INDIAN INSTITUTE OF TECHNOLOGY MANDI
KAMAND, DISTT. MANDI – 175075 (HIMACHAL PRADESH)

MINUTES OF 40TH BOARD OF ACADEMICS MEETING

VENUE   :   A-4 (SC), GUEST HOUSE CONFERENCE ROOM (NC) & ONLINE

DATE   :   11TH MAY, 2021 (TUESDAY)

TIME   :   03:00 P.M.

Following members attended the meeting

Sl. No	Responsibilities	Name
1.	Dean Academics	Dr. Rahul Vaish
2.	Associate Dean (Research)	Dr. Chayan K Nandi
3.	Associate Dean (Courses)	Dr. Srikant Srinivasan
4.	Chairman Library Advisory Committee	Dr. Astrid Kiehn
5.	Chairman Course Proposal Committee	Represented by Dr. Uday Kala
6.	Course Coordinator (IC Courses)	Dr. Aniruddha Chakraborty
7.	Course Coordinator (B.Tech.-CSE)	Dr. Dileep A D
8.	Course Coordinator (B.Tech.-EE)	Dr. Rahul Shrestha
9.	Course Coordinator (B.Tech.-ME)	Dr. Gaurav Bhutani
10.	Course Coordinator (B.Tech.-CE)	Dr. Maheshreddy Gade
11.	Course Coordinator (B.Tech.-DSE)	Dr. Manoj Thakur
12.	Course Coordinator (B.Tech.-EP)	Dr. Pradeep Kumar (SBS)
13.	Course Coordinator (B.Tech.-M.Tech. Integrated Dual Degree in Bio-Engg.)	Dr. Shubhajit Roy Chowdhury
14.	Course Coordinator (M.Tech.-(Mechanical Engg. (Energy Systems))	Dr. Pradeep Kumar
15.	Course Coordinator (M.Tech.-(Fluid and Thermal Engineering)	Dr. Pradeep Kumar
16.	Course Coordinator (M.Tech.-Biotechnology)	Dr. Shyam K Masakapalli
17.	Course Coordinator (M.Tech.-(Structural Engg.))	Dr. Sandip Kumar Saha
18.	Course Coordinator (M.Tech.-(VLSI))	Dr. Hitesh Shrimali
19.	Course Coordinator (M.Tech.-(Communication and Signal Processing))	Dr. Siddartha Sarma
20.	Course Coordinator (M.Tech.-(Power Electronics and Drives))	Dr. Narsa Reddy Tummuru
21.	Course Coordinator (M.Tech.-(Computer Science and Engineering)	Dr. Sriram Kailasam
22.	Course Coordinator M.Sc. (Chemistry)	Dr. Chayan K Nandi
23.	Course Coordinator (M.Sc.-Applied Maths)	Dr. Rajendra K Ray
24.	Course Coordinator (M.Sc.-Physics) + (I-Ph.D. (Physics))	Dr. Ajay Soni
25.	Course Coordinator (MA Dev.Studies)	Dr. Shyamasree Dasgupta
26.	Nominee-1: School of Engineering	Dr. Gaurav Bhutani
27.	Nominee-2: School of Computing & Electrical Engineering	Dr. Manas Thakur
28.	Nominee-1: School of Basic Sciences	Dr. Nitu Kumari

29.	Nominee-2: School of Basic Sciences	Dr. C.S.Yadav
30.	Research Affairs Secretary	Mr. Pawan Kumar Mandal
31.	Academic Affairs Secretary	Mr. Arnav Prasad
32.	Assistant Registrar (Academics): Secretary	Mr. Vivek Tiwari

Following members could not attend the meeting

Sl. No.	Responsibilities	Name
1.	Course Coordinator (M.Tech.- (Energy Engg. (Materials))	Dr. Sumit Sinha Ray
2.	Course Coordinator (HSS Courses)	Dr. Suman Sigroha
3.	Nominee-1: School of Humanities & Social Sciences	Dr. Devika Sethi
4.	Nominee-2: School of Humanities & Social Sciences	Dr. Puran Singh
5.	Nominee-2: School of Engineering	Dr. Subhamoy Sen
6.	Industry Member – 1	Dr. Nadeem Akhtar

Special Invitees

Sl. No.	Name	
1.	Dr. Aditya Nigam	Asst. Prof., SE
2.	Dr. Himanshu Pathak	Asst. Prof., SE
3.	Dr. Manas Thakur	Asst. Prof., SCEE
4.	Dr. Rameshwar Pratap	Asst. Prof., SCEE
5.	Dr. Varunkumar Jayapaul	Asst. Prof., SCEE

PART-A

(Issues discussed by the Board of Academics when the Student Members were present)

At the onset of the meeting, the Board of Academics thanked the earlier Dean (Academics) Prof. Pradeep Parameswaran and earlier Associate Dean (Courses) Dr. Anil K. Sao for their contributions. The BoA welcomed the new Dean (Academics) Dr. Rahul Vaish, new Associate Dean (Research) Prof. Chayan K. Nandi and new Associate Dean (Courses) Dr. Srikant Srinivasan.

40.1 **Confirmation of the minutes of 39th meeting of Board of Academics:**
The minutes of the 39th Board of Academics meeting held on 25th March 2021 were confirmed.

40.2 **To consider the modification of course execution during the remainder of the Feb-June 2021 semester and the upcoming summer duration (June-Aug 2021/ AS3), including grade change exams, and to declare Aug – Dec 2021 as an online semester:**

Dr. Srikant Srinivasan, Associate Dean (Courses) presented the following revised plan for conduction of courses and exams in view of the recently increased impact of COVID-19:
  i)   Due to the 10 day halt in academic activities from May 7 – 16, 6 working days need to be compensated. These lost days will be compensated by utilizing two upcoming Saturdays and extending the semester by 4 days.
  ii)   The summer term 'AS3' and the subsequent Aug-Dec 2021 semester may be declared as online semesters and the courses to be offered may be planned accordingly, to ensure that they can be successfully executed in the online mode. Hands-on activity that was earlier proposed during summer term is now deferred.
  iii)   During the current semester, several students residing in different part of the nation are facing COVID related challenges at different times. As the students often end up taking a break of 1 – 2 weeks, the attendance shall not have any contribution towards the grade. Further the students will be provided an opportunity to make up for their missed exams and classes during the summer term.
  iv)   The execution of the summer terms shall be as follows:
  - Students will have the opportunity to avail 'grade-change' exams from July 15 till July 30, 2021.
  - Earlier Senate notifications permitted the students to attempt the grade-change exams in person. However, as the return of the students seems uncertain in the near future and the courses eligible for grade-change exams have been accumulating over 3 semesters, it is preferable to complete all the grade-change exams in the online mode. A poll conducted over 800 students indicates that the majority of them prefer to complete the pending exams in the online mode.
  - The duration from June 16-July 15, 2021 will provide one month duration for the students to prepare for the subjects for which they are interested in availing the grade-change option. After availing the online option, no further grade-change exam related to the same course offering will be permitted, either online or in-person.
  - The format of the grade-change exam and the syllabus will be determined by the course instructor and informed to the students well ahead of time.
  - The grade-change exam can be used to replace any component of the course (e.g. some students may have missed or have had internet connectivity issues with quiz 1, others with quiz 2 or the final exam). The weight of the exam cannot be less than 25% and it cannot exceed 50%. For rare cases, where an exception may be required due to the course format, the AD (courses) may be approached by the course instructor.

After due deliberations, the BoA recommended the proposal to the Senate for consideration and approval.

