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

MINUTES OF 61ST BOARD OF ACADEMICS MEETING

VENUE	:	GUEST HOUSE (NC)CONFERENCE ROOM + ONLINE
DATE	:	23rd January, 2026 (Friday)
TIME	:	10:00 AM

Following members attended the meeting

1	Dean Academics (Chairman)	Dr. Venkatesh Hanumant Rao Chembrolu
2	Associate Dean (Research)	Dr. Maheshreddy Gade
3	Associate Dean (Courses)	Dr. Himanshu Pathak
4	Nominee-1: School of Computing and Electrical Engineering	Dr. Samar
5	Nominee-2: School of Computing and Electrical Engineering	Prof. Hitesh Shrimali
6	Nominee-1: School of Physical Sciences	Dr. Harsh Soni
7	Nominee-1: School of Chemical Sciences	Dr. Bhaskar Mondal
8	Nominee-1: School of Biosciences and Bioengineering	Dr. Baskar Bakthavachalu
9	Nominee-1: School of Mathematical and Statistical Sciences	Prof. Manoj Thakur
10	Nominee-1: School of Civil and Environmental Engineering	Dr. Sandip Saha
11	Nominee-2: School of Civil and Environmental Engineering	Dr. Harshad Kulkarni
12	Nominee-1: School of Mechanical and Materials Engineering	Dr. Gajendra Singh
13	Nominee-2: School of Mechanical and Materials Engineering	Dr. Deepak Deelip Patil
14	Nominee-1: Centre of AI and Robotics	Dr. Praful Tejerao Hambarde
15	Nominee-1:C3DAR	Dr. Vivek Gupta
16	Nominee-1: CQST	Dr. Vaibhav Gupta
17	Nominee-1: IKSHMA	Dr. Neha Thakur
18	CnP Adviser	Dr. Prateek Saxena
19	Academic Affairs Secretary PG	Mr. Hemant Kumar
20	Academic Affairs Secretary UG	Mr. Vishnu

Following members could not attend the meeting

Sl. No.		Name	
1.	Chairman Senate Library Committee	Prof. Anjan Kumar Swain	Member
2.	Nominee-1: School of Humanities & Social Sciences	Dr. Masudul Hasan Adil	Member
3.	Nominee-1: School of Management (I-MBA)	Dr. Ashish Bollimballa	Member
4.	Nominee-2: School of Management (MBA)	Dr. Puran Singh	Member
5.	Nominee-1: CHCI	Dr. Dinesh Singh	Member
6.	Industry Member-1	Mr. Avi Dahiya (CEO, TWYN)	Member
7.	Research Affairs Secretary	Mr. Anshul Aggarwal	Member
8.	Deputy Registrar (Academics): Secretary	Sh. Suresh Rohilla	Member

Special Invitee (s)

Sl. No.	Name	
1.	Dr. Rajneesh Sharma	Associate Professor, SCEE
2.	Dr. Ashutosh Kumar	Assistant Professor, SCEE
3.	Dr. Raj Kiran	Assistant Professor, SMME
4.	Dr. Shashwat Bhattacharya	Assistant Professor, SMME
5.	Dr. P. Nirmal Harish	Assistant Professor, IKSHMA
6.	Dr. Jagadeesh Kadiyam	Assistant Professor, CAIR
7.	Dr. P. Anil Kishan	Associate Professor, SMME
8.	Dr. Rahul Shrestha	Associate Professor, SCEE
9.	Dr. Parimala Kancharla	Assistant Professor, SCEE
10.	Prof. Pradeep Parameswaran	Professor, SCS
11.	Dr. Rishikesh Yadav	Assistant Professor, SMSS
12.	Dr. Kala Venkata Uday	Associate Professor, SCEE
13.	Dr. Doyel Pandey	Assistant Professor, SMSS
14.	Dr. Padmanabhan Rajan	Associate Professor, SCEE

PART-A

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

61.1 Confirmation of the minutes of 60th meeting of the Board of Academics:

The minutes of the 60th meeting of the Board of Academics held on 30th June, 2025 were confirmed.

61.2 To consider new courses from SMME:

Nominee from SMME presented the proposal for new courses from SMME. After due deliberations, the BoA approved the following courses and the same shall be reported to the Senate.

Sr. No.	Course No.	Name of the Course	Credits	Remarks
1.	AR-527	Patenting through Design Thinking	3-0-0-3	-
2.	DP-302P	Design Practicum-II	0-0-4-2	-
3.	GE-303	Modern Powertrains: Electric, Hybrid, and IC/Aero Engine	2-0-1-3	-
4.	ME-206P	Mechanics of Solid Lab	0-0-2-1	It will replace ME-311P in BTech Mechanical curriculum, implemented from 2025 batch
5.	ME-309P	Theory of Machines Lab	0-0-2-1	It will replace ME312P in BTech Mechanical curriculum, implemented from 2025 batch
6.	ME-353	Electronic Materials and Their Applications	3-0-0-3	-
7.	ME-528	Thermal Management of Electronics	3-0-0-3	-
8.	ME-595	Experiential Learning in Composite Design, Manufacturing, Testing and Recycling	1-0-4-3	

The course description is placed at **Annexure – A.**

61.3 To consider new courses from SCENE:

Nominee from SCENE presented the proposal for new courses from SCENE. After due deliberations, the BoA approved the following courses and the same shall be reported to the Senate

Sr. No.	Course No.	Name of the Course	Credits
1.	CE-452	Open Channel Flow	2-1-0-3
2.	CE-567	Highway Safety and Modeling	3-0-0-3
3.	CE-568P	Experimental Structural Dynamics	0-0-4-2
4.	CE-569P	Structural Design Studio	0-0-6-3

The course description is placed at **Annexure – B.**

61.4 To consider new courses from SCEE:

Nominee from SCEE presented the proposal for new courses from SCEE. After due deliberations, the BoA approved the following courses and the same shall be reported to the Senate.

Sr. No.	Course No.	Name of the Course	Credits
1.	CS-525	Computational Foundations of Cryptography	3-0-0-3
2.	CS-570	Algorithms for Curves and Surfaces	2-0-2-3
3.	EE-533	Access Network	3-0-2-4
4.	EE-538	Data-Driven Control	3-0-2-4
5.	EE-695	Sliding Mode Control	3-0-0-3
6.	VL-201	Semiconductor Devices for Integrated Circuits	3-0-0-3
7	VL-211	Analog Circuit Design	3-0-2-4
8	VL-312	Electronics Systems Packaging (ESP)	3-0-0-3
9	VL-326	Fundamentals of Processor Architecture and SoC Design	3-0-2-4
10	VL-402	RFIC Design	3-0-0-3
11	VL-405	Design for Testability	3-0-2-4

The course description is placed at **Annexure – C.**

61.5 To consider new courses from SMSS:

Nominee from SMSS presented the proposal for new courses from SMSS. After due deliberations, the BoA approved the following courses and the same shall be reported to the Senate.

Sr. No.	Course No.	Name of the Course	Credits
1.	MA-255	Number Theory	3-0-0-3
2.	MA-561	Fluidics and Microfluidics	3-0-2-4
3.	MA-562	An Introduction to Bayesian Analysis	3-0-2-4
4.	MA-563	Statistical Computation and Simulation	3-0-2-4

The course description is placed at **Annexure – D**

61.6 To consider new courses from SCS:

Nominee from SCS presented the proposal for new courses from SCS. After due deliberations, the BoA approved the following courses and the same shall be reported to the Senate.

Sr. No.	Course No.	Name of the Course	Credits
1.	CY-559	Machine Learning in Chemistry	2-0-2-3

The course description is placed at **Annexure – E**

61.7 To Consider Proposal for Revision of Minor Modification in the Course Codes from SCS:

The nominee from SCS presented the proposal for the revision of course codes, as detailed below:

Sr. No.	Course No. Existing	Course Name	New Course Code
1.	DP-401P	Research Literature Presentation I	DP-403P
2.	DP-402P	Research Literature Presentation II	DP-404P

After due deliberations, the BoA approved the revision in course code and the same shall be reported to the Senate.

61.8 To consider new courses from CAIR:

Nominee from CAIR presented the proposal for new courses. After due deliberations, BoA suggested that the proposal should be presented in subsequent BoA meeting with more details and clarification.

61.9 To consider modification in Existing Courses of CAIR:

Nominee from CAIR presented the proposal for modification in existing courses from CAIR. After due deliberations, BoA suggested that the proposal should be presented in subsequent BoA meeting with more details and clarification.

61.10 To consider new courses from IKSMHA:

Dr. Neha Thakur from IKSMHA presented the proposal for new courses from IKSMHA. After due deliberations, the BoA approved the following courses and the same shall be reported to the Senate.

Sr. No.	Course No.	Name of the Course	Credits
1.	IK-518	Ancient Indian Materials and Chemistry	3-0-0-3
2.	IK-519	Introduction to Indian Classical Music (IICM)	2–0–2–3

The course description is placed at **Annexure F.**

61.11 To consider new courses from SHSS:

The agenda item was not presented by the proposer the same will be presented in upcoming BoA.

61.12 To Consider Proposal for revision in requirements of Minor in Robotics:

Nominee from CAIR, presented the proposal for revision in requirements of Minor in Robotics Programme. After due deliberations, BoA suggested that the proposal should be presented in subsequent BoA meeting with more details and clarification.

61.13 To consider the proposal for updation of discipline Electives course list for B.Tech. in Engineering Physics Programme:

Nominee from SPS presented the proposal for updation of discipline Electives course list for B.Tech. in Engineering Physics Programme. After due deliberations, BoA suggested that the proposal should be presented in subsequent BoA meeting with more details and clarification.

61.14 To consider the proposal for modification in the curriculum of B.Tech. Bioengineering 2023 and 2024 batches:

The proposal was dropped.

61.15 To consider the proposal for curriculum for Double Major and Minor in Bioengineering:

Nominee from SBB presented the proposal for Double Major and Minor in Bioengineering. After due deliberations, BoA suggested that the proposal should be presented in subsequent BoA meeting with more details.

61.16 To consider the proposal for the introduction of UG specialization in Semiconductor Devices.

Nominee from SMME, presented the proposal for introduction of UG specialization in Semiconductor Devices, After due deliberations, the BoA suggested the proposal for discipline

mapping for each Schools. After mapping the same shall be presented to upcoming BoA for consideration.

61.17 To Consider the proposal for revision of Curriculum for B.Tech. in Data Science and AI Programme from 2025 batch onwards:

Nominee from SCEE presented the proposal for revision of Curriculum for B.Tech. in Data Science and AI Programme which is applicable from 2025 batch onwards. After due deliberations, BoA suggested that the proposal should be presented in subsequent BoA meeting with more details.

61.18 To consider Proposal for B.Tech. Programme in Engineering and Computational Mechanics (ECM):

Nominee from SCENE presented the proposal for B.Tech. Programme in Engineering and Computational Mechanics (ECM). After due deliberation BoA suggested Dr. Rajneesh Sharma and Dr. Raj Kiran may discuss the proposal with Chairman Senate and submit the revised proposal for the consideration in upcoming BoA. Also, BoA suggested that the name may be changed to B.Tech. Programme in Applied Mechanics.

61.19 To consider Proposal for M.Tech. Programme in Geotechnical Engineering:

Nominee from SCENE presented the proposal for M.Tech. Programme in Geotechnical Engineering. After due deliberation the BoA recommended the proposal with minor revision for the consideration of the Senate and its approval.

The modified proposal is placed at **Annexure G.**

61.20 To consider proposal for Extension of semester-wise credit limit from 22 to 25:

Dr. Himanshu Pathak, Associate Dean, Courses presented the proposal for extension of the semester-wise credit limit from 22 to 25. After due deliberations, the BoA approved the proposal as follows and the same shall be reported to the Senate:

The maximum allowable course registration limit per semester for UG students be increased from 22 credits to 25 credits. This credit limit extension will be applicable for 4th semester and onwards.

This limit will serve as the upper bound, and normal advising as per the program structure mechanisms will continue to apply.

61.21 To consider proposal to conduct Supplementary Examinations for backlog courses with F grade:

Dr. Himanshu Pathak, Associate Dean, Courses presented the proposal to conduct supplementary examinations for backlog courses with 'F' Grade. After due deliberations, the BoA approved the proposal as follows and the same shall be reported to the Senate:

Students who have obtained an "F" grade in a course be permitted to appear for supplementary examinations during the regular end-semester examination schedule and/or the institute's make-up examination schedule, in addition to the vacation semester option.

The approval mechanism and supplementary exam fee will be the same as the existing rule. The vacation semester option will remain available, but students will no longer be restricted to it as the only mechanism for clearing backlog courses.

61.22 To consider proposal for revision of UG Ordinance:

Dr. Himanshu Pathak, Associate Dean, Courses presented the proposal for revision of UG Ordinance. After due deliberations, the BoA recommended the proposal with minor modifications for the consideration of the Senate and its approval.

The modified proposal is placed at **Annexure H.**

61.23 To consider proposal for issuance of Postgraduate Diplomas to PG students who exits the programme on completion of one year:

A committee was constituted by the Dean (Academics) to prepare the guidelines for issuance of Postgraduate diplomas to M.Sc./MTech. /MA students who exit their programmes after completion of One Year. Prof. Pradeep Parameswaran, Chairperson of the committee presented the complete proposal/recommendations. After due deliberations, the BoA recommended the proposal for the consideration of the Senate and its approval.

The proposal is placed at **Annexure I.**

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.

(On leave)

Secretary, Board of Academics

C. Venkatesan 10/02/26

Chairman, Board of Academics

IIT Mandi
Proposal for a New Course

Course number : GE526 / AR-527 ✓ Final
Course Name : **Patenting Through Design Thinking**
Credit : **3-0-0-3**
Distribution : ***L-T-P-C***
Intended for : **PG, and UG 3rd and 4th Year Students**
Prerequisite : **None**
Mutual Exclusion: (Specify the equivalent courses in other schools. These *Courses (with high similarity) are not allowed to credit by the students after or along with this course.*)

---

1. Preamble:

This Course starts with an overview of the process and how design thinking helps individuals or organizations. Initially, we make a high-level introduction of the concepts so that the terminology used is seamlessly understood through a 3-circle diagram, identify key traits and values associated with design thinking methodology, stages of design thinking, benefits, and characteristics of a well-designed solution. We also talk about how one can evaluate problems and create a team (of employees or students) to help one solve that problem. Then we explore ways to understand the users, evolve innovative ideas, and test the inferences to ensure user satisfaction, for a greater understanding of design thinking. Design thinking can enhance patentability and commercial viability. It can also enhance an individual or Institution to ensure that a greater percentage of filed patents get granted and also it can help one ensure that a granted patent can fetch adequate revenue through technology transfer/licensing or entrepreneurship. The goal of this course is to achieve patenting through design thinking. The learning objectives for students include the ability to draft patents and apply design thinking stages to IP creation and/or apply strategies to commercialize patents.

2. Course Modules with quantitative lecture hours:

Unit 1: What is Design Thinking? The triad of Business, User and Technology; The Research, Ideation, and Prototyping stages of Design Thinking. Difference between invention and design; Innovation, invention, and creativity; Technology Readiness Levels (TRLs) and Business readiness levels (BRLs). **(10 Hours)**

Unit 2: Patents: Introduction, The Turmeric Story, Edison's Dictum, Prior Art Search, 'What can and cannot be patented?' Patenting landscape: number of filed patents, granted and commercialized, and why the conversion to commercialization is low; Provisional and Complete Specifications; First-to-File Concept; Infringement, Government support

system for patenting and commercialization: various financial and non-financial support available. **(10 Hours).**

Unit 3: Patent Strategies for Startups, Academia, and MSMEs; Patent filing tactics and managing the patent life cycle, Design around, Utilization of Patents: Exclusive and Non-exclusive Patent Licensing, Technology Transfer, Spinoff, Startup, Productization etc. **(12 Hours).**

Unit 4: Evaluating the cost-effectiveness of patenting and maintaining a patent, Patent drafting, Patenting through design thinking, Mock Patent filing. **(10 Hours)**

Laboratory/practical/tutorial Modules:

None.

3. Text books:

1. Kankanala, K.C. *Indian patent law and Practice*. New Delhi: OUP India, 2014.
2. Brown, T. and Katz, B. Change by design: How design thinking can transform organizations and inspire innovation. New York, NY: HarperCollins Publishers, 2009.

4. References:

1. United States Patent and Trademark Office (https://www.uspto.gov)
2. India Patent Office (https://www.ipindia.gov.in)

5. Similarity with the existing courses: None
(Similarity content is declared as per the number of lecture hours on similar topics)

S. No.		Course Code	Similarity Content	Approx. % of Content
1.				

6. Justification of new course proposal if cumulative similarity content is >30%: There exists no similarity with any existing Course.

Approvals:

Faculty interested in teaching this course: – Dr. Dipankar Deb and Dr. Satvasheel Powar

Proposed by: Dr. Dipankar Deb **School: Centre for AI and Robotics**

Signature: Dipankar Deb **Date:** 17/05/2025

The following faculty (at least 3 faculty) discussed on 17/5/25 and approved the proposal on 17/5/25

Sl. No	Faculty Name	Signature
1.	Prof. Hitesh Shrimali	
2.	Dr. Satvasheel Powar	
3.	Dr. Puran Singh	17/5/25

School Chair:

School: Centre for Artificial Intelligence & Robotics

Date: 19.05.25

This proposal is reported in ……..th Board of Academics on ……

Dean Academics

Date:

Note: School is responsible for the Course Code. Academic Office provides the IC Course Code.

IIT Mandi
Proposal for a New Course

Course number : **DP302P**
Course Name : **Design Practicum - II**
Credit : **2**
Distribution : ***0-0-4-2***
Intended for : **UG**
Prerequisite : **IC202P – Design Practicum**
Mutual Exclusion: NA

---

1. Preamble:

In this course, the teams are asked to improve further the proof-of-concept developed in the design practicum course (IC202P). The prototype can be used as the basis for developing the final solution. The goal when developing such prototypes is to capture the functions and appearance of the finished product and move towards developing a minimum viable product (/MVP). These prototypes are used for testing and evaluation and provide useful information for the user to rank the products or the features. In addition, the prototype developed will formulate a base for a potential startup.

The faculty who have mentored the projects in the earlier DP course (IC202P) will be allowed to float their projects. The students may continue their earlier DP project or may switch to another project on the recommendation of the project faculty mentor.

2. Course Modules with quantitative lecture hours:

The course does not have any dedicated lecture hours. This is a laboratory course; the students will develop the prototype in the labs.

3. Text books:

- Rapid Prototyping: Principles and Applications by Chee Kai Chua, Kah Fai Leong, Chu Sing Lim. World Scientific Publishing Company Pvt. Ltd.
- Engineering Drawing Practice for Schools & College. SP46:2003.
- Illustrating sourcebook of mechanical components by Robert O. Parmely, P.E McGraw-Hill

4. References:

NA

5. **Similarity with the existing courses:**
   (Similarity content is declared as per the number of lecture hours on similar topics)
   NA

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

NA

Note: School is responsible for the Course Code. The Academic Office provides the IC Course Code.

The course will be counted as DE for the students.

Evaluation Details

- Project Proposal (10 Marks): Students will have to submit a plan of action and the final outcome of the project.
- Midterm Report (20 Marks): Report highlighting the work done till the mid sem.
- Final Report (30 Marks): Reports highlighting the work details, CAD, Codes, and full details of the product.
- Final Presentation (40 Marks): Students will have to present their work as a startup pitch for the developed product. ***The final presentation will be evaluated by a group of faculty members working on the relevant areas.***

Project Selection Criteria & Funds

- Only the top-performing project will be allowed to continue in DP-II.
- These projects will be selected based on their performance on the Open House Day.
- The project will be continued only after approval from its faculty mentor.
- Students will be allowed to switch to another projects subjected to the faculty mentor's approval and the maximum allowable team limit. Preference will be given to students who want to continue the same projects.
- Each year, the project-wise budget will be decided with the approval of the Dean of Academics. The course coordinator will seek approval prior to the start of the semester.

Approvals:

Faculty interested in teaching this course: – Dr Gajendra Singh, Dr Atul Dhar

27/10/26

Proposed by: Dr. Gajendra Singh **School: SMME**

Signature: **Date:**

The following faculty (at least 3 faculty) discussed on 04/12/25 .....and approved the proposal on..... Email attached .....

S. No	Faculty Name	Signature
01	Vivek Gupta (SCENE)	Email approval attached.
02	Radheshyam Sharma (CAIR)	Email approval attached.
03	Sarthak Nag	

D. Anil Kishan

School Chair: Dr Anil Kishan
School: SMME

Date: 28/1/2026

This proposal is reported in .....61st.....the Board of Academics on .....24 Jan 2026

Dean Academics

Date:

Gajendra Singh <gajendra@iitmandi.ac.in>

Re: Required approval-new course proposal for Design Practicum-II (GE301P).

1 message

Vivek Gupta <vivekgupta@iitmandi.ac.in> Fri, Dec 5, 2025 at 4:02 PM
To: Gajendra Singh <gajendra@iitmandi.ac.in>

Recommended.

On Wed, 3 Dec 2025, 17:06 Gajendra Singh, <gajendra@iitmandi.ac.in> wrote:

Dear Colleagues,
I am planning to float a new course to upgrade the existing Design Practicum projects. Please have a look at the attached proposal and recommend.

Gajendra

On Wed, Dec 3, 2025 at 5:04 PM यांत्रिकी एवं पदार्थ अभियांत्रिकी विभाग SMME Office <smmeoffice@iitmandi.ac.in> wrote:

Dear Sir,
Please find the attached document for your signature.

--

Thanks & Regards,
SMME Office (School of Mechanical and Materials Engineering)
A11.04.33, North Campus, IIT Mandi
Phone: 01905-267138

Gajendra Singh <gajendra@iitmandi.ac.in>

Re: Required approval-new course proposal for Design Practicum-II (GE301P).

1 message

Radhe Shyam Sharma <radheshyam@iitmandi.ac.in> Fri, Dec 5, 2025 at 3:49 PM
To: Gajendra Singh <gajendra@iitmandi.ac.in>
Cc: Dr Atul Dhar <add@iitmandi.ac.in>, Sarthak Nag <sarthak@iitmandi.ac.in>, vivekgupta@iitmandi.ac.in, यांत्रिकी एवं पदार्थ अभियांत्रिकी विभाग SMME Office <smmeoffice@iitmandi.ac.in>

Recommended.

Regards,
Radhe Shyam

On Wed, 3 Dec, 2025, 5:06 pm Gajendra Singh, <gajendra@iitmandi.ac.in> wrote:

> Dear Colleagues,
> I am planning to float a new course to upgrade the existing Design Practicum projects. Please have a look at the attached proposal and recommend.
>
> Gajendra
>
> On Wed, Dec 3, 2025 at 5:04 PM यांत्रिकी एवं पदार्थ अभियांत्रिकी विभाग SMME Office <smmeoffice@iitmandi.ac.in> wrote:
>
> > Dear Sir,
> > Please find the attached document for your signature.
> >
> > --
> >
> > ***Thanks & Regards,***
> > ***SMME Office (School of Mechanical and Materials Engineering)***
> > ***A11.04.33, North Campus, IIT Mandi***
> > ***Phone: 01905-267138***

IIT Mandi
Proposal for a New Course

Course number : **GE303**
Course Name : **Modern Powertrains: Electric, Hybrid & IC/Aero Engines**
Credit : **3**
Distribution : ***2-0-1-3***
Intended for : **UG 3rd, 4th year, and PG students**
Prerequisite : **None**
Mutual Exclusion: None

---

1. Preamble:

The course provides an overview of the fundamentals of the modern powertrains, which includes, electric vehicles, hybrid electric vehicles, IC Engines and aero engines/turbines. The learning outcomes will be as follows: Fundamentals and architecture of a typical IC Engine; Advancement in IC Engine technology, Turbocharged, GDI, HCCI, and Flex fuel Engines; Operational fundamentals of an Aero Engine; Types of gas turbines and their working principles; Basics for Hybrid electric powertrain design and their transmission system; Conversion techniques from ICE to HEV; Fundamentals of electric powertrain and design principles for electric vehicles.

The course includes a practical part that will include dismantling & assembly of an IC Engine, dismantling & assembly of an electric scooter, performance and emission experiments on a HEV powertrain, design of planetary gear system for HEV transmission, and overview of MIG-29 aero engine.

2. Course Modules with quantitative lecture hours:

Unit 1: IC Engine Fundamentals

Explanation of the engine specification of a typical 2-wheeler and a 4-wheeler engine. Fundamental difference between SI and CI Engines. Correlation of piston movement and air standard cycles for 2 Stroke & and 4 Stroke Engines. Understanding the impact of engine displacement, bore, stroke, and bore-to-stroke ratio.

(6 Hours)

Unit 2: Advanced IC Engine Concepts

Combustion chamber design: SI, DISI, IDI, CI, etc. Valve port and manifold design. Understanding swirl, tumble, supercharging, and turbocharging in engines. Engine block design for air cooled and water-cooled engine. Learning various fuel injection systems: PFI, GDI, Carburetor, etc.

(6 Hours)

Unit 3: Hybrid Electric Powertrains:

Overview of hybrid electric powertrains. Fundamentals of typical HEV powertrains: Parallel hybrid system, series hybrid system, and mixed. Level of hybridization: micro, mild, full, and plug-in HEV. Understanding transmission system of typical HEVs: Honda City HEV, Toyota Hycross HEV, and Yamaha FZ HEV.

(6 Hours)

Unit 4: Electric Powertrain:

Understanding the basic elements of an electric powertrain. Type of motors and principles to select motors for an electric powertrain. Comparative study of all the batteries used in electric powertrains: their advantage & disadvantage. Various charging principles. Status of Charging infrastructure in India.

(6 Hours)

Unit 3: Aero Engine Design

Fundamentals of gas turbines. Type of aero engines: Turbofan, Turboshaft, and Turboprops, their advantages and disadvantages. Fuel injection system for aero engines. Structural elements of aero engines: compressor, combustion chamber, and afterburners, their use and principles.

(4 Hours)

Laboratory/practical/tutorial Modules: Hands-on Activities (14 Hours)

- Dismantling and Assembly of a 2 Stroke Engine.
- Dismantling and Assembly of a 4 Stroke Engine.
- Dismantling and Assembly of an Electric Scooter.
- Dismantling and Assembly of an Electric E-Rikshaw.
- Design & Manufacturing of HEV Planetary Gear System.
- Performance & Emission testing of a Parallel HEV Powertrain
- Visual overview of MIG-29 Aero Engine.

3. **Text books:**

- Vehicular Engine Design, Kevin Hoag & Brian Dondlinger, Springer
- Design of Automotive Engines, A Kolchin & V Demidov, MIR Publishers

4. **References:**

- Diesel-Engine Management & Gasoline-Engine Management, Robert Bosch GmbH
- Modern Electric, Hybrid Electric, and Fuel Cell Vehicles, by Ehsani Mehrdad
- Electric and Hybrid Vehicles: Design Fundamentals, by Iqbal Husain
- Aircraft Engine Design, by David T. Pratt, Jack Mattingly, and William H. Heiser

5. **Similarity with the existing courses:**
(Similarity content is declared as per the number of lecture hours on similar topics)

S. No.		Course Code	Similarity Content	Approx. % of Content
1.	IC Engines	ME355	Basics of IC Engine from Unit 1 Only	<10 %

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

NA

Approvals:

Faculty interested in teaching this course: – Dr Atul Dhar 9.1.26

Proposed by: Dr Gajendra Singh **School: SMME**

Signature: **Date: 09/01/2026**

The following faculty (at least 3 faculty) discussed on 09/01/26 ...and approved the proposal on.....

