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<th>Page No.</th>
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<td>Proforma for Certificate</td>
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</tbody>
</table>

### REGULAR COURSES

<table>
<thead>
<tr>
<th></th>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Innovative Product Development and Design Methods (Mon)</td>
<td>2+0</td>
</tr>
<tr>
<td>2</td>
<td>Project Management (Mon)</td>
<td>2+0</td>
</tr>
<tr>
<td>3</td>
<td>Basics of Nanoscience and Nanotechnology (Mon-Wed)</td>
<td>3+0</td>
</tr>
<tr>
<td>4</td>
<td>Commercializing IP (Tue)</td>
<td>2+0</td>
</tr>
<tr>
<td>5</td>
<td>Foundations of Internet of Things (Tue)</td>
<td>2+0</td>
</tr>
<tr>
<td>6</td>
<td>Design Thinking and Innovation (Tue)</td>
<td>2+0</td>
</tr>
<tr>
<td>7</td>
<td>Analysis and Design of Composite Structures (Tue)</td>
<td>2+0</td>
</tr>
<tr>
<td>8</td>
<td>Mathematical Models and Algorithms for Image Processing &amp; Computer Vision (Sat)</td>
<td>3+0</td>
</tr>
<tr>
<td>9</td>
<td>Business Analytics with Management Science Models and Methods (Tue-Thur)</td>
<td>3+0</td>
</tr>
<tr>
<td>10</td>
<td>Embedded System on ARM Platform (Wed)</td>
<td>2+0</td>
</tr>
<tr>
<td>11</td>
<td>Vibration and Noise: Theory and Practice (Wed)</td>
<td>2+0</td>
</tr>
<tr>
<td>12</td>
<td>Introduction To Numerical Grid Generation &amp; Fluid Flow Computations (Wed)</td>
<td>2+0</td>
</tr>
<tr>
<td>13</td>
<td>Internet of Things: Sensors to Cyber Systems (Thur)</td>
<td>2+0</td>
</tr>
<tr>
<td>14</td>
<td>Modern Techniques in Materials Characterization (Thur)</td>
<td>2+0</td>
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<tr>
<td>15</td>
<td>Deep Learning: Theory and Practice (Thur)</td>
<td>2+0</td>
</tr>
<tr>
<td>16</td>
<td>Online Course on Deep Learning: Theory and Practice (Thur)</td>
<td>3+0</td>
</tr>
<tr>
<td>17</td>
<td>Product Prototyping in IoT (Thur)</td>
<td>2+0</td>
</tr>
<tr>
<td>18</td>
<td>Structural Analysis &amp; Design Optimization: Theory and Practice (Fri)</td>
<td>2+0</td>
</tr>
<tr>
<td>19</td>
<td>Basics of Finite Element Analysis (Fri)</td>
<td>2+0</td>
</tr>
<tr>
<td>20</td>
<td>Basics of Data Analytics (Sat)</td>
<td>2+0</td>
</tr>
<tr>
<td></td>
<td>Course Title</td>
<td>Credits</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>21</td>
<td>Online Course on Basics of Data Analytics (Sat)</td>
<td>2+L</td>
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<td>22</td>
<td>Nonlinear Finite Element Method (Sat)</td>
<td>2+0</td>
</tr>
<tr>
<td>23</td>
<td>IPR Management (Sat)</td>
<td>2+0</td>
</tr>
<tr>
<td>24</td>
<td>Introduction to Industrial Design (Sat)</td>
<td>3+0</td>
</tr>
<tr>
<td>25</td>
<td>Reinforcement Learning (Sat)</td>
<td>3+0</td>
</tr>
<tr>
<td>26</td>
<td>DSP-Algorithms, Architecture and Applications (Sat)</td>
<td>2+0</td>
</tr>
<tr>
<td>27</td>
<td>Smart Design Methods and Processes in Automotive Industry (Sat)</td>
<td>3+0</td>
</tr>
<tr>
<td>28</td>
<td>Computational Machine Learning (Sat)</td>
<td>3+C</td>
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<tr>
<td>29</td>
<td>Basic Concepts of Finite Element Method (Sat)</td>
<td>2+0</td>
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<td>30</td>
<td>Basics of Machine Learning (Sat)</td>
<td>2+0</td>
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<td>31</td>
<td>Power System Prototyping (Sat)</td>
<td>2+0</td>
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<td>32</td>
<td>Principles and Applications in Genetic Engineering (Sat)</td>
<td>2+0</td>
</tr>
<tr>
<td>33</td>
<td>Biopharmaceutical Technology and Drug Development (Sat)</td>
<td>2+0</td>
</tr>
</tbody>
</table>
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 a 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

<table>
<thead>
<tr>
<th>Grade</th>
<th>A</th>
<th>A+</th>
<th>B+</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F (Fail)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade Points</td>
<td>10</td>
<td>9</td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>

**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-PROFICIENCY 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 work station with a variety of latest software have been set up for the CCEPROFICIENCY 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-PROFICIENCY participants can avail 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 of this facility by producing their ID card issued by CCE-PROFICIENCY.

**Timings:** IISc. Library – 8.00 am - 9.00 pm
INSTRUCTIONS

HOW TO APPLY:
Details of the courses are available online at cce.iisc.ernet.in and also download CCE App from Google Playstore. 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 online portal of CCE. Please read all the instructions provided at our portal before applying. Payment of course fee is through 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: Week days 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 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 FEE
Refund of 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 minimum 3-4 weeks.

NUMBER OF SEATS
Number of seats are limited for each course and once the seats are full, the online application portal closes the registration for the course automatically. Seats are filled on first come first server basis provided the applied candidate meets the desired pre-requisite of the course.

CLASSES
Classes will be held in the Lecture Hall Complex of IISc. 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 Saturday’s