40.3 **To consider the provision of making curricular internship optional for the B.Tech 2018 / M.Tech 2020 students and the concomitant relaxation in credit requirements for BTech 2018 (and B.Tech 2017) and M.Tech 2020 (and M.Tech 2019) batches of students.**

Dr. Srikant Srinivasan, Associate Dean (Courses) presented the provision of making the curricular internship optional for the B.Tech 2018 students and M.Tech 2020 students due to the COVID -19 situation. It was noted that a similar option was already provided to the students of B.Tech 2017 and M.Tech 2019 students, under similar circumstances. Therefore, the credit requirements for graduation should also be reduced accordingly to account for the waived internship credits for all the students availing this waiver.

After due deliberations, the BoA recommended it to the Senate for consideration and approval.

40.4 **To consider the closure of M.Tech. in Electrical Engineering with specialization in VLSI programme:**

The BoA noted the issue and recommended to the Senate to record that the M.Tech. in Electrical Engineering with specialization in VLSI programme has ceased to exist with the start of the M.Tech. in VLSI programme in August 2018.

40.5 **To consider the revised proposal for Independent Study Course:**

Dr. Sandip Kumar Saha, the Coordinator of the committee constituted to formulate Independent Study course presented the revised proposal during the meeting. After due deliberations, the BoA recommended the proposal for consideration of the Senate and its approval. The modified proposal is placed as **Annexure-A.**

40.6 **To consider revision in the curriculum for B.Tech.-M.Tech. Integrated Dual Degree in Bio-Engineering programme:**

Dr. Shubhajit Roy Chowdhury, Course Coordinator for B.Tech-M.Tech Integrated Dual Degree (IDD) in Bioengineering programme presented a proposal regarding revision in the curriculum for the IDD (Bioengineering) programme. The BoA deliberated on the proposal and decided to recommend the change in curriculum for the consideration of the Senate and its approval. The modified proposal is placed as **Annexure- B.**

40.7 **To consider procedure and norms for approval of the course:**
Dr. Uday Kala, representative of the CPC Chair presented the 'Course Proposal Process' to the BoA. After due deliberations, the BoA recommended the proposal to the Senate for consideration of its approval. The proposal is placed as **Annexure-C.**

40.8 **To consider the modification in M.Tech. in Computer Science and Engineering (CSE) programme:**

Dr. Sriram Kailasam, the programme coordinator for M.Tech.-CSE presented a proposal to amend the Eligibility criteria and Credit / Course structure for the M.Tech.-CSE programme. After due deliberations, the BoA decided to recommend the change in eligibility criteria, as stated below:

Existing criteria:
Candidates who have qualified for the award of a Bachelor's degree in Engineering (B.E.) / Technology (B.Tech.) from a recognized University/Institute in Computer Science and Engineering (CSE), Information Technology (IT), Computer Engineering (CE), Computer Technology (CT), or equivalent with minimum 60% (or 6.0 CGPA), and who have qualified and have a valid score in Graduate Aptitude Test in Engineering (GATE) in Computer Science and Engineering are eligible to apply for admission to this program.

To be replaced with:
Candidates who have qualified for the award of a Bachelor's degree in Engineering (B.E.) / Technology (B.Tech.) or equivalent from a recognized University/Institute with minimum 60% (or 6.0 CGPA), and who have qualified and have a valid score in Graduate Aptitude Test in Engineering (GATE) in Computer Science and Engineering are eligible to apply for admission to this program.

Further, as the first batch of the M.Tech. CSE would be joining the Institute during the forthcoming Academic Year 2021-22, the BoA suggested to continue with the already approved Credit/Course structure.

40.9   To consider approval of courses presented by the Course Proposal Committee (CPC):
The Chair CPC presented 11 courses for consideration and approval of the BoA. After due deliberations, the BoA recommended 07 courses with minor modifications for consideration of the Senate and its approval.

Sl.No.	Course No.	Course Title	Credits (L-T-P-C)
1	ME517	Advanced Analytical Techniques for Engineers	3-1-0-4
2	ME518	Conduction and Radiation	3-0-0-3
3	EP 302	Computational Methods for Engineering	2-0-2-3
4	EP403	Physics of atoms and molecules	3-0-0-3
5	CS514	Data Structures and Algorithms-II	3-0-2-4
6	CS515	Advanced Computer Science Practicum	2-0-2-3
7	EE528	Modelling and Analysis of Electrical Machines *(Note: modification in the course credit distribution)*	2-0-2-3

The descriptions of the recommended courses are placed at **Annexure-D.**

40.10   Any other item with the permission of the Chair.
- **Relaxation in norms regarding minimum residential requirement for MS/PhD (Part-Time/ERP) Scholars due to COVID-19**

Prof. Chayan Kanti Nandi, Associate Dean (Research) presented the following proposal regarding relaxation in the Residential requirements for the Part-Time/ ERP scholars registered under MS/PhD programme due to Covid-19 situation.

As per the Ordinances & Regulations for PhD **(R.15 (c))** :*The minimum residential requirement for the Ph.D. scholar under external registration and research scholars working on a part time basis not employed in the Institute is **one semester.***

As per the current Ordinance & Regulations for MS (by Res.) **R.13 (b)**: *The minimum residential requirement for M.S research scholars under external registration or M.S research scholars working on a part time basis not employed in the Institute is **one semester.***

Recommendation due to COVID 19

- Online classes are continuing since March 2020.

- PhD/MS (by Res.) Part-Time/ERP scholars have completed or will be completing course work in this duration (online mode).

In case scholars have completed minimum course work requirements during semester started from Feb, 2020 - till institute runs online classes, any of the above respective semester can be treated as *residential semester to fulfill the minimum residential requirement.*

After brief discussion, the BoA recommended the proposal for the consideration of the Senate and its approval.

PART-B

(Issues discussed by the BoA without the Student Members being present)
-NIL-

The meeting ended with a vote of thanks to and by the Chair.

S/d
Secretary, Board of Academics

S/d
Chairman, Board of Academics

Proposal for Independent Study Course

Needs:

A student willing to learn a specific topic in greater depth, which otherwise is not covered in any other regular courses being offered at IIT Mandi.

Primary Objective:

To complete certain number of credits completely in self-study mode under the supervision of a faculty related to the subject area of the study. The associated faculty will be called as Independent Study Supervisor (ISS).

Course Code, Credits and Distribution:

- Course Code: XX599I – Independent Study, *XX as per most relevant branch/specialization for the study area*.
- Credit: 3 (0-0-0-3)
- No discipline/institute core course credits can be substituted by independent study course(s).
- A student can credit maximum one independent study course (3 credits) during the entire program.
- The distribution of the credits, whether under discipline elective or under free/outside-discipline elective, will be decided by the PFG Chair based on the recommendation from the course ISS.