Sl. No	Faculty Name	Signature
01	Dr Parmod Kumar	09/01/26
02	Dr Sarthak Nag	9.1.26
03	Dr Atul Dhar	

School Chair:

School: SMME

Date: 9/11

This proposal is reported in ……..th Board of Academics on ……

Dean Academics

Date:

Note: School is responsible for the Course Code. Academic Office provides the IC Course Code.

यांत्रिकी एवं पदार्थ अभियांत्रिकी विभाग SMME Office <smmeoffice@iitmandi.ac.in>

Fwd: New Course Proposal Form for GE303 (Modern Powertrains: Electric, Hybrid & IC/Aero Engines)

1 message

Gajendra Singh <gajendra@iitmandi.ac.in> Tue, Jan 27, 2026 at 4:34 PM
To: SMME Office <smmeoffice@iitmandi.ac.in>

---------- Forwarded message ---------
From: **Sarthak Nag** <sarthak@iitmandi.ac.in>
Date: Tue, 27 Jan 2026 at 1:04 PM
Subject: Re: New Course Proposal Form for GE303 (Modern Powertrains: Electric, Hybrid & IC/Aero Engines)
To: Gajendra Singh <gajendra@iitmandi.ac.in>

Dear Gajendra,

The proposed course GE303: Modern Powertrains is timely, well-structured, and highly relevant to current transitions in mobility and energy systems. Its balanced coverage of IC engines, hybrid, electric, and aero engines, combined with strong hands-on laboratory components, will provide students with valuable interdisciplinary exposure and practical skills.

A small type: Unit 5 (instead of Unit 3)

Dr. Sarthak Nag | डॉ. सार्थक नाग
Assistant Professor | सहायक प्रोफेसर
School of Mechanical and Materials Engineering
Indian Institute of Technology Mandi | भारतीय प्रौद्योगिकी संस्थान मंडी
Kamand, Himachal Pradesh - 175005, India | कमांद, हिमाचल प्रदेश - 175075, भारत
Email: sarthak@iitmandi.ac.in | Phone: +91-(0)1905-26-7743

On Tue, Jan 27, 2026 at 12:49 PM Gajendra Singh <gajendra@iitmandi.ac.in> wrote:

> Dear Colleagues,
> The attached course proposal was discussed in the last BoA. The committee is asking for comments from relevant faculties. Could you please share your thoughts on the attached proposal?
>
> ---
> **Dr. GAJENDRA SINGH** | डॉ गजेन्द्र सिंह

61st B.A

IIT Mandi
Proposal for a New Course

Course number : **ME206P**
Course Name : **Mechanics of Solids Lab**
Credit : **1**
Distribution : **0-0-2-1**
Intended for : **B.Tech.**
Prerequisite : **ME206 Mechanics of Solids**
Mutual Exclusion: None

---

1. Preamble:

The proposed course aims to provide students with a strong foundation in the experimental aspects of mechanics of solids by linking theoretical principles with practical testing and analysis. Through a series of well-structured laboratory experiments, students will learn to evaluate material properties, analyze deformation and failure modes, and interpret experimental data with engineering relevance. This hands-on experience will develop experimental skills, improve understanding of stress–strain relationships, and strengthen problem-solving capabilities. The course will also expose students to standard testing equipment and procedures, fostering familiarity with industrial practices. Overall, the course bridges classroom learning with real-world engineering applications, enhancing both conceptual clarity and practical competence.

2. Course Modules with quantitative lecture hours:

Experiment 1. Torsion Test – Modulus & Shear Stress

Conduct torsion test on cylindrical specimens to determine modulus of rigidity and shear stress–strain relationships. The experiment develops understanding of torsional deformation, material strength, and failure modes in shafts, directly applicable to real-life machine and structural components.

Experiment 2. Rockwell Hardness Determination

Perform Rockwell hardness test on metallic samples to evaluate indentation hardness. This quick, nondestructive test helps in material classification, quality control, and correlation with mechanical properties such as tensile strength and wear resistance.

Experiment 3. Bending Test – Young's Modulus

Determine Young's modulus of a specimen using a three-point bending setup. The test also allows measurement of force–deflection characteristics of beams, enhancing understanding of flexural stiffness, elastic recovery, and deformation behavior under transverse loading.

Experiment 4. Photoelastic Stress Concentration Analysis

Use photoelasticity techniques to visualize stress distribution around holes or notches. This experiment highlights stress concentration phenomena and validates theoretical predictions, enabling students to appreciate optical methods for stress analysis in complex geometries.

Experiment 5. Spring Stiffness & Strain Energy

Measure stiffness of a helical spring and modulus of rigidity of the spring wire. The experiment further determines strain energy storage capacity, linking to vibration absorbers and energy storage devices in engineering applications.

Experiment 6. Friction & Wear Characterization

Study frictional behavior of material pairs under varied loads, speeds, and lubrication conditions. Additionally, measure wear characteristics to understand tribological performance. This experiment provides insights into machine component life, efficiency, and surface engineering strategies.

Experiment 7. Izod/Charpy Impact Testing

Evaluate toughness, hardness, and impact resistance of materials using standard Izod/Charpy tests. The experiment demonstrates material response to sudden loading and highlights differences between brittle and ductile fracture behavior.

Experiment 8. Thin Cylinder Stress–Strain Study

Perform stress–strain analysis on thin-walled metallic cylinders under internal pressure. The test illustrates circumferential and longitudinal stresses, validating thin-shell theory and its applications in pressure vessels and pipelines.

Experiment 9. Column Buckling Behaviour Analysis

Investigate buckling of columns with different end conditions. Predict critical load and evaluate Young's modulus from buckling data. This experiment emphasizes stability, slenderness ratio effects, and structural design considerations.

Experiment 10. Surface Roughness Measurement

Use a surface roughness tester to evaluate surface finish of specimens. This test highlights the role of machining parameters, surface texture, and their influence on fatigue strength, wear, and lubrication performance.

Experiment 11. Tensile Test – Nonferrous Specimen

Conduct tensile test on nonferrous specimens and compare stress–strain curves with ferrous materials. This experiment highlights differences in ductility, yield strength, and work-hardening behavior, providing comparative understanding of material classes.

3. Text books:

- Timoshenko S. P., and Gere J. M., Mechanics of Materials, 2nd Edition, CBS Publishers, 2002.
- Crandall S. H., Dahl N. C., and Lardner T. J., An Introduction to the Mechanics of Solids, 2nd Edition., McGraw-Hill, 1999

4. References:

- Hearn E. J., Mechanics of Materials, 3rd Edition, Pergamon, 2003.
- Higdon A., Ohslen E. H., Stiles W. B., Weese J. A., and Riley W. F., Mechanics of Materials, John Wiley & Sons, 1989
- Popov E. P., Nagarajan S., and Lu Z. A., Mechanics of Materials, 2nd Edition, Prentice-Hall of India, 2002

5. Similarity with the existing courses:
(Similarity content is declared as per the number of lecture hours on similar topics)

S. No.		Course Code	Similarity Content	Approx. % of Content
1.		ME311P	All	70

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

The existing course Design Lab-1 lacks clarity in its title, making it less recognizable to students and external stakeholders. Renaming it to Mechanics of Solids Lab (or a similarly precise title) ensures that the course objectives and experimental content are immediately evident. The revised title directly reflects its focus on fundamental material testing, deformation mechanics, and structural behavior, which are core to mechanical engineering education. Such a descriptive course name enhances transparency in the curriculum, facilitates recognition by accreditation bodies and recruiters, and aligns with the global nomenclature of engineering programs. Thus, the proposed revision strengthens both the academic value and external visibility of the course.

Approvals:

Faculty interested in teaching this course: –
Dr Rajesh Ghosh, Dr Himanshu Pathak, Dr Deepak Sachan, Dr Raj Kiran, Prof Mohammad Talha, Prof Rajeev Kumar, Prof Vishal Singh Chauhan

Proposed by: Dr Himanshu Pathak **School:** SMME

Signature: H-D Pathak **Date:** 15 Sept 2025

The following faculty (at least 3 faculty) discussed on…09 Sept 2025…and approved the proposal on 15 Sept 2025…..

Sl. No	Faculty Name	Signature
01	Prof Rajeev Kumar	
02	Prof Vishal Singh Chauhan	
03	Prof Mohammad Talha	
04	Dr Rajesh Ghosh	
05	Dr Deepak Sachan	
06	Dr Raj Kiran	

School Chair:

School: SMME

Date: 17/9/2025

This proposal is reported in ……..th Board of Academics on ……

Dean Academics

Date:

Note: School is responsible for the Course Code. Academic Office provides the IC Course Code.

IIT Mandi
Proposal for a New Course

Course number : **ME309P**
Course Name : **Theory of Machines Lab**
Credit : **1**
Distribution : **0-0-2-1**
Intended for : **B.Tech.**
Prerequisite : **ME309 Theory of Machines**
Mutual Exclusion: None

---

1. Preamble:

This laboratory course complements the Theory of Machines curriculum by providing hands-on experience with dynamic mechanical systems and mechanisms. It enables students to analyze oscillations, vibrations, balancing, gyroscopic effects, lubrication, governors, gear trains, cams, and reciprocating systems through practical experimentation. The experiments are designed to bridge theoretical understanding with real-world applications, emphasizing measurement, data interpretation, and performance evaluation of mechanical systems. By working with standard laboratory setups, students develop an appreciation of system behaviour under various operating conditions and gain problem-solving, observation, and analytical skills essential for mechanical engineering practice. The course strengthens design-oriented thinking and prepares students for advanced applications in machine dynamics and mechanism design.

2. Course Modules with quantitative lecture hours:

Experiment 1: Elastic Shaft Oscillation & Critical Speed

Study oscillatory behavior of an elastic shaft and experimentally determine its critical speed. This experiment illustrates resonance, shaft flexibility, and stability, key for safe machine design.

Experiment 2: Hydrodynamic Bearing Pressure Distribution

Demonstrate pressure distribution in a lubricated radial sleeve bearing to understand hydrodynamic lubrication principles, load-carrying capacity, and efficiency of rotating machinery.

Experiment 3: Pendulum Oscillations & Radius of Gyration

Conduct experiments with simple, compound, and trifilar pendulums to calculate oscillation periods and radii of gyration. This validates rotational inertia and vibration theory.

Experiment 4: Torsional Vibrations in Rotor Systems

Study torsional vibrations in single and two-rotor systems, including damping effects. Helps in understanding vibration isolation, energy dissipation, and rotor system safety.

Experiment 5: Static & Dynamic Balancing

Perform balancing experiments on rotating masses to observe unbalance forces and dynamic stability. Learn corrective balancing methods applicable in rotating machinery.

Experiment 6: Belt Drive – Friction, Slip & Power

Investigate frictional behavior, slip, power transmission, and creep in belt drives. The experiment connects theoretical belt drive equations with practical transmission efficiency.

Experiment 7: Cam & Follower Mechanisms

Examine cam-follower motion, effects of follower mass, and spring compression on jump speed. Demonstrates dynamic performance of cam systems.

Experiment 8: Epicyclic Gear Train Analysis

Calculate angular velocity ratios and measure torque distribution in epicyclic gear trains. Experiment validates gear kinematics and torque transmission theory.

Experiment 9: Governor Characteristics

Determine sleeve displacement against controlling force and speed in a governor. Plot characteristic curves to study governing principles and speed regulation.

Experiment 10: Forces in Reciprocating Masses

Analyze inertia forces acting on reciprocating masses and their effect on unbalanced forces in engines. Links to vibration and balancing problems.

Experiment 11: Gyroscope Dynamics

Analyze motion of a motorized gyroscope under applied couples. Understand gyroscopic effects in vehicles, aircraft, and turbines.

3. Text books:

- A. Ghosh, A. K. Mallik, Theory of Mechanisms and Machines, East West Press Pvt. Ltd.
- Uicker, J. J., Shigley, J. E., and Pennock, G. R., Theory of Machines and Mechanisms, Oxford University Press

4. References:

- Rao, S. S., Mechanical Vibrations, 6th Ed., Pearson Education, USA, 2017.
- Mabie, H. H., and Reinholtz, C. F., Mechanics and Dynamics of Machinery, Wiley, USA, 1987.
- Norton, R. L., Kinematics and Dynamics of Machinery, McGraw–Hill, USA, 2009.
- Grover, G. K., Mechanical Vibrations, Nem Chand & Bros., India, 2009.

5. Similarity with the existing courses:
(Similarity content is declared as per the number of lecture hours on similar topics)

S. No.		Course Code	Similarity Content	Approx. % of Content
1.		ME312P	All	65

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

The current course titled Design Lab-2 lacks clarity in scope and recognition. Renaming it as Theory of Machines Lab aligns the title with its theoretical foundation and experimental content, making it self-explanatory for students, faculty, recruiters, and accreditation agencies. The revised list of experiments reflects modern curriculum needs, ensuring stronger integration of dynamics, vibrations, and mechanism studies with hands-on applications. While there is content similarity with ME312P, this laboratory distinctly emphasizes experimental validation of theoretical models, complementing classroom learning. The revised title and scope enhance academic transparency, improve external recognition, and provide students with essential exposure to machine dynamics and mechanism behavior, thereby justifying the proposed change.

Approvals:

Faculty interested in teaching this course: –
Dr Rajesh Ghosh, Dr Himanshu Pathak, Dr Deepak Sachan, Dr Raj Kiran, Prof Mohammad Talha, Prof Rajeev Kumar, Prof Vishal Singh Chauhan

Proposed by: Dr Himanshu Pathak **School:** SMME

Signature: H. O Pathak **Date:** 15 Sept 2025

The following faculty (at least 3 faculty) discussed on…09 Sept 25 and approved the proposal on 15 Sept 2025…..

Sl. No	Faculty Name	Signature
01	Prof Rajeev Kumar	
02	Prof Vishal Singh Chauhan	
03	Prof Mohammad Talha	
04	Dr Rajesh Ghosh	
05	Dr Deepak Sachan	
06	Dr Raj Kiran	

School Chair: P. Vinay Chetan

School: SMMS

Date: 17/9/2025

This proposal is reported in ……..th Board of Academics on ……

Dean Academics

Date:

Note: School is responsible for the Course Code. Academic Office provides the IC Course Code.

Himanshu Pathak <himanshu@iitmandi.ac.in>

Course Revision: Design Lab 1 and Design Lab 2

Himanshu Pathak <himanshu@iitmandi.ac.in> Tue, Sep 9, 2025 at 3:38 PM
To: Rajeev Kumar <rajeev@iitmandi.ac.in>, Vishal Singh Chauhan <vsc@iitmandi.ac.in>, Mohammad Talha <talha@iitmandi.ac.in>, Rajesh Ghosh <rajesh@iitmandi.ac.in>, Raj Kiran <raj@iitmandi.ac.in>, Deepak Sachan <dsachan@iitmandi.ac.in>
Cc: Chairperson SMME <chairsmme@iitmandi.ac.in>

Dear Colleagues,
I am proposing the existing design lab course revision with renaming of the course name and content. The current titles Design Lab-1 and Design Lab-2 are generic and do not clearly reflect the scope or objectives of the respective courses. This lack of specificity makes it difficult for students, external reviewers, and accreditation bodies to immediately identify their academic intent. The proposed revisions—renaming Design Lab-1 as Mechanics of Solids Lab and Design Lab-2 as Theory of Machines Lab—provide clarity, transparency, and global recognition.
The revised course names directly align with the corresponding theory subjects, ensuring curriculum coherence and facilitating better understanding of their relevance. Furthermore, the experiment lists have been updated to reflect current academic and industry needs. Mechanics of Solids Lab emphasizes experimental validation of material behavior, stress–strain relationships, and structural response, while Theory of Machines Lab focuses on kinematics, vibrations, balancing, governors, and gyroscopic effects. Together, these revisions enhance learning outcomes, strengthen design-oriented thinking, and improve external visibility of the curriculum, thereby better preparing students for professional and research careers in mechanical engineering.
The revised course curriculum is attached herewith for your valuable suggestions.
Kindly share your suggestions/consent by 13 Sept 2025. After getting your suggestions and consent it will be discussed in the upcoming BoA meeting.

--
Thanks and Regards,
****
Dr. Himanshu Pathak | डॉ. हिमांशु पाठक
Associate Professor
School of Mechanical & Materials Engineering
Indian Institute of Technology Mandi
Mandi, Himachal Pradesh 175075
Homepage | SCOPUS ID | Research Gate | ORCID
****

2 attachments

Course proposal ME206P.docx
21K

Course proposal ME309P.docx
20K

Previous Courses Information:
ME311P Design Lab-1
ME312P Design Lab-2

यांत्रिकी एवं पदार्थ अभियांत्रिकी विभाग SMME Office <smmeoffice@iitmandi.ac.in>

Need signature new course proposal ME206P and ME309P.

2 messages

यांत्रिकी एवं पदार्थ अभियांत्रिकी विभाग SMME Office <smmeoffice@iitmandi.ac.in> Wed, Sep 17, 2025 at 9:58 AM
To: Raj Kiran <raj@iitmandi.ac.in>

Dear Sir,
Please find attachments for your signature.

--

Thanks & Regards,
SMME Office (School of Mechanical and Materials Engineering)
A11.04.33, North Campus, IIT Mandi
Phone: 01905-267138

proposal for a new course.pdf
288K

Raj Kiran <raj@iitmandi.ac.in> Wed, Sep 17, 2025 at 10:02 AM
To: यांत्रिकी एवं पदार्थ अभियांत्रिकी विभाग SMME Office <smmeoffice@iitmandi.ac.in>

Approved.

Thanks
[Quoted text hidden]
--
Dr. Raj Kiran (He/Him/His)
Assistant Professor
School of Mechanical and Materials Engineering
Indian Institute of Technology Mandi, HP, India

IIT Mandi
Proposal for a New Course

Course number : ME 353
Course Name : **Electronic Materials and Their Applications**
Credit : **3**
Distribution : *3-0-0-3*
Intended for **DE for ME & MSE**
Prerequisite : None
Mutual Exclusion : None

---

1. Preamble:

This course covers the advanced aspects of electronic properties of emerging materials and their applications. It includes materials for semiconductors, insulators, thermoelectric, ferroelectric, dielectric, pyroelectric, piezoelectric, triboelectric, and optical applications. Emphasis is given on the functional behaviour and applications of the advanced materials, including caloric effects and linear and non-linear optical properties. Unlike traditional electronics courses focused on circuits or fabrication, this course adopts a materials-centric approach, highlighting how electronic structure, defects and functional responses govern device behavior. The course prepares UG students to engage with semiconductor technology, functional electronic materials, emerging device concepts, and interdisciplinary research in electronics, energy, and smart systems.

2. Course Modules with quantitative lecture hours:

Unit 1: Introduction to Electronic Materials **(6 hours)**
Role of materials science in the evolution of electronics: from vacuum tubes to CMOS, power electronics, and quantum devices, Classification of electronic materials; conductors, semiconductors, insulators, smart materials, ferroelectrics, piezoelectrics, pyroelectrics.

Unit 2: Semiconductor Materials **(8 hours)**
Direct and indirect bandgaps, effect of defects and disorder on electronic band structure, scattering mechanisms, conventional semiconductors (Si, Ge, GaAs, GaN, SiC) and their applications. Material breakthroughs in Si technology, Ultra-pure single crystal Si, doping control, Si-oxide interface, Semiconductor junctions, metal–semiconductor contacts, interface states and traps, materials-driven limitations and reliability challenges in semiconductor technologies. Application of semiconductors in transistors, amplifiers and diodes.

Unit 3: Optical and Optoelectronic Materials **(8 hours)**
Linear and non-linear optical properties, Optical absorption and emission, photodiodes, Solar cells (Si, CdTe, Perovskites), image sensors (CCD, CMOS), LED, OLED, Micro-LED, QLED, for display applications and laser materials, Photodetectors, Optical cavities, Single photon emitters, Electro-optic effect, modulators, ultrafast detectors, Two-photon absorption, Kerr effect, optical switching and logic devices, Second Harmonic Generation (SHG) and Terahertz (THz) generation.

Unit 4: Smart Electronic Materials **(10 hours)**

Smart electronic materials that convert external stimuli into electrical signals or functional responses, enabling applications in sensors, actuators, memory devices, energy harvesting, and smart systems. Ferroelectric materials: spontaneous polarization and P–E hysteresis, Ferroelectric RAM (FeRAM), Ferroelectric Transistor (FeFET). Piezoelectric materials and their applications in sensors, actuators, and cantilevers. Triboelectric materials and nanogenerators. Pyroelectric materials and electrocaloric devices for energy harvesting and solid-state cooling.

Unit 5: Emerging Electronic Materials **(10 hours)**

Electronic materials at different length scales, bulk, thin films, nanomaterials, Low-dimensional materials: 2D materials (graphene, MoS_2, WS_2, hBN), 1D nanostructures carbon nanotubes, semiconductor nanowires, oxide nanowires, and 0D quantum dots. Wide bandgap semiconductors (GaN, SiC), Organic and polymer electronics, Perovskite electronic materials, Neuromorphic, memristive materials and devices for next-generation computing.

Laboratory/practical/tutorial Modules: NA

3. **Textbooks:**
   1. S.O. Kasap, Principles of Electronic Materials and Devices, McGraw Hill, Indian Edition (2020)
   2. S.M. Sze, Semiconductor Devices; Physics and Technology, John Wiley & Sons Inc, 3rd edition, (2016)
4. **References:**

1. Charles Kittel, Introduction To Solid State Physics, Wiley India Edition, 2012.
2. Z. L. Wang and Z.C. Kang, Functional and Smart Materials, Springer, 1998.
3. Review articles from *Nature Electronics*, *Advanced Functional Materials etc.*

5. **Similarity with the existing courses:**
   (Similarity content is declared as per the number of lecture hours on similar topics)

S. No.		Course Code	Similarity Content	Approx. % of Content
1.	Functional Properties of Materials	MT205	Semiconductors, Ferroelectrics	10 %
2.	Semiconductor Materials and Devices	MT503		15 %

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

Approvals:

Faculty interested in teaching this course: –

Prof. Rahul Vaish SMME, IIT Mandi	Dr. Ranbir Singh SMME, IIT Mandi	Dr. Neha Thakur IKSMHA, IIT Mandi

Proposed by: Prof. Viswanath Balakrishnan **School:** SMME

Signature:  **Date:** 29/01/26

The following faculty (at least 3 faculty) discussed on……and approved the proposal on……..

Sl. No	Faculty Name	Signature
1	Dr. Ravindra Buke (SMME)	
2	Dr. Ranbir Singh (SMME)	Email
3	Dr. Neha Thakur (IKSMHA)	Email
4	Prof. Rahul Vaish (SMME)	

School Chair: P. Viswanath

School: SMME

Date: 29.1.2026

This proposal is reported in ……..th Board of Academics on ……

Dean Academics

Date:

Note: School is responsible for the Course Code. Academic Office provides the IC Course Code.

Viswanath Balakrishnan <viswa@iitmandi.ac.in>

Proposal for Course Revision - ME 353

Neha Thakur <nehathakur@iitmandi.ac.in> Sun, Jan 11, 2026 at 6:01 PM
To: Viswanath Balakrishnan <viswa@iitmandi.ac.in>

Dear Prof. Viswanath,

Thank you for sharing the course proposal. I really liked the materials-centric approach and the way it brings together fundamentals, smart materials, and emerging electronic materials.

One small suggestion, if you feel it fits, could be to "explicitly" frame some of the existing topics in **Unit 2** around **materials-driven limitations and reliability challenges in semiconductor technologies**. Bringing together defects, interfaces, scaling effects, and manufacturing considerations under this perspective could help to connect fundamentals to real-world constraints.

I would also be happy to be involved in teaching this course, if that works.

Regards
Neha

On Sat, Jan 10, 2026 at 11:51 PM Viswanath Balakrishnan <viswa@iitmandi.ac.in> wrote:

> Dear all,
>
> Please find the attached proposal for revision of ME353 course (Electronic Materials and Their Applications) and let me know your comments. This will be presented in the upcoming BoA and hence I appreciate your inputs within the next couple of days.
>
> Regards
> Viswanath
>
> Prof. Viswanath Balakrishnan
> School of Mechanical and Materials Engineering
> Indian Institute of Technology Mandi
> Kamand, Himachal Pradesh, India-175005
> Website: https://sites.google.com/iitmandi.ac.in/nanoscale-materials-devices/home
> Research: https://scholar.google.co.in/citations?user=0GIW2ZYAAAAJ&hl=en

Viswanath Balakrishnan <viswa@iitmandi.ac.in>

Proposal for Course Revision - ME 353

Dr. Ranbir Singh <ranbir@iitmandi.ac.in> Sun, Jan 11, 2026 at 11:57 PM
To: Viswanath Balakrishnan <viswa@iitmandi.ac.in>

Dear Sir,

ME353 course proposal looks fine to me. Please go ahead.

Best wishes,

Dr. Ranbir Singh, PhD (Assistant Professor)

A11.04.14, School of Mechanical and Materials Engineering (SMME)

Indian Institute of Technology Mandi (IIT-Mandi)
Kamand - 175005, Mandi, Himachal Pradesh, India
Phone - +91-8894639383
Web-page: https://smme.iitmandi.ac.in/faculty-details-card-?id=684d77ca9a4d6a88b4fdd772

On Sat, Jan 10, 2026 at 11:51 PM Viswanath Balakrishnan <viswa@iitmandi.ac.in> wrote:

> Dear all,
>
> Please find the attached proposal for revision of ME353 course (Electronic Materials and Their Applications) and let me know your comments. This will be presented in the upcoming BoA and hence I appreciate your inputs within the next couple of days.
>
> Regards
> Viswanath
>
> Prof. Viswanath Balakrishnan
> School of Mechanical and Materials Engineering
> Indian Institute of Technology Mandi
> Kamand, Himachal Pradesh, India-175005
> Website: https://sites.google.com/iitmandi.ac.in/nanoscale-materials-devices/home
> Research: https://scholar.google.co.in/citations?user=0GlW2ZYAAAAJ&hl=en

IIT Mandi
Proposal for a New Course

Course number : **ME528**
Course Name : **Thermal Management of Electronics**
Credit : **3-0-0-3**
Distribution : ***L-T-P-C***
Intended for : **DE for ME/ FE for others**
Prerequisite : **Heat Transfer ME303**
Mutual Exclusion: None

---

1. Preamble:

The rapid miniaturization of devices and increasing power densities in modern electronics have made thermal management a critical design challenge. Efficient cooling not only ensures reliability and performance but also extends the operational lifespan of systems ranging from consumer electronics to high-power electric vehicles and aerospace systems. This course introduces students to the fundamentals and advanced concepts of thermal management in electronics, building upon the foundation of heat transfer. Topics will cover conduction, convection, and radiation in electronic systems, cooling technologies such as heat sinks, heat pipes, phase-change materials, microchannels, and immersion cooling. Through case studies, simulations, and problem-solving, students will gain the knowledge and tools to design, analyse, and optimize thermal solutions for next-generation electronics.