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 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
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the Course</th>
<th>Credit</th>
<th>Faculty</th>
<th>Department</th>
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<tbody>
<tr>
<td>1.</td>
<td>Innovative Product Development and Design Methods (Mon)</td>
<td>2+0</td>
<td>Dr. J E Diwakar (Retd.) &amp; Prof. P. Achutha Rao (Retd.)</td>
<td>CPDM &amp; NID R&amp;D Campus</td>
</tr>
<tr>
<td>2.</td>
<td>Project Management (Mon)</td>
<td>2+0</td>
<td>Dr. S Dasappa &amp; Prof. TVP Chowdry</td>
<td>CGPL &amp; CST</td>
</tr>
<tr>
<td>3.</td>
<td>Basics of Nanoscience and Nanotechnology (Mon-Wed)</td>
<td>2+0</td>
<td>Dr. Sanjeev Kumar Shrivastava</td>
<td>CeNSE</td>
</tr>
<tr>
<td>4.</td>
<td>Commercializing IP (Tue)</td>
<td>2+0</td>
<td>Dr. R N Narahari &amp; Dr. Vijay Mishra</td>
<td>CeNSE</td>
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<tr>
<td>5.</td>
<td>Foundations of Internet of Things (Tue)</td>
<td>2+0</td>
<td>Dr. Vijay Mishra</td>
<td>CeNSE</td>
</tr>
<tr>
<td>6.</td>
<td>Design Thinking and Innovation (Tue)</td>
<td>2+0</td>
<td>Dr. J E Diwakar (Retd.) &amp; Prof. P. Achutha Rao (Retd.)</td>
<td>CPDM &amp; NID R&amp;D Campus</td>
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<tr>
<td>7.</td>
<td>Analysis and Design of Composite Structures (Tue)</td>
<td>2+0</td>
<td>Dr. G Narayana Naik</td>
<td>AE</td>
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<td>8.</td>
<td>Mathematical Models and Algorithms for Image Processing &amp; Computer Vision (Sat)</td>
<td>3+0</td>
<td>Dr. Kunal Narayan Choudhury</td>
<td>EE</td>
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<tr>
<td>9.</td>
<td>Business Analytics with Management Science Models and Methods (Tue-Thur)</td>
<td>3+0</td>
<td>Dr. M Mathirajan</td>
<td>MS</td>
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<tr>
<td>10.</td>
<td>Embedded System on ARM Platform (Wed)</td>
<td>2+0</td>
<td>Mr. Haresh Dagale</td>
<td>DESE</td>
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<tr>
<td>11.</td>
<td>Vibration and Noise : Theory and Practice (Wed)</td>
<td>2+0</td>
<td>Dr. S B Kandagal</td>
<td>AE</td>
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<tr>
<td>12.</td>
<td>Introduction To Numerical Grid Generation &amp; Fluid Flow Computations (Wed)</td>
<td>2+0</td>
<td>Dr. P S Kulkarni</td>
<td>AE</td>
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<tr>
<td>13.</td>
<td>Internet of Things: Sensors to Cyber Systems (Thur)</td>
<td>2+0</td>
<td>Dr. Vijay Mishra</td>
<td>CeNSE</td>
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<td>14.</td>
<td>Modern Techniques in Materials Characterization (Thur)</td>
<td>2+0</td>
<td>Dr. Suresha S J</td>
<td>CeNSE</td>
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<tr>
<td>15.</td>
<td>Deep Learning: Theory and Practice (Thur)</td>
<td>2+0</td>
<td>Dr. Sriram Ganapathy</td>
<td>EE</td>
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<tr>
<td>16.</td>
<td>Online Course on Deep Learning: Theory and Practice (Thur)</td>
<td>2+L</td>
<td>Dr. Sriram Ganapathy</td>
<td>EE</td>
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<tr>
<td>17.</td>
<td>Product Prototyping in IoT (Thur)</td>
<td>2+0</td>
<td>Dr. Vijay Mishra &amp; Mr Ganesh Hassan</td>
<td>CeNSE &amp; Founder &amp; MD Flux Gen Engg. Tech Pvt. Ltd. B’luru.</td>
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<tr>
<td>18.</td>
<td>Structural Analysis and Design Optimization: Theory and Practice (Fri)</td>
<td>2+0</td>
<td>Dr. S B Kandagal</td>
<td>AE</td>
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<tr>
<td>19.</td>
<td>Basics of Finite Element Analysis (Fri)</td>
<td>2+0</td>
<td>Dr. R Vidhyasagar</td>
<td>Civil Engineering</td>
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<tr>
<td>20.</td>
<td>Basics of Data Analytics (Sat)</td>
<td>2+0</td>
<td>Dr. Gopal Krishna Sharma, Dr. Badarinath Ambati &amp; Prof. M Sekhar</td>
<td>Fiserv India Ltd., Altair Engineering, &amp; Civil Engg.</td>
</tr>
<tr>
<td>21.</td>
<td>Online Course on Basics of Data Analytics (Sat)</td>
<td>2+L</td>
<td>Dr. Gopal Krishna Sharma, Dr. Badarinath Ambati &amp; Prof. M Sekhar</td>
<td>Fiserv India Ltd., Altair Engineering, &amp; Civil Engg.</td>
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<tr>
<td>Course Code</td>
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<td>Credits</td>
<td>Instructor(s)</td>
<td>Affiliation</td>
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<td>---------------------------------------------------</td>
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</tr>
<tr>
<td>22</td>
<td>Nonlinear Finite Element Method (Sat)</td>
<td>2+0</td>
<td>Prof. P C Pandey (Retd.) IISc.</td>
<td>Distinguished Prof. Gitam Univ.</td>
</tr>
<tr>
<td>23</td>
<td>IPR Management (Sat)</td>
<td>2+0</td>
<td>Dr. R N Narahari</td>
<td>CeNSE</td>
</tr>
<tr>
<td>24</td>
<td>Introduction to Industrial Design (Sat)</td>
<td>3+0</td>
<td>Dr. J E Diwakar, (Retd.) Prof. P. Achutha Rao, (Retd.) &amp; Prof. TVP Chowdry</td>
<td>CPDM, NID R&amp;D Campus &amp; CST</td>
</tr>
<tr>
<td>25</td>
<td>Reinforcement Learning (Sat)</td>
<td>3+0</td>
<td>Prof. Shalabh Bhatnagar</td>
<td>CSA</td>
</tr>
<tr>
<td>26</td>
<td>DSP-Algorithms, Architecture and Applications (Sat)</td>
<td>2+0</td>
<td>Mr. M Krishna Kumar (Retd.)</td>
<td>DESE</td>
</tr>
<tr>
<td>27</td>
<td>Smart Design Methods and Processes in Automotive Industry (Sat)</td>
<td>3+0</td>
<td>Prof. Anindya Deb &amp; Mr. Kalyan Kumar K V</td>
<td>CPDM &amp; Founder &amp; Director Abhiyantara Technologies</td>
</tr>
<tr>
<td>28</td>
<td>Computational Machine Learning (Sat)</td>
<td>3+C</td>
<td>Mrs. Anandi Giridharan &amp; Dr. Vijay Kumar B P</td>
<td>ECE &amp; MSRIT</td>
</tr>
<tr>
<td>29</td>
<td>Basic Concepts of Finite Element Method (Sat)</td>
<td>2+0</td>
<td>Prof. P C Pandey (Retd.) IISc.</td>
<td>Distinguished Prof. Gitam Univ.</td>
</tr>
<tr>
<td>30</td>
<td>Basics of Machine Learning (Sat)</td>
<td>2+0</td>
<td>Dr. Gopal Krishna Sharma, Dr. Badarinath Ambati &amp; Prof. M Sekhar</td>
<td>Fiserv India Ltd., Altair Engineering, &amp; Civil Engg.</td>
</tr>
<tr>
<td>31</td>
<td>Power System Protection (Sat)</td>
<td>2+0</td>
<td>Dr. Sarasij Das</td>
<td>EE</td>
</tr>
<tr>
<td>32</td>
<td>Principles and Applications in Genetic Engineering (Sat)</td>
<td>2+0</td>
<td>Dr. N Ravi Sundaresan</td>
<td>MCB</td>
</tr>
<tr>
<td>33</td>
<td>Biopharmaceutical Technology and Drug Development (Sat)</td>
<td>2+0</td>
<td>Dr. N Ravi Sundaresan</td>
<td>MCB</td>
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</table>
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 = Lecture Hours per week

$C Stands for Computer Laboratory

$L Stands for Online Course
1. Innovative Product Development and Design Methods (2+0)

Objectives:
The globalization and digital connectivity have forced many organizations to look at the way new products are to be developed for customer acceptance in the changed competitive “global village”. Proven methods of the past which made many companies succeed in the “Sellers’ Market” are no longer valid. The organizations have to develop new approaches for design and innovation to meet the challenges of technology explosion and to increase the speed of development.

There is an urgent need to adopt integrated innovative product development strategies to meet the ever-changing customer expectations. This Course, through theory classes, aims to look at these issues and create an awareness of innovative product development process and various design methods to achieve success.

Syllabus:
- Creativity and Innovation
- Integrated Product Development
- Product Design
- Industrial design
- Quality Function Deployment
- Value Engineering
- Design to Cost
- Design for Assembly and Manufacture
- Design for Service
- Failure Modes and Effects Analysis
- TRIZ (systematic Innovation) - Overview
- Concept Generation Methods
- Concept Selection Methods

Target Group:

Faculty:
Dr. J E Diwakar (Retd.)
CPDM.,
IISc., Bengaluru.
Email: jed@iisc.ac.in

Prof. P Achutha Rao
Retired from NID R & D Campus,
Bengaluru.
E-Mail: raopanambur@gmail.com

Reference Books
2. Winning at New Products, Robert G Cooper; Basic Books, 2011

Who Can apply?
Graduation in Engineering, MANAGEMENT

Course Fee: Rs. 10,000/-

Schedule: Monday’s 6.00 p.m. to 8.00 p.m.
2. Project Management (2+0)

Objective

This course is envisaged to develop the competences and skills for planning, scheduling and controlling projects. This course provides a systematic and through introduction to all aspects of project management.