Proposal submission and approval:

- Academic office will announce a last date of submission of independent study course proposal for the students. Preferably, it can be marked/ in the academic calendar for each semester and winter/summer breaks. For regular semester it may start with pre-registration of the regular courses.
- Interested student(s) should initiate the proposal and approach suitable faculty/faculties (ISS) for guidance.
- Once the topic and supervisor(s) are decided, a detailed proposal in a prescribed format (Annexure-I) is to be prepared. The proposal of the independent study course is to be formulated together by the student and the supervising faculty as a 500-level course.
- Alternatively, contents of any pre-approved course of IIT Mandi may be taken as independent study course. However, if the course is running at a regular interval, then it is expected to complete the course credit as a regular course. PFG chair may take appropriate call during the approval process.
- The student will take the proposal, duly signed by Independent Study Supervisor, to thePFG Chair (of the program in which the student is registered) for recommendation. PFG Chairwill ascertain the suitability of the content to be categorised under the proposed distribution (i.e., DE/ODE/FE).PFG Chair may seek inputs from other PFG Chair(s) if the course content is relevant to other disciplines. S/he may provide suitable comments and recommendation, including but not limited to credit distribution and evaluation plan, on the proposal to facilitate the final approval/rejection by the competent authority.
- Student will submit the proposal, duly recommended by the PFG Chair, to the academic office before the announced deadline for final approval.
- Once the proposal is approved by the competent authority, the list of approved independent study courses will be announced by the academic office with a link to the approved course content. Concerned PFG Chairs may be communicated for information.
- The flow of the approval process will be as follows:
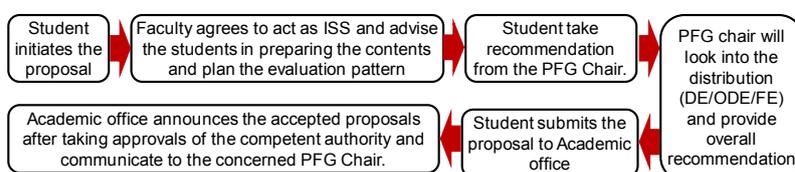
- Decision on the proposal should be made available well before the registration for the regular courses starts (when the course is to be completed during regular semester) orthe last date of teaching (when the course is to be completed during the summer/winter break).

Registration:
- Once the approval process is completed, the course can be registered for credit.
- This course can be registered during regular semestersor during the summer/winter term.
- Registration process (offline/online) can be decided by the academic office time to time.
- Not more than four students should generally be allowed to register for same topic as independent study courseconcurrently.

Evaluation:
- The independent study supervisor(s)may choose her/his/their own evaluation policy appropriate for a 500-level course and must mention that in the course proposal.
- The evaluation will be done as PASS/FAIL and will be counted towards total pass/fail credits as per the notification no.: IITMandi/Acad/Senate/2020/13441-45.

Eligibility:
- B.Tech./Dual Degreestudents (4th semester completed), and M.A./M.Sc./M.Tech.students (1[st]semestercompleted)can register for an independent study course.
- Minimum CGPA should be 7.5 at the time of applying for independent study course.
- The independent study course should not be allowed to merely reduce the expected challenge, e.g., literature review, of the Major Technical Project (U.G.), Postgraduate Project (M.A./M.Sc./M.Tech.).
- This course, in general, is not to be recommended for M.S. or Ph.D. students. An M.S. or Ph.D. student may take an independent study course which will reflect in the transcript, however the credits earned through independent study course will not be counted towards minimum course work requirements.

Other Guidelines:
- No classroom teaching or tutorial is admissible, the student is expected to be in self-learning mode.
- No teaching load will be considered for the faculty member associated with the course.
- Class Committee Meeting (CCM) is not required for this course.

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Proposal for Independent Study Course

To be submitted for each student separately when same content is taken by more than one student.
Attach separate sheet wherever necessary.

Details of The Student
Name of the student: ID number:
Program registered for: Branch: Current semester:
Total credits already completed (basket wise):
CGPA:

Details of The Independent Study Supervisor(s)
Name of the supervisor(s) and School:
Reason/Motivation for Opting Independence Study Course:

Course Code: **XX599I**(Use XX for most relevant branch code in consultation with the proposed independent study supervisor**)**
Title: Independent Study
Proposed Category (Discipline/Free/Outside-discipline elective):
Specific Topics for The Course:

Course Objectives:

Learning objectives of the course are to be mentioned categorically.

Course Plan: (attach already approved course content, if applicable)

The course plan must include:

- Contents of the course
- Total duration of rigours involvement expected from the student, which is to be at par or more with respect to other regular courses at IIT Mandi.
- Frequency of meeting and discussion, if required.
- Availability of course materials and other support required for the student to achieve the stated course objectives.
- Management of course diary, assignments, tests etc. with timeline.
- Expected date of the final evaluation.

Deliverables:

Expected deliverables (physical or scholastic) may be listed here.

Evaluation:

Detailed evaluation policy with weightage to different components must be enlisted here.

Proposed by:

                    Signature of the student   Signature of the supervisor(s)

Recommendation from PFG Chair:

Signature: Date:

Approved by Competent Authority: YES/NO/Comments

Signature: Date:

Proposal for revision in curriculum of B.Tech M.Tech Integrated Dual Degree Programme in Bioengineering.

The Programme Faculty Group (PFG) of B.Tech M.Tech Integrated Dual Degree Programme (IDD) in Bioengineering met with the Associate Dean (Courses) and Dean (Academics) on February 10, 2021 to discuss and deliberate on the revision of curriculum of B.Tech M.Tech Integrated Dual Degree Programme in Bioengineering. The following members attended the meeting:

1. Dr. Anil Kr. Sao, AD (Courses)
2. Dr. Arnav V. Bhavsar, PFG Member
3. Dr. Erwin Fuhrer, PFG Member
4. Dr. GarimaAgrawal, PFG Member
5. Dr. PradeepParameswaran, Dean (A)
6. Dr. Prasad Kasturi, PFG Member
7. Dr. ProsenjitMondal, PFG Member
8. Dr. Rajesh Ghosh, PFG Member
9. Dr. Shubhajit Roy Chowdhury, PFG Chair
10. Dr. Shyam Kr. Masakapalli, PFG Member
11. Dr. SrikanthSugavanam, PFG Member
12. Dr. TrayambakBasak, PFG Member

The following observations were made:

1. It was recognized that several courses were placeholders with content keeping in view the major body of knowledge these will be covering.
2. The PFG has been entrusted to ensure the placeholder courses gets due approval from CPC and BoA, and has been practicing due process of deliberations and filling the placeholders with suitable Course number and Name (with minor changes if any are sent for CPC process with the minutes of the PFG meeting being enclosed for records and communicated to the CPC as well).
3. It was recognized as well as advised by Dean (Academics) that course names as well as content shouldn't be deviating much from senate approved structure. In case, under unavoidable circumstances PFG deems it is necessary, then proper process must be followed as per IIT Mandi practice leading to get revised approval from Senate.

Accordingly, the PFG (Bioengineering) met on March 05, March 17 and April 22, 2021 to duly deliberate on the curriculum and course content of B.Tech (core) courses on IDD (Bioengineering)

The following changes are proposed:

Course Code	Course title (Old title as approved by Senate)	Proposed title	Reason of change
BE201	Biology I	Cell Biology	To make the course title more meaningful with its contents
BE202	Biology II	Molecular Biology and Biochemistry	To make the course title more meaningful

			with its contents
BE203	Biology III	Enzymology and Bioprocessing	To make the course title more meaningful with its contents
BE303	Biostatistics	Applied Biostatistics	Course content has undergone major revision in view of content of IC252 and IC272. The course has also gone through CPC process.
BE304	Computational Biology	Basic Bioinformatics	Course has undergone revision because the course content was getting too heavy as per discussions in PFG. The course has also gone through CPC process.
BE3XX	Physics and Modeling of Biological Systems	Bioelectric Systems Modeling	Course content has undergone major change as per feedback received from external reviewers. Had detailed discussion and deliberation in the PFG. The course is currently under CPC process.

Course Proposal Process

Preamble: Once the syllabus of a course is notified to the Senate, it becomes an important reference document that governs the delivery of the course and portrays the course to the outside world. Hence, it is desirable to have each course proposal vetted by experts other than the proposers, as well as reviewed by a wider academic audience. The Course Proposal Committee (CPC) has been constituted at the institute level to facilitate the entire process of course development and approval, including courses that bridge schools and academic programs of the institute. The Committee will report to the Dean Academics through the AD (Courses).