2. Course Modules with quantitative lecture hours:

Module 1: Introduction to Thermal Management: Importance of thermal management: reliability, performance, safety, Heat generation in semiconductor devices and power electronics, Failure mechanisms due to overheating, Thermal specifications of microelectronics packaging, Thermal design considerations and key metrics **(2 Hours)**

Module 2: Fundamentals of Heat Transfer in Electronics Cooling: Heat transfer mechanisms, Conduction: thermal resistance networks, spreading resistance, contact resistance, thermal interface materials, Convection: natural and forced convection in electronics cooling, concept of boundary layer, laminar and turbulent flows, Radiation in compact enclosures, Transient thermal analysis **(7 Hours)**

Module 3: Cooling Technologies for Electronics: Air cooling: fins and heat sinks, design of heat sinks, fans- performance curves, fin optimization and material selection, Flow management in Enclosures and Racks, baffles, flow straighteners, Liquid cooling: cold plates fundamentals and material selection, Microchannel heat sinks: pressure drop considerations, pump selection, applications, jet impingement, Phase-change based cooling: heat pipes, vapor chambers, boiling heat transfer, Immersion cooling and dielectric fluids, Comparative analysis of cooling methods **(16 Hours)**

Module 4: Advanced Thermal Management Approaches: Thermoelectric cooling, Phase change materials (PCMs) for thermal storage, Additively manufactured heat exchangers, Emerging technologies: TPMS structures, nanofluids, hybrid cooling systems, Reliability and long-term performance considerations **(7 Hours)**

Module 5: System-Level Thermal Management: Thermal management in mobile phones, data centers and high-performance computing, Thermal design in EV batteries and power electronics, Compact electronic packages and 3D integration, Co-design of electrical, mechanical, and thermal systems **(6 Hours)**

Module 6: Experimental techniques and modelling tools: Thermal modeling tools and methods (analytical, CFD, FEM), Thermal characterization and experimental methods, IR imaging, Experiments on heat sinks and heat pipes **(4 Hours)**

3. Text books:

1. Shabany, Younes. Heat transfer: thermal management of electronics. CRC press, 2009.
2. Yeh, L. T. Thermal management of microelectronic equipment: heat transfer theory, analysis methods, and design practices. ASME Press, 2016.

4. References:

1. Incropera, F. P. (1999). Liquid cooling of electronic devices by single-phase convection. Wiley.
2. Bejan, A. (2013). Convection heat transfer. John wiley & sons.
3. Incropera, Frank P., et al. Fundamentals of heat and mass transfer. Wiley, 2018.
4. Çengel, Yunus A. Heat transfer: a practical approach. Mcgraw Hill, 2002.

5. Similarity with the existing courses:
(Similarity content is declared as per the number of lecture hours on similar topics)

S. No.	Course Name	Course Code	Similarity Content	Approx. % of Content
1.	Heat Transfer	ME303	Module 2: Fundamentals of Heat Transfer in Electronics Cooling	< 15%

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

NA

Approvals:

Faculty interested in teaching this course: – Dr. Sarthak Nag, Dr. Parmod Kumar, Dr. Gajendra Singh, Prof. Atul Dhar

Proposed by: Dr. Sarthak Nag, Dr. Parmod Kumar **School: SMME**

Signature: **Date: 02/09/2025**

The following faculty (at least 3 faculty) discussed on 02/09/2025 and approved the proposal on 05/09/2025

Sl. No	Faculty Name	Signature
1	Prof. Atul Dhar	– email –
2	Dr. Gajendra Singh	– email –
3	Dr. Shashwat Bhattacharya	SBhattacharya

School Chair: P. Dutta

School: SMME

Date: 28/11/2025

This proposal is reported in ……..th Board of Academics on ……

Dean Academics

Date:

Note: School is responsible for the Course Code. Academic Office provides the IC Course Code.

Sarthak Nag <sarthak@iitmandi.ac.in>

Proposed Course on Thermal Management of Electronics

Gajendra Singh <gajendra@iitmandi.ac.in> Tue, Sep 2, 2025 at 4:19 PM
To: Sarthak Nag <sarthak@iitmandi.ac.in>
Cc: Parmod Kumar <parmod@iitmandi.ac.in>

Hi Sarthak,
This is an excellent proposal. It is in line with the current needs. It will definitely help the students.

Dr Gajendra Singh

On Tue, Sep 2, 2025 at 12:06 PM Sarthak Nag <sarthak@iitmandi.ac.in> wrote:

> Dear Colleagues,
>
> Dr. Parmod and I have proposed a course on ***Thermal Management of Electronics***, intended for 3rd/4th year B.Tech., PG, and PhD students. The course content is attached for your reference.
> We would be glad to hear your suggestions on this course, and also request you to let us know if you would be interested in teaching this course in future.
>
> Thanks and regards,
> Sarthak
> --
> **Dr. Sarthak Nag | डॉ. सार्थक नाग**
> Assistant Professor | सहायक प्रोफेसर
> School of Mechanical and Materials Engineering
> Indian Institute of Technology Mandi | भारतीय प्रौद्योगिकी संस्थान मंडी
> Kamand, Himachal Pradesh - 175005, India | कमांद, हिमाचल प्रदेश - 175075, भारत
> Email: sarthak@iitmandi.ac.in | Phone: +91-(0)1905-26-7743

Sarthak Nag <sarthak@iitmandi.ac.in>

Proposed Course on Thermal Management of Electronics

Dr Atul Dhar <add@iitmandi.ac.in> Fri, Sep 5, 2025 at 12:18 PM
To: Sarthak Nag <sarthak@iitmandi.ac.in>
Cc: Parmod Kumar <parmod@iitmandi.ac.in>

Dear Dr. Sarthak and Dr. Parmod,
In my opinion, the course on Thermal Management of Electronics is comprehensive and extremely useful for developing an appreciation of the concepts of heat transfer in an emerging and challenging application. Proposed units cover the review of basic concepts, a detailed description of fundamental cooling technologies, and an introduction to the implementation systems of solutions for thermal management of electronics. This approach will motivate the students to further study the concepts as per the application requirements.
I recommend this course proposal.

Best Wishes,
Atul

On Tue, Sep 2, 2025 at 12:06 PM Sarthak Nag <sarthak@iitmandi.ac.in> wrote:

> Dear Colleagues,
>
> Dr. Parmod and I have proposed a course on ***Thermal Management of Electronics***, intended for 3rd/4th year B.Tech., PG, and PhD students. The course content is attached for your reference.
> We would be glad to hear your suggestions on this course, and also request you to let us know if you would be interested in teaching this course in future.
>
> Thanks and regards,
> Sarthak
> –
> **Dr. Sarthak Nag | डॉ. सार्थक नाग**
> Assistant Professor | सहायक प्रोफेसर
> School of Mechanical and Materials Engineering
> Indian Institute of Technology Mandi | भारतीय प्रौद्योगिकी संस्थान मंडी
> Kamand, Himachal Pradesh - 175005, India | कमांद, हिमाचल प्रदेश - 175075, भारत
> Email: sarthak@iitmandi.ac.in | Phone: +91-(0)1905-26-7743

Sarthak Nag <sarthak@iitmandi.ac.in>

Request for Feedback on Proposed Course: Thermal Management of Electronics

Sarthak Nag <sarthak@iitmandi.ac.in> Wed, Sep 3, 2025 at 10:22 AM
To: Arup Kumar Das <arup.das@me.iitr.ac.in>
Cc: Parmod Kumar <parmod@iitmandi.ac.in>

Dear Prof. Arup,

Thank you very much for reviewing our course proposal and for your valuable feedback. Based on your suggestions, we have revised Modules 3, 5, and 6.

In brief, the updates include:

- Module 3: Addition of heat sink design
- Module 5: Applications of thermal management in phones, data centres, etc. (+1 hour)
- Module 6: Inclusion of experimentation (+1 hour)

We have also adjusted the hour distribution across modules accordingly. The updated version is attached for your kind reference.

We sincerely appreciate your time and thoughtful input. Thank you very much!

Warm regards,
Sarthak

On Tue, Sep 2, 2025 at 7:31 PM Arup Kumar Das <arup.das@me.iitr.ac.in> wrote:

> Dear Dr. Nag,
>
> Thank you very much for your email. I have gone through the course modules and lecture plan. The plan is adequately drafted.
>
> Some topics may be included if they fit within the given constraint of maximum lecture hours:
>
> - 1. Specific applications of thermal management in electronics used in avionics, data centers, mobile, internet of things, high-performance computing, automotive, etc.
> - 2. Design of the heat sink can also be included.
>
> Also, suggest including some hands-on, practical experiments, such as demonstrations of a heat pipe, calculations of the thermal resistance of a heat sink, and estimation of battery health due to overheating, etc.
>
> However, overall, the course is well-drafted and relevant to students with a mechanical engineering background.
>
> Please let me know if you require any additional information.
>
> Regards,
>
> Dr. Arup Kumar Das
> Professor
> Department of Mechanical and Industrial Engineering

IIT Roorkee
Roorkee 247667
India
Phone: 91-1332284802 or 91-8979602679
Email: arup.das@me.iitr.ac.in or arupdas80@gmail.com

From: "Sarthak Nag" <sarthak@iitmandi.ac.in>
To: "Arup KumarDas" <arup.das@me.iitr.ac.in>
Cc: "Parmod Kumar" <parmod@iitmandi.ac.in>
Sent: Tuesday, September 2, 2025 12:06:30 PM
Subject: Request for Feedback on Proposed Course: Thermal Management of Electronics

Dear Prof. Arup Das,

I hope this message finds you well.

Dr. Parmod and I have recently proposed a course titled Thermal Management of Electronics, intended for 3rd/4th year B.Tech., PG, and PhD students at IIT Mandi. The course aims to cover fundamentals as well as advanced aspects of thermal management techniques relevant to electronic devices and systems.

I am attaching the detailed course content for your kind perusal. Given your expertise in the field, I would be grateful if you could review the material and share your valuable feedback or suggestions for improvement.

Looking forward to hearing from you.

With warm regards,
Sarthak and Parmod
--
Dr. Sarthak Nag | डॉ. सार्थक नाग
Assistant Professor | सहायक प्रोफेसर
School of Mechanical and Materials Engineering
Indian Institute of Technology Mandi | भारतीय प्रौद्योगिकी संस्थान मंडी
Kamand, Himachal Pradesh - 175005, India | कमांद, हिमाचल प्रदेश - 175075, भारत
Email: sarthak@iitmandi.ac.in | Phone: +91-(0)1905-26-7743

Course_Proposal_Thermal_Management_Electronics_v2.docx
83K

IIT Mandi
Proposal for a New Course

Course number : **ME 595**
Course Name : **Experiential Learning in Composite Design, Manufacturing, Testing and Recycling**
Distribution : 1-0-4-3 (1-0-P-3)
Intended for : UG/M.Tech/PhD
Prerequisite : Consent of Faculty Advisor
Mutual Exclusion : None

1. Preamble:

Polymer Matrix Composites (PMCs) are advanced materials widely used in aerospace, automotive, marine, renewable energy, and defense sectors due to their high strength-to-weight ratio, corrosion resistance, and design flexibility. This course offers a holistic experiential learning framework that spans composite design, multi-scale simulation (micro–meso–macro), hand lay-up, vacuum-assisted resin transfer molding (VARTM) for manufacturing, and standardized mechanical testing to evaluate tensile, compressive, flexural, and impact performance. Students will also gain hands-on expertise in advanced characterization methods such as Scanning Electron Microscopy (SEM) to study fracture morphology and failure modes, including delamination, fatigue delamination, and matrix or fiber cracking. A distinctive feature of the course is its focus on sustainability, with modules on recycling technologies, fiber recovery from waste composites, and circular economy practices to address environmental challenges. This course provides a comprehensive framework for the design, simulation, manufacturing, testing, and recycling of polymer matrix composites (PMCs).

Course Objectives

- To introduce fundamental principles of polymer matrix composites and their design methodologies.
- To impart skills in micro–meso–macro simulation strategies for predicting composite performance.
- To provide practical training in hand lay-up and VARTM-based manufacturing.
- To develop competency in standard mechanical testing of composites.
- To analyze fracture morphology and modes through SEM and other advanced characterization techniques.
- To familiarize students with sustainability challenges, recycling technologies, and fiber recovery from composite waste.
- To cultivate awareness of circular economy principles and environmental effects of composites.

2. **Course Modules with quantitative lecture hours:**

Practical 1: Composite Fabrication (Hand lay-up and VARTM Hands-on) [6 hrs]

- Introduction and Methodologies for composite materials
- Students prepare molds, perform resin infusion under vacuum, cure laminates, and evaluate quality (voids, fiber wet-out).
- Exposure to real manufacturing challenges such as leakage, incomplete impregnation, or resin flow control.

Practical 2: Multi-scale Simulation Projects [8 hrs]

- Micro-macro mechanics introduction, and their importance, case studies of RVE based design and classical laminate theory
- Micro-scale: Building a Representative Volume Element (RVE) and predicting fiber/matrix properties.
- Meso-scale: Laminate design and delamination modeling.
- Macro-scale: Finite Element Analysis (FEA) of a composite beam or panel under impact load.

Practical 3: Mechanical Testing Laboratory [6 hrs]

- Mechanical Properties of composite materials and their ASTM standards
- Conduct tensile, compression, bending, and impact tests as per ASTM/ISO standards.
- Collect and interpret load–displacement and stress–strain data.
- Compare experimental results with simulation predictions.

Practical 4: Fracture Morphology Study [4 hrs]

- Identification of fiber pull-out, matrix cracking, interfacial debonding, and delamination.
- Correlation of fracture features with failure modes.

Practical 5: Recycling & Fiber Recovery [6 hrs]

- Small-scale demonstration of mechanical or thermal recycling of cured composites.
- Fiber extraction trials (carbon/glass fibers).
- Property evaluation of recycled fibers compared to virgin fibers.

Practical 6: Circular Economy Case Study [6 hrs]

- Group project analyzing the lifecycle of composites in aerospace/automotive/wind energy sectors.
- Proposal of sustainable design and recycling solutions for end-of-life composites.

Practical 7: Capstone Project: Design → Manufacture → Test → Recycle Cycle [24 hrs]

- Teams design a composite component (e.g., plate, beam, or panel).
- Manufacture it via Hand lay up or VARTM.
- Test its mechanical performance.
- Computational simulation for performance/properties evaluation
- Analyze fracture morphology.
- Attempt partial recycling and assess recovered materials.

Project-Based Problems for Experiential Learning

A. Design & Simulation (Micro–Meso–Macro)

- Develop a Representative Volume Element (RVE) to predict elastic constants of a unidirectional composite.
- Model stress distribution at the fiber–matrix interface under transverse loading.
- Simulate the effect of fiber misalignment on tensile strength.
- Study impact of fiber waviness on stiffness using finite element analysis.
- Analyze progressive matrix cracking in a cross-ply laminate under tensile load.
- Model delamination propagation using cohesive zone elements.
- Conduct multi-scale simulation to connect micro-level properties with structural performance.
- Optimize stacking sequence of a laminate for maximum bending stiffness.
- Study the influence of fiber volume fraction on overall composite modulus.
- Simulate drop-weight impact on a composite plate and validate with experiments.
- Investigate fatigue life of a composite plate under cyclic loading.
- Study vibration response of a composite beam using FEA and compare with experiment.

B. Manufacturing & Processing

- Fabricate glass fiber/epoxy laminates using Hand layup method and VARTM; and measure void fraction.
- Compare properties of laminates fabricated at different vacuum levels.
- Study effect of resin viscosity on resin infusion time.
- Manufacture laminates with different curing cycles and evaluate mechanical properties.
- Investigate influence of mold release agents on surface finish and quality.
- Study effect of fiber stacking sequence on resin infusion rate.
- Develop hybrid laminates (carbon + glass fibers) and evaluate performance.
- Compare laminates fabricated with and without peel ply layers.
- Measure permeability of different fiber preforms for VARTM.
- Conduct flow visualization experiments to analyze resin front progression.

- Optimize mold design for uniform resin distribution.
- Study influence of compaction pressure on fiber volume fraction in laminates.

C. Mechanical Testing & Performance Evaluation

- Perform tensile testing of fabricated laminates and compare with theoretical predictions.
- Conduct flexural tests (three-point and four-point bending) and analyze failure modes.
- Evaluate compressive strength of composites using short-block method.
- Carry out interlaminar shear strength (ILSS) testing.
- Perform impact testing (drop-weight or Charpy/Izod) on composite panels.
- Study effect of laminate thickness on impact energy absorption.
- Compare mechanical performance of unidirectional vs. woven laminates.
- Analyze effect of fiber orientation (0°, 45°, 90°) on tensile/flexural strength.
- Study effect of repeated low-velocity impacts on composite durability.
- Evaluate mechanical property degradation after thermal aging cycles.
- Measure fatigue life of laminates under tension–tension cyclic loading.
- Study creep behavior of polymer composites at elevated temperatures.

D. Fracture Morphology & Failure Modes

- Use SEM to analyze fracture surfaces of tensile-tested samples.
- Compare fracture morphology of composites with brittle vs. toughened matrices.
- Identify fiber pull-out, matrix cracking, and interfacial debonding in flexural failure.
- Study fracture surfaces from impact tests and correlate with absorbed energy.
- Analyze delamination regions in cross-ply laminates after cyclic loading.
- Compare SEM images of virgin and thermally aged composites to study degradation.
- Investigate effect of stacking sequence on fracture morphology.
- Correlate fracture features with predicted failure modes from simulation.

E. Recycling, Fiber Recovery & Circular Economy

- Demonstrate mechanical recycling of waste composites via grinding and reuse in secondary products.
- Extract glass fibers from end-of-life composites using pyrolysis and analyze fiber quality.
- Recover carbon fibers using chemical recycling methods and compare properties with virgin fibers.
- Manufacture hybrid laminates using a mix of virgin and recycled fibers and test mechanical properties.
- Evaluate thermal stability of recycled fibers using DSC/TGA.
- Conduct a lifecycle assessment (LCA) of a composite product (e.g., wind turbine blade, automotive panel) and propose sustainable recycling strategies.

3. Text books:

- P.K. Mallick – *Fiber-Reinforced Composites: Materials, Manufacturing, and Design* (3rd Ed., CRC Press, 2007)
- Robert M. Jones - *Mechanics of Composite Materials* (Taylor & Francis, 1999).

4. References:

- B.D. Agarwal, L.J. Broutman & K. Chandrashekhara – *Analysis and Performance of Fiber Composites (4th Ed., Wiley, 2017)*
- A.B. Strong – *Fundamentals of Composites Manufacturing: Materials, Methods, and Applications (2nd Ed., SME, 2008)*
- S.T. Peters (Ed.) – *Handbook of Composites* (2nd Ed., Chapman & Hall, 1998)
- S. Gay, J. Hoa & S.W. Tsai – *Composite Materials: Design and Applications* (3rd Ed., CRC Press, 2015)
- L. Tong, A.P. Mouritz & M. Bannister – *3D Fibre Reinforced Polymer Composites* (Elsevier, 2002)
- S.J. Pickering (Ed.) – *Recycling Technologies for Thermoset Composites* (Elsevier, 2016)
- Y. Yang, R. Boom, B. Irion et al. – *Recycling of Composite Materials* (Springer, 2012)
- M. Piggott – *Load Bearing Fibre Composites* (2nd Ed., Springer, 2002)
- F.L. Mathews and R.D. Rawlings-*Composite Materials: Engineering and Science* (Elsevier, 1999)
- I.M. Daniel & O. Ishai – *Engineering Mechanics of Composite Materials* (2nd Ed., Oxford University Press, 2006)

5. Similarity with the existing courses:
(Similarity content is declared as per the number of lecture hours on similar topics)

S. No.		Course Code	Similarity Content	Approx. % of Content
1.		NA	NA	NA

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

Approvals:

Faculty interested in teaching this course:
Dr Himanshu Pathak, Dr Sunny Zafar, Dr Raj Kiran, Prof Rajeev Kumar, Prof Mohammad Talha, Prof Vishal Singh Chauhan, Dr Rajesh Ghosh, Dr Deepak Sachan, Dr Prateek Saxena, Dr Deepak Deelip Patil

Proposed by: Dr Himanshu Pathak and Dr Sunny Zafar
School: SMME

Signature: **Date:** 16/09/2025

The following faculty (at least 2 faculty) provided the feedback and it was discussed among school/centre faculty on……..

Sl. No	Faculty Name	Signature
01	Dr Anoop Anand, Composites Research Center RDEE-DRDO	Email enclosed
02	Dr Ujendra Kumar Komal, IIT Guwahati	Email enclosed
03	Dr Raj Kiran IIT Mandi	Email enclosed
04	Dr Rajneesh Sharma IIT Mandi	Email enclosed
05	Prof Rajeev Kumar IIT Mandi	
06	Prof Mohammad Talha IIT Mandi	
07	Prof Vishal Singh Chauhan IIT Mandi	Email
08	Dr Rajesh Ghosh IIT Mandi	
09	Dr Prateek Saxena IIT Mandi	Email
10	Dr Deepak Sachan IIT Mandi	Email
11	Dr Deepak Deelip Patil IIT Mandi	

School Chair: D. Amit Kumar 19/9/25

School: SMME

Date:

This proposal is reported in ……..th Board of Academics on ……

Dean Academics

Date:

Note: School is responsible for the Course Code. Academic Office provides the IC Course Code.

Comments of the Reviewers: Enclosed

यांत्रिकी एवं पदार्थ अभियांत्रिकी विभाग SMME Office <smmeoffice@iitmandi.ac.in>

Required approval-new course proposal

4 messages

यांत्रिकी एवं पदार्थ अभियांत्रिकी विभाग SMME Office <smmeoffice@iitmandi.ac.in> Fri, Oct 17, 2025 at 10:07 AM
To: Vishal Singh Chauhan <vsc@iitmandi.ac.in>, Deepak Sachan <dsachan@iitmandi.ac.in>, Prateek Saxena <prateek@iitmandi.ac.in>

Dear Sir,
PFA

--

Thanks & Regards,
SMME Office (School of Mechanical and Materials Engineering)
A11.04.33, North Campus, IIT Mandi
Phone: 01905-267138

2 attachments

new course.pdf
397K

new course.pdf
397K

Prateek Saxena <prateek@iitmandi.ac.in> Fri, Oct 17, 2025 at 10:09 AM
To: यांत्रिकी एवं पदार्थ अभियांत्रिकी विभाग SMME Office <smmeoffice@iitmandi.ac.in>, Vishal Singh Chauhan <vsc@iitmandi.ac.in>, Deepak Sachan <dsachan@iitmandi.ac.in>

Approved from my side

Thank you and Best regards,
Prateek

Dr. Prateek Saxena
School of Mechanical and Materials Engineering
Indian Institute of Technology Mandi,
Kamand, Himachal Pradesh – 175005, India

From: यांत्रिकी एवं पदार्थ अभियांत्रिकी विभाग SMME Office <smmeoffice@iitmandi.ac.in>
Sent: Friday, October 17, 2025 10:07:30 AM
To: Vishal Singh Chauhan <vsc@iitmandi.ac.in>; Deepak Sachan <dsachan@iitmandi.ac.in>; Prateek Saxena <prateek@iitmandi.ac.in>
Subject: Required approval-new course proposal

[Quoted text hidden]

Deepak Sachan <dsachan@iitmandi.ac.in> Fri, Oct 17, 2025 at 10:10 AM
To: यांत्रिकी एवं पदार्थ अभियांत्रिकी विभाग SMME Office <smmeoffice@iitmandi.ac.in>
Cc: Vishal Singh Chauhan <vsc@iitmandi.ac.in>, Prateek Saxena <prateek@iitmandi.ac.in>

Approved.

Regards,
-Deepak
[Quoted text hidden]

Vishal Singh Chauhan <vsc@iitmandi.ac.in> Fri, Oct 17, 2025 at 11:05 AM
To: Deepak Sachan <dsachan@iitmandi.ac.in>
Cc: यांत्रिकी एवं पदार्थ अभियांत्रिकी विभाग SMME Office <smmeoffice@iitmandi.ac.in>, Prateek Saxena <prateek@iitmandi.ac.in>

Recommended.
VSC
[Quoted text hidden]

Course Title: Experiential Learning in Composite Design, Manufacturing, Testing and Recycling

#Reviewer 1

Dr Anoop Anand
Scientist "F"
Composites Research Center
RDEE-DRDO, Pune

Comment 1: The course is seemingly impressive. It has good blend of composite fabrication, modelling and testing/characterisation portions. The course proposal in the project mode learning would be good learning opportunities for the students.

Response/Reply: Thank you for the insightful comment and appreciation.

 # Reviewer 2

Dr Ujendra Kumar Komal
Assistant Professor
Department of Mechanical Engineering,
Indian Institute of Technology Guwahati

Comment 1: The proposed course is both well-organized and highly relevant, providing a comprehensive framework that includes composite design, simulation, manufacturing, testing, and recycling. Its robust emphasis on experiential learning, which is achieved through VARTM, SEM-based fracture analysis, mechanical testing, and a capstone project, will equip students with valuable industry relevant skills. The course is distinguished from conventional composites courses by the timely incorporation of modules on circular economy, fiber recovery, and sustainability.

Response/Reply: Thank you for the insightful comment and appreciation.

Comment 2: A short set of lecture hours can be introduced to complement the practical work and strengthen theoretical foundation.

Response/Reply: Each module (Practical 1 – Practical 7) will have one hour lecture sessions on the theoretical concepts of composite domain. Further, students will explore the knowledge by doing the assigned problems and demonstration of the practical (1-7).

Comment 3: The following books can be included in the Text/Reference Books:

- Composite Materials: Engineering and Science, By F.L. Mathews and R.D. Rawlings.
- Mechanics of Composite Materials by R.M. Jones.

Response/Reply: Thank you for the suggestion. The suggested books are included in the reference list.

 # Reviewer 3
Dr Raj Kiran
Assistant Professor
SMME, IIT Mandi

Comment 1: In light of the current requirements for a practical training-based curriculum, this course will certainly be quite useful for the candidates at the PG level. However, the course can be tailored at various places to cater to the needs of UG students as well. In this regard, I have the following observations which may be considered.

Response/Reply: Thank you for the insightful comment and appreciation.

Comment 2: Prerequisites may be well defined before offering this course at least for UG students.

Response/Reply: Each module will have brief introduction of the theoretical concepts in lecture mode. Therefore, the pre-requestees is not needed/mentioned.

Comment 4: Each practical session may be accompanied by 20-30 minutes of theory.

Response/Reply: Each module will have brief introduction of the theoretical concepts in lecture mode.

Comment 5: In addition to VARTM, other composite fabrication techniques can also be taught. Later, the major focus can be put only on VARTM.

Response/Reply: As suggested, hand lay-up and VARTM-based manufacturing process included in the course content.

Comment 6: While making a transition from Meso Scale Modeling to Macro Scale Modeling, the students should get familiarised with some plate theories. In this context, a simple Classical Laminate Theory can be handy.

Response/Reply: Thanks for suggestion, Classical Laminate Theory included in the course content.