Students explore project management with a practical, hands-on approach through case studies and class exercises.

The knowledge and skills gained in this course will help in Project Management Institute’s (PM) Project Management Professional (PMP) Program.

Syllabus:

- What is Project Management
- Organizing Project Management Office & Term
- Project Planning
  - Work Break Down Structure
- Project Budgeting
  - Cost Estimation
- Project Scheduling
  - Gantt Chart
  - PERT/CPM
- Project Resource Allocation
  - Fast Tracking-Crashing
  - Resource Loading & Leveling
- Project Management & Controlling
  - Earned Value
  - Scope Creep and Change Control
- Project Evaluation & Termination

Target Group:

Practicing Engineers, Scientists, R&D Managers, Construction Managers, Architects, Designers, Professionals from knowledge & IT Industries, Entrepreneurs.

Faculty:

**Dr. S Dasappa**
Dept. of CGPL.,
IISc., Bengaluru.
Email: dasappa@iisc.ac.in

Faculty:

**Prof. TVP Chowdry**
Project Scientist CST
E mail: tvpchowdry@gmail.com

Reference Books:

1. Meredith R Jack, Mantel J Samuel, Shafer M Scott, Sutton M Margaret and Gopalan M R,

Who Can apply?

Graduation in Engineering//Architecture/Design or any Post Graduation

Course Fee: Rs. 10,000/-

Schedule: Monday’s : 6.00 pm. to 8.00 pm
### 3. Basics of Nanoscience and Nanotechnology (3+0)

**Objectives:**
The field of nanoscience and nanotechnology in which the manipulation of matter on an atomic, molecular and supramolecular scale and is used to obtain entirely new configuration and materials behavior.

Nanotechnology and nanoscience are broad and interdisciplinary areas that include (bio) chemistry, physics, biology, materials science, electrical and electronics engineering and more.

The course main objective is to enhance, original, and innovative thinking.

The course encourages diverse group work, constructing international 'think tank' for the creation of new ideas.

The main objectives of this course are:
1. To understand the fundamentals of Nanoscience Nanotechnology
2. To give a general overview of different classes of Nanomaterials
3. To impart basic knowledge on various synthesis and characterization techniques involved in Nanotechnology
4. To make the learner familiarize with nanotechnology prospective

**Syllabus:**
- Basic concepts of Nanoscience and Nanotechnology (9 hours)
- Different classes of Nanomaterials (9 hours)
- Overview of Fabrication and characterization techniques (15 hours)
- Research Trends & IP Protection (3 hours)
- Various Applications (3 hours)
- How to prepare good research proposal? (3 hours)
- A tour to the National Nano Fabrication and Characterization facilities at CeNSE (3 hours)

**Target Group:**
Faculty teaching undergraduates courses on Science and Engineering
Undergraduate students (BE/MSc)/PhD students

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### Faculty:

**Dr. Sanjeev Kumar Shrivastava** (PhD, IIT Delhi)
National Coordinator & Chief Operating Officer (I-STEM &INUP)
Project Management Office,
Centre for Nano Science and Engineering,
IISc., Bengaluru
Email: sanjeevs@iisc.ac.in.

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### Reference Books

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### Who Can apply?
B.E/ B.Tech./ M.Sc./Faculty Teaching Similar Courses in Engineering Colleges.

### Course Fee:
Rs. 15,000/-

### Schedule:
Monday – Wednesday- 6.00 p.m to 7.30 p.m.
4. Commercializing Intellectual Property (IP) (2+0)

**Objectives:**
Introduction to the broad field of Intellectual Property Rights (IPR) in brief including Indian IP laws. To train participants-Scouting for IP in research work; patents genesis to current day trend, drafting provisional/final specs. Forms of IP. Strategic decision on PCT filing, creation of business proposal and commercialization of IP/start up.

**Syllabus:**
Scouting for IP in the research work; Discovery V/s invention. Inventive ideas to vendible products with IP Protection. Various types of IP: patent drafting, strategic decision of filing PCT application, creation of business proposal-stages of product development of finances, startup initiatives, registration of company and so on.

**Target Group:**
All interested in creating and commercializing IP.

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<tr>
<th>Faculty:</th>
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<tbody>
<tr>
<td><strong>Dr. R.N. Narahari</strong></td>
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<tr>
<td>CeNSE</td>
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<tr>
<td>IISc., Bengaluru.</td>
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<tr>
<td>Email: <a href="mailto:naraharirn@iisc.ac.in">naraharirn@iisc.ac.in</a></td>
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<th>Faculty:</th>
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<tr>
<td><strong>Dr. Vijay Mishra</strong></td>
</tr>
<tr>
<td>CeNSE., IISc., Bengaluru</td>
</tr>
<tr>
<td>Email: <a href="mailto:vijaymishra@iisc.ac.in">vijaymishra@iisc.ac.in</a></td>
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</table>

**Reference Books**
1. Linda Pison, *Anatomy of a Business* Published by out of your mind … into market place, Cal., USA 2008.

2. Taraporevala, V J  

1. Prabudheha R Ganguli,  

**Who Can apply?**
BE/B.Tech./Master .in Science/Commerce.

**Course Fee:** Rs. 10,000/-

**Schedule:** Tuesday’s - 6.00 p.m. to 8.00 p.m.
### 5. Foundations of Internet of Things (2+0)

**Objectives:**
- To teach basic concepts and practices in development of IoT Prototypes for real world applications.

**Syllabus:**
- Introduction to IoT and IoT Business Scenario
- IoT Architecture and concepts
- Enabling technologies of IoT revolution
- Signal processing, as well as other aspects of digital and wireless communication systems
- Circuit design and performance
- The components of embedded systems
- Web applications and computer security risks that can be related to IoT devices
- Sensor/Actuators

**Target Group:**
All Engineers and Scientists in Industry and Research Organizations, who have a state in Charting the Organizational Strategy.

**Faculty:**

Dr. Vijay Mishra  
CeNSE.,  
IISc., Bengaluru.  
Email: vijaymishra@iisc.ac.in

**Reference Books**

1. Ammar Rayes, Samer Salam,  
   Internet of Things from Hype to Reality:  
   The Road to Digitization, Springer;  
   1st Ed. 2017 Edition (2 November 2016),

2. David Johns, Ken Martin ,  
   Analog Integrated Circuit Design,  
   John Wiley and Sons, Inc,

3. Jan M. Rabaey ,  
   Digital Integrated Circuits: A design Perspective,  
   Prentice Hall of India,

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**Who Can apply?**

BE/B.Tech./M.Sc/ or equivalent

**Course Fee:** Rs. 10,000/-

**Schedule:** Tuesday’s - 6.00 p.m. to 8.00 p.m.
6. Design Thinking and Innovation (2+0)

Objectives:
The globalization and technology explosion have thrown new challenges to the most successful organizations. Barriers to competition have fallen precipitously as regulations have eased and markets have become more global. The tools and methods which were useful in the past are not enough to solve complex/wicked problems faced by these organizations due to unpredictability and dynamic global environment. These management tools have actually taken them away from viable competitive positions. A company’s innovation capabilities will determine its future growth potential. Design Thinking has been making waves in the business world. This new approach promises to foster potential 21st century competencies. Design thinking is now known as a creative-problem solving approach designers use to create new values that are different and create positive impact. Design thinking has gained popularity as the approach to innovate. The course will expose the participants, through theory sessions, to the design thinking process and the various proven tools used to achieve innovative, breakthrough solutions to complex problems.

Syllabus:
- Creativity and Innovation
- Design, Design thinking,
  - Empathies
  - Define
  - Ideate
  - Prototype
  - Test
  - Design Thinking in New Product/Service Development
  - Design Thinking Tools.

