOOK
JAN-MAY 2025

CONTENTS

Sl. No.	Particulars	Page No.
1	Introduction	3
2	Instructions	5
3	Course Schedule	7
4	Fee Structure	8
5	Performa for Certificate	23

REGULAR COURSES

Sl. No.	Name of the Course	Credit
1	Online Course on Machine Learning for 5G and 6G wireless communication (Mon & Wed) (8.00PMto 9.30PM)	3:0
2	Online Course on Introduction to Photonics (Tue & Thu) (8:00PM to 9.30PM)	3:0
3	Online Course on Applications of solution Nuclear Magnetic Resonance Spectroscopy in Pharmaceutical Analysis (Tue & Thu) (8:00PM to 9.30PM)	3:0
4	Online Course on Learning, Memory, Behavior and Brain (Tue & Thu) (8:30PM to 10:00PM)	3:0
5	Online Course Transgenic Technology: Principles and Applications (Tue & Thu) (8:00PM to 9.30PM)	3:0
6	Online Course on Introduction to High Performance Computing (HPC) and Parallel Programming (Tue & Thu) (6.00PM to 7.30PM)	3:1
7	Online Course on Vibration and Noise Control: Theory and Practice (Wed) (6.00PM to 8.00PM)	2:0
8	Online Course on Analysis and Design of Composite Structures (Thu) (8.00PM to 10.00PM)	2:0
9	Online Course on Statistical methods in Semiconductor Manufacturing (Sat) (10.00PM to 12.00PM).	2:0
10	Online Course on Structural Analysis and Design Optimization: Theory and Practice (Sat) (12.00PM to 2.00PM).	2:0
11	Online Course on Prescriptive Analytics (Sat) (2.00PM to 5.00PM)	3:0
12	Online Course Principles and Advances in Genetic Engineering (Sat) (10.00AM to 12.00PM)	2:0
13	Online Course on Unlocking Business Challenges Using Zero-Code Analytics (Sun) (10.00AM to 1.00PM)	3:0

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. 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).

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. Courses are offered during the period AUG-DEC and JAN-MAY and around 15-20 courses are scheduled during each semester. 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 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**

CERTIFICATES

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.

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

INSTRUCTIONS

HOW TO APPLY:

Details of the courses are available online at cce.iisc.ac.in and also download CCE App from Google Play store. Essential Qualification for any course is a degree in Engineering or a postgraduate degree in Science/Humanities as applicable with pre-requisites. 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. Payment of the course fee is through the payment gateway provided at our online portal and no other means of payment is accepted. The course fee is Rs. 5000/- per credit and registration fee is Rs. 300/- per course. Any other gateway charges must be borne by participant during online payment. For each application, participants must upload (BE, B. Tech / Post Graduation) Convocation/Degree Certificate without fail. (Class conducted: Weekdays 6 pm. to 8 pm) & (Saturday's 10 am to 1 pm & 2 pm to 4 pm)

FEES

The course fee is Rs. 5000/= per credit. Some of the courses include 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 FEE

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 8.00 p.m. Monday through Friday and between 10 a.m. to 1 p.m. and 2pm to 4 pm on Saturdays.

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 (August & January) 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.

RESULTS

Results of the courses will be announced normally around 1st week of January for August-December term and 1st week of May for January-May 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 successfully completed should surrender the ID card at the time of receiving certificate, failing which the certificate(s) will not be issued to her/him. Police authorized by lodging and compliant and then request the

Section Officer, CCE to issue duplicate ID during submitting police compliant and Rs.100/- on penalty in the event of loss of identity card, the matter should be immediately reported to the Officer-in-Charge, CCE-PROFICIENCE in writing.