Comment 7: A few practical sessions can be included on the static and dynamic analysis of the laminated composite plates in addition to the stability of the structures. Herein, ANSYS can be quite helpful to understand: (a) Effect of laminate sequencing; (b) Effect of loading and boundary conditions; (c) Effect of geometrical configurations; and (d) The effect of cracks and defects on the static, dynamic, and buckling analysis of the plate and shell structures.

Response/Reply: Thanks for suggestion, the suggested contents are included in the course content.

 # Reviewer 4

Dr Rajneesh Sharma
Associate Professor
SCENE, IIT Mandi

Comment 1: The course is well structured.

Response/Reply: Thank you for the comment and appreciation.

Himanshu Pathak <himanshu@iitmandi.ac.in>

Request for Review of Course Proposal on Polymer Matrix Composites

Anoop Anand <aanand.rde@gov.in> Fri, Oct 3, 2025 at 2:43 PM
To: Himanshu Pathak <himanshu@iitmandi.ac.in>
Cc: Sunny Zafar <sunnyzafar@iitmandi.ac.in>

Dear Prof. Himanshu,

The course is seemingly impressive. It has good blend of composite fabrication, modelling and testing/characterisation portions. The course proposal in the project mode learning would be good learning opportunities for the students.

Thank you,
Anoop.

---- On Mon, 29 Sep 2025 12:23:58 +0530 **Himanshu Pathak** <himanshu@iitmandi.ac.in> wrote ---
[Quoted text hidden]

Anoop Anand, PhD
Scientist
Composites Research Center
RDEE-DRDO
Alandi Road, Pune 411015

0091 20 27044866

Himanshu Pathak <himanshu@iitmandi.ac.in>

Request for Review of Course Proposal on Polymer Matrix Composites

Ujendra Kumar Komal <ukk@iitg.ac.in> Thu, Oct 2, 2025 at 7:35 PM
To: Himanshu Pathak <himanshu@iitmandi.ac.in>
Cc: Sunny Zafar <sunnyzafar@iitmandi.ac.in>

Dear Prof. Himanshu Pathak,

The proposed course is both well-organized and highly relevant, providing a comprehensive framework that includes composite design, simulation, manufacturing, testing, and recycling. Its robust emphasis on experiential learning, which is achieved through VARTM, SEM-based fracture analysis, mechanical testing, and a capstone project, will equip students with valuable industry-relevant skills. The course is distinguished from conventional composites courses by the timely incorporation of modules on circular economy, fiber recovery, and sustainability.

I suggest the following refinements to strengthen the proposal:

- A short set of lecture hours can be introduced to complement the practical work and strengthen theoretical foundation.
- The following books can be included in the Text/Reference Books.
    1. Composite Materials: Engineering and Science, By F.L. Mathews and R.D. Rawlings.
    2. Mechanics of Composite Materials by R.M. Jones

Best Regards,
Ujendra

****
Ujendra Kumar Komal, PhD
Assistant Professor,
Department of Mechanical Engineering,
Indian Institute of Technology Guwahati,
Guwahati - 781039, Assam, India
Phone:+91-361-2582681

From: Himanshu Pathak <himanshu@iitmandi.ac.in>
Sent: 29 September 2025 12:20
To: Ujendra Kumar Komal <ukk@iitg.ac.in>
Cc: Sunny Zafar <sunnyzafar@iitmandi.ac.in>
Subject: Request for Review of Course Proposal on Polymer Matrix Composites

[Quoted text hidden]

Himanshu Pathak <himanshu@iitmandi.ac.in>

Request for Review of Course Proposal on Polymer Matrix Composites

Raj Kiran <raj@iitmandi.ac.in> Wed, Oct 1, 2025 at 10:49 AM
To: Himanshu Pathak <himanshu@iitmandi.ac.in>

Dear Dr. Pathak,

Thanks a lot for reaching out to me regarding the course proposal and its review. In light of the current requirements for a practical training-based curriculum, this course will certainly be quite useful for the candidates at the PG level. However, the course can be tailored at various places to cater to the needs of UG students as well. In this regard, I have the following observations which may be considered.

1- Prerequisites may be well defined before offering this course at least for UG students.In my opinion, it should be offered only to UG Year 4 so that they can get out maximum out of it.
2- Each practical session may be accompanied by 20-30 minutes of theory.
3- In addition to VARTM, other composite fabrication techniques can also be taught. Later, the major focus can be put only on VARTM.
4- While making a transition from Meso Scale Modeling to Macro Scale Modeling, the students should get familiarised with some plate theories. In this context, a simple Classical Laminate Theory can be handy.
5- A few practical sessions can be included on the static and dynamic analysis of the laminated composite plates in addition to the stability of the structures. Herein, ANSYS can be quite helpful to understand: (a) Effect of laminate sequencing ; (b) Effect of loading and boundary conditions; (c) Effect of geometrical configurations; and (d) The effect of cracks and defects on the static, dynamic, and buckling analysis of the plate and shell structures.

It will be great if these observations can be taken into account. Please do not hesitate to write back to me for any further clarification, if any.

Thanks
[Quoted text hidden]
--
Dr. Raj Kiran (He/Him/His)
Assistant Professor
School of Mechanical and Materials Engineering
Indian Institute of Technology Mandi, HP, India

Himanshu Pathak <himanshu@iitmandi.ac.in>

Request for Review of Course Proposal on Polymer Matrix Composites

Rajnish Sharma <rsharma@iitmandi.ac.in> Mon, Sep 29, 2025 at 5:26 PM
To: Himanshu Pathak <himanshu@iitmandi.ac.in>

The course is well structured.
[Quoted text hidden]

ANNEXURE B

IIT Mandi

Proposal for a New Course

Course Number : CE-452
Course Name : Open Channel Flow
Credit : 3
Distribution : 2-1-0-3
Intended for : UG (Civil Engineering)
Prerequisite : CE251-Hydraulics Engineering
Mutual Exclusion: None

Preamble:

This course provides a comprehensive understanding of open channel flow and hydraulic systems, covering fundamental concepts, flow resistance, energy and momentum principles, uniform and non-uniform flow, canal design methodologies, unsteady flow phenomena, pipe flow analysis, and hydraulic modeling techniques. The course emphasizes both theoretical foundations and practical applications in water resources engineering, including design of irrigation canals, analysis of hydraulic structures, and modeling of complex flow systems. Students will develop skills in analyzing and designing various hydraulic systems encountered in civil and environmental engineering practice.

Course Modules with quantitative lecture hours:

Module 1: Introduction to Open Channel Flow (6 Hours)

Open Channel Flow Definition, Types of Channels, Geometric parameters of a channel, Classification of Open Channel Flow, Continuity equation for open channel flow, Momentum equation and its applications in open channel flow.

Module 2: Uniform Flow (8 Hours)

Resistance flow formula, Velocity distribution in open channels, Equivalent roughness coefficient, Velocity coefficients, Uniform flow in rigid boundary channel, Uniform flow in mobile boundary channel. Concept of Specific Energy, Critical depth and its computation, Alternate depth, Choke condition, Specific Force diagram, Sequent depth and its applications.

Module 3: Gradually Varied Flow (8 Hours)

Governing equation of Gradually Varied Flow (GVF), Dynamic equation of GVF, Classification of Gradually Varied Flow (types of flow profiles - M, S, C, H, A curves), Computation of GVF profile (direct step method, standard step method),

Module 4: Rapidly Varied Flow (8 Hours)

Rapidly Varied Flow characteristics, Hydraulic Jump (formation, types, energy loss, length, and location), Flow over a Hump (free flow and submerged flow conditions), Flow in Channel Transition (expansions and contractions, design considerations).

Module 5: Unsteady Flow (6 Hours)

Occurrence of Unsteady Flow, Waves and their classification (gravity waves, dynamic waves), Celerity of wave in open channels, Surges (positive and negative surges), Governing equation for unsteady flows, St. Venant Equations, Boussinesq Equations.

Module 6: Numerical Methods (6 Hours)

Method of Characteristics, Initial and Boundary Conditions, Characteristic Grid Method, Method of Specified Intervals, Introduction to Finite Difference Methods, Flood Modeling using HEC-RAS.

Tutorial Modules:

Problem-solving sessions covering numerical applications of open channel flow equations; Computation of flow profiles; Case studies on real-world hydraulic engineering projects; Computer-aided analysis of hydraulic systems.

Text books:

1. Subramanya, K., Flow in Open Channels, 4th Edition, McGraw Hill Education, India, 2021

2. Chaudhry, M. H., Open Channel Flow, 2nd Edition, Springer, USA, 2008

References:

1. Chow, V. T., Open Channel Hydraulics, McGraw Hill, USA, 1959

2. French, R. H., Open Channel Hydraulics, McGraw Hill, USA, 1985

3. Chanson, H., The Hydraulics of Open Channel Flow: An Introduction, 2nd Edition, Elsevier, UK, 2004

4. Henderson, F. M., Open Channel Flow, Macmillan, USA, 1966

5. Modi, P. N. and Seth, S. M., Hydraulics and Fluid Mechanics, Standard Book House, India, 2020

6. Streeter, V. L. and Wylie, E. B., Fluid Mechanics, McGraw Hill, USA, 1985

Similarity with the existing courses:

(Similarity content is declared as per the number of lecture hours on similar topics)

S. No.	Course Code	Similarity Content	Approx. % of Content
1.	CE251	Discharge measurements in open channel, Concept of Specific Energy, Critical flow and depth computation, application of specific energy. [2 Lectures]	5%

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

Approvals:

Faculty interested in teaching this course: – (1) Vivek Gupta (2) Harshad Kulkarni (3) Aliva Nanda

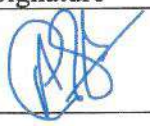
Proposed by: Vivek Gupta

Signature:

School: SCENE

Date: 23/10/2025

The following external faculty (at least 2 faculty) provided the feedback, and it was discussed among school/centre faculty on……..

Sl. No	Faculty Name	Signature
1.	Prof. Ashutosh Sharma Department of Hydrology IIT Roorkee	
2.	Prof. Priyank Sharma Civil Engineering IIT Indore	

School Chair:

School:

Date:

This proposal is reported in ……..th Board of Academics on ……

Dean Academics

Date:

Note: School is responsible for the Course Code. Academic Office provides the IC Course Code.

Comments of the Reviewers:

Reviewer 1

Dr. Priyank Sharma
to me

2:30 PM (6 hours ago)

Dear Prof. Gupta,

The course is well designed to cater to the fundamental knowledge of Hydraulics for undergraduate students. I have carefully reviewed it and found the contents elaborate and well-structured. However, I have a few suggestions.
1) Module 4 - Unsteady flow can be proposed as an additional module since it does not have a direct linkage with canal design. Additionally, the Saint-Venant equations can be added to the Unsteady flow module at the outset. The lecture hours for both modules can be distributed accordingly.
2) Module 5 - Pipe flow portions can be removed from this module since they won't align with the open channel flow theme. The hydraulic model study part can be retained with applications on open channel flow.

The rest is fine.

If there are any queries about my suggestions, please let me know.

Thanks and Regards!
Priyank Sharma

Dr. Priyank J. Sharma | डॉ. प्रियांक जे. शर्मा
Assistant Professor | सहायक प्राध्यापक
Department of Civil Engineering | जनपद अभियांत्रिकी विभाग
Indian Institute of Technology Indore | भारतीय प्रौद्योगिकी संस्थान इंदौर
Simrol - 453552, Madhya Pradesh, India | सिमरोल - ४५३५५२, मध्यप्रदेश, भारत
Phone: +91-731-660-3382
Mobile: +91 9898838823
Email: priyankusharma@iiti.ac.in, pjs230686@gmail.com

[Reply] We appreciate the reviewer's suggestions. Accordingly, the revised proposal now includes an additional module on Unsteady Flow and removes the module on Pipe Flow. We have also incorporated one more module covering the numerical modeling of open channel flow.

Reviewer 2

Ashutosh Sharma
to me

8:25 AM (15 hours ago)

Dear Prof. Gupta,

Thank you for sending the "Open Channel Flow" course proposal for review.

The proposal is comprehensive and well-structured, covering essential topics like uniform and non-uniform flow, canal design (including Kennedy's and Lacey's theories), pipe flow analysis, and hydraulic modeling. The course offers an excellent balance between theoretical foundations and practical applications, making it highly relevant for undergraduate Civil Engineering students. It is indeed a valuable addition to the curriculum.

I cannot think of any major additions; the inclusion of problem-solving sessions and case studies in the practical component is highly beneficial.

One minor suggestion for future enhancement, if feasible, would be to include a Flume Experiment in the lab modules to provide students with a better understanding of different flow types. This could be added if and when such a facility becomes available at IIT Mandi.

Overall, I fully support the course.

Best regards,
Ashutosh

[Reply] We thank the reviewer for the feedback. Regarding the Flume Experiment, an additional lab course will be added in the upcoming year once the necessary resources have been arranged.

Vivek Gupta <vivekgupta@iitmandi.ac.in>

Need feedback on new proposed course

2 messages

Vivek Gupta <vivekgupta@iitmandi.ac.in> Wed, Oct 22, 2025 at 11:48 AM
To: Ashutosh Sharma <ashutosh.sharma@hy.iitr.ac.in>

Dear Prof. Sharma,

We are going to offer a new course on open channel flow for civil engineering undergraduate students at IIT Mandi. This is a standard course offered across many IITs. I would highly appreciate it if you could provide any feedback you may have on the attached proposal.

Please let me know if you have any questions.

Thanks and regards,
Vivek

Course_Proposal_Open_Channel_Flow.pdf
159K

Ashutosh Sharma <ashutosh.sharma@hy.iitr.ac.in> Thu, Oct 23, 2025 at 8:24 AM
To: Vivek Gupta <vivekgupta@iitmandi.ac.in>

Dear Prof. Gupta,

Thank you for sending the "Open Channel Flow" course proposal for review.

The proposal is comprehensive and well-structured, covering essential topics like uniform and non-uniform flow, canal design (including Kennedy's and Lacey's theories), pipe flow analysis, and hydraulic modeling. The course offers an excellent balance between theoretical foundations and practical applications, making it highly relevant for undergraduate Civil Engineering students. It is indeed a valuable addition to the curriculum.

I cannot think of any major additions; the inclusion of problem-solving sessions and case studies in the practical component is highly beneficial.

One minor suggestion for future enhancement, if feasible, would be to include a Flume Experiment in the lab modules to provide students with a better understanding of different flow types. This could be added if and when such a facility becomes available at IIT Mandi.

Overall, I fully support the course.

Best regards,
Ashutosh

[Quoted text hidden]

Vivek Gupta <vivekgupta@iitmandi.ac.in>

Need feedback on new course

2 messages

Vivek Gupta <vivekgupta@iitmandi.ac.in> Wed, Oct 22, 2025 at 11:46 AM
To: "Dr. Priyank Sharma" <priyanksharma@iiti.ac.in>

Dear Prof. Sharma,

We are going to propose a new course on open channel flow for undergraduate students at IIT Mandi. This is a standard course offered across many IITs. I would highly appreciate it if you could provide any feedback you may have on the attached proposal.

Please let me know if you have any questions.

Thanks and regards,
Vivek

Course_Proposal_Open_Channel_Flow.pdf
159K

Dr. Priyank Sharma <priyanksharma@iiti.ac.in> Thu, Oct 23, 2025 at 2:29 PM
To: Vivek Gupta <vivekgupta@iitmandi.ac.in>

Dear Prof. Gupta,

The course is well designed to cater to the fundamental knowledge of Hydraulics for undergraduate students. I have carefully reviewed it and found the contents elaborate and well-structured. However, I have a few suggestions.
1) Module 4 - Unsteady flow can be proposed as an additional module since it does not have a direct linkage with canal design. Additionally, the Saint-Venant equations can be added to the Unsteady flow module at the outset. The lecture hours for both modules can be distributed accordingly.
2) Module 5 - Pipe flow portions can be removed from this module since they won't align with the open channel flow theme. The hydraulic model study part can be retained with applications on open channel flow.

The rest is fine.

If there are any queries about my suggestions, please let me know.

Thanks and Regards!
Priyank Sharma

Dr. Priyank J. Sharma | डॉ. प्रियांक जे. शर्मा
Assistant Professor | सहायक प्राध्यापक
Department of Civil Engineering | जनपद अभियांत्रिकी विभाग
Indian Institute of Technology Indore | भारतीय प्रौद्योगिकी संस्थान इंदौर
Simrol - 453552, Madhya Pradesh, India | सिमरोल - ४५३५५२, मध्यप्रदेश, भारत
Phone: +91-731-660-3382
Mobile: +91 9898838823
Email: priyanksharma@iiti.ac.in, pjs230688@gmail.com

Visit my webpage for more details:
https://sites.google.com/view/priyank2306
[Quoted text hidden]

Vivek Gupta <vivekgupta@iitmandi.ac.in>

Regarding Course Review

6 messages

Vivek Gupta <vivekgupta@iitmandi.ac.in> Thu, Oct 23, 2025 at 11:41 PM
To: Ashutosh Sharma <ashutosh.sharma@hy.iitr.ac.in>, "Dr. Priyank Sharma" <priyanksharma@iiti.ac.in>

Dear Both,

I highly appreciate your time and effort to provide feedback on the course proposal. I have revised the proposal thoroughly as per the comments. You may find the reply to the comments in the attached PDF.

If you accept the revised proposal. I would highly appreciate it if you could sign the and return the proposal as soon as possible.

Thanks and Regards,
Vivek

Course_Proposal_Open_Channel_Flow_revised.pdf
401K

Dr. Priyank Sharma <priyanksharma@iiti.ac.in> Thu, Oct 23, 2025 at 11:55 PM
To: Vivek Gupta <vivekgupta@iitmandi.ac.in>
Cc: Ashutosh Sharma <ashutosh.sharma@hy.iitr.ac.in>

Dear Prof. Gupta,

The revised course syllabus seems fine to me.

Regards!
Priyank Sharma

Dr. Priyank J. Sharma | डॉ. प्रियांक जे. शर्मा
Assistant Professor | सहायक प्राध्यापक
Department of Civil Engineering | जनपद अभियांत्रिकी विभाग
Indian Institute of Technology Indore | भारतीय प्रौद्योगिकी संस्थान इंदौर
Simrol - 453552, Madhya Pradesh, India | सिमरोल - ४५३५५२, मध्यप्रदेश, भारत
Phone: +91-731-660-3382
Mobile: +91 9898838823
Email: priyanksharma@iiti.ac.in, pjs230688@gmail.com

Visit my webpage for more details:
https://sites.google.com/view/priyank2306
[Quoted text hidden]

Ashutosh Sharma <ashutosh.sharma@hy.iitr.ac.in> Fri, Oct 24, 2025 at 1:00 AM
To: "Dr. Priyank Sharma" <priyanksharma@iiti.ac.in>
Cc: Vivek Gupta <vivekgupta@iitmandi.ac.in>

Dear Prof. Gupta,

The revised course content looks good to me. I am satisfied with the changes made to the proposal. Please find attached the signed proposal.

Thanks,
Ashutosh

Dr. Ashutosh Sharma, PhD
Assistant Professor
Department of Hydrology
Indian Institute of Technology Roorkee

Email: ashutosh.sharm@hy.iitr.ac.in
Phone: (+91) 7896880487
[Quoted text hidden]

Course_Proposal_Open_Channel_Flow_revised.pdf
684K

Vivek Gupta <vivekgupta@iitmandi.ac.in> Fri, Oct 24, 2025 at 10:02 AM
To: Ashutosh Sharma <ashutosh.sharma@hy.iitr.ac.in>
Cc: "Dr. Priyank Sharma" <priyanksharma@iiti.ac.in>

Dear Prof. Ashutosh,

Thanks a lot for the prompt response on this.

Thanks and Regards,
Vivek
[Quoted text hidden]

Dr. Priyank Sharma <priyanksharma@iiti.ac.in> Fri, Oct 24, 2025 at 10:11 AM
To: Vivek Gupta <vivekgupta@iitmandi.ac.in>
Cc: Ashutosh Sharma <ashutosh.sharma@hy.iitr.ac.in>

Dear Prof. Gupta,

Pls find attached the signed document from my end.

Regards!
Priyank Sharma

[Quoted text hidden]

Course_Proposal_Open_Channel_Flow_revised.pdf
716K

Vivek Gupta <vivekgupta@iitmandi.ac.in> Fri, Oct 24, 2025 at 10:21 AM
To: "Dr. Priyank Sharma" <priyanksharma@iiti.ac.in>
Cc: Ashutosh Sharma <ashutosh.sharma@hy.iitr.ac.in>

Dear Prof. Priyank,

Thanks a lot for the response.

Regards,
Vivek
[Quoted text hidden]

Final

IIT Mandi

Proposal for a New Course

Course number	**: CE567**
Course Name	**: Highway Safety and Modeling**
Credit Distribution	**: *3-0-0-3***
Intended for	**: UG/PG elective**
Prerequisite	**: IC 252 Probability and Statistics; CE 352 – Transportation Engineering**
Mutual Exclusion	**: None**

---

1. Preamble:

This course provides comprehensive coverage of the state-of-the-art knowledge about highway safety and analysis of road safety data. This course covers aspects like collecting road safety-related data, integrating it, choosing appropriate analytical techniques, and evaluating countermeasures based on their efficacy. This course has been crafted after reviewing materials from various textbooks, research papers, and national and international codes of best practices. This course is immensely important for developing countries like India, as it can help achieve India's goal of reducing roadway fatalities in alignment with United Nations Sustainable Development Goal 3.6.

2. Course Modules with quantitative lecture hours:

Module 1: Introduction to Road Safety – Overview of road safety status in India and the world, development and function of road safety agencies, human factors, crash characteristics, crash data, roadway data, national road safety plans, road safety plans of different states in India, road safety audits, fundamentals of road safety **[5 hours]**

Module 2: Analytical Methods to Explore Road Safety – Analyze Crash/Accident Data, Fundamentals of data collection, network screening, t-test, linear regression, injury severity analysis, crash frequency models **[10 hours]**

Module 3: Effectiveness of Crash Countermeasures – Exploratory analysis of safety data, regression to mean, cross-sectional and panel studies, naïve before and after studies, empirical bayes method, crash modification factor, countermeasure selection, safety

performance function **[10 hours]**

Module 4: Science of Crash Reconstruction – Fundamentals of accident/crash studies, crash investigation procedures, causal factor analysis in crash events, use of vehicle dynamics, applications of reconstruction in legal, insurance, and safety contexts **[5 hours]**

Module 5: Crashes and Economics – Economic appraisal, cost-benefit analysis, project prioritization, data-driven decision making, estimation of economic and societal cost of crashes **[5 hours]**

Module 6: Advances in Road Safety – Surrogate safety measures, naturalistic driving, vehicle telematics data, V-box data, advanced driver assistance systems, driving simulator, autonomous emergency braking systems, use of machine learning and artificial intelligence in crash data analysis **[5 hours]**

3. **Textbook:**
   - Lord, D., Qin, X., Geedipally, S.R., 2021. Highway Safety Analytics and Modeling. Science Direct. ISBN 978-0-12-816818-9
   - Washington, S., Karlaftis, M.G., Mannering, F., Anastaspoulos, 2020. Statistical and Econometric Methods for Transportation Data Analysis. Chapman and Hall/CRC, New York, USA.
   - Daily, J., Shigemura, N., Daily, J, 2018. Fundamentals of Traffic Crash Reconstruction. Institute of Police Technology and Management, Vol 3.

4. **References:**
   - Indian Roads Congress, 1996, Highway Safety Code, Special Publication no. 44.
   - Indian Roads Congress, 2019, Manual of Road Safety Audit, Special Publication no. 88.
   - Indian Motor Vehicles (Amendment) Act, 2019.
   - Indian Roads Congress, 2018, Guidelines for traffic calming measures in urban and rural areas.
   - United States Department of Transportation, 2024, Highway Safety Manual
   - Ministry of Road Transport and Highways, 2010, National Road Safety Policy.

5. **Similarity with the existing courses:**
   (Similarity content is declared as per the number of lecture hours on similar topics)

S.No	Course Code	Similarity Content	Approx. % of Content
1	IC 252	t-test, p-values, confidence intervals, normal distribution	<7%
2	CE 352	Traffic signals, roadway characteristics	<5%

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

NA

Approvals:

Jan 29, 2026

Proposed by: Dr. Anshu Bamney
School: SCENE

29/01/26

Signature: **Date: Sept 28, 2025**

Recommended/Not Recommended, with Comments:

_____ **Date:**_____

Chairperson, CPC

Approved / Not Approved

_____ **Date:**_____

Chairperson, BoA

Anshu Bamney <anshu@iitmandi.ac.in>

Request for External Review of Course - CE5XY "Highway Safety and Modeling"

Dr. Anshuman Sharma Deptt. of CIV, IIT(BHU) Varanasi <anshuman.civ@iitbhu.ac.in> Sun, Sep 28, 2025 at 3:20 PM

To: Anshu Bamney <anshu@iitmandi.ac.in>

Dear Anshu,

I am writing to strongly recommend the introduction of this course. Given the increasing complexity of transportation systems and the growing emphasis on safety in road design and management, this course is both timely and relevant. It will equip students with essential skills and knowledge to address critical issues in highway safety, ultimately contributing to the reduction of accidents and fatalities on our roads.

The proposed syllabus outlines a comprehensive curriculum that covers various aspects of highway safety. I would like to provide some specific feedback and suggestions to enhance the course further:

1. Module 3: I recommend incorporating safety performance functions into this module. These functions are vital for understanding the relationship between road design, traffic conditions, and safety outcomes. By including this topic, students will gain valuable insights into how to assess and improve road safety effectively.

2. Module 5: I would like to commend the inclusion of this module, as it represents a significant addition to the course. It aligns well with current trends in highway safety research and practice, ensuring that students are exposed to contemporary issues and methodologies.

3. Module 6: In light of recent advancements in technology, I suggest adding a lecture on the application of machine learning and artificial intelligence in crash data analysis. Researchers have begun leveraging these tools to uncover patterns and predict accidents more accurately. By introducing this content, students will be better prepared to utilize cutting-edge techniques in their future careers.

In conclusion, the proposed course on highway safety and modelling is an essential step towards fostering a safer transportation environment.

All the best!

Dr. Anshuman Sharma
Assistant Professor
Transportation Engineering Section
Civil Engineering Department
Indian Institute of Technology (BHU), Varanasi, India
Google Scholar (link)| LinkedIn (link)

[Quoted text hidden]

Anshu Bamney <anshu@iitmandi.ac.in>

Request for External Review of Course - CE5XY "Highway Safety and Modeling"

Jashami, Hisham <hisham.jashami@oregonstate.edu> Sat, Sep 27, 2025 at 12:41 PM
To: Anshu Bamney <anshu@iitmandi.ac.in>

Hi Dr. Bamney,

It is always good to hear from you.

This is a very well-designed course. It appears robust to me and will, for sure, enhance students' understanding of road safety, enabling them to apply the knowledge they have gained throughout their academic journey.

A few suggestions to consider:

- Module 1- Maybe consider adding road safety plans for different Indian states, especially the state where you are located.
- Module 2- I would recommend removing the time-series model and duration models and introducing them in a higher-level course, possibly at the graduate level. As this is an elective for UG/PG students, it may become heavy for them.
- Module 4- I like this module. As this is not taught in many universities.
- Module 5- Maybe consider including a cost-benefit analysis.