Target Group:

Faculty:
Dr. J E Diwakar (Retd.)
CPDM.,
IISc., Bengaluru.
Email: jed@iisc.ac.in

Faculty:
Prof. P Achutha Rao (Retd.)
NID R & D Campus,
Bengaluru.
E-Mail: raopanambur@gmail.com

Reference Books
1. Thomas Lockwood,
   Design Thinking: Integrating Innovation, Customer Experience, and Brand Value; Allworth Press; 2009
2. Daniel Ling,
   Complete Design Thinking Guide for Successful Professionals; Create Space Independent Publishing Platform, 2015
3. Tim Brown,
   Change by Design; Harper Business; 2012
4. Michael G. Luchs, K. Scott Swan, Abbe Griffin;
   Design Thinking, New Product Development Essentials from the PDMA; 2015, Wiley.

Who Can apply?
Graduation in Engineering, MANAGEMENT

Course Fee: Rs. 10,000/-

Schedule: Tuesday’s - 6.00 p.m. to 8.00 p.m.
7. Analysis & Design of Composite Structures (2+0)

Objectives:

"Composites are new kind of materials which are finding applications in all fields of Engineering. Many FEM software packages are available for analysis & Design of composites. Simply using FEM packages will be of no use without the knowledge of mechanics of composites. One should first understand the Mechanical behaviour of the Composite Structures before using FEM packages for better quality of professional work and optimum usage of time, computing and human resources. This course will help to achieve the same."

Syllabus:

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

Micromechanics of Composites: Prediction of properties,

Macromechanics of Lamina: The theory of elasticity, Constitutive equations of a lamina, transformations, numerical examples.

Failure theories for composite lamina, numerical examples.


Bending Analysis of Beams.

Analysis of Laminated composite plates: Classical and first order theories, Energy Method, numerical examples.

Buckling analysis of plates.

Design of laminates using Carpet plots, AML plots and numerical examples on design of composite laminates.

Target Group:

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

2. Fresh Graduates, Post Graduates, Ph.D. Students, Research Fellows, SRFs, JRFs, Project Associates, Project Assistants etc.

Faculty:

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

Reference Books

1. Robert M. Jones,

2. J.N. Reddy,

3. Madhujit Mukhopadhyay,

Who Can apply?

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

Course Fee: Rs. 10,000/-

Schedule: Tuesday’s - 6.00 p.m. to 8.00 p.m.
8. Mathematical Models and Algorithms for Image Processing and Computer Vision (3+0)

**Objectives:**

The course is ideally suited for those who wish to learn in depth about some of the core models and algorithms in image processing and computer vision (IP-CV). The first half of the course will focus on mathematical preliminaries and introduce the participants to classical models and algorithms in IP-CV. The second half will be about state-of-the-art filtering and optimization algorithms, particularly those which are not covered in standard textbooks on IP-CV.

**Syllabus:**

- Broad overview of image processing and computer vision.
- Recap of linear algebra, probability, and optimization.
- Learning and geometry based models.
- Optimization models and algorithms.
- Applications: Computational photography, image reconstruction, image stitching, segmentation, compressed sensing, 3D reconstruction, structure from motion, etc.

**Target Group:**
Research Scholars, Teachers, Engineers, Mathematicians, Computer Scientists and Working Professionals.

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<tr>
<th>Faculty:</th>
<th>Dr. Kunal Narayan Chaudhury</th>
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<tr>
<td></td>
<td>Assistant Professor,</td>
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<td></td>
<td>Department of Electrical Engineering</td>
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<td></td>
<td>IISc, Bengaluru.</td>
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<td>Email: <a href="mailto:kunal@iisc.ac.in">kunal@iisc.ac.in</a></td>
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<th>Reference Books</th>
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<th>Who Can apply?</th>
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<td>BE/BTech (or equivalent)</td>
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| Course Fee: |
| Rs. 15,000/- |

| Schedule: |
| Saturday - 10.00 a.m. to 1.00 p.m. |
## 9. Business Analytics with Management Science Models and Methods (3+0)

### Objectives:
To provide business practitioners and those who are interested in Business 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 a 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

### Target Group:
Today every Business, Industry and Government (BIG) organizations has “Business Analytics’ group to address various problems associated with Prescriptive Analytics,

### Faculty:
**Dr. M Mathirajan**  
Chief Research Scientist,  
Dept. of M S.,  
IISc, Bengaluru.  
Email: msdmathi@iisc.ac.in; drmuthu.mathirajan@gmail.com

### Reference Books:
1. U Dinesh Kumar,  

2. William P Fox,  

3. Abben Asllani,  

4. Stephen G Powell and Kenneth R Baker,  

### Who Can apply?  

### Course Fee:  
Rs. 15,000/-

### Schedule:
*Tuesday & Thursday - 6.00 p.m. to 7.30 p.m.*
# 10. Embedded System on ARM Platform (2+0)

## Objectives:
To Design and Prototype Embedded System using ARM Cortex M3/M4 Microcontroller.

## Syllabus:
Development Toolchain (Coupiel Linker and Debugger), ARM Cortex Processor Architecture, Peripherals, Standalone Application. Intro to RTOS.

## Faculty:
**Mr. Haresh Dagale**  
Principal Research Scientist  
Dept. of ESE (CEDT),  
IISc., Bengaluru  
Email. haresh@iisc.ac.in

## Reference Books:
1. Joseph Yiu  
   Definitive Guide to the ARM Cortex M3.  
2. John Levine  
   Linker & leaders  
3. Jonathan Valvano  

## Who can apply?
BE or MCA

**Pre Requisites:** C Programming Language

**Course Fee:** Rs. 10,000/-

**Schedule:** Wednesday's - 6.00 p.m to 8.00 p.m
### 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 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:
- **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
2. Ewins, D.J.  
3. Gillespie, T.D.,  
4. Beranek, L.L.,  

### Who Can apply?
B.E / ME / MSc./ AMIE OR equivalent

### Course Fee: Rs. 10,000/-

### Schedule: Wednesday’s - 6.00 p.m. to 8.00 p.m.
# 12. Introduction To Numerical Grid Generation & Fluid Flow Computations (2+0)

**Objective:**
To impart basic knowledge in fluid dynamics, and numerical methods used in computational fluid dynamics to a beginner. CFD has become a very important tool in design and analysis. It is necessary to understand the basic concepts of Mesh generation, governing equations of fluid dynamics and numerical methods. To impart certain CFD expertise to a practicing CFD Engineer in an industry.

**Syllabus:**
- Introduction and Relevance of CFD, Governing equations of fluid dynamics and their various levels of approximations; Behaviour of Partial Differential Equations (PDE). Introduction to discretization, Various numerical techniques, FDM and FVM. Time Marching and space Marching methods. Introduction to geometrical aspects of simple and complex bodies; Grid/Mesh generation Methods; Algebraic, PDE based Mesh Generations with examples.

**Target Group:**
Aerospace Industries / National Laboratories/Private sectors involved in Fluid flow studies, Teaching Faculty in colleges.

**Faculty:**
Dr. P S Kulkarni  
Computational Mechanics Lab,  
Dept. of Aerospace Engineering/ JATP, IISc,  
E-mail: psk@aero.iisc.ernet.in / pskdhar@gmail.com

**Reference Books:**
2. Weatherhill N P Grid Generation  

**Who can apply?**
Those with B.E./M.Sc. OR equivalent

**Course Fee:** Rs. 10,000/-

**Schedule:**
Wednesday’s - 6.00 p.m. to 8.00 p.m.
13. Internet of Things: Sensor to Cyber Systems (2+0)

Objectives:
- To teach advanced concepts and practices in development of IoT prototypes to be transformed as Cyber Physical Systems

Syllabus:
- Introduction to IoT and IoT Business Scenario
- IoT Architecture and concepts
- IoT prototypes for real world applications with special reference to Nano sensors
- Biochips, biosensors, implantable systems, and other emerging IoT technology
- Signal processing, as well as other aspects of digital and wireless communication systems
- Circuit design and performance
- The components of embedded systems
- 3D Systems Scaling and their impact on IoT Industry
- Cloud Computing

Target Group:
All Engineers and Scientists in Industry and Research Organizations, who have a state in Charting the Organizational Strategy. Young Entrepreneurs willing to Build IoT based Startups, fresh Engineering/Science Graduates.