NO REQUEST FOR CHANGE OF EITHER THE STIPULATED DATES, MODE OF PAYMENT, CHANGE OF COURSE OR SUBMISSION/VERIFICATION OF ENCLOSURE TO APPLICATION ETC., WILL BE ENTERTAINED UNDER ANY CIRCUMSTANCE

Schedule of Online Courses for Jan – May 2025				
Sl. No.	**Name of the Course**	**Credit**	**Faculty**	**Department**
1	Online Course on Machine Learning for 5G and 6G wireless communication,	3:0	Prof. Sudhan Majhi	DEPT ECE
2	Online Course on Introduction to Photonics	3:0	Prof. T Srinivas	DEPT ECE
3	Online Course on Applications of solution Nuclear Magnetic Resonance Spectroscopy in Pharmaceutical Analysis	3:0	Prof. Siddhartha P Sarma	Dept. of Molecular Biophysics Unit
4	Online Course on Learning, Memory, Behavior and Brain	3:0	Prof. Balaji Jayaprakash	Dept of CNS
5	Online Course Transgenic Technology: Principles and Applications	3:0	Dr. N. Ravi Sundaresan	Dept. Microbiology and Cell Biology, IISc
6	Online Course on Introduction to High Performance Computing (HPC) and Parallel Programming	3:1	Prof. Yoginder Kumar Negi,	SERC IISc
7	Online Course on Vibration and Noise Control: Theory and Practice	2:0	Dr. S B Kandagal	AE, IISc
8	Online Course on Analysis and Design of Composite Structures	2:0	Dr. G. Narayana Naik	DEPT AE, IISc
9	Online Course on Statistical methods in Semiconductor Manufacturing	3:0	Prof. Manoj Varma	Dept CeNSE
10	Online Course on Structural Analysis and Design Optimization: Theory and Practice	2:0	Dr. S B Kandagal	AE, IISc
11	Online Course on Prescriptive Analytics	3:0	Dr. M Mathirajan	DEPT MS, IISc
12	Online Course Principles and Advances in Genetic Engineering	2:0	Dr. N. Ravi Sundaresan	Dept Microbiology and Cell Biology, IISc
13	Online Course on Unlocking Business Challenges Using Zero-Code Analytics (3:0)	3:0	Dr M Mathirajan	DEPT MS, IISc

FEE STRUCTURE AT A GLANCE

Regular Courses

Per Credit - Rs.5,000/-
Computer Lab Fee - Rs.5,000/-

1. Course with 2 credits # Rs.10,000/-
2. Course with 2+C credits # Rs.15,000/-
3. Course with 3+0 credits # Rs.15,000/-
4. 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

01. Online Course on Machine Learning for 5G and 6G wireless communication (3:0)

Objectives:

AI/ML has several applications in physical layer communication. It brings adaptiveness 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 study material for 5G and 6G wireless communication. 6G AI Native radio also requires a solid knowledge of AI/ML. Most of the Telecom companies (network and modem) are looking for people who have knowledge in AI/ML for wireless communication; having this knowledge may help them find a job in these companies.

Syllabus:

Introduction to Machine Learning: Overview of supervised, semi-supervised and unsupervised. Wireless Communications: AI/ML-based Modulation classification, channel estimation, Channel prediction, Classification of wireless signals Autoencoder (based on 3GPP Standard), CSI compression and feedback (based on 3GPP Standard), Beam forming and beam Management (based on 3GPP Standard). Signal Estimation and Detection: AL/ML based Parameter estimation, STO and CFO estimation, MIMO/OFDM/OTFS detectors. Spectrum sharing and resource allocation: Resource allocation, Spectrum sharing, Power allocation using reinforcement learning (RL) and deep RL.

Basic tools: Python, TensorFlow and PyTorch.

Target Group:

IITs, NITs, IIIT, Samsung, Qualcomm, Nokia, Jio, MediaTek, Mavenir, Tejas Networks, Sasken Technologies, Tata Elxsi, Mistral Solutions, BEL, Sterlite Technologies Limited, CDOT, HFCL, Wipro Limited, DRDO, BSNL, ISRO, L&T Technology, and Tech Mahindra, ECE department of Local colleges in Bangalore

Faculty:

Prof. Sudhan Majhi
SP 1.05, Dept. of ECE,
IISc, 560012
Email: smajhi@iisc.ac.in

Reference Books

1. I. Goodfellow, Y. Bengio, and A. Courville, Deep Learning, MIT Press, 2016.
2. R.-S. He and Z.-G. Ding, Applications of Machine Learning in Wireless Communications, IET, 2019.
3. F.-L. Luo, Machine Learning for Future Wireless Communications, Wiley-IEEE Press, 2020.
4. Y. C. Eldar, A. Goldsmith, D. Gündüz, and H. V. Poor, Machine Learning and Wireless Communications, Cambridge University Press, 1st edition, 2022.