Other than that, everything looks great and spot on to me.

Thanks for giving me the opportunity to review the materials.

Have a wonderful weekend!
Hisham

--
Hisham Jashami, Ph.D., RSP1 (he/him)
Assistant Professor
Oregon State University | School of Civil and Construction Engineering
Driving and Bicycling Simulator Laboratory
Office | Owen Hall 301
Email | hisham.jashami@oregonstate.edu
Phone | 541-602-6736
P-Web | jashami.net
Book time to meet with me | Go Beavs!

From: Anshu Bamney <anshu@iitmandi.ac.in>
Sent: Friday, September 26, 2025 8:22 PM
To: Jashami, Hisham <hisham.jashami@oregonstate.edu>
Subject: Request for External Review of Course - CE5XY "Highway Safety and Modeling"

[Quoted text hidden]

Anshu Bamney <anshu@iitmandi.ac.in>

Request for External Review of Course - CE5XY "Highway Safety and Modeling"

2 messages

Anshu Bamney <anshu@iitmandi.ac.in> Sat, Sep 27, 2025 at 8:52 AM
To: hisham.jashami@oregonstate.edu

Dear Dr. Jashami,

Hope you are good and everything is fine at your end. I am planning to introduce a course titled "Highway Safety and Modeling". The course focuses on state-of-the-art methods for crash data analysis, evaluation of countermeasures, crash reconstruction fundamentals, economics of safety, and a theory-only module on emerging technologies/recent advances in road safety.

Given your expertise in transportation safety, your feedback on the syllabus would be valuable.

Thank you very much for your time.

Best,
Anshu

--

Anshu Bamney, Ph.D.

Assistant Professor

School of Civil and Environmental Engineering

Indian Institute of Technology, Mandi, Himachal Pradesh, India, 175075

Email: anshu@iitmandi.ac.in

Google Scholar (link) | LinkedIn (link)

Course Proposal_Highway Safety and Modeling_Sept 27_2025.docx
3825K

Jashami, Hisham <hisham.jashami@oregonstate.edu> Sat, Sep 27, 2025 at 12:41 PM
To: Anshu Bamney <anshu@iitmandi.ac.in>

Hi Dr. Bamney,

It is always good to hear from you.

This is a very well-designed course. It appears robust to me and will, for sure, enhance students' understanding of road safety, enabling them to apply the knowledge they have gained throughout their academic journey.

A few suggestions to consider:

- Module 1- Maybe consider adding road safety plans for different Indian states, especially the state where you are located.
- Module 2- I would recommend removing the time-series model and duration models and introducing them in a higher-level course, possibly at the graduate level. As this is an elective for UG/PG students, it may become heavy for them.
- Module 4- I like this module. As this is not taught in many universities.

- Module 5- Maybe consider including a cost-benefit analysis.

Other than that, everything looks great and spot on to me.

Thanks for giving me the opportunity to review the materials.

Have a wonderful weekend!
Hisham

--
Hisham Jashami, Ph.D., RSP1 (he/him)
Assistant Professor
Oregon State University | School of Civil and Construction Engineering
Driving and Bicycling Simulator Laboratory
Office | Owen Hall 301
Email | hisham.jashami@oregonstate.edu
Phone | 541-602-6736
P-Web | jashami.net
Book time to meet with me | Go Beavs!

From: Anshu Bamney <anshu@iitmandi.ac.in>
Sent: Friday, September 26, 2025 8:22 PM
To: Jashami, Hisham <hisham.jashami@oregonstate.edu>
Subject: Request for External Review of Course - CE5XY "Highway Safety and Modeling"

[Quoted text hidden]

Anshu Bamney <anshu@iitmandi.ac.in>

Request for External Review of Course - CE5XY "Highway Safety and Modeling"

2 messages

Anshu Bamney <anshu@iitmandi.ac.in> Sat, Sep 27, 2025 at 8:56 AM
To: "Dr. Anshuman Sharma Deptt. of CIV, IIT(BHU) Varanasi" <anshuman.civ@iitbhu.ac.in>

Dear Dr. Sharma,

Hope you are good and everything is fine at your end. I am planning to introduce a course titled "Highway Safety and Modeling". The course focuses on state-of-the-art methods for crash data analysis, evaluation of countermeasures, crash reconstruction fundamentals, economics of safety, and a theory-only module on emerging technologies/recent advances in road safety.

Given your expertise in transportation safety, your feedback on the syllabus would be valuable. Please find attached.

Thank you very much for your time.

Best,
Anshu

--

Anshu Bamney, Ph.D.

Assistant Professor

School of Civil and Environmental Engineering

Indian Institute of Technology, Mandi, Himachal Pradesh, India, 175075

Email: anshu@iitmandi.ac.in

Google Scholar (link) | LinkedIn (link)

Course Proposal_Highway Safety and Modeling_Sept 27_2025.docx
3825K

Dr. Anshuman Sharma Deptt. of CIV, IIT(BHU) Varanasi <anshuman.civ@iitbhu.ac.in> Sun, Sep 28, 2025 at 3:20 PM
To: Anshu Bamney <anshu@iitmandi.ac.in>

Dear Anshu,

I am writing to strongly recommend the introduction of this course. Given the increasing complexity of transportation systems and the growing emphasis on safety in road design and management, this course is both timely and relevant. It will equip students with essential skills and knowledge to address critical issues in highway safety, ultimately contributing to the reduction of accidents and fatalities on our roads.

The proposed syllabus outlines a comprehensive curriculum that covers various aspects of highway safety. I would like to provide some specific feedback and suggestions to enhance the course further:

1. Module 3: I recommend incorporating safety performance functions into this module. These functions are vital for understanding the relationship between road design, traffic conditions, and safety outcomes. By including this topic, students will gain valuable insights into how to assess and improve road safety effectively.

2. Module 5: I would like to commend the inclusion of this module, as it represents a significant addition to the course. It aligns well with current trends in highway safety research and practice, ensuring that students are exposed to

contemporary issues and methodologies.

3. Module 6: In light of recent advancements in technology, I suggest adding a lecture on the application of machine learning and artificial intelligence in crash data analysis. Researchers have begun leveraging these tools to uncover patterns and predict accidents more accurately. By introducing this content, students will be better prepared to utilize cutting-edge techniques in their future careers.

In conclusion, the proposed course on highway safety and modelling is an essential step towards fostering a safer transportation environment.

All the best!

Dr. Anshuman Sharma
Assistant Professor
Transportation Engineering Section
Civil Engineering Department
Indian Institute of Technology (BHU), Varanasi, India
Google Scholar (link)| LinkedIn (link)

[Quoted text hidden]

IIT Mandi
Proposal for a New Course

Course Number: CE568P
Course Name: Experimental Structural Dynamics
Credit: 1
Distribution (L-T-P-C): 0-0-~~4~~ 2-1
Intended for: M.Tech (Structural Engineering) First-Year Students, Second Semester
Prerequisite: Basic Structural Dynamics or equivalent

---

1. **Preamble:**

This course adopts an **experimental approach** to structural dynamics. The suite of experiments are designed to illustrate several aspects of vibratory behaviour of engineering structures subjected to earthquake induced support motions. Students first observe how archetypal structural models respond to controlled vibration or seismic input, then analyze measured data to identify natural frequencies, damping ratios, mode shapes, and other dynamic behaviours. Emphasis is placed on connecting physical observations with idealized analytical models, understanding resonance, damping, and modal interactions directly from experiments. Students learn to operate sensors, data acquisition systems, and analysis tools. This hands-on framework develops deep physical intuition, curiosity-driven learning, and practical insights for applications in earthquake resistant design of building frames, bridges, wave amplification through supporting medium, and water tanks. The experiments are designed to aid an understanding of problems of structural dynamics as relevant to earthquake engineering applications.

Laboratory/Practical/Tutorial Modules:

1. Dynamic response of a three-storied building frame under harmonic base motion
2. Behaviour of an asymmetric single-story frame under harmonic excitation
3. Response of a building frame to non-harmonic periodic base motion
4. Study of vibration isolation in secondary systems
5. Dynamic performance of vibration absorber systems
6. Behaviour of frames with soft or weak ground floors
7. Seismic wave amplification and soil–structure interaction
8. Motion of free-standing rigid bodies under base excitations
9. Vibration of beams subjected to harmonic loading
10. Sloshing of liquid storage tanks under dynamic support motions.

Laboratory Infrastructure:

- Electromechanical shake tables (horizontal and vertical)
- Accelerometers, signal conditioning amplifiers, and data acquisition systems

- Oscilloscopes and software such as MATLAB or other coding platforms for response analysis
- Model frames, beams, tanks, and isolation systems based on IISc-developed educational modules

3. Textbooks:

1. Paz, M., Structural Dynamics, CBS Publishers, New Delhi, 1984
2. Chopra, A. K., Dynamics of Structures: Theory and Applications to Earthquake Engineering, Pearson Education, India, 2012

4. References:

1. Manohar, C. S., and Venkatesha, S., Development of Experimental Setups for Earthquake Engineering Education, Department of Civil Engineering, IISc Bangalore, 2006
2. Clough, R. W., and Penzien, J., Dynamics of Structures, Computers and Structures Inc., USA, 2003

5. Similarity with Existing Courses:

S. No.	Course Code	Similarity Content	Approx. % of Content
1	CE556P	Basic modal analysis	10%

6. Justification of New Course Proposal if Cumulative Similarity >30%:
Not applicable

Approvals:
Faculty Interested in Teaching This Course:

- Dr. Subhamoy Sen
- Dr. Shivang Sekhar

29/01/26

Proposed by: Dr. Subhamoy Sen & Dr. Shivang Sekhar
School: School of Civil and Environmental Engineering

Signature: _____ **Date:** _____

The following external faculty (at least 2) provided feedback, discussed among school/centre faculty on: _____

Sl. No Faculty Name Signature

1

Sl. No Faculty Name Signature

2

School Chair: 29/01/26
School: _____
Date: _____

This proposal is reported in ____th Board of Academics on _____

Dean Academics: _____
Date: _____

Comments of the Reviewers:

Preamble may mention that the experiments are designed to aid an understanding of problems of structural dynamics as relevant to earthquake engineering applications.

SCENE OFFICE <office_scene@iitmandi.ac.in>

Re: Regarding a new course proposal (Experimental structuraldynamics)

7 messages

Shivang Shekhar <shivang@iitmandi.ac.in> Thu, Oct 30, 2025 at 8:11 AM
To: SCENE Office <office_scene@iitmandi.ac.in>, Preeti Rana <office_sceneoa1@iitmandi.ac.in>, Ajay Kumar <ajaykashyap@iitmandi.ac.in>
Cc: Chairperson SCENE <chair_scene@iitmandi.ac.in>, Subhamoy Sen <subhamoy@iitmandi.ac.in>

SCENE Office,

The course review (both internal and external) is done and can be included in the next semester.

Course code - CE 568P is assigned by the school office.

@Chairperson SCENE - Kindly recommend

@SCENE Office - Kindly do further processing for onetime/BoA approval.

Shivang

On Thu, Oct 30, 2025 at 7:49 AM Subhamoy Sen <subhamoy@iitmandi.ac.in> wrote:

Dear all,

With your approval, I now request Dr. @Shivang Shekhar to process this course further so that it can be included in the upcoming semester.

The complete process of finalizing the same with BOA will be done in accordance with the institute norms.

Thanks in advance,
SMS

On Wed, Oct 15, 2025 at 11:36 AM Subhamoy Sen <subhamoy@iitmandi.ac.in> wrote:

Dear Colleagues,

Earlier, I proposed a new laboratory course on Experimental Structural Dynamics, which has now received reviews from Prof. C.S. Manohar (IISc Bangalore) and Dr. Koushik Roy (IIT Patna). While the corrections suggested by Prof. Manohar have been explicitly integrated, we could only partially accommodate Dr. Roy's suggestions. The responses are as follows:

1) The proposed duration of practical hours (i.e. 2 hours) in the laboratory may not be enough for smooth conduction of the tests and to have hands-on exposure in dealing with various advanced sensors. The session should be of three hours.
2) Basic understanding of structural vibration may not suffice in developing in-depth understanding of a few of the experiments listed therein. Some advanced-level lecture hours would be required in my opinuion. The L-T-P-C can be 1-0-3-2.5, therefore.

Regarding Points 1 and 2, I propose to change the course credits as L-T-P-C to 0-0-4-2 since we can not accommodate fractional credits. The additional hours will be used to teach the the theoretical background pertinent to the experiment.

3) Apart from practical exposure, post-processing of the vibration data would need some basic understanding of digital signal processing (including FFT, filtration etc.), which is usually not taught as a part of any typical structural dynamics course.

Regarding point 3, these aspects will be taught during the course in the additional hours.

4) Experimentation of sloshing phenomena, soil-structure interaction etc. would require a different skill-set and laboratory arrangement. Please ensure the laboratory infrastructure is in place.

Regarding point 4, we would sincerely follow this suggestion.

Please find attached the drive link for all feedback and the revised draft for the course, and provide your suggestions.

https://drive.google.com/drive/folders/1uE7iAysahUCoxpNS3_rknWeBEPC1KZqM?usp=drive_link

--
Thanking you,
With regards,


Subhamoy Sen, Ph.D.
https://www.i4siitmandi.com/
Associate Professor, School of Civil and Environmental Engineering,
i4s Laboratory, Room no - A14-4-06
Indian Institute of Technology Mandi,
Mandi 175005, HP, India
Ph no: +91 1905 267 261
Mob: +91 8894 087 002

--
Thanking you,
With regards,


Subhamoy Sen, Ph.D.
https://www.i4siitmandi.com/
Associate Professor, School of Civil and Environmental Engineering,
i4s Laboratory, Room no - A14-4-06
Indian Institute of Technology Mandi,
Mandi 175005, HP, India
Ph no: +91 1905 267 261
Mob: +91 8894 087 002

--

Dr. Shivang Shekhar, Ph.D.

Assistant Professor
School of Civil and Environmental Engineering
Indian Institute of Technology Mandi (IIT Mandi)

Kamand - 175005, Mandi

Himachal Pradesh, India
Phone: +91 - 8193048583
Alt. Email: shivang12287@gmail.com
Web: https://scene.iitmandi.ac.in/pages/postdocs_details/OA==
https://sites.google.com/site/shivangssingh122/

Kala Venkata Uday <uday@iitmandi.ac.in> Thu, Oct 30, 2025 at 8:16 AM
To: Subhamoy Sen <subhamoy@iitmandi.ac.in>, SCENE Office <office_scene@iitmandi.ac.in>
Cc: Shivang Shekhar <shivang@iitmandi.ac.in>, Chairperson SCENE <chair_scene@iitmandi.ac.in>

Subhamoy, just to be in safe side, send a request through Chairperson SCENE for one time approval for floating the course. One time approval will avoid any issues later. The course number needs to be assigned by @SCENE Office which can continue for regular course as well.

Email for your request will be forwarded by chair to adcourses to Dean Academics for this approval.

Regards
Uday
[Quoted text hidden]

Subhamoy Sen <subhamoy@iitmandi.ac.in> Thu, Oct 30, 2025 at 8:19 AM
To: Chairperson SCENE <chair_scene@iitmandi.ac.in>
Cc: SCENE Office <office_scene@iitmandi.ac.in>, Shivang Shekhar <shivang@iitmandi.ac.in>, Kala Venkata Uday <uday@iitmandi.ac.in>

Dear Chair,

Appreciating Dr. Kala's valuable suggestion, I would like to request an OTA for the mentioned course.

Please provide the same.

Regards,
SMS
[Quoted text hidden]

Chairperson SCENE <chair_scene@iitmandi.ac.in> Thu, Oct 30, 2025 at 8:41 AM
To: Subhamoy Sen <subhamoy@iitmandi.ac.in>
Cc: SCENE Office <office_scene@iitmandi.ac.in>, Shivang Shekhar <shivang@iitmandi.ac.in>, Kala Venkata Uday <uday@iitmandi.ac.in>

Approved and recommend for further action.

Thanks and Regards
धन्यवाद एवं शुभकामनाएँ

HK
Dr. Rajneesh Sharma
Chairperson and Associate Professor,
School of Civil and Environmental Engineering,
IIT Mandi, North Campus, Kamand,
Mandi, 175075, HP.
[Quoted text hidden]

Office Scene <office_sceneoa1@iitmandi.ac.in> Fri, Oct 31, 2025 at 3:27 PM
To: Subhamoy Sen <subhamoy@iitmandi.ac.in>
Cc: SCENE Office <office_scene@iitmandi.ac.in>

Dear Sir,

[Quoted text hidden]

CE5XXP -Exp Str Dyn - Revised.pdf
141K

Office Scene <office_sceneoa1@iitmandi.ac.in> Fri, Oct 31, 2025 at 3:38 PM
To: Subhamoy Sen <subhamoy@iitmandi.ac.in>
Cc: SCENE Office <office_scene@iitmandi.ac.in>

Dear Sir,
Kindly find the attachment document for your signature and approval.
[Quoted text hidden]

CE5XXP -Exp Str Dyn - Revised.pdf
141K

Subhamoy Sen <subhamoy@iitmandi.ac.in> Fri, Oct 31, 2025 at 4:39 PM
To: Office Scene <office_sceneoa1@iitmandi.ac.in>
Cc: SCENE Office <office_scene@iitmandi.ac.in>

Please consider this mail as my approval.

Thanking you,
With regards,

Subhamoy Sen, Ph.D.
https://www.i4siitmandi.com/
Associate Professor, School of Civil and Environmental Engineering,
i4s Laboratory, Room no - A14-4-06
Indian Institute of Technology Mandi,
Mandi 175005, HP, India
Ph no: +91 1905 267 261
Mob: +91 8894 087 002

[Quoted text hidden]

SCENE OFFICE <office_scene@iitmandi.ac.in>

Fwd: 61st BoA Meeting-23rd January, 2026 (Friday)(10:00 AM)

Harshad Vijay Kulkarni <harshad@iitmandi.ac.in> Thu, Jan 29, 2026 at 10:35 AM
To: SCENE Office <office_scene@iitmandi.ac.in>

Dear Ajay,

Please include the printout of the email below by Dr. Subhamoy along with his course proposal.

Thank you,

--
Harshad Vijay Kulkarni, Ph.D.
Assistant Professor,
School of Civil and Environmental Engineering,
Indian Institute of Technology Mandi, Himachal Pradesh, India.
Office: A11-5-29, North Campus
Website: https://sites.google.com/iitmandi.ac.in/aecbl

---------- Forwarded message ---------
From: **Subhamoy Sen** <subhamoy@iitmandi.ac.in>
Date: Wed, Jan 28, 2026 at 11:30 AM
Subject: Re: 61st BoA Meeting-23rd January, 2026 (Friday)(10:00 AM)
To: Harshad Vijay Kulkarni <harshad@iitmandi.ac.in>
Cc: Sandip Kumar Saha <sandip_saha@iitmandi.ac.in>, Chairperson SCENE <chair_scene@iitmandi.ac.in>, Academic_Office_IITMandi <acadoffice@iitmandi.ac.in>

Dear Dr. Kulkarni,

1. We are putting emphasis on Prof. Manohar's responses.

2. No lecture hours are added. This was our response to that comment.

Regarding Points 1 and 2, I propose to change the course credits as L-T-P-C to 0-0-4-2 since we can not accommodate fractional credits. The additional hours will be used to teach the the theoretical background pertinent to the experiment.

I am sharing the responses we prepared here verbatim.

****

****

Dear Colleagues,

Earlier, I proposed a new laboratory course on Experimental Structural Dynamics, which has now received reviews from Prof. C.S. Manohar (IISc Bangalore) and Dr. Koushik Roy (IIT Patna). While the corrections suggested by Prof. Manohar have been explicitly integrated, we could only partially accommodate Dr. Roy's suggestions. The responses are as follows:

1) The proposed duration of practical hours (i.e. 2 hours) in the laboratory may not be enough for smooth conduction of the tests and to have hands-on exposure in dealing with various advanced sensors. The session should be of three hours.
2) Basic understanding of structural vibration may not suffice in developing in-depth understanding of a few of the experiments listed therein. Some advanced-level lecture hours would be required in my opinuion. The L-T-P-C can be 1-0-3-2.5, therefore.

Regarding Points 1 and 2, I propose to change the course credits as L-T-P-C to 0-0-4-2 since we can not accommodate fractional credits. The additional hours will be used to teach the the theoretical background pertinent to the experiment.

3) Apart from practical exposure, post-processing of the vibration data would need some basic understanding of digital signal processing (including FFT, filtration etc.), which is usually not taught as a part of any typical structural dynamics course.

Regarding point 3, these aspects will be taught during the course in the additional hours.

4) Experimentation of sloshing phenomena, soil-structure interaction etc. would require a different skill-set and laboratory arrangement. Please ensure the laboratory infrastructure is in place.

Regarding point 4, we would sincerely follow this suggestion.

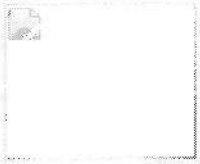
****

****

Regards,

Subhamoy

Thanking you,
With regards,

Subhamoy Sen, Ph.D.

https://www.i4siitmandi.com/
Associate Professor, School of Civil and Environmental Engineering,
i4s Laboratory, Room no - A14-4-06
Indian Institute of Technology Mandi,
Mandi 175005, HP, India
Ph no: +91 1905 267 261
Mob: +91 8894 087 002

SCENE OFFICE <office_scene@iitmandi.ac.in>

Fwd: 61st BoA Meeting-23rd January, 2026 (Friday)(10:00 AM)

Harshad Vijay Kulkarni <harshad@iitmandi.ac.in> Thu, Jan 29, 2026 at 11:56 AM
To: SCENE Office <office_scene@iitmandi.ac.in>

FYI

--
Harshad Vijay Kulkarni, Ph.D.
Assistant Professor,
School of Civil and Environmental Engineering,
Indian Institute of Technology Mandi, Himachal Pradesh, India.
Office: A11-5 29, North Campus
Website: https://sites.google.com/iitmandi.ac.in/aecbl

---------- Forwarded message ---------
From: **Subhamoy Sen** <subhamoy@iitmandi.ac.in>
Date: Thu, Jan 29, 2026 at 11:54 AM
Subject: Re: 61st BoA Meeting-23rd January, 2026 (Friday)(10:00 AM)
To: Harshad Vijay Kulkarni <harshad@iitmandi.ac.in>

Am flying back to India today and will reach late hours. The signing have to wait.

Apologies.

Thanking you,
With regards,

Subhamoy Sen, Ph.D.
https://www.i4siitmandi.com/
Associate Professor, School of Civil and Environmental Engineering,
i4s Laboratory, Room no - A14-4-06
Indian Institute of Technology Mandi,
Mandi 175005, HP, India
Ph no: +91 1905 267 261
Mob: +91 8894 087 002

On Thu, 29 Jan, 2026, 5:58 am Harshad Vijay Kulkarni, <harshad@iitmandi.ac.in> wrote:

> Dear all,
>
> A gentle reminder.
>
> Thank you,
>
> --
> Harshad Vijay Kulkarni, Ph.D.
> Assistant Professor,
> School of Civil and Environmental Engineering,
> Indian Institute of Technology Mandi, Himachal Pradesh, India.
> Office: A11-5-29, North Campus
> Website: https://sites.google.com/iitmandi.ac.in/aecbl

On Wed, Jan 28, 2026 at 5:01 PM Harshad Vijay Kulkarni <harshad@iitmandi.ac.in> wrote:

Dear Dr. Anshu, Dr. Vivek, and Dr. Subhamoy,

As per the recent email, could you please share the signed copies of the final course proposals discussed during the 61st BoA, along with the review comments in the Institute's course proposal format?

Thank you,

--

Harshad Vijay Kulkarni, Ph.D.
Assistant Professor,
School of Civil and Environmental Engineering,
Indian Institute of Technology Mandi, Himachal Pradesh, India.
Office: A11-5-29, North Campus
Website: https://sites.google.com/iitmandi.ac.in/aecbl

On Wed, Jan 28, 2026 at 4:19 PM Academic Office <acadoffice@iitmandi.ac.in> wrote:

Dear Sir

Please provide Final Course proposals discussed during 61st BoA alongwith Reviews comments in the course proposal format of the Institute

@SCENE Office Please provide signed copies of the proposals latest by tomorrow

Regards

Acad Office

On Wed, Jan 28, 2026 at 10:16 AM Harshad Vijay Kulkarni <harshad@iitmandi.ac.in> wrote:

Dear Dr. Subhamoy,

Following information was requested for your course's approval during the BoA meeting. Can you please share this information.

1) response to reviewer's comments - which comments were accepted and which were not accepted
2) one reviewer had mentioned adding Lecturer / lecture component and make it 2 credits / more comprehensive... Please comment on whether that suggestions is accepted or not.

Thank you,

--

Harshad Vijay Kulkarni, Ph.D.
Assistant Professor,

School of Civil and Environmental Engineering,
Indian Institute of Technology Mandi, Himachal Pradesh, India.
Office: A11-5-29, North Campus
Website: https://sites.google.com/iitmandi.ac.in/aecbl

On Wed, Jan 28, 2026 at 10:09 AM Sandip Kumar Saha <sandip_saha@iitmandi.ac.in> wrote:

Please ensure that the revised documents are shared with the academic office.
Thanks and regards,
Sandip.

.....

Dr. Sandip Kumar Saha

Associate Professor,

School of Civil and Environmental Engineering,

Indian Institute of Technology Mandi (IIT Mandi),

Kamand Campus, VPO Kamand,

Mandi, Himachal Pradesh,

PIN – 175075, India.

Phone: +91-1905-267-907

https://sites.google.com/site/sandipksh/home?authuser=0

http://faculty.iitmandi.ac.in/~sandip_saha/

https://scene.iitmandi.ac.in/pages/postdocs_details/Nw==

---------- Forwarded message ---------
From: **Academic Office** <acadoffice@iitmandi.ac.in>
Date: Wed, 28 Jan 2026 at 10:07 AM
Subject: Re: 61st BoA Meeting-23rd January, 2026 (Friday)(10:00 AM)
To: <boa@iitmandi.ac.in>
Cc: Dean Academics <deanacad@iitmandi.ac.in>, Assoc. Dean Courses <adcourses@iitmandi.ac.in>, adresearch iitmandi <adresearch@iitmandi.ac.in>, <sushil@iitmandi.ac.in>, Pradeep Parameswaran <pradeep@iitmandi.ac.in>, Amandeep Singh <amandeep_singh@iitmandi.ac.in>

Dear Sir/Madam

This is a gentle reminder as we have to finalize the minutes before 30.01.2026

On Tue, Jan 27, 2026 at 10:06 AM Academic Office <acadoffice@iitmandi.ac.in> wrote:
> Dear BoA members,
>
> Kindly share the annexures/relevant files for the preparation of the minutes at the earliest.
>
> regards
> Acad Office
>
> On Wed, Jan 14, 2026 at 2:38 PM Academic Office <acadoffice@iitmandi.ac.in> wrote:
> > Dear BoA Members,
> >
> > The 61st BoA is scheduled on 23rd January, 2026 (Friday) from 10:00 AM onwards at the Guest House Conference Room.
> >
> > Agenda and relevant items are available at following link for your reference:
> > https://cloud.iitmandi.ac.in/d/9c17354c0474459fa1f2/
> >
> > Online Meeting Link:
> > https://iitmandi.webex.com/iitmandi/j.php?MTID=mae31e8d8852f2c5e54bd67c94aee089d
> >
> > Kindly make it convenient to attend the meeting.
> >
> > **Please note: Due to the large Number of Agendas the meeting is splitted into two parts and another BoA meeting will be scheduled soon (tentatively on 30th January, 2026) to discuss the remaining agenda items.**
> >
> > Regards
> > Academic Office

IIT Mandi
Proposal for a New Course

Course number : **CE569P**
Course Name : **STRUCTURAL DESIGN STUDIO**
Credit Distribution : ***0-0-6-3***
Intended for : **UG/PG Elective**
Prerequisite : **CE 351, CE 353P, CE 401**
Mutual Exclusion : **None**

---

1. Preamble:

The Design Studio course is designed to bridge the gap between theoretical knowledge and practical application in the field of Structural Engineering. In today's design and construction industry, proficiency in both traditional design principles and modern computational tools is essential. This course provides students with hands-on experience in using advanced software packages for the analysis and design of both reinforced concrete (RC) and steel structures. Through a combination of computer programming, CAD-based drawing development, software packages, and comprehensive design documentation, students will acquire the necessary skills to tackle complex structural engineering challenges.