The process to be followed from the initiation of a course proposal to its final acceptance is listed below:

1. Any proposal for a new course or modification to an existing course is initiated by a faculty member and submitted in the ***prescribed format*** to the relevant PFG Chair. The format is available on the IIT Mandi intranet. (Note: In the case where the course doesn't fit into one specific program, it may be submitted directly to the AD courses.)

2. The PFG Chair discusses the proposal within the PFG. If the PFG (with adequate quorum) finds that the proposal can be taken forward, then the PFG identifies the corresponding reviewers for detailed feedback on the course content, and the PFG Chair sends this information along with the PFG discussion minutes/ recommendations to the CPC Chair.

3. The CPC chair identifies a shepherd within the CPC to guide the course proposal process. The shepherd posts the course proposal on an IIT Mandi platform (faculty discussion board/mail to faculty local/ or other means) to make the course proposal available to all faculty for their feedback, if available.

4. After obtaining feedback from the internal faculty, the shepherdin consultation with PFG chair will choose at least two subject experts for review. These experts should be from other IITs or from similar institutions in India or abroad. In rare cases, they may be internal members of IIT Mandi.

   • When course proposals are sent to outside experts, the expertsshall also be given relevant documentation related to the B.Tech. curriculum and the syllabi of related courses (or links to these documents/courses) so that they can provide their comments in the context of the IIT Mandi curriculum.

5. On receipt of the review comments from the experts, the CPC shepherdwill send the same to the proposers for consideration. The course proposer will modify the course proposal as appropriate and prepare a point-wise response to the reviewers' comments. These comments should be accepted by the PFG and then sent back to the CPC shepherd through the PFG chair.

6. The CPC shepherd will send the modified course proposal along with the reviewers' comments and point-wise response, along with the recommendation of the PFG to the CPC chair.

7. The CPC chair conducts one final inspection to ensure that due diligence has been carried out (checking for format, prerequisites, exclusions and other such issues) and asks the shepherd to post the final version on the IIT Mandi internal forum (as mentioned earlier). Normally, a few days' timewill be given to the faculty members to post their comments on the forum.

8. The CPC Chair will then present the course proposals to the Board of Academics (BoA). If required, the BoA may invite the CPC shepherd and/or course proposer to the respective BoA meeting for assisting the board in its deliberations. The BoA will decide whether or not to provide the final approval to the course. The board may also require the course proposer to make changes to the proposal and resubmit the same.

9. The finalized course proposals will be compiled and submitted to the AD (Courses) and Dean Academics by the CPC Chairafter approval by the BoA. The approval of the course will then be included as a reporting item in the subsequent senate meeting.

10. In case of any issues in the above process, an appeal can be made by the course proposer/any other personto Dean Academics.Further, the Chairperson Senate, on the recommendation of the Dean Academics, or otherwise may relax any of the above processes, as the chairperson deems fit.

11. Modification in the content of existing courses that amounts to >25% change, in terms ofcourse hours,will follow the same process as detailed in points 1-10. In such cases, the CPC chair may recommend the creation of a new course and the retirement of the earlier course.

12. Modification in the content of existing courses that amount to < 25% change, in terms of course hours, may be sent directly to BoA through the CPC Chair, without involving any external reviewers. Such modification requires due deliberation within the respective PFG, and such deliberations of the PFG and justification for changing the content shall also be sent along with the proposed course modification. The BoAwill then take the decision on whether to accept the course modification.The BoA may also recommend sending the proposal to external reviewers.

Guidelines for Course Proposer

- The course proposer should ensure that the correct format is used for the course proposal.
- It is expected and preferred that course proposer should discuss the proposed course with relevant faculty colleagues before sending it to PFG.
- All approved courses will be visible on the Institute website. They will remain so for a long period of time. Hence, utmost care is to be taken to ensure that a good quality course proposal is prepared and submitted.
- The issues raised by the external experts, other faculty members and the BoA are to be appropriately addressed by the proposer and the proposal modified accordingly, if needed.

- The proposer shall be responsible for satisfactory defense in case of deliberations in the BoA.
- Normally, a course can be offered only after final approval from the BoA.

Guidelines for PFG

- The PFG hold a prominent role in the internal review and rebuttal process, because they are most closely related to the subject area.
- All the discussions on the course content, relevance to the program, course level, credit distribution, books and standard references, similarity content (as per lecture hours), suggested internal/external reviewers shall be done at the PFG level.
- It is suggested to have consensus on the acceptance of the proposal by the PFG quorum before sending for external review.
- The reviewer comments and pointwise responses to the same are also discussed and should be accepted by the PFG quorum before forwarding to the CPC Chair.

Guidelines for the CPC shepherd

- The CPC shepherd ensuresthat the due processes have been adhered to for course proposals, including course format.
- The CPC shepherd serves as the interface to the external reviewer's and ensures that the course proposal meets adequate standards before being sent out for review.

Tentative split-up of the work load, per above course proposal process

- ✓ PFG = 60% (Technical content and suitability)
- ✓ CPC = 20% (Administrative)
- ✓ BoA = 20% (validation and approval)

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IIT Mandi
Proposal for a New Course

Course Number	:	ME517
Course Name	:	Advanced Analytical Techniques for Engineers
Credits	:	3-1-0-4
Prerequisites	:	None
Intended for	:	UG/MTech/MS/PhD in engineering streams.
Distribution	:	core for M.Tech students in Fluid and Thermal Engineering
Semester	:	Odd/Even

1: Preamble: The present course is proposed as a core course in Fluid and Thermal Engineering (FTE) MTech program to develop a strong background in analytical (mathematical) techniques that are required in the various other core and elective courses in the program. The courses, which will benefit from the course on analytical techniques include, but are not limited to, advanced fluid dynamics, convective heat transfer, conduction and radiation, advanced thermodynamics, and computational fluid dynamics.

2: Course modules with quantitative lecture hours:

- Integral Transforms: Fourier transform for solution of ODEs and PDEs, Laplace transform for solution of ODEs and PDEs. [6hrs]
- Partial Differential Equations: solution of linear PDEs including special cases of heat conduction equation and Navier--Stokes equation, solution of PDEs in cylindrical and spherical coordinate systems. [10hrs]
- First-order integral equations: Fredholm, Volterra and Wiener-Hopf equation, power series solution for integral equations, integral equations as a generalization of eigenvalue equations and connection to inverse problems [6hrs]
- Tensors: Einstein notation, tensor transformations, tensor fields and tensor calculus, integral theorems. [6hrs]
- Complex analysis: functions of a complex variable, limits and continuity, analytic functions, complex exponents, contour integrals, Cauchy integral formula, complex series, Chauchy's residue theorem, singularity, zeros and poles, improper integrals in Fourier analysis, application to plane fluid flow and signal processing. [8hrs]
- Linear Algebra: spaces and subspaces, positive definiteness and singular value decomposition (best basis), transformations and change of basis, pseudoinverse, eigenvalues and eigenvectors, introduction to multigrid, Krylov subspaces and conjugate gradients methods for solving large linear systems. [10 hrs]

- Statistical Methods: probability, random variables, discrete and continuous probability distributions, autocorrelation and cross correlation, Monte-Carlo method for the solution of diffusion equation, radiative transfer equation and collimated beam radiation problem; linear regression and curve fitting. [10 hrs]

3: Text Books:

1. B. Dasgupta, Applied Mathematical Methods, Pearson Education, 2006.
2. Sheldon M Ross, Probability and Statistics for Engineers and Scientists, 5/e, Academic Press, 2014.