Who Can apply?

ME/MTech, BE/BTech, MSc/MS, PhD in ECE can apply

Pre-requisites required: Nil

Course Fee: Course Fee: Rs. 15,000/- + 18% GST

Online Seats are Limited to 100

Schedule: Monday & Wednesday (8.00PM to 9.30PM)

02. Online Course on Introduction to Photonics (3+0)

Objectives:

The main objective of the course is to introduce basics and applications of photonics. Photonics is the science and technology of using light waves for applications ranging from optical communications to sensors and quantum computing. Recently there is considerable interest in the subject with several universities offering courses in photonics. The main purpose of the course is to give basics in some depth and many applications.

Syllabus:

Photonics and electronics. optics and optoelectronics. lasers. fiber optic communications. photonic integrated circuits. fiber optic sensors, optical signal processing and computing. biomedical applications. quantum information technology.

Target Group:

College lectures, and students who just finished B. Tech or M. Sc. Industry persons who want to take up projects in photonics can benefit.

Faculty:
Prof. T Srinivas
Dept of Electrical Communication Engineering,
Indian Institute of Science,
Bangalore 560012, Karnataka

Reference Books:

1. Saleh, Bahaa EA, and Malvin Carl Teich. Fundamentals of photonics. john Wiley & sons, 2019.
2. Keiser, Gerd. Optical fiber communications. Vol. 2. New York: McGraw-Hill, 2000.
3. Reed, Graham T., and Andrew P. Knights. Silicon photonics: an introduction. John Wiley & Sons, 2004.

Who Can apply?

B. Tech Electronics or M. Sc Physics.

Pre-requisites:

Basic mathematics

Course Fee: Rs. 15,000/- + 18% GST

Online Seats are Limited to 100

Schedule: Tuesday and Thursday (8.00PM to 9.30PM for 3 credits course)

03.Online Course on Applications of solution Nuclear Magnetic Resonance Spectroscopy in Pharmaceutical Analysis (3:0)

Objectives:

The objective of the course will be to train the participants in the basic theory of NMR, the best practises in data acquisition, processing and interpretation of high-resolution solution NMR spectroscopic data of organic molecules, bioactive peptides, identification of impurities and suppression of signals from excipients. Data interpretation exercises will involve analysis of a variety of one- and two-dimensional NMR spectra. The course will also contain a module on the use of third-party software for data processing and analysis including principal component analysis and analysis of DOSY data for analysis of biomolecular aggregates.

Syllabus:

Basic principles of NMR spectroscopy. NMR instrumentation. Data acquisition (one- and two-dimensional spectra, pulse calibration, shimming, spectral parameters, solvent suppression) and Diffusion Spectroscopy. Data Processing methods. Analysis of one-dimensional proton and carbon NMR spectra, two-dimensional homonuclear and heteronuclear NMR spectra. Intermolecular interactions. Introduction to software programs for data analysis and PCA analysis.

Target Group:

Manufacturing / Quality Control / R & D in Pharmaceutical / Chemical industry / Agrochemical industries.

Faculty:
Siddhartha P Sarma
Professor
Dept. of Molecular Biophysics Unit
Indian Institute of Science,
Bangalore – 560012
sidd@iisc.ac.in

Reference Books:

1. Basic One- and Two-Dimensional NMR Spectroscopy, 5th, Completely Revised and Updated Edition Horst Friebolin ISBN: 978-3-52782-9, December 2010, 442 pages
2. High-Resolution NMR Techniques in Organic Chemistry, 2nd Edition, Volume 2 - November 5, 2008, Author: Timothy D.W. Claridge
   Language: English
   Paperback ISBN: 9780080548180
   Paperback ISBN: 9780080975450
   Hardback ISBN: 9780080546285
   eBook ISBN: 9780080915098
   eBook ISBN: 9780080915036
3. 200 and More NMR experiments: A practical Course Stefan Berger, Seigmar Braun ISBN978-3-527-31067-8 834 pages

Who can apply?