The course is meticulously structured to guide students through the entire design process, from initial conceptualization to the final production of detailed construction drawings and design reports. Emphasis is placed on the development of automated design tools and the application of relevant IS Standards, ensuring that students are well-equipped to meet the demands of the profession. By the end of the course, students will have enhanced their technical competencies and ability to integrate innovative solutions into real-world engineering projects.

On successful completion of the course, the student will be able to:

- Develop Customized Programs: Write and implement computer programs for analyzing trusses, beams, and frames.
- Create Architectural and Structural Drawings: Use CAD software to produce

architectural and structural general arrangement (GA) drawings, including plans, sections, and elevations.

- Perform Structural Analysis: Set up and analyze numerical models for RC buildings and steel structures, considering earthquake and wind loads.
- Design Structural Components: Design RC and steel members using relevant IS Standards and develop automated Excel design sheets.
- Produce Project Documentation: Prepare detailed construction drawings, including reinforcement detailing, and compile comprehensive design reports.
- Apply Theoretical Knowledge Practically: Integrate theoretical concepts with practical applications in structural engineering.

2. Course Contents:

The course content is split into several computer applications of different structural engineering analysis and design problems. Details are given below:

- Development of a Computer Program for Analysis of 2D and 3D Truss **[6 Hours]**
- Development of a Computer Program for the Analysis of Beams and Frames **[6 Hours]**
- Review of Structural Design and Drawings of a Completed Project **[6 Hours]**
- Analysis and Design of Reinforced Concrete (RC) Multistorey Buildings in Software Packages: **[30 Hours]**
    a. Development of Architectural GA Drawings using CAD software - Include plan, sections, and elevation
    b. Development of Structural GA Drawings using CAD software - Include layout of columns, beams, slabs, and foundations
    c. Development of Numerical Model in Software Packages - Model Setup; Specification of Material and Section Properties; Loading and Boundary conditions; Load cases and Load combinations; Earthquake and Wind Analysis
    d. Design of RC Members (Beams, Slabs, Columns, Shear Walls and Foundations) using relevant IS Standards, Development of Automated Excel Design Sheets
    e. Development of Construction Drawings of the Buildings - Ductile Detailing, Reinforcement Drawings, Bill of Quantities
    f. Development of Design Report with all Loads Calculations, Drawings, Design, and relevant Documentation.
- Analysis and Design of Industrial Steel Structures in Software Packages: **[24 Hours]**
    a. Selection of Appropriate Configuration of the Industrial Steel Shed - Trusses or

Moment Resisting Frames

b. Case-study Industrial Steel Shed - Development of Structural GA Drawings using Steel Sections in CAD software

c. Development of Numerical Model in Software Packages - Model Setup; Specification of Material and Section Properties; Loading and Boundary Conditions; Load cases and Load combinations; Connection Boundary Conditions; Earthquake and Wind Analysis

d. Design of Steel Members (Beams, Columns, Purlins, Rafter, Girts and Ties); Design of Moment and Shear Connection; Design of Base Plate; Development of Automated Excel Design Sheets

e. Development of Final GA Drawings showing Plan and Sections; Development of Connection Detailing Drawings, Fabrication Drawings

f. Development of Design Report with all Loads Calculations, Drawings, Design, and relevant Documentation.

- Introduction to Analysis of Other Infrastructure Systems - Short-Medium Span Bridges, Dams, Water Tanks, etc. **[12 Hours]**

3. Textbook:

- Shah, V. L., & Karve, S. R. (2005), "Illustrated design of reinforced concrete buildings, Structures Publication.
- Krishna Raju, N. (2011) Structural Design and Drawing (4th Edition), Universities Press

4. References:

- Weaver, W., and Gere, J. M. (2012), "Matrix analysis framed structures", Springer science & business media.
- Pillai, S.U. and Menon, D. (2009), "Reinforced concrete design", Third Edition, McGraw Hill Education.
- Subramanian, N. (2008). "Design of steel structures", Oxford University Press.

5. Similarity with the existing courses:
(Similarity content is declared as per the number of lecture hours on similar topics)

S.No	Course Code	Similarity Content	Approx. % of Content
		NIL	

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

NA

Approvals:

Other Faculty interested in teaching this course:

Proposed by: Dr. Shivang Shekhar and Dr. Rajneesh Sharma

School: SCENE

Signature: **Date:** 05-10-2024

Recommended/Not Recommended, with Comments:

_____ **Date:**_____

Chairperson, CPC

Approved / Not Approved

_____ **Date:**_____

Chairperson, BoA

SCENE OFFICE <office_scene@iitmandi.ac.in>

Course Proposal - CE5XXP - Structural Design Studio

6 messages

Shivang Shekhar <shivang@iitmandi.ac.in> Sun, Oct 6, 2024 at 9:31 AM
To: R Prasanna <prasanna@iitmandi.ac.in>, SCENE Office <office_scene@iitmandi.ac.in>
Cc: Chairperson SCENE <chair_scene@iitmandi.ac.in>, Rajnish Sharma <rsharma@iitmandi.ac.in>, Sandip Kumar Saha <sandip_saha@iitmandi.ac.in>, Kaustav Sarkar <srkr@iitmandi.ac.in>

Dear All,

Attached is the course proposal of CE5XXP - Structural Design Studio.

Both internal and external reviews of the course proposal have been completed and comments are incorporated.

The course proposal was already discussed in the Structural Stream meeting on 3rd Sep 2024 and a revised proposal was shared with Structural Engg. Stream coordinator and other faculty members (Date - 11 Sept.) for comments and suggestions.

The google drive link contains following documents:

- CE5XXP - Structural Design Studio course proposal
- SCENE internal review
- Two external reviews

Kindly send the course proposal for further processing and issue of course number.
--

Dr. Shivang Shekhar, Ph.D.

Assistant Professor
School of Civil and Environmental Engineering
Indian Institute of Technology Mandi (IIT Mandi)

Kamand - 175005, Mandi
Himachal Pradesh, India
Phone: +91 - 8193048583
Alt. Email: shivang12287@gmail.com
Web: https://scene.iitmandi.ac.in/pages/postdocs_details/OA==
https://sites.google.com/site/shivangssingh122/

Sandip Kumar Saha <sandip_saha@iitmandi.ac.in> Tue, Oct 8, 2024 at 9:45 AM
To: Shivang Shekhar <shivang@iitmandi.ac.in>
Cc: R Prasanna <prasanna@iitmandi.ac.in>, SCENE Office <office_scene@iitmandi.ac.in>, Chairperson SCENE <chair_scene@iitmandi.ac.in>, Rajnish Sharma <rsharma@iitmandi.ac.in>, Kaustav Sarkar <srkr@iitmandi.ac.in>

Dear Shivang,
As discussed with the school chair, it is requested to submit the details of the space and financial implications for this course to the school for consideration of necessary approval.
Without ensuring the logistics, new course may not be possible to run.

Thanks and regards,
Sandip.
[Quoted text hidden]
--

Dr. Sandip Kumar Saha

Associate Professor,

School of Civil and Environmental Engineering,

Indian Institute of Technology Mandi (IIT Mandi),

Kamand Campus, VPO Kamand,

Mandi, Himachal Pradesh,

PIN – 175075, India.

Phone: +91-1905-267-907

https://sites.google.com/site/sandipksh/home?authuser=0

http://faculty.iitmandi.ac.in/~sandip_saha/

https://scene.iitmandi.ac.in/pages/postdocs_details/Nw==

Shivang Shekhar <shivang@iitmandi.ac.in> Thu, Oct 9, 2025 at 3:56 PM
To: Chairperson SCENE <chair_scene@iitmandi.ac.in>
Cc: SCENE Office <office_scene@iitmandi.ac.in>, Rajnish Sharma <rsharma@iitmandi.ac.in>, Kaustav Sarkar <srkr@iitmandi.ac.in>

Dear Chair,

As you may recall, last year we completed both the internal and external reviews for the course proposal - **CE5XXP – Structural Design Studio**. See trailing email.

The following documents are available in the shared Google Drive folder Link:

- CE5XXP – Structural Design Studio course proposal
- SCENE internal review
- Two external reviews

The course was not approved earlier due to space and financial constraints. However, since SCENE has now received a budget to establish the **SCENE CAD Lab**, the necessary facilities will be available, and the course can now be offered.

I request you to forward the course proposal for further processing and issuance of the course number.

Regards,

Shivang

[Quoted text hidden]

Chairperson SCENE <chair_scene@iitmandi.ac.in> Fri, Oct 10, 2025 at 3:42 PM
To: Shivang Shekhar <shivang@iitmandi.ac.in>
Cc: SCENE Office <office_scene@iitmandi.ac.in>, Rajnish Sharma <rsharma@iitmandi.ac.in>, Kaustav Sarkar <srkr@iitmandi.ac.in>

Recommend please go ahead

Thanks and Regards
धन्यवाद एवं शुभकामनाएँ

HK
Dr. Rajneesh Sharma

Chairperson and Associate Professor,
School of Civil and Environmental Engineering.
IIT Mandi, North Campus, Kamand,
Mandi, 175075, HP.
[Quoted text hidden]

Shivang Shekhar <shivang@iitmandi.ac.in> Fri, Oct 10, 2025 at 3:47 PM
To: Preeti Rana <office_sceneoa1@iitmandi.ac.in>, SCENE Office <office_scene@iitmandi.ac.in>

Kindly assign the course number and send the course for BoA approval.

https://drive.google.com/drive/folders/11akXeBCuMc-KdX7PdxcaZT-em0HV9i20?usp=sharing
[Quoted text hidden]

Shivang Shekhar <shivang@iitmandi.ac.in> Mon, Nov 3, 2025 at 12:20 PM
To: Preeti Rana <office_sceneoa1@iitmandi.ac.in>, SCENE Office <office_scene@iitmandi.ac.in>

Kindly do further processing...

Dr. Shivang Shekhar, Ph.D.

Assistant Professor
School of Civil and Environmental Engineering
Indian Institute of Technology Mandi (IIT Mandi)

Kamand - 175005, Mandi
Himachal Pradesh, India
Phone: +91 - 8193048583
Alt. Email: shivang12287@gmail.com
Web: https://scene.iitmandi.ac.in/pages/postdocs_details/OA==
https://sites.google.com/site/shivangssingh122/

[Quoted text hidden]

Shivang Shekhar <shivang@iitmandi.ac.in

nvitation to Review CE 5XX Structural Design Studio Course Proposal

Ir. Vishwajit Anand <anand.civ@itbhu.ac.in> Fri, Sep 27, 2024 at 3:11 PI
o: Shivang Shekhar <shivang@iitmandi.ac.in>

Dear Dr. Shekhar

I am glad to learn that you are proposing a course on Structural Design Studio as an UG/PG elective.

I have gone through the prepared course proposal. The draft proposal looks good overall. Further, I have entered some of my observations in the online document in this regard.

Thank you
Vishwajit

On Wed, Sep 25, 2024 at 6:41 PM Dr. Vishwajit Anand <anand.civ@itbhu.ac.in> wrote:
> Dear Dr. Shekhar
>
> I am doing well, and hope that you are doing great too.
>
> Thank you for providing the opportunity. I shall be able to review the course proposal.
>
> Regards
> Vishwajit

On Wed, Sep 25, 2024 at 4:41 PM Shivang Shekhar <shivang@iitmandi.ac.in> wrote:
> Dear Dr. Anand,
>
> I hope that you are doing well.
>
> At IIT Mandi, I am proposing an elective course on CE 5XX Structural Design Studio.
>
> I am inviting you to be an external reviewer of the course proposal.
>
> The course content can be seen in the link below:
>
> https://docs.google.com/document/d/1ONj0j4gILt9GYWY0T6wnDgQQu3SFTDNI/edit?usp=sharing&ouid=107003329941239417074&rtpof=true&sd=true
>
> I request you to kindly give your comments on the course proposal, if possible, within one week.
> --
>
> Dr. Shivang Shekhar, Ph.D.
>
> Assistant Professor
> School of Civil and Environmental Engineering
> Indian Institute of Technology Mandi (IIT Mandi)
>
> Kamand - 175005, Mandi
> Himachal Pradesh, India
> Phone: +91 - 8193048583
> Alt. Email: shivang12287@gmail.com
> Web: https://scene.iitmandi.ac.in/pages/postdocs_details/OA==
> https://sites.google.com/site/shivangssingh122/

Shivang Shekhar <shivang@iitmandi.ac.in

nvitation to Review CE 5XX Structural Design Studio Course Proposal

Dr. T Jothi Saravanan <tjs@iitbbs.ac.in> Fri, Oct 4, 2024 at 9:15 AM
To: Shivang Shekhar <shivang@iitmandi.ac.in>

Dear Dr. Shivang,
Greetings!

Here are my potential comments for the proposed course "Structural Design Studio",

-The course offers a robust curriculum, covering essential design principles, practical case studies, and hands-on projects. It will give students a well-rounded understanding of structural design, bridging the gap between theoretical knowledge and real-world applications.

-Integrating studio-based learning into a structural design course is an innovative approach. This format encourages creativity, collaboration, and problem-solving, crucial skills for future structural engineers.

-Including real projects and design challenges from the industry will help students stay updated with current trends in structural engineering and develop skills that are directly applicable to their future careers.

-The course maintains a balanced approach, emphasizing both the theoretical aspects of structural analysis and the practicalities of designing structures in a studio setting. This balance ensures a deep, comprehensive learning experience.

-The open-ended nature of the design problems in a studio environment promotes critical thinking and creativity, allowing students to explore innovative solutions beyond conventional methods. The course content is also highly adaptable, allowing for future updates to stay aligned with evolving industry practices.

I strongly recommend the proposed course, Structural Design Studio, as it offers a unique and much-needed addition to the structural engineering curriculum. This course bridges the gap between theoretical instruction and practical application, providing students with an immersive, hands-on learning experience that aligns with industry demands.

Regards
Jothi Saravanan
--
Dr. T. Jothi Saravanan, PhD (Univ. of Tokyo)
Faculty in Civil Engineering,
School of Infrastructure (SIF),
Indian Institute of Technology (IIT) Bhubaneswar,
Argul, Khordha, Odisha - 752050, India.
Contact: +91-7008588061 (M); +91-674-7136646 (O)

On Thu, Oct 3, 2024 at 3:18 PM Shivang Shekhar <shivang@iitmandi.ac.in> wrote:
> Dear Dr. Saravanan,
>
> Gentle reminder.... Kindly request you to submit the review.
>
> Thanks
>
> On Wed, 25 Sept, 2024, 16:37 Dr. T Jothi Saravanan, <tjs@iitbbs.ac.in> wrote:
> > Dear Dr. Shivang,
> >
> > Hope you are doing well. Good to hear from you!
> > Sure I will look into it and get back to you at the earliest.
> >
> > Regards
> > Jothi Saravanan
> >
> > On Wed, Sep 25, 2024 at 4:35 PM Shivang Shekhar <shivang@iitmandi.ac.in> wrote:
> > > Dear Dr. Jothi Saravanan T,
> > >
> > > I hope that you are doing well.
> > >
> > > At IIT Mandi, I am proposing an elective course on CE 5XX Structural Design Studio.
> > >
> > > The course content can be seen in the link below:

https://docs.google.com/document/d/1ONj0j4gILt9GYWY0T6wnDgQQu3SFTDNl/edit?usp=sharing&ouid=107003329941239417074&rtpof=true&sd=true

I am inviting you to be an external reviewer of the course proposal.

I request you to kindly give your comments on the course proposal, if possible, within one week.

--

Dr. Shivang Shekhar, Ph.D.

Assistant Professor
School of Civil and Environmental Engineering
Indian Institute of Technology Mandi (IIT Mandi)

Kamand - 175005, Mandi
Himachal Pradesh, India
Phone: +91 - 8193048583
Alt. Email: shivang12287@gmail.com
Web: https://scene.iitmandi.ac.in/pages/postdocs_details/OA==
https://sites.google.com/site/shivangssingh122/

Disclaimer: This email and any files transmitted with it are confidential and intended solely for the use of the individual or entity to whom they are addressed. If you have received this email in error please notify the system manager. This message contains confidential information and is intended only for the individual named. If you are not the named addressee you should not disseminate, distribute or copy this e-mail. Please notify the sender immediately by e-mail if you have received this e-mail by mistake and delete this e-mail from your system. If you are not the intended recipient you are notified that disclosing, copying, distributing or taking any action in reliance on the contents of this information is strictly prohibited.

Shivang Shekhar <shivang@iitmandi.ac.in

Re: Course Proposal - CE 5XX Structural Design Studio

Sandip Kumar Saha <sandip_saha@iitmandi.ac.in> Wed, Sep 11, 2024 at 10:04 PM
To: Shivang Shekhar <shivang@iitmandi.ac.in>
Cc: "Dr. Kaustav Sarkar" <srkr@iitmandi.ac.in>, "Dr. Shashank Pathak" <shashank@iitmandi.ac.in>, "Dr. Thainswemong Choudhury" <thainswe@iitmandi.ac.in>, "Dr. Maheshreddy Gade" <maheshreddy@iitmandi.ac.in>, "Dr. Dhanya J." <dhanya@iitmandi.ac.in>, "Dr. Subhamoy Sen" <subhamoy@iitmandi.ac.in>, Surya Kant Sahdeo <suryasahdeo@iitmandi.ac.in>, "Dr. Rajneesh Sharma" <rsharma@iitmandi.ac.in>, Chairperson SCENE <chair_scene@iitmandi.ac.in>

Dear Dr Shivang,
I have marked my commnets on the google doc for your consideration.
Thanks and regards,
Sandip.

On Wed, Sep 11, 2024 at 11:09 AM Shivang Shekhar <shivang@iitmandi.ac.in> wrote:
> Dear All,
>
> Based on the suggestions received in the last Structural Stream Meeting, I have revised the course proposal on Computer Applications.
>
> The details of the new proposed UG/PG elective course on "Structural Design Studio" is given here: https://docs.google.com/document/d/1znQbGCaZjSGMLFqwyg96jwisnQcRKkTx/edit?usp=sharing&ouid=107003329941239417074&rtpof=true&sd=true
>
> Kindly provide your suggestions if any by 17th Sept. 2024 (1 week). After that I will do further processing for final review incorporation and allotment of course number.
>
> Thanks
>
> Shivang
>
> On Wed, Sep 4, 2024 at 12:33 PM Dr. Kaustav Sarkar <srkr@iitmandi.ac.in> wrote:
> > Dear All,
> >
> > Please find the attached draft of MoM in editable format. If you want to suggest alterations please do so in the track-changes mode. Please respond back by Sat (7th) evening.
> >
> > Thanks
> > KS
> >
> > On Tue, Sep 3, 2024 at 10:07 AM Dr. Kaustav Sarkar <srkr@iitmandi.ac.in> wrote:
> > > A gentle reminder for today's meeting.
> > >
> > > KS
> > >
> > > On Mon, Sep 2, 2024 at 10:58 AM Preeti Rana <office_sceneoa1@iitmandi.ac.in> wrote:
> > > > Dear Sir/Madam,
> > > >
> > > > Thank you for the quick response. The meeting is scheduled as mentioned below:
> > > >
> > > > **Time & Date: 3rd** September 2024, Tuesday , **12:00-1:00 P.M**
> > > > **Venue:** A11-05-43, Conference Room.
> > > >
> > > > *With Warm Regards,*
> > > >
> > > > *प्रीति राणा / Preeti Rana*
> > > > *कार्यालय सहायक / Office Assistant*
> > > > *सिविल एवं पर्यावरण अभियांत्रिकी स्कूल / School of Civil & Environmental Engineering*
> > > > *भारतीय प्रौद्योगिकी संस्थान / Indian Institute of Technology, Mandi (H.P)*

On Fri, Aug 30, 2024 at 10:00 PM Dr. Kaustav Sarkar <srkr@iitmandi.ac.in> wrote:

Dear Colleagues,

The scoolchair has asked for our inputs related to (i) Future programs, (ii) A new lab (Computer-aided Design Lab) and (iii) A new course (Computer Applications in Civil Engineering)

We need to meet for an hour or so preferably in the next week to discuss these items.

Preeti: Please share a doodle link to help us decide the timings.

Thanks
KS

---------- Forwarded message ---------
From: **Preeti Rana** <office_sceneoa1@iitmandi.ac.in>
Date: Fri, Aug 16, 2024 at 5:35 PM
Subject: Office Memorandum regarding Re-constituted the committees with partial modification for the faculties role & responsibilities of SCENE
To: <scene@iitmandi.ac.in>
Cc: SCENE Office <office_scene@iitmandi.ac.in>, Chairperson SCENE <chair_scene@iitmandi.ac.in>, Academic Office <acadoffice@iitmandi.ac.in>, <spoa1@iitmandi.ac.in>

Dear Sir/Ma'am,

The following Office Memorandum no. **IITM/SCENE/2024/1835-38** dated 13.08.**2024** regarding **"Re-constituted the committees with partial modification for the faculties role & responsibilities"** in the School of Civil & Environmental Engineering (SCENE) .

Please click below web link to view and download:-" https://cloud.iitmandi.ac.in/f/d98edc23d255442ca6a9/ "

Copy to all concerned via emails.

With Warm Regards,

प्रीति राणा / Preeti Rana
कार्यालय सहायक / Office Assistant
सिविल एवं पर्यावरण अभियांत्रिकी स्कूल / School of Civil & Environmental Engineering
भारतीय प्रौद्योगिकी संस्थान / Indian Institute of Technology, Mandi (H.P)

--

Dr. Shivang Shekhar, Ph.D.

Assistant Professor
School of Civil and Environmental Engineering
Indian Institute of Technology Mandi (IIT Mandi)

Kamand - 175005, Mandi
Himachal Pradesh, India
Phone: +91 - 8193048583
Alt. Email: shivang12287@gmail.com
Web: https://scene.iitmandi.ac.in/pages/postdocs_details/OA==
https://sites.google.com/site/shivangssingh122/

--

Dr. Sandip Kumar Saha

Associate Professor,

School of Civil and Environmental Engineering,

Indian Institute of Technology Mandi (IIT Mandi),

Kamand Campus, VPO Kamand,

Mandi, Himachal Pradesh,

PIN – 175075, India.

Phone: +91-1905-267-907

https://sites.google.com/site/sandipksh/home?authuser=0

http://faculty.iitmandi.ac.in/~sandip_saha/

https://scene.iitmandi.ac.in/pages/postdocs_details/Nw==

IIT Mandi
Proposal for a New Course

Course number : **CS-525**
Course Name : **Computational Foundations of Cryptography**
Credit : **3-0-0-3**
Distribution : **All B.Tech / M.Sc / M.Tech / Ph.D**
Intended for : **B.Tech / M.Sc / M.Tech / Ph.D**
Prerequisite : **CS208/CS513 or equivalent**
Mutual Exclusion: None

---

1. Preamble:

This course introduces core cryptographic primitives and demonstrates how their security can be formally established using standard complexity and information-theoretic assumptions.

2. Course Modules with quantitative lecture hours:

Unit 1: Introduction to cryptography, Shannon's definitions of perfect secrecy, one-time pad, Shannon's theorem on perfect secrecy. **(4 Hours)**

Unit 2: One-way functions, equivalence of strong and weak one-way functions, candidate one-way functions, hard-core predicates, Goldreich-Levin theorem. **(8 Hours)**

Unit 3: Pseudorandom generators (PRG), computational indistinguishability, equivalence of one-way functions and PRGs, construction of PRGs, pseudorandom functions. **(10 Hours)**

Unit 4: Interactive proofs, interactive proof for graph non-isomorphism, zero-knowledge proofs, zero-knowledge proof for graph isomorphism, zero-knowledge proofs for NP, non-interactive zero-knowledge proofs. **(10 Hours)**

Unit 5: Introduction to Information Theory, Perfect secrecy and secret-key encryption, Universal hash families, Information reconciliation and privacy amplification, Two-party secure computation with active/passive adversaries, Multiparty secure computation: broadcast, Byzantine agreement. **(10 Hours)**

Laboratory/practical/tutorial Modules: None

3. **Textbook:**

Oded Goldreich, Foundations of Cryptography, Vol. 1, Cambridge University Press, 2001.

4. **References:**
   1. Salil P. Vadhan, Pseudorandomness, Now Publishers, 2012.
   2. R. Cramer, I. V. Damgard, and J. B. Nielsen, Secure Multiparty Computation and Secret Sharing, Cambridge University Press, 2015.

5. **Similarity with the existing courses:**
(Similarity content is declared as per the number of lecture hours on similar topics)

S. No.	Course Title	Course Code	Similarity Content	Approx. % of Content
1.	Computational Complexity Theory	CS-524	Interactive proofs, zero-knowledge proofs	5%

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

Approvals:

Faculty interested in teaching this course: – Gaurav Sood

Proposed by: Gaurav Sood **School:** SCEE

Signature: Gaurav Sood **Date:** 29 September 2025

The following faculty (at least 3 faculty) discussed on 29 September 2025 and approved the proposal on 29 September 2025.

Sl. No	Faculty Name	Signature
1	Samar Agnihotri	
2	Prateek Vishnoi	
3	Jinesh Machchhar	

School Chair:

School: SCEE

Date:

This proposal is reported in ……..th Board of Academics on …….

Dean Academics

Date:

Note: School is responsible for the Course Code. Academic Office provides the IC Course Code.

CS. 525

Prateek Vishnoi: No changes are needed.

Jinesh Machchhar: Okay as it is.

Samar:

1. The proposed course does not cover information-theoretic foundations of cryptography, particularly the notions such as perfect-secrecy, universal hash families, two- and multi-party secure communication, and Byzantine agreement. The course should include such theoretical notions to give wider exposure to computational and information-theoretic foundations to the students.