4: References:

1. M D. Greenberg, Advanced Engineering Mathematics, 2nd Edition, Pearson India, 2007.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, International 10th Revised Edition, 2015.
3. G. Strang, Linear Algebra and Its Applications, Thomson, Brooks/Cole, 2006
4. P. V. O'Neil, Advanced Engineering Mathematics, CENGAGE Learning,, 2011.
5. R. L. Thomas and G. B. Finney, Calculus and Analytic Geometry, 11/e Addition-Wisley Reading, 2010.
6. M. L. Boas, Mathematical Methods in the Physical Sciences, 3rd Ed, Wiley India, 2009.
7. A. D. Polyanin and A. V. Manzhirov, Handbook of Integral Equations, Second Edition, Chapman & Hall/CRC Press, Boca Raton, 2008.

5: Similarity Content Declaration with Existing Course

S.N	Course Code	Similarity Content	Approx. % of Content
1.	MA522	solution of linear PDEs	15%
2.	MA512	Spaces and subspaces, transformations and change of basis, eigenvalues and eigenvectors,	10%
3.	MA524, EE534	Probability, Random Variables, Discrete and Continuous Probability Distributions	10%

6: Justification for new course proposal if cumulative similarity content is > 30 %

The cumulative similarity content is more than 30%, which is expected for a course on mathematical techniques. Various postgraduate mathematics courses overlap with this course, however, the overlap does not exceed 10% with any one course. The present course is proposed as a core course in Fluid and Thermal Engineering (FTE) MTech program to develop a strong background in analytical techniques that are required in the various other

core and elective courses in the program and it cannot be therefore replaced by multiple mathematics courses. Moreover, there are topics which are not covered in any course available at IIT Mandi presently.

Other Faculty interested in teaching this course: P. Anil Kishan, Gaurav Bhutani

Proposed by: Pradeep Kumar School: School of Engineering

Signature_____Date_____

Recommended/Not Recommended, with Comments:

_____   Date:_____
Chairman, CPC

Approved / Not Approved

_____   Date:_____
Chairman, Senate

Proposal for a New Course

IIT Mandi
Proposal for a New Course

Course Number   :   ME518
Course Name   :   Conduction and Radiation
Credits   :   3-0-0-3
Prerequisites   :   None
Intended for   :   MTech/MS/PhD in engineering streams.
Distribution   :   Elective
Semester   :   Odd/Even

1: Preamble: The concepts involved in all three modes of heat transfer are beyond to deliberate in a single course of heat transfer even at the UG level. Thus, generally, the teaching of the concepts in heat transfer have been bifurcated into two parts and grouped conduction and radiation modes of heat transfer in one course, and convective mode of heat transfer in another course. Thus, this course covers the detailed topics in conduction and radiation modes of heat transfer.

2: Course modules with quantitative lecture hours:

- Derivation of Heat Conduction Equation for Heterogeneous, Isotropic Materials in Cartesian Coordinates. Heat conduction equation for homogeneous, isotropic materials in Cartesian, Cylindrical and Spherical Coordinates. Heat transfer from a fin of uniform and variable cross-section. Two-dimensional Steady State Heat Conduction: Solution by Method of Separation of Variables, time constants, thermal boundary layer, Steady 2D Conduction in Cylindrical Coordinates - Fourier-Bessel Series Solution.   [8hrs]
- Treatment of variable conductivity by Kirchhoff transformation.Unsteady State Conduction: Applications. Biot Number and its Physical Significance. Lumped System Analysis: Time Constant and its Physical Significance. Semi-Infinite Solid: Definition. Solution by Laplace Transform and Similarity technique. Time-dependent Boundary Conditions-Duhamel's Superposition Principle. Derivation of the integral. Solidification and Melting: Introduction. Stefan problem, enthalpy method.   [8hrs]
- Inverse heat conduction and microscale transport: Determination of unknown boundary conditions from interior measurement; Stefan problem, enthalpy method, Experimental determination of thermal conductivity and heat capacity. Microscale heat transfer: hyperbolic heat conduction, speed of propagation of thermal waves, time lag, solution for a thin slab.   [6hrs]
- Introduction To Radiation heat transfer. Physical Mechanism. Laws of Thermal Radiation: Planck's Law. Wien's Displacement Law. Stefan-Boltzmann Law. Intensity of Radiation. Diffuse and Specular Surfaces. Absorptivity, Reflectivity and

Transmissivity. Monochromatic and Total Emissivity. Definition of an ideal gray body. Monochromatic and Total Absorptivity. Kirchhoff's Law. Restrictions of Kirchhoff's law. View Factor. Hottel's Crossed-strings Method:. Radiation Exchange in a Gray Enclosure. [5hrs]

- Two-Surface Enclosure: Network, Expression for the net radiation exchange. Radiation Shields. Radiation Effects in Temperature Measurement (Conduction effects negligible). Integral equation approach. Spectrally diffuse enclosure surfaces; band approximation. Treatment of specularly reflecting surfaces; specular and diffuse reflectivities, modified definition of radiosity, method of images. [5hrs]

- The equation of radiative heat transfer in participating media. Solution methods. Non-Gray Radiative properties of molecular gases. Introduction to HITEMP DATABASE. Approximate solution methods for one-dimensional media: The optically thin approximation. The optically thick approximation (Diffusion Approximation). [5hrs]

- Gas Radiation: Introduction. Beer's law: Monochromatic transmissivity, absorptivity and emissivity of a gas. Mean Beam Length. Gas emissivity charts. Correction factor charts. Heat Exchange between gas volume and black enclosure: Calculation of gas absorptivity using charts. Heat exchange between two black parallel plates at different temperatures. Heat exchange between gas volume and gray enclosure: Hottel's Expression. [5hrs]

3. **Text Books**
1. Hahn, D. W., and Ozisik, M. N., Heat Conduction, John Wiley and Sons, 2012.
2. Modest, M.F., Radiative Heat Transfer, 3rd Edition Academic Press, 2013.

4. **Reference**
1. Arpaci, V. S., Conduction Heat Transfer, Longman Higher Education 1967.
2. Siegel, R., and Howell, J., Thermal Radiation Heat Transfer, Taylor and Francis, 2015.
3. Schneider, P., Conduction Heat Transfer, Addison-Wesley Pub. Co, 1974.
4. Kakac et al., Heat Conduction, CRC Press, 5st ed, 2018.
5. Myers, Analytical Methods in Heat Conduction, AMCH, 2nd Ed 1998.