BSc / MSc in Chemistry / Biochemistry / Microbiology / Biotechnology

Pre-requisites:

BSc Chemistry / Biotechnology

Course Fee: Rs. 15,000/- + 18% GST

Online Seats are Limited to 100

Online Classes using Microsoft Teams

Schedule: Tuesday and Thursday (8.00PM to 9.30PM for 3 credits course)

04. Online Course on Learning, Memory, Behavior and Brain (3:0)

Objectives:

Why do we learn and how does our brain learn? What are the rules that govern whether our brain would learn or not? I will be starting from description and interpretation of initial experiments/studies that were done to answer these questions. All along keeping in mind how this intricate psychological process is intricately connected to brain and its function. We will be studying how complex brains function can be tracked down to molecules and their function. Simultaneously we will also be learning about how the information is stored, organized and utilized in our brain. Towards the end we will be discussing the contemporary areas of research such as social learning, how the learning rules have led to emergence of neural networks.

Syllabus:

Origin of memory studies, Substrates of memory, Brain and behavior, Memory consolidation: Nature and its dependence, Memory and its classification, Contingency, Salience and Valence, Classical conditioning, Pavlov's experiment: What it is and what it is not? Recorla's experiment on contingency, Garcia and Koleing experiments, Kamin's Observations, Rescorla and Wagner model of learning, Second order conditioning, Latent Inhibition, Reinforcement learning, Punishment learning, Positive and Negative reinforcement, punishments. Cognitive vs Reflexive behavior, Sign vs Goal tracking behavior, Rodent model of learning and memory, Molecular basis of memory.

Target Group:

Colleges, HR and Learning

Faculty:
Balaji Jayaprakash
Associate Professor
B-09 CNS, IISc
jbalaji@iisc.ac.in

Reference Books:

1. Learning: David Liberman, Memory:
2. Pruves : Fundamentals of Neuroscience
3. Kandel and Sqire : Memory from molecules to mind

Who can apply?

Basic Science (Pre UG level)

Pre-requisites:

Pre - UG (Basic Science)

Course Fee: Rs. 15,000/- + 18% GST

Online Seats are Limited to 100

Online Classes using Microsoft Teams

Schedule:

Tuesday and Thursday (8.30PM to 10.00PM for 3 credits course) - Online only

05. Online Course on Transgenic Technology: Principles and Applications (3:0)

Objectives:

This course is proposed for those who wish to develop a strong background in technologies and principals involved in the generation of genetically modified experimental organisms, from worms to animals, and explore their use in scientific research.

Syllabus: History and overview of transgenic technology- Molecular technologies used in transgenic technology- Direct single-cell embryo pronuclear injection, embryonic stem cells, and somatic cell nuclear transfer- Lentiviral and BAC transgenesis- Zinc finger nuclease technology- Genome editing approaches such as TAL effector nucleases and Cas9/CRISPR- Generation of the stable transgenic and mutant nematode worm Caenorhabditis elegans- Production of transgenic and mutant zebrafish and Xenopus- Production of transgenic mice (Embryonic development, Design, and optimizing Constructs for transgenic expression, Preparation of females for embryo collection- Pronuclear microinjection, Generation of Pseudo pregnant Females, Implantation in foster mothers, Identification of transgenic progeny)- Generation of knock-out mice (Isolation and culture of embryonic stem (ES) cells, Gene targeting construct design, Transfection, Homologous recombination in ES Cells, Positive and negative selection; blastocyst injection, Breeding of germ-line chimeras)- Transgenic animal model supporting techniques (Cryopreservation and rederivation; ICSI and IVF)- Cre/lox and Flp/FRT system for inducible transgenics, general knockouts, conditional knockouts, and reporter strains in mice – Chemically inducible transgene expression systems- Use of transgenic technology in the modelling of human diseases, including cardiovascular diseases, diabetes, obesity, cancer, atherosclerosis, neurodegenerative diseases, muscle degeneration, and aging.