Faculty:
Dr. Vijay Mishra
CeNSE.,
IISc., Bengaluru.
Email: vijaymishra@iisc.ac.in

Reference Books
2. G K Ananthasuresh et al., Micro and Smart Systems, 2011, Wiley India

Who Can apply?
BE/B.Tech./M.Sc// MCA. or equivalent

Course Fee: Rs. 10,000/-

Schedule: Thursday’s - 6.00 p.m. to 8.00 p.m.
### 14. Modern Techniques in Materials Characterization (2+0)

**Objectives:**

This course will introduce a range of advanced materials Characterization Techniques, including electron microscopy, atomic force microscopy, spectroscopy and thermal analysis.

Discuss the basic underlying principles, capabilities, limitations and applications of different characterization methods.

Real-world examples of materials characterization will be presented throughout the course, including characterization of thin films, surfaces, interfaces, and nanostructured materials.

**Syllabus:**

Introduction to Structure of Materials, X-ray Diffraction: Principles and Applications, Scanning Electron Microscopy (SEM), Basics of Transmission electron microscopy (TEM) and diffraction, Focused ion beam (FIB), Atomic Force Microscopy and Applications

Electrical resistivity, Hall effect, UV-VIS spectroscopy, FT-IR and Raman spectroscopy

Brief survey on surface characterization (XPS, RBS, SIMS) as well as thermal (DSC, TGA) and mechanical characterization (Nanoindentation, Micro UTM) techniques.

**Target Group:**

Lecturers, Assistant/Associate Professors, (Engineering Colleges), Engineers, Scientist, Research Staffs in industry and Research Organizations.

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<tr>
<td><strong>Dr. Suresha S J</strong></td>
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<tr>
<td>CeNSE., IISc., Bengaluru</td>
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<td>Email: <a href="mailto:sureshasj@iisc.ac.in">sureshasj@iisc.ac.in</a></td>
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</table>

**Reference Books**


2. B.D. Cullity, Elements of X-ray Diffraction, Addison- Wesley Publishing Co Inc. 1978


**Who Can apply?**

B.E/ B.Tech./ M.Sc./M.E/M.Tech./ or equivalent

**Course Fee:** Rs. 10,000/-

**Schedule:** Thursday’s - 6.00 p.m. to 8.00 p.m.
# 15. Deep Learning: Theory and Practice (2+0)

## Objectives:
Introduction to Neural Network. Introduction to Deep Learning, Convolutional Neural Networks, Applications.

## Syllabus:
Basics of Pattern Recognition, Neural Networks and Learning, Deep Learning and Practical Scenarios, Convolutional and Recurrent Network, Applications in Audio, Image, Text.

## Target Group:
Government and Industry interest in broad area of Artificial Intelligence.

## Faculty:
**Dr. Sriram Ganapathy**  
Asst. Prof.,  
Dept. of EE.,  
IISc., Bengaluru.  
E-mail: sriramg@iisc.ac.in

## Reference Books:
1. C Bishop  
   "Neural Networks" 1995  
2. Ian Goodfellow, Yoshua Bengio & Aaron Caurvila  

## Who can apply?
Bachelor of Technology in Electrical, Electronics Or Computer Science.

### Pre-requisites:
Basic Linear Algebra/Matrix basic probability.

### Course Fee: Rs. 10,000/

### Schedule: Thursday’s 6.00 p.m - 8.00 p.m
# 16. Online Course on Deep Learning: Theory and Practice (2+L)

## Objectives:
Introduction to Neural Network. Introduction to Deep Learning, Convolutional Neural Networks, Applications.

## Syllabus:
Basics of Pattern Recognition, Neural Networks and Learning, Deep Learning and Practical Scenarios, Convolutional and Recurrent Network, Applications in Audio, Image, Text.

## Target Group:
Government and Industry interest in broad area of Artificial Intelligence.

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| **Dr. Sriram Ganapathy**  
Asst. Prof.,  
Dept. of EE.,  
IISc., Bengaluru.  
E-mail: [sriramg@iisc.ac.in](mailto:sriramg@iisc.ac.in) |

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| 2. Ian Goodfellow, Yoshua Bengio & Aaron Cauvila  

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<tr>
<td>Bachelor of Technology in Electrical, Electronics Or Computer Science.</td>
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<td>Basic Linear Algebra/Matrix basic probability.</td>
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17. Product Prototyping in IoT (2+0)

Objectives:
Prototyping is one of the most essential skills in this generation. Let it be fixing your table or building your own system at home to make a toy for your child. It doesn't matter if you are an innovator, an engineering student, an entrepreneur or someone with an idea that could help solve the problems of humankind. An Idea alone cannot take you anywhere, but quickly building it and showing out to the world that your idea really works and has the potential to scale is what matters. This course will give you a head start into the world of Product Prototype development in Internet of Things (IoT).

The course is a blend of engineering and business of IoT. It deals with connectivity, building systems to enable delivery of software services networked to the cloud platforms. At the end of the course the students will be in a position to launch an IoT product prototype and a business in IoT.

Syllabus:

Target Group:
Working professionals in Embedded, Automation, R&D, Resource Management, Professionals, Engineering College faculty, Smart Cities and Villages developers, Mobile app developers, Business Development Managers, Technical Sales Engineers, Policy makers, Entrepreneurs and Aspiring Entrepreneurs

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<tbody>
<tr>
<td>Mr. Ganesh Hassan Shankar</td>
<td>Dr. Vijay Mishra</td>
</tr>
<tr>
<td>E-mail: <a href="mailto:sganesh@alum.iisc.ac.in">sganesh@alum.iisc.ac.in</a></td>
<td>Email: <a href="mailto:vijaymishra@iisc.ac.in">vijaymishra@iisc.ac.in</a></td>
</tr>
</tbody>
</table>

Reference Books:
1. Dirk Slama, Frank Puhimann, Jim Morrish & Rishi M Bhatnagar, Enterprise IoT.
2. Rafiq Nanroni, Rapid Prototyping Principles and Applications
3. Daniel Obodovski, Daniel Kellmereit, The Silent Intelligence – The Internet of Things

Who can apply?
B.E / B.Tech. MCA, & MSc. (Physics, Electronics, Computer Science)

Pre-requisites:
Basic Knowledge in Electronics and C Programming

Course Fee: Rs. 10,000/-

Schedule: Thursday’s 6.00 pm - 8.00 pm
## 18. Structural Analysis and Design Optimization: Theory and Practice (2+0)

### Objectives:
Advanced research in material science to enhance the life with reduced cost 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:


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 vehicle and automobiles).

### Target Group:

### 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”,  
2. Shigley, J.E and Mischke, C.R.,  
   “Mechanical Engineering Design”  
3. Johnson Ray, C.  
   “Optimum Design of Mechanical Elements”,  

### Who Can apply?
BE, ME, MSc, AMIE, or equivalent

### Course Fee:
Rs. 10,000/-

### Schedule:
**Friday’s** 6.00 p.m. to 8.00 p.m.
# 19. Basic of Finite Element Analysis (2+0)

**Objectives:**
This is an introductory course which is intended to emphasize the importance of the basics of finite element analysis. This course will be useful to engineers who do not have any formal training in the subject area of finite element analysis. It is believed that it would be of interest to engineers working in industries and consulting firms.

**Syllabus:**

**Introduction:** Problem classification, modeling and discretization, Typical application examples.

**Finite element formulation starting from governing differential equations:** Weighted residual method-use of single continuous trial function, the general weighted residual (WR) statement, Weak (variational) form of the weighted residual statement, comparison of differential equation, weighted residual and weak forms, piece-wise continuous trial function solution of the weak form, one dimensional bar finite element.

**Finite element formulation based on stationary of a functional:** Introduction, functional and differential equation forms, principle of stationary total potential (OSTP) Rayligh-Ritz method, piecewise continuous trial functions-finite element analysis.