5: Similarity Content Declaration with Existing Course

S.N	Course Code	Similarity Content	Approx. % of Content
1	ME613	Radiation properties of real surfaces, Methods to calculate view factor, The equation of radiative heat transfer in participating media. Solution methods	20-25%

Justification for new course proposal if cumulative similarity content is > 30 %

Not Applicable

Proposal for a New Course

Other Faculty interested in teaching this course: P. Anil Kishan, Gaurav Bhutani

Proposed by: Pradeep Kumar School: School of Engineering

Signature_____Date_____

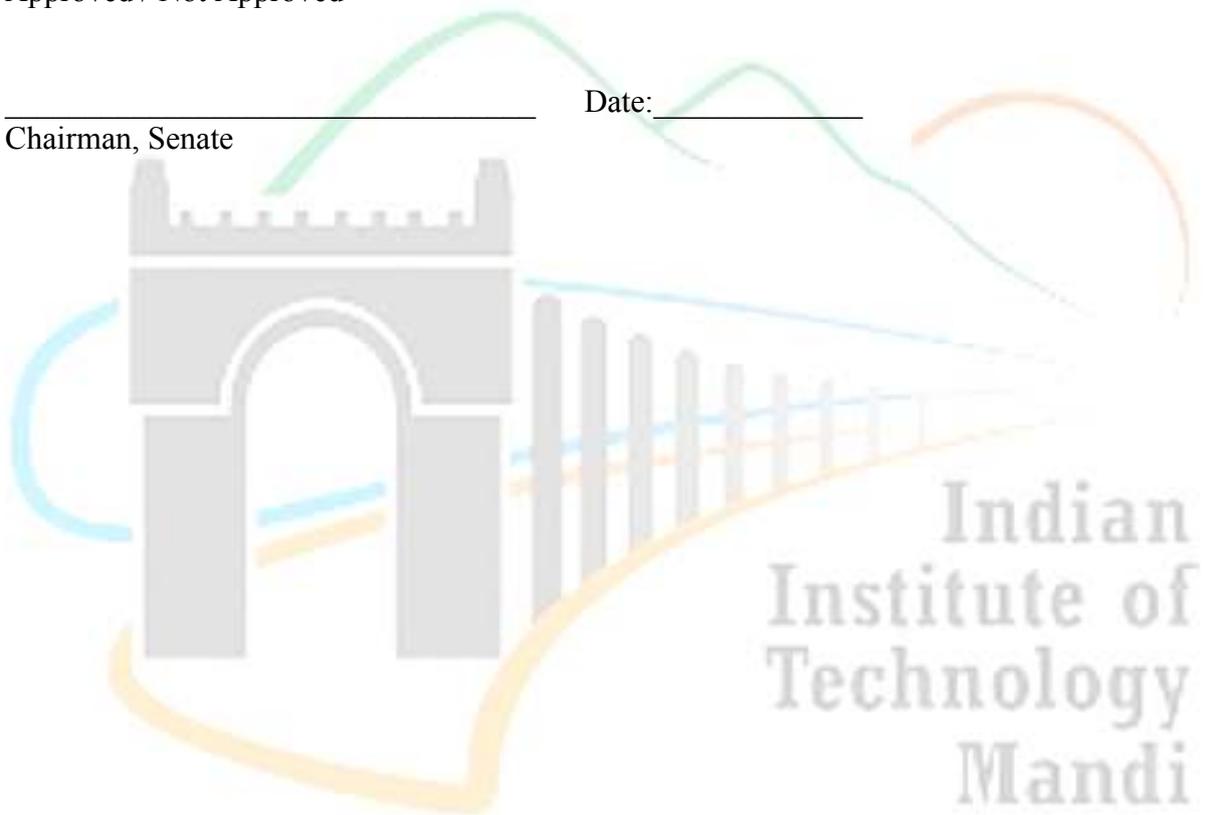---

Recommended/Not Recommended, with Comments:

_____   Date:_____
Chairman, CPC

Approved / Not Approved

_____   Date:_____
Chairman, Senate

Proposal for a New Course

IIT Mandi
Proposal for a New Course

Course Name   : Computational Methods for Engineering
Course Number   : EP302
Credits   : 2-0-2-3
Prerequisites   : IC110 Engineering Mathematics
Intended for   : UG
Distribution   : Core
Semester   : Odd/Even

Preamble: Computational Methods are becoming an important tool of industrial design and development and so, it is necessary to train the students in these techniques. Computational Methods have been matured over the years with its own body of knowledge, theory, and research methodology. At the core of the discipline is the realization that every system can be represented by differential equations, the computational methodology can be helpful to analyses physical system in virtual domain. This course objective is to impart computational and numerical solving skills to students for the purpose of design analysis of multi-physics systems. This course focuses on various aspects with particular reference to application and implementation of computational methodology by using computational software package.

Course Modules with Quantitative Lecture Hours:

Module 1:   (14 hours)
Numerical Techniques: Linear Equations and Non-linear Equations.
Solving Linear Systems: Gauss Elimination, Gauss-Jordan; LU Decomposition.
Solving Linear System with iterative methods: Jacobi method, Gauss-Seidel Method, Successive Over Relaxation (SOR) method.
Finding roots of polynomial and transcend equations:bisection method, Newton-Raphson method.
Numerical Integration: Trapezoid Rule, Simpson's Rule, Gaussian Quadrature.
Case study from multi-physics systems,Computer implementation.

Module 2:   (6 hours)
FEM Concept: Introduction, Engineering applications of finite element method,Weak formulation, Interpolation scheme, FEM formulation for 1D and 2D problems, Computer implementation issues, Convergence and Error analysis.

Module 3:   (5 hours)
FEM for Multi-Physics Systems: Case study of thermo-mechanical systems, electro-mechanical systems, thermo-electro-mechanical systems.

Module 4:   (3 hours)
Simulation of Engineering Systems: Monte-Carlo simulation, Simulation of continuous and discrete processes with suitable examples from engineering problems.

Laboratory sessions:

Exp. 1 & 2 Use of numerical techniques to solve system of equations using computer programming platform.

Exp. 3&4 Introductions to computational software (FEM based packages).

Exp. 5,6 & 7 Find the simulation response of a physical system under (i) Mechanical load (ii) Thermal load (iii) Electrical load environment.

Exp. 8 & 9 Use of computational (FEM based) package to simulate multi-physics systems case e.g. Electric motor under electro-mechanical and thermal environment.

Exp. 10 & 11 Monte Carlo simulation.

Text books:

Reddy J. N., An introduction to Finite Element Methods, 3rd Ed., Tata McGraw-Hill, 2005

Steven C. Chapra and Raymond P. Canale, Numerical methods for engineers, 4th Edition, McGrawHill. 2015

References:

S D Conte and C de Boor, Elementary numerical analysis: algorithmic approach, 3rd Edition McGraw-Hill International, 1980.

Reuven Y. Rubinstein, Simulation and the Monte Carlo Method, 2nd Edition,,Wiley, 2007.

I. M. Smith, D. V. Griffiths, L. Margetts, Programming the Finite Element Method, 5th Edition, Wiley. 2013.

Anju Khandelwal, Numerical Methods and Computer Programming, 4th Edition, Alpha Science International Ltd. 2015.

Similarity content declaration with existing courses:

Sl. No.	Course Code	Similarity Content	Approximate % of Content
1	ME504	Partially Module 1	10%
2	PH621	Partially Module 1	5 %
3	ME513	Partially Module 2	5 %

Justification for new course proposal if cumulative similarity content is > 30%:
NA

Approvals:
Other faculty interested in teaching this course:

Proposed by: PFG-EP, Dr. Himanshu Pathak School:
Signature: Date:

Recommended / Not Recommended, with comments:

Chairman, CPC   Date:

Approved / Not Approved:

Chairman, Senate   Date:

Proposal for a New Course

IIT Mandi
Proposal for a New Course

Course Number	: EP403
Course Name	: Physics of atoms and molecules
Credits	: 3-0-0-3
Prerequisites	: PH301and/orfaculty consent. Out of EP403 and PH524, a student is allowed to take only one course.
Intended for	: B.Tech.
Distribution	: Core course for B.Tech. in Engineering Physics and elective for others.
Semester	: Odd/even

Preamble: This course introduces the basic ideas of working of physics at atomic and molecular level for practical applications and is founded on the basic quantum mechanics course. It teaches students how to apply quantum mechanics and extract information from many-electrons atoms and molecules.