Target Group: College students (Veterinary, Pharmacy, Biotechnology & Medical) · Industry (Pharmaceutical Companies & Biotech Companies) · Researchers, Postdocs and students in the field of biological sciences

Faculty:

Dr. N. Ravi Sundaresan
Associate Professor
Dept. of Microbiology and Cell Biology
Indian Institute of Science
Bengaluru-560012
Email: rsundaresan@iisc.ac.in

Reference Books:

1. Principles of Gene Manipulation and Genomics by Sandy B. Primrose, R. Twyman Oxford press; 7th edition.
2. Transgenic Animal Technology: A Laboratory Handbook. Carl A. Pinkert Elsevier Science Publishing Co Inc: 3rd Revised edition.
3. Transgenic Mouse Methods and Protocols (Methods in Molecular Biology) Marten H.
4. Hofker, Jan van Deursen. Humana Press.2nd Edition.

Who can apply?

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

Pre-requisites: Basic knowledge in the Life Sciences

Course Fee: Rs. 15,000/- + 18% GST

Online Seats are Limited to 100

Online Classes using Microsoft Teams/Google Meet

Schedule: Tuesday and Thursday (8.00PM to 9.30PM)

06. Online Course on Introduction to High Performance Computing (HPC) and Parallel Programming (3:1)

Objectives:
The objective of the course is to make working professionals, and graduate students acquaint themselves with parallel Programming and High-Performance Computing (HPC) terminology and concepts. Explain the ways in which parallelization can enable high performance computing. Make familiar with the issues involved in developing a parallel application and to decide on an approach for developing a parallel version of the application.

Syllabus:

- Why HPC?
- Profiler: NVPROF, GPROF (GNU GCC Profiling Tool)
- OpenMP: MPMD model, Fork 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, OpenACC
- Hybrid programming

Target Group:

DRDO, ISRO, Corporate employees or fresh graduates interested in computational science.

Faculty:
Prof. Yoginder Kumar Negi,
Senior Scientific Officer
SERC IISc Bangalore.
Emai: yoginder@iisc.ac.in

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) ISBN: 0-201-64865-2
4. MPI: The Complete Reference. Available Online.

Who can apply?
BE/B.Tech with basic knowledge of Computer Programming

Pre-requisites:
Familiarity with programming in C/Fortran/C++/Python using editors or IDE's

Course Fee: Rs. 20,000/- + 18% GST

Online Seats are Limited to 100

Online Classes using Microsoft Teams

Schedule: Tuesday and Thursday (6.00PM to 7.30PM for 3 credits course)

07. Online Course on Vibration and Noise Control: Theory and Practice (2:0)

Objectives:

Growing awareness of vibration, noise and harshness feeling has necessitated the valid design criterion in the design of machines, automobiles, buildings, industrial facilities, etc, and the increasing number of standard regulations and human comfort associated with noise, harshness and vibration makes it mandatory to control vibration and noise leading to quieter technology in pumps, engines, compressors, chillers and other consumer products. There is a great demand to enhance the ride comfort of bikes, cars, aircrafts and other automobiles. Vehicle Dynamics basics and rowing awareness about noise pollution among the consumer necessitates the OEM companies to stress upon the products without NVH problems. Analytical, MATLAB and FEM based tools such as ANSYS, NASTRON, ABACUS and SYSNOISE helps to achieve the goals of NVH study. This course is for engineers/scientists/entrepreneurs/instructors in the industries/institutes to learn the analytical and experimental skills to tackle the problems related noise, vibration and harshness (NVH) during design and manufacturing stage for technically superior and commercially viable product to achieve "EMPOWER INDIA WITH SKILL AND Knowledge"

Syllabus:

Vibration of structural systems. SDOF, 2-DOF, MDOF and continuous systems. Eigen values and vector estimation methods. Free and Forced vibration analysis. Torsional vibration and applications. Damping estimation methods Structural Vibration control elements: isolation, damping, balancing, resonators, absorption, barriers and enclosures. Vibration and noise standards. NVH measurement tools and techniques. Modal parameter (natural frequency, mode shape and damping) estimation techniques. Signal and system analysis. Demonstration of vibration and noise experiments – beam, plates, impulse excitation, electrodynamic shaker excitation, FFT analyzer, stroboscope and mode shape animation, sound level meter, microphones. Vibration transfer function (VTF) and noise transfer function (NTF) Noise and its effects on man. 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. Case studies discussion (vibration reduction in passenger car, tiller, tractors, steering column/wheel vibration diagnosis, Modal analysis of Helicopter, Vibration diagnosis in diesel engine power plant, rotodynamic analysis of DWR and tracking antenna and engine and compressor noise attenuation and vibration isolation, engine-compressor mount design, vibration diagnosis in power plants, gear shift harshness, newspaper printing cylinder vibration diagnosis, engine filter bracket dynamic analysis, noise reduction for mixer grinders, field audit of industrial chimney for wind induced vibration, stability studies of sports bike, aerodynamic stability derivatives of scaled model of aerospace vehicles)

Target Group:

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

Faculty:
Dr. S B Kandagal
Principal Research Scientist,
Dept of AE,
IISc., Bengaluru.
Email: ksb@iisc.ac.in

Reference Books

1. Harris, C.W" Shock and vibration handbook" McGraw Hill, New York, 2012.
2. Ewins, D.J." Modal analysis: Theory and Practice", Research Studies Press Ltd, England, 2014
3. Gillespie, T.D., "Fundamentals of Vehicle Dynamics", Society of Automotive Engr's., Inc, 2010.
4. Beranek, L.L," Noise and Vibration Control", Wiley, 2008

Who Can Apply?

BE, ME, MSc, AMIE, or equivalent

Course Fee: Rs. 10,000/- + 18% GST

Online Seats are Limited to 100

Online Classes using Microsoft Teams

Schedule: Wednesday (6.00PM to 8.00PM);

Online only

08. Online Course on Analysis and Design of Composite Structures (2:0)

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 behaviour 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 fibres 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.

Target Group:

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.

Faculty:
Dr. G Narayana Naik
Principal Research Scientist,
Dept. of AE.,
IISc., Bengaluru.
Email: gnn@iisc.ac.in

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. J.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.

Who can apply?

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

Course Fee: Rs. 10,000/- + 18% GST

Online Seats are Limited to 100

Online Classes using Microsoft Teams

Schedule: Thursday (8.00PM to 10.00PM) - Online only;

09. Online Course on Statistical methods in Semiconductor Manufacturing (2:0)

Objectives:
The objective of this course is to introduce the foundational statistical concepts and specialized topics of relevance to the semiconductor manufacturing industry. This course will be useful for industry professionals currently working in the semiconductor and related industries or desirous of doing so.

Syllabus:
Introduction to semiconductor manufacturing, unit processes in semiconductor manufacturing, probability distributions, moments, parameter estimation, hypothesis testing, ANOVA, PCA, data clustering and classification, semiconductor yield modelling, statistical process control, process modelling and diagnosis, design of experiments

Target Group:
Industry professionals working in semiconductor and related industries

Faculty:
Prof. Manoj Varma
SF04, Centre for Nano Science and Engineering
mvarma@iisc.ac.in

Reference Books:

1. Fundamentals of Semiconductor Manufacturing and Process Control, Gary S. May and Costas J. Spanos, Wiley-Interscience, 2006
2. Introduction to Statistics and Data Analysis, Christian Heumann, Michael Schomaker, and Shalabh, Springer 2016
3. Probability & Statistics for Engineers & Scientists, Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, and Keying Ye, Prentice Hall 9th Ed.

Who Can apply?
BTech/BE/MSc in any field

Pre-requisites: familiarity with basic calculus

Course Fee: Rs. 10,000/- + 18% GST

Online Seats are Limited to 100

Schedule: Saturday (10.00AM to 12.00PM)

10. Online Course on Structural Analysis and Design Optimization: Theory and Practice (2:0)

Objectives:

Advanced research in material science to enhance life with reduced costs resulted in metal alloys, plastics, composites and nano materials. Structural design and optimization of components with unusual shapes became possible with current available finite element software tools such as ANSYS, NISA, NASTRON, ABACUS, SYSNOISE, LSDYNA and MATLAB etc. The fundamental knowledge of stress, strain, shear, torsion in relation to the structures and S-N curves in relation to the material fatigue life becomes important. The interpretation of the FEM software output calls for the knowledge of analysis and design optimization of mechanical systems. This course essentially trains engineers/scientists/entrepreneurs/instructors in the industries/institutes to optimally design various mechanical systems and sub-systems for technically superior and commercially viable value-added product and achieve "EMPOWER INDIA WITH SKILL AND Knowledge"