2. Better to change the name of the course from 'Foundations of Cryptography' to 'Computational Foundations of Cryptography' as the proposed course only covers the theoretical CS aspects of cryptography. There is a whole area of mathematical foundations of cryptography that this course does not cover ... in fact, it does not even touch those. Given the existing breadth of the proposed course, I feel it should not venture in that direction lest the coverage depth of different topics is reduced. Maybe in near future we can offer a full-fledged course on mathematical foundations of cryptography that includes number-theory aspects as well as elliptic curve cryptography and lattice-base cryptography, etc.

updated

IIT Mandi
Proposal for a New Course

Course number : **CS570**
Course Name : **Algorithms for Curves and Surfaces**
Credit : **2-0-2-3**
Distribution : ***L-T-P-C***
Intended for : **B.Tech. (CSE, DSE, EE and ME) II/III/IV year/ M.Tech/M.Tech(R) /Ph.D (any branch)**
Prerequisite : **IC111 Linear Algebra or equivalent course, IC250 Data Structure and Algorithms or equivalent course.**
Mutual Exclusion: **None**

1. Preamble:

This course is intended to introduce the algorithms and techniques found in modern CAD kernels. The primary requirement of such algorithms is a high degree of numerical precision. The main application area of this technology is in engineering design. The course will include assignments about using popular CAD software suites as well as programming assignments.

2. Course Modules with quantitative lecture hours:

Introduction: Motivation; Use of CAD software in different domains; Example use-cases; Different geometric representations. **(2 Hours)**

***Differential geometry of curves*:** Parametric curves, tangent-spaces, curvature, Frenet-Serret equations, winding number of a planar curve. **(4 Hours)**

***Differential geometry of surfaces*:** Parametric surfaces, tangent-spaces, normals, the first fundamental form, lengths of curves on surfaces, the second fundamental form, the Gauss and Weingarten maps, Gaussian and mean curvatures, Principal curvatures. **(6 Hours)**

***Bezier curves and surfaces*:** Definition and properties of Bezier curves, Bernstein basis, De Casteljau's algorithm, definition and properties of Bezier surfaces, Subdivision algorithm. **(6 Hours)**

***B-splines*:** Definition and construction, de Boor's algorithm for evaluation. **(4 Hours)**

***Boolean operations*:** Boundary representation, Euler's formula, curve-curve intersection, curve-surface intersection, surface-surface intersection, projection of a curve on a surface. **(6 Hours)**

Laboratory/practical/tutorial Modules:

Lab1: Part design using a CAD software. Emphasis on operations such as 2D sketching, extruding, blending and booleans.
Lab2-4: Plot parametric curves and their tangents, normals, binormals, osculating circles at sampled points. This and all subsequent labs are to be done in C++ using OpenCascade geometric kernel.
Lab5-7: Plot parametric surfaces and their tangent planes, normals, directions of principal curvatures. Computing Gaussian and mean curvatures. Computing lengths of curves on surfaces.
Lab8-10: Write code to implement evaluation of Bezier curves and surfaces using De Casteljau's algorithm. Verify various properties Bezier curves and surfaces.
Lab11-12: Write code to compute intersection of a pair of planar parametric curves and for a pair of parametric surfaces.
Lab13-14: Write code to traverse the different topological entities in the Brep of a solid. Write code to project a space curve onto a surface.

3. Text books:

1. ***Gerald Farin*, Curves and Surfaces for CAGD: A Practical Guide, 5rd edition, *Morgan Kaufmann Publishers*, USA, 2002**
2. **Andrew Pressley, Elementary Differential Geometry, 2th Edition, Springer, USA, 2010**

4. References:

3. **Andrew Pressley, Elementary Differential Geometry, 2th Edition, Dover Publications, USA, 2016**

5. Similarity with the existing courses:
(Similarity content is declared as per the number of lecture hours on similar topics)

S. No.	Course Code	Similarity Content	Approx. % of Content
1.	CS550	Bezier curves and surfaces	10%

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

Approvals:

Faculty interested in teaching this course: – Jinesh Machchhar

Proposed by: Jinesh Machchhar **School: SCEE**

Signature: 29-Jan **Date: ~~01-September 2025~~**

The following external faculty (at least 2 faculty) provided the feedback and it was discussed among school/centre faculty on 25 September 2025.

Sl. No	Faculty Name	Signature
1	Dr. Gaurav Sood	Gaurav Sood
2	Dr. Prateek Vishnoi	
3	Dr. Siddhartha Sarma	

School Chair:

School:

Date:

This proposal is reported in ……..th Board of Academics on ……

Dean Academics

Date:

Note: School is responsible for the Course Code. Academic Office provides the IC Course Code.

Comments of the Reviewers:

Dr. Siddhartha Sarma: The course contents are fine.

Dr. Gaurav Sood: No changes required.

Dr. Prateek Vishnoi: No edits necessary.

Updated

IIT Mandi
Proposal for a New Course

Course number : **EE-533**
Course Name : **Access Network**
Credit : **4**
Distribution : ***3-0-2-4***
Intended for : 3rd/4th year B.Tech. in SCEE; Elective for SCEE PG (M.Tech., M.Tech (R), and Ph.D.)
Prerequisite : EE-304 Communication Theory or equivalent, CS-313 Computer Networks or equivalent, or Instructor's consent
Mutual Exclusion : None

---

1. Preamble:

Access networks form the edge of communication infrastructures, connecting users to core networks through wired, optical, and wireless technologies. This course focuses on the Medium Access Control (MAC) layer across broadband, optical, and cellular systems. Students will learn MAC design, resource allocation, QoS provisioning, and energy-efficient operation. The laboratory component, based on OMNeT++/INET and Simu5G, enables hands-on simulation and analysis of MAC protocols in EPON/GPON, WLANs, and LTE/5G NR—equipping students for research and development in next-generation access technologies.

2. Course Modules with quantitative lecture hours:

Unit 1: Traditional Broadband Access Networks (8 Hours)
Evolution of broadband access; DSL/ADSL/VDSL families and MAC aspects; Ethernet and CSMA/CD; Distributed Queue Dual Bus (DQDB); Token Ring and FDDI.

Unit 2: Optical Access Networks (11 Hours)
Introduction to PONs; EPON/GPON MAC; Dynamic Bandwidth Allocation (DBA); ONU sleep modes; MAC control for energy saving; QoS and service differentiation; trade-offs between latency, throughput, and energy.
Optional Topics:
Advanced Optical Access – TWDM-PON, Long-Reach PON, QoS in DBA, Green PON, ML-based DBA.

Unit 3: Wireless Access – WLANs (11 Hours)
Random access mechanisms (ALOHA, Slotted ALOHA, CSMA/CA with RTS/CTS); IEEE 802.11 MAC evolution (DCF, PCF, EDCA, HCF); evolution from Wi-Fi 6/6E (IEEE 802.11ax) to Wi-Fi 7 (IEEE 802.11be) — OFDMA, MU-MIMO, 4K-QAM, Multi-Link Operation (MLO), and punctured transmission; introduction to Wi-Fi 8 (IEEE 802.11bn) features such as Coordinated Spatial Reuse (Co-SR) and Network Performance Control and Adaptation (NPCA), as a preview of emerging research directions.

Optional Topics:
Wireless Sensor Networks – Energy-constrained MACs, duty cycling (S-MAC, T-MAC, X-MAC), IEEE 802.15.4, LoRaWAN, NB-IoT.

Unit 4: Cellular Access – LTE & 5G NR (12 Hours)
Resource allocation (RB, RBG, CoReset); Scheduling (Round Robin, Proportional Fair, MAX-C/I, QoS-aware); MAC functions (BSR, DSR, HARQ, logical channel prioritization); Energy efficiency (cDRX, PDCCH monitoring/skipping); C-RAN MAC scheduling and fronthaul constraints.

3. Laboratory/practical/tutorial Modules:

Lab 1–2: Introduction to OMNeT++ and INET; environment setup, writing simple modules, running simulations, collecting results.
Lab 3–4: EPON scheduling experiments; implementing DBA algorithms for TDM/TWDM PON; EPON registration process.
Lab 5–7: Simulation of random-access MACs (Ethernet CSMA/CD, ALOHA, Slotted ALOHA, CSMA/CA); throughput–delay–efficiency analysis.
Lab 8–10: Using Simu5G for LTE/5G NR; comparing Round Robin, Proportional Fair, and MAX-CQI schedulers; evaluating XR/video traffic; modifying schedulers for semantic-aware performance.

4. Text books:

1. D. P. Bertsekas and R. G. Gallager, Data Networks, 2nd ed., Prentice Hall, USA, 1992.
2. G. Kramer, Ethernet Passive Optical Networks, McGraw-Hill, 2005.

5. References:

1. S. Sesia, I. Toufik, and M. Baker, LTE: The UMTS Long Term Evolution – From Theory to Practice, 2nd ed., Wiley, UK, 2011.
2. G. Kramer, B. Mukherjee, and G. Pesavento, "IPACT: A dynamic protocol for an Ethernet PON (EPON)," IEEE Commun. Mag., vol. 40, no. 2, pp. 74–80, 2002.
3. M. P. Mcgarry, M. Reisslein, and M. Maier, "Ethernet passive optical network architectures and dynamic bandwidth allocation algorithms," IEEE Communications Surveys & Tutorials, vol. 10, no. 3, pp. 46-60.
4. K. Kanonakis and I. Tomkos, "Improving the efficiency of online upstream scheduling and wavelength assignment in hybrid WDM/TDMA EPON networks," IEEE J. Sel. Areas Commun., vol. 28, no. 6, pp. 838-848, Aug. 2010.
5. W. Ye, J. Heidemann, and D. Estrin, "An energy-efficient MAC protocol for wireless sensor networks (S-MAC)," in Proc. IEEE INFOCOM, 2002, pp. 1567–1576.
6. T. van Dam and K. Langendoen, "An adaptive energy-efficient MAC protocol for wireless sensor networks (T-MAC)," in Proc. ACM SenSys, 2003, pp. 171–180.
7. IEEE Standard for Service Interoperability in Ethernet Passive Optical Networks (SIEPON), IEEE Standard 1904.1, 2017.
8. IEEE Standard 802.11 (WLAN MAC/PHY) and IEEE 802.3ah (Ethernet in the First Mile). 3GPP, "NR; Physical channels and modulation (Release 17)," 3GPP TS 38.211, v17.x.x, Sep. 2023.

6. **Similarity with the existing courses:**
(Similarity content is declared as per the number of lecture hours on similar topics)

S. No.	Course Name	Course Code	Similarity Content	Approx. % of Content
1.	Performance Analysis of Computer Networks	CS 549	Random access portion of unit 3	5%
2.	Wireless Communications and Networking	EE 517	Random access portion of unit 3	5%

Sourav Dutta

Proposed by: Sourav Dutta **School: SCEE**

Signature: **Date: 06/11/2025**

The following faculty (at least 3 faculty) discussed on.....and approved the proposal on.....

Sl. No	Faculty Name	Signature
1.	Dr. Manne Pavan Kumar Reddy	
2.	Dr. Siddhartha Sarma	
3.	Dr. Sreelakshmi Manjunath	
4.	Dr. Samar Agnihotri	
5.	Dr. Adarsh Patel	29/01/26

Comments already shared. Dr. Samar.

School Chair:

School:

Date:

This proposal is reported in ……..th Board of Academics on ……

Dean Academics

Date:

Note: School is responsible for the Course Code. Academic Office provides the IC Course Code.

EE-533 Review Comments

Dr. Samar Agnihotri

- The breadth of topics covered in the syllabus was considered ambitious for a single course, raising concerns about insufficient depth in certain access technologies.
- It was recommended that the wireless LAN component be refreshed to reflect contemporary standards, particularly IEEE 802.11be (Wi-Fi 7), with a brief outlook on forthcoming standards.
- A restructuring was suggested whereby supplementary material is absorbed into the main modules rather than being handled as separate optional units.
- It was proposed that renaming the course to "Access Network" would better capture its revised scope.

Dr. Siddhartha Sarma

- The proposal was advised to adhere strictly to the most recent course proposal template issued by the Academic Section.
- Potential overlap with existing offerings should be clarified by explicitly stating relevant mutual exclusion conditions.
- The appropriate course structure was suggested as 3–0–2–4, corresponding to two hours of laboratory work per week and a total of 42 lecture hours.
- It was recommended that the list of reference books be restricted and that granular allocation of lecture hours across sub-topics be avoided.
- From a structural perspective, it was suggested that optional material be embedded within relevant modules instead of being presented independently.
- The revised title "Access Network" was viewed as a more accurate reflection of the course content.

Dr. Sreelakshmi P. M.

- For better pedagogical flow, it was suggested that additional topics be placed alongside closely related core material within each module.
- It was recommended that laboratory work progress in tandem with lectures, while keeping experiment descriptions sufficiently broad to allow flexibility across offerings.
- In light of the streamlined syllabus, the title "Access Network" was considered more appropriate.

Proposal for a new course

Course Name: Data-driven Control

Course Number: EE-538

Credits: 3-0-2-4

Prerequisites: IC111 Linear Algebra or similar course, EE509 Linear Dynamical Systems, EE301Control Systems.

Intended for: B.Tech. (CSE, DSE, EE and ME) III/IV year/ M.Tech/M.Tech(R) /Ph.D (any branch) or instructor's consent

Distribution: Elective for B.Tech. III/IV year/ M.Tech/M.Tech(R)/PhD

*Semester:*Even

Preamble: This course is meant to serve as an introduction to the emerging field of data-driven control. The relevance of the course in the current BTech curriculum is twofold: (i) it acquaints EE and ME students with new methods of identification and design of complex systems based on data, (ii) it exposes students of CSE and DSE to the possibility of applying data science concepts to solve engineering problems. The course could also serve as a starting point for research scholars looking for tools to study complex systems, or for those interested in developing learning algorithms for the design of such systems. It requires concepts of linear algebra and basic control systems, but the instructor may decide to cover the relevant concepts as and when required.

Course modules:

Data-driven modelling for linear systems (10 lectures) Introduction to system identification and model reduction. Linear system identification from measurement data. Fundamental lemma, Persistency of Excitation (PE), Eigensystem Realization Algorithm. Balanced Truncation and Balanced Proper Orthogonal Decomposition. Models: Auto Regressive (AR), Moving Average (MA), ARMA. Kernel, image, latent variables.
Dynamic Mode Decomposition (DMD) (6 lectures) Formulation, DMD algorithm, System identification with DMD, DMD with control,
Virtual Reference Feedback Tuning (VRFT) (6 lectures) Methodology and design, measurement noise effect, non-minimum phase plants, multivariable plants, closed-loop stability, iterative feedback tuning (IFT).
Data-driven control (8 lectures) Controllability and stabilizability from data, noisy data, stabilization using data, data-driven LQR, h_2, h_∞ control, model predictive control, DeePC.

Data-driven modelling for nonlinear systems (8 lectures) Nonlinear system identification from measurement data. Nonlinear Auto Regressive Moving Average model with Exogenous input (NARMAX) methods. Sparse Identification of Nonlinear Dynamics (SINDy). Koopman theory. Koopman operator based linearization.

Lab Experiments: The lab sessions are to be conducted on 2-hour slots, aligned with the lectures so the concepts needed for the lab experiments are already discussed in the theory class. The lab experiments are majorly based on the tools available in Matlab.

Lab-1: System identification using data for a practical system like a dc motor

Lab-2: Data collection and persistence of excitation (PE)

Lab-3: Subspace identification and AR, MA, ARMA

Lab-4: Tune PID controller using Virtual Reference Feedback Tuning (VRFT)

Lab-5: Iterative feedback tuning (IFT) for dc motor speed control

Lab-6: Data-driven LQR design

Lab-7: DeePC implementation for linear time invariant systems

Lab-8: Koopman based linearization of nonlinear systems

Lab-9: Data-driven control of Furuta pendulum

Lab-10: Data-driven control of Maglev systems

Textbooks and papers:

1. S.L. Brunton and J.N. Kutz, Data-driven science and engineering: Machine learning, dynamical systems and control, Cambridge University Press, 2019.
2. H. J. Van Waarde, M. K. Camlibel, and H. L. Trentelman, Data-based linear systems and control theory, ed. 1, Kindle Direct Publishing, 2025, ISBN 9798289885807
3. I. Markovsky, Low-Rank Approximation: Algorithms, Implementation, Applications, Springer, 2019.
4. J.N. Kutz, S.L. Brunton, B.W. Brunton and J.L. Proctor, "Dynamic Mode Decomposition: Data-Driven Modeling of Complex Systems", Society for Industrial and Applied Mathematics, 2016.
5. C. de Persis and P. Tesi, "Formulas for Data-Driven Control: Stabilization, Optimality, and Robustness", IEEE Transactions on Automatic Control, 65:3, pp 909-924, 2020.
6. H. J. van Waarde , J. Eising , H. L. Trentelman and M. K. Camlibel, "Data Informativity: A New Perspective on Data-Driven Analysis and Control", IEEE Transactions on Automatic Control, 65:11, pp 4753-4768, 2020.
7. Recent journal articles in the domain specified by the course instructor.

Reference Books:

1. A. Khaki Sedigh: An Introduction to Data-Driven Control Systems, Wiley-IEEE Press, 2023.
2. Andrew Pressley, Elementary Differential Geometry, 2th Edition, Springer, 2010
3. Manfredo P. Do Carmo, Differential Geometry of Curves and Surfaces, 2th Edition, Dover Publications, 2016

Content Similarity Declaration with Existing Courses:

Sr #	Course code	Similarity content	Approx. % of content
1	MA 570	Data-driven Dynamical Systems	10%

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

Approvals:
Other Faculty who may be interested in teaching this course: Dr. Sreelakshmi Manjunath, Dr. Tushar Jain

Proposed by Yanumula Venkata Karteek School: SCEE

Signature: Y.V.Karteek Date 07-01-2026

The following faculty members (at least 3) discussed the course on 8,9th Nov, 2025, 7th Jan, 2026 and approved the course on 7th Jan, 2026.

S.No.	Name	Signature
1	**Dr. Tushar Jain**	
2	**Dr. Akhilanda Pati Tiwari**	
3	**Dr. Narendra Kumar Dhar**	Narendra Dhar

School Chair

Signature:

08 JAN 2026

School: SCEE

Date:

Recommended/Not Recommended, with Comments:

_____ Date: _____

Chairman, CPC

Approved / Not Approved

_____ Date: _____

Chairman, Senate

Indian Institute of Technology Mandi

Y. Venkata Karteek <karteek@iitmandi.ac.in>

New course proposal [EE-538 Data-driven Control]

8 messages

Y. Venkata Karteek <karteek@iitmandi.ac.in> Sat, Nov 8, 2025 at 12:01 PM
To: Tushar JAIN <tushar@iitmandi.ac.in>, Akhilanand Pati Tiwari <akhilanand@iitmandi.ac.in>, Narendra Kumar Dhar <narendra@iitmandi.ac.in>
Cc: Sreelakshmi PM <sreelakshmi@iitmandi.ac.in>, Kaushik Halder <kaushik@iitmandi.ac.in>

Dear All,

I am proposing a new course titled Data-driven Control in the upcoming semester. The course content is available at the link given below, I would request you to please go through it and give your valuable feedback.
https://docs.google.com/document/d/1xB_7UT0X97U2SG1Dvz_n6uCXm6YA7-Ds/edit?usp=sharing&ouid=112347585552438844147&rtpof=true&sd=true

I acknowledge the initial inputs of the syllabus content by Dr. Sreelakshmi.

Thanks and Regards.

--
Dr. Yanumula, Venkata Karteek,
Assistant Professor,
School of Computing and Electrical Engineering (SCEE),
Indian Institute of Technology (IIT) Mandi.

Akhilanand Pati Tiwari <akhilanand@iitmandi.ac.in> Sat, Nov 8, 2025 at 1:03 PM
To: "Y. Venkata Karteek" <karteek@iitmandi.ac.in>

The course proposal looks fine to me. Please go ahead to submit to BoA.

Akhilanand Pati Tiwari
Visiting Professor,
School of Computing and Electrical Engineering (SCEE),
Indian Institute of Technology Mandi,
Kamand, Mandi 175075
Phone: +91 9757000345
[Quoted text hidden]

Y. Venkata Karteek <karteek@iitmandi.ac.in> Sat, Nov 8, 2025 at 4:45 PM
To: Akhilanand Pati Tiwari <akhilanand@iitmandi.ac.in>

Thanks for your feedback sir.

Best regards.

Dr. Yanumula, Venkata Karteek,
Assistant Professor,
School of Computing and Electrical Engineering (SCEE),
Indian Institute of Technology (IIT) Mandi.
[Quoted text hidden]

Tushar JAIN <tushar@iitmandi.ac.in> Sat, Nov 8, 2025 at 7:31 PM
To: "Y. Venkata Karteek" <karteek@iitmandi.ac.in>
Cc: Akhilanand Pati Tiwari <akhilanand@iitmandi.ac.in>, Narendra Kumar Dhar <narendra@iitmandi.ac.in>, Sreelakshmi PM <sreelakshmi@iitmandi.ac.in>, Kaushik Halder <kaushik@iitmandi.ac.in>

Pls check the link, I am not able to access the document.

[Quoted text hidden]

Y. Venkata Karteek <karteek@iitmandi.ac.in> Sat, Nov 8, 2025 at 8:03 PM
To: Tushar JAIN <tushar@iitmandi.ac.in>
Cc: Akhilanand Pati Tiwari <akhilanand@iitmandi.ac.in>, Narendra Kumar Dhar <narendra@iitmandi.ac.in>, Sreelakshmi PM <sreelakshmi@iitmandi.ac.in>, Kaushik Halder <kaushik@iitmandi.ac.in>

I have updated the access as editor, please check.

Dr. Yanumula, Venkata Karteek,
Assistant Professor,
School of Computing and Electrical Engineering (SCEE),
Indian Institute of Technology (IIT) Mandi.
[Quoted text hidden]

Tushar JAIN <tushar@iitmandi.ac.in> Sun, Nov 9, 2025 at 12:57 PM
To: "Y. Venkata Karteek" <karteek@iitmandi.ac.in>
Cc: Akhilanand Pati Tiwari <akhilanand@iitmandi.ac.in>, Narendra Kumar Dhar <narendra@iitmandi.ac.in>, Sreelakshmi PM <sreelakshmi@iitmandi.ac.in>, Kaushik Halder <kaushik@iitmandi.ac.in>

Thanks Karteek for sharing the proposal. Here is some feedback.

Breadth vs. Depth:
The proposal covers a very broad range of topics—linear and nonlinear system identification, reinforcement learning, advanced data-driven methods, etc. I recommend focusing on depth for core linear system identification and data-driven controller design methods. Advanced nonlinear methods and reinforcement learning could be introduced towards the end as extensions, which serve as a base for the follow-up course in the subsequent semester. Consider reducing the total number of topics to allow for much greater depth, especially in key methods.

Curriculum Structure:
Core methods (system identification, DMD, VRFT, unfalsified control) should be treated in depth first, with nonlinear identification, Koopman, SINDy, and reinforcement learning techniques reserved for advanced modules at the end of the course.

References and Literature:
The current reliance on differential geometry textbooks may not be directly relevant. Please include recent research papers on data-driven control, SINDy, VRFT, Koopman methods, and RL for control.

Practical Component (LTPC Structure):
I strongly recommend using a 3-0-2-4 LTPC structure, which includes hands-on labs utilising MATLAB/Python and at least one hardware-based implementation (e.g., a DC motor, pendulum, or tank system).

Special Topics:
Explicitly include modules on unfalsified control and VRFT in the syllabus. Equally important, include discussion and practical checks for data richness and the persistent excitation (PE) condition in data-driven identification and control.

Prerequisites:
Please use EE509 (Linear Dynamical Systems) as a prerequisite. Then, a separate linear algebra review module is not required, so core topics can be embedded within context.

Regards,
Tushar
[Quoted text hidden]

Y. Venkata Karteek <karteek@iitmandi.ac.in> Sun, Nov 9, 2025 at 5:01 PM
To: Tushar JAIN <tushar@iitmandi.ac.in>
Cc: Akhilanand Pati Tiwari <akhilanand@iitmandi.ac.in>, Narendra Kumar Dhar <narendra@iitmandi.ac.in>, Sreelakshmi PM <sreelakshmi@iitmandi.ac.in>, Kaushik Halder <kaushik@iitmandi.ac.in>

Thanks a lot Dr. Tushar for your insightful review of the draft proposal, especially the depth vs breadth and lab component are very good suggestions. I will update considering all your suggestions accordingly and get back to you.

Thanks and regards.
[Quoted text hidden]

Y. Venkata Karteek <karteek@iitmandi.ac.in> Wed, Dec 31, 2025 at 12:12 AM

To: Tushar JAIN <tushar@iitmandi.ac.in>
Cc: Akhilanand Pati Tiwari <akhilanand@iitmandi.ac.in>, Narendra Kumar Dhar <narendra@iitmandi.ac.in>, Kaushik Halder <kaushik@iitmandi.ac.in>

Hi Dr. Tushar,
Please see the updated syllabus at https://docs.google.com/document/d/1xB_7UT0X97U2SG1Dvz_n6uCXm6YA7-Ds/edit?usp=sharing&ouid=112347585552438844147&rtpof=true&sd=true
I have incorporated the suggestions along with lab experiments. Please have a look for further processing.

Thanks and regards.
[Quoted text hidden]

Updated

IIT Mandi
Proposal for a New Course

Course number : EE-695

Course Name : Sliding Mode Control

Credit Distribution: *3-0-0-3*

Intended for : B. Tech Final year, M. Tech. and Ph. D. students

Prerequisite : Linear Control Systems Theory

Mutual Exclusion: (Specify the equivalent courses in other schools. These *Courses (with high similarity) are not allowed to credit by the students after or along with this course.*) **None**

---

1. Preamble:

Slide mode control is a simple and yet robust control technique. In case of sliding mode control, the system states are made to confine to a selected subset of the state space so as to achieve some desirable dynamics. Traditionally, a relay–based control has been used for this purpose and had its roots in the variable structure system philosophy. Developed in the erstwhile Soviet Union, the concept was pioneered by Vadim Utkin. Sliding mode control has numerous applications in defence, reactor control, robotics, etc. and it is one of the fastest growing fields.

The course will start from the fundamentals of sliding mode control. The history of sliding mode control will be discussed next. The basic theory of sliding mode control design will be discussed such as sliding surface design and control design. Much emphasis will be given to discrete time sliding mode control as the control is implemented digitally. After that the advanced topics on sliding mode control will be discussed. The sliding mode observer and integral sliding mode control will also be discussed. Finally, higher order sliding mode control and event triggered sliding mode control will be discussed.

After going through this course, the learners will be able to apply continuous-time and discrete-time sliding mode controllers and observers to practical systems, as alternative to other control techniques, besides further advanced learning and pursuing theoretical research in the area.