Modules:

1. Time-independent perturbation theoryfor first and second-order correction and its application; Identical particles, eigen functions for identical two particle systems. [6 Hours]

2. Time-dependent perturbation theoryfor two level systems and it generalization to higher level systems, its application to Fermi-Golden rule.   [6 Hours]

3. Interaction of electromagnetic radiation with single electron atoms,Sinusoidal perturbation and Rabi flopping, Dipole approximation and dipole selection rules, Transition rates, Line broadening mechanisms,Incoherent perturbations, spontaneous and stimulated emissions and Einstein coefficients, selection rules for transitions   [12 Hours]

4. Review of atomic structure of H, Atomic structure of two electron system-variational method, central field approximation, Slater determinant, L-S coupling, J-J coupling.[7 Hours]

5. General nature of molecular structure, molecular binding, LCAO, Born-Oppenheimer Approximation.   [5 Hours]

6. Introduction to infra-red and Raman spectroscopy, Introduction to group theory and symmetry and Spectroscopy.   [6 Hours]

Textbooks:
1. Atomic Physics, C. J. Foot (Oxford, First edition 2005)
2. Fundamentals of molecular spectroscopy- C. Banwell and E. Maccash (Mc Graw Hill, 2013)

References:
1. Atoms, Molecules and Photons - Wolfgang Demtroder (Springer, Second edition, 2006)

2. Group theory and Quantum Mechanics - M. Tinkham (Dover Publications, First edition, 2003)
3. Physics of atoms and molecules - Bransden and Joachain (Pearson, second edition, 2011)
4. Advances in Atomic Physics - Claude Cohen-Tannoudji and David Guéry-Odelin (World Scientific Publishing Company, 2011).
5. Introductory Quantum Mechanics, R.L. Liboff, Addison-Wesley (2002).

1. Similarity Content Declaration with Existing Courses

S.N.	Course Code	Similarity Content	Approx. % of Content
1	PH524		35-40%

2. Justification for new course proposal if cumulative similarity content is > 30%:

This course has content similarity to that of course titled PH524 which is a core course for master students. However, this course is specifically intended for B.Tech. EP students and designed for that purpose with special focus on applications. A student cannot take these two course to complete his/her degree.

Proposed by: Dr. Pradeep Kumar   School: SBS

Signature: _____   Date: _____

Recommended/Not Recommended, with Comments:

--   Date: _____
Chairman, CPC

Approved/Not Approved

--   Date: _____

Chairman, Senate

Proposal for a New Course

IIT Mandi
Proposal for a New Course

Course number : CS514

Course name : Data Structures and Algorithms-II

Credits : 3-0-2-4

Prerequisites : CS-202 (DSA) or equivalent for UG students, None for PG students

Intended for : BTech (Semester 5 or 6) who have not taken CS403, MTech (CSE), MS, PhD

Distribution : Discipline Core for MTech CSE, Elective for UG CSE/DS, MS/PhD

Semester : Odd/Even

1. Preamble

The proposed elective course, building on top of the course on Data Structures and Algorithms (CS202), offers formal introduction to various common algorithm design techniques, methods for analyzing the performance of corresponding algorithms and improving their efficiency, and to provide performance guarantees.

The theoretical aspects of this course are going to be supplemented by comprehensive practice exercises and weekly programming labs worth one lab credit.

2. Course modules

1. Review of Data Structures from CS202: Asymptotic Notations, Solving recurrences, Insertion Sort, Merge Sort, QuickSort (3 H)
2. Advanced topics in Sorting and Searching:- Randomized Data Structures Treaps, Hashing, AVL Trees, Bucket Sort. (6 H)
3. Dynamic Programming (3 H)
4. Amortized analysis: aggregate analysis, accounting, potential method (3 H)
5. Graph Algorithms: Single-Source Shortest Paths Bellman Ford, All-Pairs Shortest Paths using Floyd Warshall, Maximum Flow (Ford Fulkerson) (6 H)
6. Advanced Data Structures: Quake heaps, van Emde BoasTrees, Union Find Data structures (6 H)
7. Computational complexity: Problem classes: P, NP, NP-complete, NP-hard. Reduction. Cook's theorem. Examples of NP-complete problems. (6 H)
8. Approximation Algorithms:- Greedy and Local Search algorithms, DP Algorithms (3 H)

9. Parameterized Complexity:- Introduction to FPT, Bounded Search Trees, Kernels
10. Additional Topics:-
    Streaming Algorithms:- Misra Gries, Count–min sketch, LSH, lossy count algorithm   (3 H)
    Comp. Geometry:- Convex Hull, Line segment intersection, Voronoi Diagrams   (3 H)
11. Coding Lab which covers topics discussed in this course   (28H)

3. Textbook

1) T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, Introduction to Algorithms, MIT Press, 3/e, 2009.
2) J. Kleinberg and E. Tardos, Algorithm Design, Pearson, 2006.

4. Reference books

1) S. Dasgupta, C. H. Papadimitriou, U. V. Vazirani, Algorithms, McGraw-Hill, 2006.
2) S. S. Skiena, The Algorithm Design Manual, Springer, 2/e, 2008

5. Similarity content declaration with existing courses:

	Course Name	Common Topic(s)	Overlap (%)
CS202	Data Structures and Algorithms	Hashing and Heap related concepts	Less than 10%
CS403	Advanced Data Structures & Algorithms	Several common topics	More than 30%

6. Justification of new course proposal if cumulative similarity content is >30%:

This course is proposed as a core course for MTech (CSE) and BTech students shall also be allowed to credit the same. The overwhelming overlap of contents (with CS403) is deliberate because we intend to discontinue offering CS403 starting from the winter session of 2021. Some parts of CS403 have either been covered in CS202 or are not relevant to the currently trending research areas. We compensate for these topics by adding new topics which we feel are best suited for the students and this upgrade in coursework also makes this course suitable for M.S., M.Tech and Ph.D. candidates.

<u>Approvals:</u>

Other faculty members who may be interested in teaching this course: Dr. Rameshwar, Dr. Satyajit

Proposed by: Dr. Varunkumar Jayapaul   School: SCEE

Signature: _____   Date: _____

Recommended/Not Recommended, with Comments:

_____   Date: _____
Chairman, CPC

Approved / Not Approved

_____   Date: _____
Chairman, Senate

IIT Mandi
Proposal for a New Course

Course number : CS515

Course name : Advanced Computer Science Practicum

Credits : 2-0-2-3

Prerequisites : UG level courses on Computer Networks, Operating Systems, Databases, Computer Organization and Compilers

Intended for : MTech (CSE), MS, PhD

Distribution : Discipline Core for MTech CSE, Elective for others

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1. Preamble

The CSE MTech program envisions to train students in the skill-set required to work on large problems. Though courses such as operating systems, databases, networks, computer architecture and compilers are typically a part of all BTech CSE curriculums, students joining IIT Mandi after clearing GATE may have differing backgrounds when the practical experience with these courses is concerned. The objective of this course is to fill this gap and bring all MTech CSE students on the same page with respect to hands-on experience with some of the standard tools and techniques in designing computer systems, with a hope that this will help them perform well in all other practicum-based courses in future.

2. Course modules

1. Databases: Assignment on implementing an end-to-end system involving database backend, front-end web-based visualization and using database queries, joins, procedures, triggers, views, cursors, and transactions. Possible problems include:

[8 hours]

- Create a backend database application with a front-end web-based visualization that plots dependent variables of interest.
- Create a front-end website with the ability to register and authenticate users with respect to usernames and passwords; write a trigger on a table in a database that allows us to back-up the deleted entries in the table; write other complex queries involving joins on multiple tables.