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, tension, compression, shear, torsion, coupled system, and S-N curves. Design of beams, torsion, compression members and fasteners. Stability of structures. Composite materials and their importance in structural analysis design optimization. Principles of optimization, formulation of objective function and design constraints, classification of optimization problem. Single and multivariable optimization. Optimization with equality and inequality constraints. Optimal design of mechanical elements – fasteners, springs, gears, bearings, belts, clutches, brakes, shafts and axles. Procedures for product design, development and testing. Vibration of structures Practical problem discussion with industrial products, (optimization of passenger car sub systems for vibration and noise reduction, Rail-coach-CBC couplers, Car door window regulator, satellite tracking antenna and DWR antenna design, Tractor canopy, hydraulic crawler driller (drilling machine), Bike brake system, sluice valve design, failure analysis if piston drill bit, thermally insulated box, IP turbine blade failure analysis, design analysis of super pump impeller, Structural design aspects in power plants. Hydraulic jacks/Feed cylinder with intermediate supports, Industrial chimney design, optimization of box culverts, metal-composite sprocket for bikes, Thermal analysis of heat exchangers, 6-DOF force balance, pitch flexure, roll flexure design for wind tunnel model studies for aerodynamic derivatives of aerospace vehicles and automobiles).
"

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

Faculty:
Dr. S B Kandagal
Principal Research Scientist,
Dept of AE,
IISc., Bengaluru.
Email: ksb@iisc.ac.in

Reference Books

1. Beer F P and Johnson, E.R, "Vector Mechanics for Engineers- Statics and Dynamics", Tata-MacGrawhill, sixth Edison, 2012.
2. Shigley, J.E and Mischke, C.R., "Mechanical engineering design" Tata-MacGrawhill, sixth Edison, 2010.
3. Johnson Ray, C." Optimum design of mechanical elements", Wiley, John & Sons, 2014.

Who Can Apply?

BE, ME, MSc, AMIE or equivalent

Course Fee: Rs. 10,000/- + 18% GST

Online Seats are Limited to 100

Online Classes using Microsoft Teams

Schedule: Saturday (12.00PM to 2.00PM)

11. Online Course on Prescriptive Analytics (3:0)

Objectives:

To provide business practitioners and those who are interested in Prescriptive Analytics, a selected set of Management Science and Optimization Techniques along with the fundamental concepts, methods, and models for understanding prescriptive-analytics and implementation of these techniques in the era of Big Data.

Syllabus:

Introduction to Prescriptive 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 most business optimization problems], with case studies from Business, Industry, and Government (BIG) applications using LINDO/LINGO/CPLEX/etc. optimization package.

Target Group:

Every Business, Industry and Government (BIG) organizations which has "Business Analytics" group to address various problems associated with Prescriptive Analytics. In addition, all Faculty and interested UG and PG Graduates in Engineering and Postgraduate in Business Administration/Management, Operations Research, Computer Science, Computer Applications, Mathematics, Statistics, Economics.

Faculty:

Dr. M. Mathirajan, FORSI
Elected National President of ORSI,
National Vice President of Analytics Society of India,
Chief Research Scientist,
Department of Management Studies,
Faculty of Engineering,
Indian Institute of Science, Bangalore 560012
Email: msdmathi@iisc.ac.in; mathiiisc@gmail.com

Reference Books:

1. Waynel L Winston. Operations Research : Applications and Algorithms.
2. Thomson, Belmont, CA. [Sixth Indian Reprint 2010].
3. Abben Asllani. Business Analytics with Management Science Models and Methods. Person Education. 2015.
4. U Dinesh Kumar. Business Analytics: The Science of Data-Driven Decision Making. Wiley India, 2017
5. William P Fox. Mathematical Modeling for Business Analytics. CRC Press. Taylor & Francis Group, LLC. 2018

Who Can apply?