**One dimensional finite element:** General form of the total potential for I-D, General form of the finite element equations, the linear bar element, the quadratic bar element, determination of shape functions. Element matrices, beam element, selection of Nodal degrees of freedom, determination of shape functions, element matrices.

**Two dimensional finite element analysis:** Introduction- Dimensionality of a problem approximation of geometry and field variable, simple three nodded triangular element (CST element), four nodded rectangular element, six nodded triangular element, natural coordinates-quadrilateral elements, natural coordinates-triangular elements, 2-D elements for structural mechanics numerical integration, incorporation of boundary conditions.

Element formulation and applications to plane stress, plane strain and axisymmetric problems. Isometric concept, equations solvers, post processing. Hands-on practice using available FEM package.

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**Faculty:**

Dr. R Vidya Sagar  
Principal Research Scientist,  
Dept. of Civil Engineering,  
IISc. Bengaluru.  
E-mail: rvsagar@iisc.ac.in

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**Reference Books:**


2. Chandrupatala, T.R. and Belegundu A.D.  

3. P Seshu,  

4. C S Desai and J F Abel,  
Introduction to the Finite Element Method, CBS Publishers, Delhi.

---

**Who can apply?**

BE/ B.Tech.  
(Civil/Mechanical/Aerospace Engineering)

**Course Fee:** Rs.10,000/-

**Schedule:** Friday’s - 6.00 pm to 8.00 pm
20. Basics of Data Analytics (2+0)

**Objective**

To introduce various aspects of Data Science and prepare the students for future education in advanced topics of data science.

**Syllabus:**

Basics of Probability and Stochastic Processes, Forecasting, Smoothing Techniques, Bivariate and Multivariate Regression, Non Linear Regression, Univariate Data, Auto Correlation and Partial Auto Correlation, Box – Jenkins’s ARIMA, Introduction to AI, Neural Network, Machine Learning and NLP.

**Target Group:** Any Industry dealing with Data.

**Faculty**

- **Dr. Gopal Krishna Sharma**
  - Fiserv India Ltd., Bengaluru.
  - Email: gopaiaks@yahoo.com

- **Dr. Badarinath Ambati**
  - Altair Engineering, Bengaluru.
  - Email: abadarinath@yahoo.com

- **Prof. Muddu Sekhar**
  - Dept. of Civil Engineering, IISc., Bengaluru.
  - Email: madhu@iisc.ac.in

**Reference Books:**


**Who Can apply?**

Any Engineering Degree with Mathematics

**Course Fee:** Rs. 10,000/-

**Schedule:** Saturday’s- 10.00 am to 12.00 Noon
### 21. Online Course on Basics of Data Analytics (2+L)

**Objective**
To introduce various aspects of Data Science and prepare the students for future education in advanced topics of data science.

**Syllabus:**
Basics of Probability and Stochastic Processes, Forecasting, Smoothing Techniques, Bivariate and Multivariate Regression, Non-Linear Regression, Univariate Data, Auto Correlation and Partial Auto Correlation, Box – Jenkins’s ARIMA, Introduction to AI, Neural Network, Machine Learning and NLP.

**Target Group:** Any Industry dealing with Data.

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Faculty</th>
<th>Faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dr. Gopal Krishna Sharma</strong>&lt;br&gt;Fiserv India Ltd., Bengaluru.&lt;br&gt;Email: <a href="mailto:gopalaks@yahoo.com">gopalaks@yahoo.com</a></td>
<td><strong>Dr. Badarinath Ambati</strong>&lt;br&gt;Altair Engineering, Bengaluru.&lt;br&gt;Email: <a href="mailto:abadarinath@yahoo.com">abadarinath@yahoo.com</a></td>
<td><strong>Prof. Muddu Sekhar</strong>&lt;br&gt;Dept. of Civil Engineering, IISc., Bengaluru.&lt;br&gt;Email: <a href="mailto:madhu@iisc.ac.in">madhu@iisc.ac.in</a></td>
</tr>
</tbody>
</table>

**Reference Books:**


**Who Can apply?**
Any Engineering Degree with Mathematics

**Course Fee:** Rs. 15,000/-

**Schedule:** **Saturday’s**- 10.00 am to 12.00 Noon
# 22. Nonlinear Finite Element Method (2+0)

**Objectives:**

This is a second level course covering some advanced topics in Finite Element Analysis. In particular, focus would be on Concepts and techniques of Nonlinear Finite element Analysis in this course.

Nonlinear FEM techniques are usually not covered in the first course of FEM. The FEM treatment of Nonlinear problems requires additional background of the inelastic behavior of materials and nonlinear-mechanics for better understanding but, such options are generally not available to graduate engineers or even to post-graduates. However, practicing engineers, especially structural analysts and designers, usually come across many practical problems which require nonlinear finite element analysis. Most of the commercial packages do have nonlinear analysis facilities. However, even to use such packages a good understanding of Nonlinear Finite Element analysis techniques is required. The objective of this course is to introduce basic concept of nonlinear finite element analysis with reference to solid mechanics applications. Bucklings are included.

**Syllabus:**


**Faculty:**

Prof. P. C. Pandey (Retd. IISc.)  
Distinguished Professor, GITAM University,  
E-mail: profpcpandey@yahoo.com / pcpandey@iisc.ac.in

**Reference Books:**

1. Cook, R. D., et.al,  
   Concepts & Applications of Finite Element Analysis,  
   John Wiley & Sons, 2002 (IV Ed)

2. Zienkiewicz, O. C., and Taylor, R. L.,  
   The Finite Element Method, V Edn., Vol 1 & 2,  

3. Reddy, J. N.  
   An Introduction to Nonlinear Finite Element Analysis,  
   Oxford University Press Inc,  

**Who can apply?**

BE/ B.Tech.  
(Civil/Mechanical/Aerospace), OR equivalent

**Pre-requisites:**

Basic knowledge of Solid Mechanics. An Exposure to Basic Finite Element Method

**Course Fee:** Rs.10,000/-

**Schedule:** Saturday’s – 10 am to 12 noon
# 23. Reinforcement Learning (3+0)

**Objectives:**
Teach Students about this emerging field of Reinforcement Learning because of its wide applicability.

**Syllabus:**
Introduction to Reinforcement learning, Multi-armed bandits, Finite Markov decision processes, Dynamic Programming, Monte-Carlo Methods, Temporal difference methods, on-policy prediction and control.

**Target Group:**
All People interested in Artificial Intelligence in Industry as well as Academia should find the course useful.

<table>
<thead>
<tr>
<th>Faculty:</th>
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<tbody>
<tr>
<td><strong>Prof. Shalabh Bhatnagar</strong></td>
</tr>
<tr>
<td>Chairman, Dept. of CSA, IISc.</td>
</tr>
<tr>
<td>E-mail: <a href="mailto:shalabh@iisc.ac.in">shalabh@iisc.ac.in</a></td>
</tr>
</tbody>
</table>

**Reference Books**

1. R. S. Sutton and A. G. Barto  
   Reinforcement learning: An Introduction,  
   MIT Press, 2018

2. D. P. Bertsekas and J. N. Tsitsiklis  
   Neuro-Dynamic Programming, 1996

**Who can apply?**
B.Tech

**Course Fee:** Rs. 15,000/-

**Schedule:** Saturday’s 10am to 1 pm
24. Introduction to Industrial Design (3+0)

Objective

“Industrial Design” is one of the youngest professions gaining recognition as a differentiator to survive and grow in the competitive global market. Professional Industrial Designers are in great demand in all sectors of industry today. Graduate and postgraduate courses are offered in India and abroad on Industrial Design and allied fields. In this Course, the Students are Introduced to what Industrial Designers do, how they contribute to be innovative and create great products. Industrial Designers bring new perspectives based on understanding of the users’ real needs and the context in which they use the products, and help develop products which meet users’ aspirations and contribute for the improvement of quality of life. They follow a proven process to identify opportunities and develop concepts to meet the challenges.