2. Operating Systems: Assignments on understanding practical aspects of synchronization and implementing kernel modules in Linux. Modules allow extending the function of the kernel without rebooting the system. This assignment will introduce the students to implementing simple modules, their compilation and also tools for debugging kernels.

[8 hours]

3. Computer Networks: Assignments that involve socket programming, and protocol analysis by using network simulators. [8 hours]

4. Compilers and Architecture: Assignments that involve understanding the mapping of a high-level program down to a machine. The idea would be to familiarize students with the nuances of the connection between translating a high-level program and the machine on which it is executed. The assignments could be a subset of:

[16 hours]

- Writing a translator for converting programs written in a small programming language to an intermediate representation.
- Writing an interpreter for evaluating expressions/statements in a (small) programming language.
- Writing a register allocator for a given reference architecture.
- Writing an assembler that translates programs in an intermediate representation to the assembly for a given architecture.

5. Mini-project on designing scalable systems for different applications. This project will follow software engineering principles of project management, will emphasize scalable design principles, and involve performance analysis. [16 hours]

4. Reference books

1) Linux Device Drivers, Third Edition by Jonathan Corbet, Alessandro Rubini, and Greg Kroah-Hartman, O'Reilly Media, 2005.
2) Operating Systems: Three Easy Pieces by Remzi H. Arpaci-Dusseau and Andrea C. Arpaci-Dusseau, Arpaci-Dusseau Books, August, 2018 (Version 1.00).
3) Computer Networking: A Top-Down Approach,by Kurose and Ross, (6th edition), Pearson 2013.
4) Modern Compiler Implementation in Java, Second Edition, by Andrew W. Appel and Jens Palsberg, Cambridge University Press, 2002.
5) Elmasri, R., & Navathe, S. B. (2015). Fundamentals of Database Systems (7th edition). London, UK: Pearson Education, UK.

5. Similarity content declaration with existing courses:

Course Code	Course Name	Common Topic(s)	Overlap (%)
CS 207	Applied Database Practicum	Database queries, cursors, triggers, and stored procedures	20%
CS309	System Practicum	Scalable system design	20%
CS 310	Introduction to Communicating Distributed Processes	Certain concepts in operating systems and networking	15%
CS502	Compiler Design	IR generation, register allocation	10%

Proposal for a New Course

6. Justification of new course proposal if cumulative similarity content is >30%:

This course is proposed as a core course for MTech (CSE) and BTech students will not be allowed to credit the same. The overlapping contents are essentially with various BTech core courses, and thus the intended audience is completely different.

<u>**Approvals:**</u>

Other faculty members who may be interested in teaching this course: Dr. Sriram Kailasam, Dr. Aditya Nigam, Dr. Varun Dutt, Dr. Arti Kashyap, Dr. Sreelakshmi PM

Proposed by: Dr. Manas Thakur, Dr. Aditya, Dr. Varun, and Dr. Sriram   School: SCEE

Signature: _____   Date:
_____

Recommended/Not Recommended, with Comments:

_____   Date: _____
Chairman, CPC

Approved / Not Approved

_____   Date: _____
Chairman, Senate

Proposal for a New Course

IIT Mandi
(Modification in course credit distribution)

Course Number   : EE528
Course Name   : Modelling and Analysis of Electrical Machines
Credits   : 2-0-2-3 (L-T-P-C)
Prerequisites   :EE 201 and EE201P - Electromechanics Theory and Laboratory/ Instructor Consent
Intended for   : BTech/M.Tech./MS/PhD
Distribution   : Core course for M. Tech. in Power Electronics and Drives, Elective forBTech, MTech, MS, PhD
Semester   : Odd

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1.   Course Preamble:

This is a fundamental modelling and analysis course for electrical machines. This course will focus on design-oriented analysis of conventional and advanced electrical machines. Analytical concepts discussed in the course are intended to strengthen thefundamental understanding of electromechanical systems, and also to provide a basic framework for control of electric drives. This course will be helpful for students interested in doing projects in this field. It is recommended that the students opting for this course should have the basic knowledge of Electromechanics.

2. Course Modules with quantitative lecture hours:

Module1: Basic Principles of Electric Machine Analysis   (4 hours)

1.   Review on basic magnetic circuits and electromagnets including analysis of magnetic circuits with airgap and permanent magnets.

2.   Principle of Electromagnetic Energy Conversion

3.   Basic Two pole DC Machine – primitive 2 axis machine -Voltage and Current relationship – Torque equation

Module2: DC Machine Modeling   (5 hours)

4.   Mathematical modeling of D.C. Machine (Separately Excited, shunt and series type)

5.   Linearization of machine equations and state space modeling of the machine

Module3: Induction Machine Modeling   (9 hours)

6.   Distributed Winding in AC Machinery, winding function, air gap mmf, rotating mmf. Calculation of self and mutual inductances

7.   Reference frame theory, stator and rotor voltage equations and torque equation in different reference frames, Linearized machine equations and Eigenvalue analysis, Derivation of model for steady-state analysis

Proposal for a New Course

8. Derivation of induction motor model in rotor fluxand stator flux oriented reference frame

Module4: Synchronous Machine Modeling (4 hours)
9. Voltage and torque equations of salient pole synchronous machine including damper winding in stator and rotor reference frames

10. Derivation of steady state model

Module5: Permanent Magnet Machine Modeling (6 hours)
11. Modeling of sine-wave and square-wave machines

12. Voltage and torque equations of surface-mounted permanent magnet machine in stator and rotor reference frames

13. Derivation of steady state model

Modeling and Simulation Lab. Sessions:

- Introduction to software's

- Mathematical modeling of simple circuits & systems

- Mathematical modeling of D.C. machines

- Reference frame theory

- Induction machine modelling in different reference frames including saturation effects

- Induction machine modelling for steady-state analysis

- Synchronous machine modelling in different reference frames including saturation effects

- Synchronous machine modelling for steady-state analysis

- Permanent magnet synchronous machine modelling

- Brushless DC machine modelling

3. Textbooks
1. Paul C. Krause, Oleg Wasynczuk, Scott D.Sudhoff, "Analysis of Electric Machinery and Drive Systems" John Wiley and Sons, 2ndEdition, 2006.

2. CheeMunOng, Dynamic Simulation of Electric Machinery, Prentice Hall, 1997 (https://in.mathworks.com/matlabcentral/fileexchange/9941-dynamic-simulations-of-electric-machinery-using-matlab-simulink)

Proposal for a New Course

3. R Krishnan, "Permanent Magnet Synchronous and Brushless DC Motor Drives, CRC Press; 2009.

4. References

1. NPTEL Videos: Advanced Electric Drives by Prof. S P Das(https://nptel.ac.in/courses/108/104/108104011/#)

2. NPTEL Videos: Modelling and Analysis of Electric Machines, by Prof. K. Vasudevan(https://nptel.ac.in/courses/108/106/108106023/)

3. Bimbhra P.S., "Generalized Circuit Theory of Electrical Machines", Khanna Publishers Limited, 5th Edition, New Delhi, 2000.

4. B. K. Bose, "Modern Power Electronics and AC Drives", PearsonEducation, 2015

5. R Krishnan, "Electric Motor Drives – Modelling, Analysis and Control", Pearson Education, 2015.

6. P.Vas, Vector Control of A.C. Machines, Clarendon Press, Oxford 1990.

Other Faculty Members interested in teaching this course: Dr. Bharat Singh, Dr. Pratim Kundu, Dr. Himanshu Misra, Dr. Narsa Reddy

Proposed by: **Dr. Bharat Singh**   School: **SCEE**

Signature_____Date_____

Approved / Not Approved

_____   Date:_____
Chairman, Senate

Proposal for a New Course