ME/MTech, BE/BTech, MSc/MS (in Business Analytics, Operations Research, Computer Science, Mathematics, Statistics), MCA, MA (in Economics), MBA

Course Fee: Rs. 15,000/- + 18% GST

Online Seats are Limited to 100

Online Classes using Microsoft Teams

Schedule:

Saturday (2.00PM to 5.00PM for 3 credits course)

12.Online Course on Principles and Advances in Genetic Engineering 2:0

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:

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 labelling 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

Target Group:

Faculty:

Dr. N. Ravi Sundaresan
Associate Professor
Dept. of Microbiology and Cell Biology
Indian Institute of Science
Bengaluru-560012
Email: rsundaresan@iisc.ac.in

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 Manipulation and Genomics, 7th Edn, Blackwell Publishing.
3. J. J. Greene and V. B. Rao. Recombinant DNA Principles and Methodologies. CRC Press

Who can apply?

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

Pre-requisites:

Basic knowledge in the Life Sciences

Course Fee: Rs. 10,000/- + 18% GST

Online Seats are Limited to 100

Online Classes using Microsoft Teams

Schedule: Saturday (10.00AM to 12.00PM)

13.Online Course on Unlocking Business Challenges Using Zero-Code Analytics (3:0)

Objectives:

Apart from the basics of machine learning concepts, Participants would be introduced to real-life scenarios by case-study method, where Statistical and Machine Learning concepts can be applied to solve business/data problems. This course takes a deep dive to explain and interpret the machine learning output in the context of the case study.

There would be a bridge course on basic concepts of statistics which can be taken by students who would like to refresh their knowledge. It's recommended that all students take it to enable faster learning during course sessions.

Syllabus:

Introduction of statistical inferences, Exploratory data analysis, Data preprocessing, hypothesis, machine learning, different types of machine learning (supervised: Regression, classification, decision tree, random forest, unsupervised learning: clustering, factor analysis, PCA), Overview Neural learning.

Target Group: Working professionals (IT/ITES/Pharma/Health/Fintech/Banking/E-Commerce/Real Estate/PSUs/Energy/Sustainability), Faculties of STEM and commerce stream, Pharma, Healthcare, PG/Graduates, Engineering, Management, Mathematics, Statistics, Economics

Faculty:
Dr. M. Mathirajan
Chief Research Scientist, Department of Management Studies, Indian Institute of Science, Bangalore 560012
Email: msdmathi@iisc.ac.in; mathiiisc@gmail.com

Faculty:
Vineet Srivastava
Zero Code Learning (OPC) Pvt. Ltd.
Email:
vineet@zerocodelearning.com

Faculty:
Gaurav Gupta
Zero Code Learning (OPC) Pvt. Ltd.
Email: gaurav@zerocodelearning.com

Reference Books:

1. Hands-On Machine Learning with Scikit-Learn and TensorFlow Publisher(s): O'Reilly Media, Inc. Author: Geron Aurelien
2. Data Science from Scratch. Publisher(s): O'Reilly Media, Inc. Author: Joel Grus
3. Complete Business Statistics | 7th Edition: Publisher(s): McGraw Hill, Author: Amir Aczel (Author), Jayavel Sounderpandian (Author), P Saravanan (Author)
4. Marketing Analytics: Data-Driven Techniques with Microsoft Excel: Publisher(s): Willey, Author: y Wayne L. Winston

Who can apply?

ME/MTech, BE/BTech. Msc/MS (Data Science), Computer Science, Mathematics, Statistics, MCA, MA in economics, MBA

Pre-requisites:

Basic knowledge of statistics, mathematics

Course Fee: Rs. 15,000/- + 18% GST

Online Seats are Limited to 100

Online Classes using Microsoft Teams

Schedule: Sunday (10.00PM to 1.00PM) - Online only

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.

IMPORTANT DATES			
Opening of application portal		**25 Nov 2024**	Monday
Receipts of application along with fees (up to)	From To	**25 Nov 2024** **30 Nov 2024**	Monday Saturday
Classes Commence	To	**06 January 2025**	Monday
Final Exams	From To	**05 May 2025** **10 May 2025**	Monday Saturday

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.