This course serves as an introduction to the world of industrial design and its wide-ranging applications. The students will learn about the history of design, design methodology, product ergonomics, developing successful products through lectures, discussions. The students are expected to do a lot of exercises in the classes and at home to get a good understanding of the topics. Ability in free hand sketching is necessary.

Syllabus:

- Innovation, Creativity, Embedded Mindset to Creative Thinking. Barriers to Creativity.
- History of Design
- Industrial Design-Yesterday, Today and Tomorrow.
- Design Communication
- Product Design Process/ Methodology
- Elements of Design
- Principles of Design
- Materials & Manufacture
- Product Ergonomics

Target Group:

Practicing Engineers, Managers Responsible for developing engineering services, Professional in Design and Development in Industries, R & D Organizations etc., Academic Personal in teaching/practicing Product design/Service design, Product engineering, Design and Development and fresh engineers interested in Design and Innovation; Start up entrepreneurs.

Faculty:

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Dept. of CPDM., IISc., Bengaluru.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. J. E. Diwakar</td>
<td>Email: <a href="mailto:jed@iisc.ac.in">jed@iisc.ac.in</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Faculty</th>
<th>NID R &amp; D Campus.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prof. P. Achutha Rao (Retd.)</td>
<td>Email: <a href="mailto:raoparambur@gmail.com">raoparambur@gmail.com</a></td>
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</table>

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Project Scientist CST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prof. TVP Chowdry</td>
<td>E-mail: <a href="mailto:tvpchowdry@gmail.com">tvpchowdry@gmail.com</a></td>
</tr>
</tbody>
</table>

Reference Books:


Who Can apply?

Graduation in Engineering, Architecture, Management with a flair for arts and free hand sketching.

Course Fee: Rs. 15,000/-

Schedule: Saturday’s: 10.00 am. to 1.00 pm
<table>
<thead>
<tr>
<th><strong>Objective:</strong></th>
<th>To give insight to Engineers in Digital Signal Processing Fundamentals Algorithms &amp; Architecture for various Applications</th>
</tr>
</thead>
</table>
| **Syllabus:**  | - Fundamental of DSP  
- Various Algorithms and that would suit different Signal Processing Applications like include Image Processing, Data Compression etc. |
| **Target Group:** | All Research and Hardware Organisations like BEL, Texas, BOSCH etc. |

| **Faculty:** | Mr. M Krishna Kumar (Retd.),  
Dept. of ESE (CEDT),  
IISc., Bengaluru  
Email. mkkumarcedt@gmail.com |

| **Reference Books:** |  
1. Markovien,  
Practical Signal Processing  
2. Keshab Parhi,  
VLSI Signal Processing Architecture  
3. Sen M.Kno & Gau warg Sen,  
DSP Processors and Architectures |

<table>
<thead>
<tr>
<th><strong>Who can apply?</strong></th>
<th>BE or MCA</th>
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</thead>
<tbody>
<tr>
<td><strong>Pre Requisites:</strong></td>
<td>Practical knowledge in Electronics + Programming in ‘C’ Language</td>
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<tr>
<td><strong>Course Fee:</strong></td>
<td>Rs. 10,000/-</td>
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<tr>
<td><strong>Schedule:</strong></td>
<td>Saturday’s - 12.00 pm - 2.00 pm</td>
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</tbody>
</table>
26. Smart Design Methods and Processes in Automotive Industry (3+0)

Objectives:
- In depth training on design methods in Automotive industry
- Industry design methods in the area of automotive design viz. Vehicle dynamics, Chassis, chassis aggregates, Automotive body and Vehicle architecture and packaging.
- Overall, this program is designed to enhance the understanding of design processes and methods for young design engineers when they get employed in the Industry.

Syllabus:
1. Introduction to Smart Design Methods and Processes in Automotive Industry
   - Why “Smart Design Methods” required in the Automotive Industry?
   - Motivation: Design in Automotive Industry
   - Importance of time to Market
   - Challenges in Automotive Industry
   - “Simultaneous Engineering
   - Contact of Design/Information Management
   - What is Process? What is Design Process? VDI 2221
   - Views of the Experts involved in Design
   - Outline of the Automotive Development Process
   - Key Factors in Automotive Engineering
   - Process Optimization

2. Introduction to Automotive Domain Processes
   - Overview of Passenger car Portfolio
   - Overview of Truck Portfolio

3. Introduction to Manufacturing Processes
   - Casing Design
   - Sheet Metal Design

4. Introduction to Vehicle dynamics
   - Longitudinal
   - Lateral
   - Vertical

5. Automotive Chassis and Aggregates Design
   - Chassis frame design
   - Suspension systems
   - Steering systems
   - Braking systems

6. Automotive Power Train Design
   - Automotive Engine
   - Basics of Automotive Engine Design
   - Engine-Cylinder Block Design
   - Engine-Cylinder Head Design
   - Engine-Connecting Rod Design
   - Engine-Piston Design
   - Engine Subsystems

7. Automotive Body Design/BIW

8. CAE Applications in Automotive Design

Target Group:
- Trainee Engineers from Automotive OEM R&D Centers (Eg. GM, FORD, Mercedes-Benz and others)
- Trainee Engineers from Engineering Service Providers (Eg. TCS, L&T Technologies, Infotech and others)
- Fresh graduates from Engineering Colleges looking for Employment in above Companies

Faculty:
- Prof. Anindya Deb
  Professor,
  Dept. of CPDM, IISc.
  Email: gdeb@iisc.ac.in

Faculty:
- Mr. Kalyan Kumar K.V
  Founder & Director
  Abhiyantara Technologies
  Bengaluru -94.
  Email: kalyan.kumar@abhiyantara.com

Reference Books:
3. Internet Sources in Public Domain.

Who can apply?
B.E./B.Tech./M.Tech (Mechanical, Automobile and IP)

Course Fee: Rs. 15,000/-
Schedule: Saturday’s: 1.00 pm to 4.00 pm.
### 27. Computational Machine Learning (3+C)

#### Objectives:
- Learn machine learning, deep learning concepts.
- Provide hands-on training so that students can write applications in AI.
- Provide ability to run real machine learning production examples.
- Understand programming techniques that underlie the production software.
- Provide a jump-start to a great career in AI.
- Provide ability to make the right career choices, and gain exposure to the vast and varied opportunities.
- Help take up research positions in academia or venture into start-up world or get into positions in large enterprises.

#### Syllabus:
1. Fundamentals of Machine Learning and Basic theory on Machine Learning
2. Learning Algorithms: Mathematical aspects
3. Learning Julia: arrays, broadcasting, indexing, concatenation, linear algebra etc.
4. Unsupervised machine learning including SVD, PCA, etc.
5. Deep Learning and Back propagation
6. Multi-layer perceptrons
7. Data preparation and cleansing techniques
8. Convolutional Neural Nets
9. Recurrent Neural Networks
10. Applications speech, natural language processing, handwriting recognition.

#### Target Group:
Enterprise/Graduate Students, R&D groups & Industry

#### Faculty:
- **Mrs. Anandi Giridharan**  
  PRS., Dept. of ECE., IISc., Bengaluru.  
  Email: anandi@iisc.ac.in
- **Dr. Vijaya Kumar B P**  
  Professor and Head, Information Science and Engineering, MSRIT., Bengaluru.  
  Email: vijaykbpi@yahoo.co.in, vijay.beekan@gmail.com

#### Reference Books
1. Avik Sengupta, Packt

#### Who can apply?
Any Engineering Graduate with atleast 2 courses in Mathematics and course in basic programming.

#### Pre-requisites:
Basic Programming and Basics of Linear Algebra

#### Course Fee: Rs. 20,000/-

#### Schedule: Saturday’s – 1.00 pm. to 4.00 p.m.
# 28. IPR Management (2+0)

## Objectives:
To introduce participants to the broad field of Intellectual Property Rights (IPR), in brief on Indian IP laws. Scouting for IP in research. This course aims to impart theoretical and practical aspects of IP Creation, Protection and commercialization - patents in particular.

## Syllabus:
Scouting for IP in the research work; Discovery V/s invention. Inventive ideas to vendible products with IP Protection. Various types of IP; inculcating IP culture in an academic environment. Patenting an Invention – disclosure to drafting claims. Avenues of commercialization of IP.

## Target Group:
All engineers and scientists in R&D establishments and industry who have a stake in creating IP.

## Faculty:
**Dr. R.N. Narahari**  
CeNSE  
IISc., Bengaluru.  
Email: naraharirn@iisc.ac.in

## Reference Books
1. Universal’s “Intellectual Property Laws” 2017  

## Who Can apply?
B.E./ B.Tech./ Masters in Science/Commerce.

## Course Fee:  Rs. 10,000/-

## Schedule: Saturday’s - 2.00 p.m. to 4.00 p.m.
29. Basic Concepts of Finite Element Method (2+0)

Objectives:
This is a foundation course in Finite Element Method (FEM) aimed at Civil, Mechanical and Aerospace Engineering professionals. In particular, it would be beneficial to engineers who do not have any formal training in FEM, even though they may have skill to use a FEM package. The course is designed to provide a basic introduction to FEM with emphasis on stress and structural analysis. It is believed that it would be of interest to engineers working in industries, consulting firms and teachers of engineering colleges.

Syllabus:
Concept of Stiffness and Flexibility in structural analysis. Basic foundations of elasticity and energy principles. Introduction to displacement based FEM with reference to continuum and skeletal structures. Element formulation and Applications to Plane stress, Plane strain, Axisymmetric and 3-D problems. Isoparametric concept, equation solvers, Post-processing. Adaptivity, Programming and Computational aspects as well as practical applications would be discussed.

Faculty:
Prof. P. C. Pandey (Retd. IISc.)
Distinguished Professor, GITAM University,
E-mail: profpcpandey@yahoo.com / pcpandey@iisc.ac.in

Reference Books:
5. Logan Daryl L
   A first Course in Finite Element Method Thomson,
   5th Edition 2012..
6. Chandrupatala, T.R. and Belegundu A.D.
   Introduction to Finite Elements in Engineering,
7. Cook, R.D. et.al.
   Concept and Applications of Finite Element Analysis,

Who can apply?
BE/ B.Tech.
(Civil/Mechanical/Aerospace), OR equivalent

Course Fee: Rs.10,000/-

Schedule: Saturday’s -2.00 pm to 4.00 pm
### Objective
The Course attempts to give a basic knowledge on Machine Learning Concepts. This would enable the students to go forward.

### Syllabus:
Basic concepts of Machine Learning, Definition, Supervised and Unsupervised Learning, Regression and Classification, Neural Networks, Regression estimation, Hidden Markov Models, Basics of Graphical Model, Principal Component Analysis, Sequential Data-Hidden Markov Models.

### Target Group:
IT Industry, Academics Interested in Data Science, Any other Industry dealing with Data Analysis.

### Faculty

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Gopal Krishna Sharma</td>
<td><a href="mailto:gopalaks@yahoo.com">gopalaks@yahoo.com</a></td>
</tr>
<tr>
<td>Dr. Badarinath Ambati</td>
<td><a href="mailto:abadarinath@yahoo.com">abadarinath@yahoo.com</a></td>
</tr>
<tr>
<td>Prof. Muddu Sekhar</td>
<td><a href="mailto:madhu@iisc.ac.in">madhu@iisc.ac.in</a></td>
</tr>
</tbody>
</table>

### Reference Books:

### Who Can apply?
Any Engineering Degree with Mathematics

### Course Fee: Rs. 10,000/-

### Schedule: Saturday’s: 2.00 pm. to 4.00 pm
### 31. Power System Protection (2+0)

**Objectives:**
The objective of this course is to teach power system protection. This course will cover both conventional topics and advanced topics such as protection of distribution systems with renewables, IEC 61850, wide Area Protection. During teaching special emphasis will be given to IEEE standards and papers published by protection companies.

**Syllabus:**
Overview of over-current, directional, distance and differential protection; service conditions and ratings of relays, Impacts of CT saturation and CVT transience on protection, protection of transmission lines, generator, transformer, Bus, Protection of Microgrids, IEC61850, Special Protection Schemes, Wide Area Protection, Schematic representation of power system relaying.

**Target Group:**
TATA Consulting Engineers, Schneider, Electric, PRDC, GE, Electricity Board, POSFO, Researchers and Teachers for Academic Institution.

<table>
<thead>
<tr>
<th>Faculty:</th>
<th>Reference Books</th>
<th>Who can apply?</th>
</tr>
</thead>
</table>
| Dr. Sarasij Das  
Asst. Prof., Dept. of EE.,  
IISc., Bengaluru.  
Email: sarasij@iisc.ac.in | 1. Horowitz, S H and A G Phandha,  
“Power System Relaying”  
3. C R Manon,  
“The Art and Science of Protective Relaying” | B.Tech in Electrical Engineering  
Course Fee: Rs. 10,000/-  
Schedule: Saturday’s – 2.00 pm. to 4.00 p.m. |
32. Principles and Applications in Genetic Engineering (2+0)

**Objectives:**
This course is Proposed for those who wish to develop a strong background in technologies and principles involved in Genetic Engineering and Generation of Genetically modified experimental organisms.

**Syllabus:**

**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. Ravi Sundaresan N
Assistant Professor,
Dept. of MCBL,
IISc., Bengaluru.
Email: rsundaresan@iisc.ac.in

**Reference Books:**

**Who Can apply?**
B.Tech., B.Pharam., BVSc., /M.Sc., M.Pharm., MVSc., MS (Biotech), MBBS or Equivalent.

**Course Fee:** Rs. 10,000/-

**Schedule:** Saturday’s - 9.00 a.m to 11.00 a.m
### 33. Biopharmaceutical Technology and Drug Development (2+0)

#### Objectives:

This course is for professionals and students interested in understanding the drugs, mechanism and action of drugs, their development and manufacturing process in the pharmaceutical and biotech industry. This course will also focus on the clinical development of new drugs.

#### Syllabus:


#### 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. Ravi Sundaresan N**  
Assistant. Professor,  
Dept. of MCBL,  
IISc., Bengaluru.  
Email: rsundaresan@iisc.ac.in

#### Reference Books:

1. Katzung, B.G.,  

2. Troy, D.B (Ed),  
   Lippincott Williams & Wilkins., New York 2006

3. Laurence L. Brunton, Bruce A. Chabner, Bjorn C. Knollmann. Goodman & Gilman’s The Pharmacological Basis of Therapeutics.

#### Who Can apply?

B.Tech., B.Pharam., BVSc., /M.Sc., M.Pharm., MVSc.,  
MS (Biotech), MBBS or Equivalent.

**Course Fee:** Rs. 10,000/-

**Schedule:** Saturday’s - 11.00 a.m to 1.00 p.m
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

<table>
<thead>
<tr>
<th>Event</th>
<th>Date/Time</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Download application forms from CCE Web Site</td>
<td>14&lt;sup&gt;th&lt;/sup&gt; November 2018</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Receipts of application along with fees (upto)</td>
<td>From 14&lt;sup&gt;th&lt;/sup&gt; November 2018 To 31&lt;sup&gt;st&lt;/sup&gt; December 2018</td>
<td>Wednesday, Monday</td>
</tr>
<tr>
<td>Classes Commence</td>
<td>To 07&lt;sup&gt;th&lt;/sup&gt; January 2019</td>
<td>Monday</td>
</tr>
<tr>
<td>Final Exams</td>
<td>From 06&lt;sup&gt;th&lt;/sup&gt; May 2019 To 11&lt;sup&gt;th&lt;/sup&gt; May 2019</td>
<td>Monday, Saturday</td>
</tr>
</tbody>
</table>

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**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.