2. **Course Modules with quantitative lecture hours:**

Introduction to sliding mode, History and origin of sliding mode, Continuous sliding mode, Filippov solution, Sliding surface design, Equivalent control, unit vector approach, sliding mode control for MIMO system. ..... (8 Lectures)

Discrete time sliding mode control(DSM), Need for discrete time sliding mode and definition of DSM, Quasi sliding mode(QSM), QSM band, Reaching law based DSM, Switching and non-switching based DSM, Multi-rate output feedback based DSM. .....(8 Lectures)

Luenberger observer, Reduced order observer, Sliding mode observer, Modified sliding mode observer, Integral sliding mode control(ISM), Composite nonlinear feedback control(CNF), CNF-ISM control design, Sliding mode control with actuator saturation.
Tracking control for non-minimum phase system. .....(10 Lectures)

Higher order sliding mode control, Twisting and Super-twisting control, Higher order sliding mode based observer and differentiator, Continuous integral sliding mode control,
Implementation of super-twisting control by higher order finite time observer
.....(10 Lectures)

Event triggered control, Event triggered sliding mode control, Discrete time event triggered sliding mode control, Periodic event triggered sliding mode control. ....(4 Lectures)

3. **Laboratory/practical/tutorial Modules:** None

4. **Text books:**

1. Christopher Edwards and Sarah Spurgeon, ' Sliding Mode Control: Theory and Applications, CRC Press, London, UK, 1998.

2. Y. Shtessel, C. Edwards, L. Fridman and A. Levant, ' Sliding mode control and Observation, Birkhauser, (a division of Springer, New York.) 2013.

3. B. Bandyopadhyay and S. Janardhanan, ' Discrete-time sliding mode control: A multi-rate Approach, LNCIS, Springer Verlag, Germany, 2006.

4. **Similarity with the existing courses: None**
(Similarity content is declared as per the number of lecture hours on similar topics)

S. No.		Course Code	Similarity Content	Approx. % of Content
1.				

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

Not applicable

Approvals:

Faculty interested in teaching this course: – Prof. Bijnan Bandyopadhyay

Proposed by: Prof. Bijnan Bandyopadhyay **School**: SCEE

Signature: Bandyopadhyay **Date:** 29-01-2026

The following faculty (at least 3 faculty) discussed on 29/1/2026 and approved the proposal on……..

Sl. No.	Faculty Name	Signature
1.	Prof. Akhilanand Pati Tiwari	29/1/2026
2.	Prof. Tushar Jain	
3.	Dr. Kaushik Halder	

Comments are enclosed.

School Chair:

School:

Date:

This proposal is reported in ……..th Board of Academics on ……

Dean Academics

Date:

Note: School is responsible for the Course Code. Academic Office provides the IC Course Code.

Akhilanand Pati Tiwari <akhilanand@iitmandi.ac.in>

Re: Revised Syllabus of EE-695, Sliding Mode Control

1 message

Tushar JAIN <tushar@iitmandi.ac.in> Thu, Jan 29, 2026 at 9:13 AM
To: Akhilanand Pati Tiwari <akhilanand@iitmandi.ac.in>
Cc: Kaushik Halder <kaushik@iitmandi.ac.in>, Bijnan Bandyopadhyay <bijnanbandyopadhyay@gmail.com>, Nalini <nalinisingh@iitmandi.ac.in>

This course complements the set of control system related courses at IIT Mandi. The course is strongly recommended.

Regards

On 29 Jan 2026, at 9:06 AM, Akhilanand Pati Tiwari <akhilanand@iitmandi.ac.in> wrote:

Some words and phrases got jumbled in my previous email. Kindly ignore it. Here is the corrected one.

Dear Colleagues,
Based on the BoA's suggestion, the syllabus of EE-695 has been revised so as to add a preamble in it.

The revised syllabus is sent herewith for your review and concurrence. In view of the very short time available for submitting it to BoA, you are requested to offer comments at your earliest convenience.

Thanks and regards!

Akhilanand Pati Tiwari
Visiting Professor,
School of Computing and Electrical Engineering (SCEE),
Indian Institute of Technology Mandi,
Kamand, Mandi 175075
Phone: +91 9757000345

On Thu, Jan 29, 2026 at 9:03 AM Akhilanand Pati Tiwari <akhilanand@iitmandi.ac.in> wrote:

Dear Colleagues,
Based on the BoA's suggestion, the syllabus of EE-695 preamble has been added so as to add preamble.

The revised syllabus is sent herewith for your review and concurrence. In view of the very short time available for submitting it to BoA, you are requested to offer your comments at your earliest convenience.

Thanks and regards!

@Nalini Kindly do the needful to circulate a hardcopy for signatures. Thanks!

Akhilanand Pàti Tiwari

Indian Institute of Technology Mandi

Nalini Singh <nalinisingh@iitmandi.ac.in>

Revised Syllabus of EE-695, Sliding Mode Control

Kaushik Halder <kaushik@iitmandi.ac.in> Thu, Jan 29, 2026 at 9:25 AM
To: Akhilanand Pati Tiwari <akhilanand@iitmandi.ac.in>
Cc: Bijnan Bandyopadhyay <bijnanbandyopadhyay@gmail.com>, Nalini <nalinisingh@iitmandi.ac.in>, Tushar JAIN <tushar@iitmandi.ac.in>

This course is a valuable addition to the control systems curriculum at IIT Mandi and is strongly recommended.

Thanks & Regards
Kaushik

--
Dr. Kaushik Halder
Assistant Professor,
School of Computing & Electrical Engineering (SCEE),
Indian Institute of Technology Mandi,
Himachal Pradesh 175005, INDIA

On Thu, 29 Jan 2026, 09:14 Tushar JAIN, <tushar@iitmandi.ac.in> wrote:
This course complements the set of control system related courses at IIT Mandi. The course is strongly recommended.

Regards

> On 29 Jan 2026, at 9:06 AM, Akhilanand Pati Tiwari <akhilanand@iitmandi.ac.in> wrote:
>
> Some words and phrases got jumbled in my previous email. Kindly ignore it. Here is the corrected one.
>
> Dear Colleagues,
> Based on the BoA's suggestion, the syllabus of EE-695 has been revised so as to add a preamble in it.
>
> The revised syllabus is sent herewith for your review and concurrence. In view of the very short time available for submitting it to BoA, you are requested to offer comments at your earliest convenience.
>
> Thanks and regards!
>
> Akhilanand Pati Tiwari
> Visiting Professor,
> School of Computing and Electrical Engineering (SCEE),
> Indian Institute of Technology Mandi,
> Kamand, Mandi 175075
> Phone: +91 9757000345
>
> On Thu, Jan 29, 2026 at 9:03 AM Akhilanand Pati Tiwari <akhilanand@iitmandi.ac.in> wrote:
> Dear Colleagues,
> Based on the BoA's suggestion, the syllabus of EE-695 preamble has been added so as to add preamble.

IIT Mandi
Proposal for a New Course

Course Number	**VL-201**
Course Name	**Semiconductor Devices for Integrated Circuits**
Credit Distribution	**L-T-P-C (3-0-0-3) *3-credits***
Intended for	**Discipline Core for B.Tech. in Microelectronics and VLSI Engineering students**
Prerequisite	**Applied Electronics (IC-161)**
Mutual Exclusion	**EE-311**

---

1. Preamble:

The objective of the course is to provide the fundamental knowledge for understanding the concepts of semiconductor devices for Integrated Circuits (IC's). This course builds the knowledge base of the physics of semiconductors as related to the characteristics and design of solid-state electronic devices for IC's. This is a required core-course for VLSI and Microelectronics Engineering undergraduate students.

2. Course Modules with quantitative lecture hours:

- **Unit-1: Introduction to Semiconductors (9 hours)**

  Introduction & Evolution of Semiconductor Devices and Technology; Semiconductor Materials; Crystal Planes & Miller Indices; Band Model of Solids; Concept of Equilibrium, Electrons & Holes; Free Carriers in Semiconductors; Carrier Distribution Functions (Intrinsic & Extrinsic semiconductors)

- **Unit-2: Current Conduction Mechanism in Semiconductors (8 hours)**

  Carrier Drift, Measurement of Semiconductor properties (Four-Point Probe & Hall Effect Methods); Carrier Diffusion; Excess Carriers (Generation & Recombination) and Characteristics of Excess Carriers; Thermionic Emission; Tunneling, High Field Effect

- **Unit-3: P-N Junctions (9 hours)**

  Fundamentals of p-n junction, p-n junction under thermal equilibrium and electric field, I-V characteristics of a p-n junction, Junction Breakdown: Zener & Avalanche, Small Signal Equivalent Circuit, Devices based on p-n junctions: LED, LASER, Photodetectors & Solar Cells

- **Unit-4: Metal-Semiconductor Contacts (3 hours)**

  Ideal M-S Junction, Schottky and Ohmic Contact, Effect of Surface States, Devices based on M-S Contacts: MESFET, MODFET

- **Unit-5: Bipolar Transistors (4 hours)**

  Physics and operation of bipolar junction transistors, Current conduction mechanism in bipolar junction transistor, Effects of Collector Bias Variation (Early Effect), Small-Signal Transistor Model, High-Frequency Transistor Model, Devices based on bipolar junction transistor: Thyristor

- **Unit-6: Metal Oxide Semiconductor Field Effects Transistors (9 hours)**

  MOS System: The Ideal MOS Structure, Capacitance-Voltage Characteristics, Effect of oxide and interface charges; MOSFET: Structure and operation, Scaling, Short-Channel Effects (V_{th} roll-off, DIBL, Bulk Punch Through); Devices based on MOSFET: CMOS Inverter & Latch up, BiCMOS, MOSFET on Insulator (TFT, SOI), MOS Memory Structures (DRAM, SRAM, NVM)

3. Text Books:

- S.M. Sze and M.K. Lee, Semiconductor Devices: Physics and Technology, John Wiley & Sons, 2012.

4. References:

- S. M. Sze and K. K. Ng, Physics of Semiconductor Devices, John Wiley & Sons, 2002.
- D. A. Neamen, Semiconductor Physics and Devices, McGraw Hills, 2003.
- B. G. Streetman and S. Banerjee, Solid State Electronic Devices, Prentice Hall, 2005.
- Robert F. Pierret, Semiconductor Device Fundamentals, Addison-Wesley Publishing, 1996.

a) Similarity with the existing courses:
(Similarity content is declared as per the number of lecture hours on similar topics)

S. No.	Course Name	Course Code	Similarity Content	Approx.% of content
1.	Device Electronics for Integrated Circuits	EE-311		~60%

b) Justification of new course proposal if cumulative similarity content is >30%:

VL-201 is meticulously designed to provide undergraduate students specializing in Microelectronics and VLSI with a robust, application-oriented understanding of the fundamental physics and operational characteristics of semiconductor devices. While building upon traditional curricula (such as EE-311), VL-201 tailors its content specifically to the requirements of modern Integrated Circuit (IC) design.

(i) *Strategic Curriculum Alignment*: VL-201 (3rd Semester) strategically shifts focus away from the general fabrication overviews typically found in introductory electronics courses (like Chapter 6 of EE-311). By removing redundant fabrication content—which is covered in depth during the 4th-semester core course VL-311: CMOS Processing—VL-201 gains the instructional bandwidth to dive deeper into advanced device physics.

(ii) *Foundation for IC*: The foundational physics (Units 1-3) is streamlined yet comprehensive. It ensures students master critical concepts such as carrier transport, generation-recombination, and junction behavior. These physical phenomena directly inform the parameters used in subsequent VLSI design and technology courses.

(iii) *Material Science and Crystallography*: Unit 1 introduces Semiconductor Materials, Crystal Planes, and Miller Indices. This knowledge is essential for understanding the anisotropic properties of silicon, such as orientation-dependent etching and carrier mobility variations, which are critical factors in advanced wafer manufacturing and device performance.

(iv) *Characterization and Optoelectronics*: Unit 2 bridges the gap between theoretical physics and industrial manufacturing by incorporating practical material characterization methods (Four-Point Probe and Hall Effect). Furthermore, the emphasis on optoelectronic devices (LEDs, LASERs, Photodetectors, and Solar cells) provides students with a versatile understanding of the diverse device portfolio found in modern photonic integrated circuits.

(v) *Advanced Carrier Dynamics*: Unit 3 provides a rigorous treatment of excess carrier characteristics. Mastering non-equilibrium conditions is vital for understanding switching speeds, leakage currents, and transient responses in high-speed IC's.

(vi) *Industry-Relevant Device Modeling*: Unit 6 explicitly introduces high-priority industry topics, including device scaling and Short-Channel Effects (SCEs) such as DIBL, V_{th} roll-off, and bulk punch-through. By covering CMOS inverters, memory structures (SRAM, DRAM, NVM), and specialized technologies like SOI and TFTs, the course ensures graduates are prepared for the complexities of modern System-on-Chip (SoC) design and industry roles in device modeling and testing.

In Summary, VL-201 serves as a vital pedagogical bridge, transforming general physical principles into the specialized knowledge required for VLSI professionals. It is a necessary core component of the Microelectronics and VLSI specialization.

Approvals:

Faculty interested in teaching this course: Dr. R. Khosla

Proposed by	Dr. R. Khosla	**School**	SCEE
Signature	RobinKhosla 28.01.2026	**Date**	28.01.2026

The following faculty discussed and approved the proposal on 28 Jan 2026.

S. No.	Faculty Name	Signature
1.	Prof. Satinder K. Sharma	Email approval
2.	Dr. Abhishek Sharma	
3.	Dr. Kunal Ghosh	Email approv

School Chair:

School: SCEE 29 JAN 2026

Date:

This proposal is reported in _____ Board of Academics on _____

Dean Academics

Date:

Note: School is responsible for Course Code. Academic Office provides IC Course Code.

Updated

New Course Proposal

Course number: VL-211/~~VL-211P~~

Course name: Analog Circuit Design

Credit: 3-0-2-4 (L-T-P-C)

Prerequisite: Network theory (EE203), Applied Electronics (IC161), Devices Electronics for Integrated Circuits (EE311)

Intended for: BTech (EE) & B.Tech(VLSI)

Elective or Core: Core for B. Tech. (EE) and Elective for other UG Programs

Semester: Even/Odd

Preamble and Objectives: Analog Circuit Design course is designed to build a strong foundation in both design and analysis of electronic circuits by mixture of lectures and having relevant experiments. This course syllabus offers conceptual understanding and mastery of the material by using modern examples to motivate and prepare IIT Mandi's undergraduate students for advanced courses and their careers. The course has unique problem-solving framework enables the students to deconstruct complex active circuits ~~into small signal equivalent model that they are familiar with~~ which builds the confidence and intuitive skills needed for success. To succeed in the practice of electronics in industry, students must develop the ability to think intuitively about circuits. They need to move beyond simply plugging and chugging numbers in equations and be prepared to face real design trade-offs. The course components also help students to develop intuitive techniques so they can design and implement circuits not just analyze them. Using many real-word examples and applications will motivate the student to understand the importance of today's microelectronics. The course is intended for advance stream of studies such as communication engineering, power electronics and very large scale integration (VLSI).

Course modules:

Lecture modules:

- **PN junction, BTJ, MOSFET and PN junction circuit and Network theory review [5 hrs]**
- **BJT/MOS single stage amplifiers, cascade and cascodes [8 hrs]**
  - Large signal and small-signal model, biasing, input and output impedance, operating point calculations and design, single ended BJT/CMOS amplifiers, cascade and cascode
    amplifiers

- **BJT/MOS Current mirrors** **[3 hrs]**
  - PVT independent normal current mirror, cascode current mirror, regulated current mirror and Wilson current mirror
- **Differential Amplifiers** **[6 hrs]**
  - MOS/BJT Differential Pair, qualitative large/small signal analyses, differential pairs with active loads and common-mode rejection
- **BJT/MOS Frequency Response** **[6 hrs]**
  - High frequency model of single ended and differential amplifiers, Frequency response: magnitude and phase plot calculations
- **Feedback theory** **[6 hrs]**
  - Properties of negative and positive feedback, loop gain calculations, types of amplifiers, voltage controlled current source (VCCS), current controlled current source (CCCS), current controlled voltage source (CCVS), voltage current voltage source (VCVS), stability analyses under negative feedback topology.
- **Oscillators** **[4 hrs]**
  - Barkhausen criteria of oscillation, bistable, monostable and astable multi-vibrators, LC, relaxation, phase shift and Colpit oscillators

Experiment modules:

1. Introduction to laboratory wit DSO and its advance features, XY-mode (Lissajous pattern), LTspice and required softwares,
2. Voltage amplifier circuit design and SPICE simulations
3. Understanding of I-V characteristics of BJT/MOS transistor using net-listing in SPICE simulations.
4. Common emitter amplifier design.
5. Oscillator: design of ring, LC and phase shift oscillators.
6. Project on analog circuit application

Text book:

1. "Fundamentals of microelectronics" by Behzad Razavi, Wiley, Apr. 2013.

Reference book:

1. "Microelectronic Circuits-Theory & Applications" by A.S. Sedra and K.C. Smith, 7th Edition, Oxford University Press, Jun. 2017.

Other Faculty interested in teaching this course: Prof.. Hitesh Shrimali, Dr. Rahul Shrestha, Dr. Robin Khosala, Dr. Bikram Paul

Proposed by: Prof.. Hitesh Shrimali, Dr. Rahul Shrestha, Dr. Abhishek Sharma

School: SCEE

Signature: Dr. Abhishek Sharma **Date: Sep. 1, 2025**

Recommended/Not Recommended,

with Comments: Already cleared by Academics office.

Date:_____

Chairman, CPC

Approved / Not

Approved

04 FEB 2026

Date:_____

Chairman, Senate

IIT Mandi
Proposal for a New Course

Course Number	**VL-312**
Course Name	**Electronics Systems Packaging**
Credit Distribution	**L-T-P-C (3-0-0-3) 3-credits**
Intended for	**Discipline Core for B.Tech. in VLSI and Microelectronics Engineering students**
Prerequisite	**3rd Sem VL-201/EE-311, FE for EE & GE, Core for VLSI**
Mutual Exclusion	**None**

1. Preamble:

Packaging is crucial for the performance of Electronics & Microsystems. It not only encases components but also connects the die to the system, protects against environmental threats, enables efficient heat transfer, and ensures reliable power and signal delivery. As technology advances, the need for cost-effective, space-efficient, high-speed, and reliable packaging grows. Professionals in this field must understand advanced technologies to create high-performance packages affordably. This course provides an opportunity for students to explore the latest packaging technologies and their interconnections, ultimately enhancing performance, manufacturability, functionality, and reliability in electronics & microelectronics. Join us to help shape the future of microelectronic systems.

2. Course Modules with quantitative lecture hours:

- **Unit-1: Introduction to Electronic System Packaging (8 hours)**

  Introduction to electronic systems and the significance of packaging, Historical perspective and evolution of semiconductor packaging, Different levels of packaging: chip-level, board-level, and system-level.

- **Unit-2: Chip Processing and Electronic Packaging (8 hours)**

  Basics of semiconductor manufacturing processes, Wafer fabrication, inspection, and testing procedures. Evolution of wafer packaging and chip connection techniques, including wire bonding, Tape Automated Bonding (TAB), and flip-chip methods, Package materials, thermal mismatch in packages, and current packaging trends and various applications.

- **Unit-3: Integrated Packaging & Computer-Aided Design (CAD) (8 hours)**

  Electrical, Thermal, and Mechanical Perspective of Resistive Parasitic, Capacitive Parasitic, and Inductive Parasitic, Signal integrity and power distribution challenges of electrical, thermal, and mechanical design. Introduction to Computer-Aided Design (CAD) tools for PCB design. Design flow considerations, including schematic capture and component layout. Design for Manufacturability (DFM), Reliability (DFR), and Testability (DFT).

- **Unit-4: Materials Consideration & Process Flow for Packaging (8 hours)**

  Materials properties for packaging, Selection criteria based on application requirements. Printed circuit wiring & boards (PWB & PCBs), flexible circuits, Process flow-chart PCB and PWD substrates fabrication. Surface Mount Technology (SMT): Benefits and design considerations of SMT. Soldering techniques: reflow wave soldering, lead-free soldering, and green electronics. Process flow: photoresist and application methods, UV exposure and developing PWB etching, Resist stripping, Screen-printing technology, Through-hole manufacture process steps, and pattern plating methods.

- **Unit-5: Advanced Packaging Technologies & Reliability (8 hours)**

  Assessment of package reliability under various conditions, Failure mechanisms and testing methodologies, Heterogeneous integration and 3D packaging, Emerging trends in electronics packaging.

3. **Text Books:**

- Fundamentals of Microsystems Packaging (Ed. Rao Tummala), McGraw-Hill, 2001

4. **References:**

- Advanced Electronic Packaging, Richard K. Ulrich and William D. Brown, Second Edition, IEEE Press Series on Microelectronic Systems, A Johan Wiley & Sons, INC. Publication, 2006.
- Microelectronics Packaging Handbook, Tummala, R.R., 3 volumes, Chapman Hall, 1996.

a) Similarity with the existing courses:
(Similarity content is declared as per the number of lecture hours on similar topics)

S. No.	Course Name	Course Code	Similarity Content	Approx.% of content
	N.A	N.A	N.A	N.A

b) Justification of new course proposal if cumulative similarity content is >30%: N.A.

Approvals: This is a new course.

Faculty interested in teaching this course: Prof. Satinder K. Sharma

Proposed by Prof. Satinder K. Sharma **School** SCEE

Signature **Date** 29.01.2026

The following faculty discussed and approved the proposal on 12, Feb.,2025.

S. No.	Faculty Name	Signature
1.	Dr. Robin Khosla	
2.	Dr. Abhishek Sharma	
3.	Dr. Ranbir Singh	

School Chair:

School: SCEE

Date:

This proposal is reported in _____ Board of Academics on _____

Dean Academics

Date:

Note: School is responsible for Course Code. Academic Office provides IC CourseCode.

Updated.

IIT Mandi
Proposal for a New Course

Course Number	**VL-326**
Course Name	**Fundamentals of Processor Architecture and SoC Design**
Credit	**L-T-P-C (3-0-2-4) 4-Credits**
Intended for	**Discipline Core for BTech in VLSI & Microelectronics Engineering Students**
Prerequisite	**Digital System Design (EE 210) or equivalent**

1. Preamble:

This course provides a hardware-centric introduction to processor architecture and System-on-Chip (SoC) design, bridging classical computer organization concepts with contemporary processor and SoC implementation methodologies. The course begins with foundational computer organization principles—datapath, control, memory, interrupts, and DMA—and progressively advances toward modern pipelined processors, interconnects, and SoC integration using RTL-based design approaches. Emphasis is placed on open-source RISC-V processors, bus-based communication, and hardware/software interaction, supported by hands-on RTL labs and SoC-level projects.

2. Course Contents:

- **Unit-1: Foundations of Computer Organization (5 hours)**
  Digital system hierarchy; Von Neumann vs Harvard architectures; Instruction execution cycle (fetch–decode–execute–writeback); Introduction to ISA vs microarchitecture; RISC-V ISA overview (instruction formats, addressing modes); Mapping instruction flow to hardware blocks.
- **Unit-2: Processor Datapath and Control (7 hours)**
  Single-cycle processor organization; Multi-cycle datapath design; FSM-based control unit; Microprogrammed control concepts; RTL modeling of datapath and controller.
- **Unit-3: Pipelined Processor Architecture (6 hours)**
  Pipeline stages and timing; Structural, data, and control hazards; Hardware techniques: Forwarding, Stalling; Introduction to performance metrics (CPI, throughput).
- **Unit-4: Memory System Organization (6 hours)**
  Memory hierarchy fundamentals; Cache organization: direct-mapped, set-associative; Write policies and replacement strategies; Memory-mapped I/O; Introduction to virtual memory (conceptual level).
- **Unit-5: I/O, Interrupts, and DMA (4 hours)**
  Programmed I/O vs interrupt-driven I/O; Interrupt handling mechanisms; DMA architecture and operation; DMA controller hardware overview; Role of DMA in SoC performance.
- **Unit-6: SoC Interconnect and Bus Architectures (5 hours)**
  Shared bus vs point-to-point interconnects; AMBA buses: AHB, APB, AXI (conceptual + RTL view); Arbitration logic; Basic NoC concepts; Interconnect integration in SoCs.
- **Unit-7: Processor Architecture Case Study (5 hours)**
  Case study of one commercial/open processor: ARM or RISC-V reference core (any one); Instruction decoding; Execution stages; Pipeline organization.
- **Unit-8: Introduction to SoC Design Flow (4 hours)**
  IP-based SoC design; Peripheral integration; Hardware/software co-design overview; FPGA-based prototyping.

3. Laboratory / practical / tutorial Modules:

- RTL implementation of:
  - Single-cycle and pipelined processor datapath
- Cache design (direct-mapped / set-associative)
- Interrupt and DMA controller modeling
- Bus-based SoC integration:
  - CPU + memory + DMA + UART

- **Hardware/Software Co-Verification course projects:** Design and verify a small open-source SoC integrating CPU, interconnect, and peripherals. Students document synthesis, timing, and area trade-offs. Run compiled RISC-V assembly programs on the designed SoC using co-simulation.

4. Text Books:

- David A. Patterson & John L. Hennessy. Computer Organization and Design: RISC-V Edition, Morgan Kaufmann, 2021.
- Michael J. Flynn & Wayne Luk, Computer System Design: System-on-Chip, Wiley, 2011.

5. References:

- Patterson & Hennessy, Computer Architecture: A Quantitative Approach, 6th Ed., Elsevier, 2019.
- W. Wolf, Computers as Components: Principles of Embedded Computing System Design. Morgan Kaufmann, 2012.

a) Similarity with existing courses:
(similarity content is declared as per the number of lecture hours on similar topics)

Sl. No.	Course Name	Course Code	Similarity Content	Approx % of Content
1.	Computer Organization and Processor Architecture Design	EE326	Processor control and datapath, Memory subsystems	17%

b) Justification of new course proposal if cumulative similarity content is >30%: **NA**

Approvals:

Faculty interested in teaching this course: Dr. Bikram Paul

Proposed by Dr. Bikram Paul **School:** SCEE

Signature **Date:** 07-11-2025

The following faculty discussed and approved the proposal on 06-11-2025

Sl. No.	Faculty Name	Signature
1.	Dr. Rahul Shrestha	
2.	Dr. Srinivasu Bodapati	
3.	Prof. Hitesh Shrimali	

School Chair

School: **SCEE**

Date:

This Proposal is reported in _____ Board of Academics on _____

Dean Academics

Date:

Note: School is responsible for course code. Academic Office provides IC courses code.

Bikram Paul <bikram@iitmandi.ac.in

MY SUGGESTIONS: Review of New Course Syllabi: VL402, VL211, and VL326

2 messages

Rahul Shrestha <rahul_shrestha@iitmandi.ac.in> Thu, Nov 6, 2025 at 10:19 AM
To: Hitesh Shrimali <hitesh@iitmandi.ac.in>
Cc: Bikram Paul <bikram@iitmandi.ac.in>, Abhishek Sharma <abhisheksharma@iitmandi.ac.in>, Srinivasu Bodapati <srinivasu@iitmandi.ac.in>, Shubhajit Roy Chowdhury <src@iitmandi.ac.in>, Kunal Ghosh <kunal@iitmandi.ac.in>, Robin Khosla <robin@iitmandi.ac.in>, Satinder Sharma <satinder@iitmandi.ac.in>, Animesh Biswas <animesh@iitmandi.ac.in>

Dear Colleagues,

The syllabi attached in the trailing mail are really competitive and look really good. If you could agree to include some of my suggestions as below then it would slightly improve them.

For VL211 (Analog Circuit Design):

Minor: There is a typo error: BJT is written as "BTJ".

Major:
1. I think this course should not be extended upto PLL and Data Converter. Here, we must focus more on strengthening the very fundamentals of analog circuit concepts and spend more hours in amplifier designs, feedback architectures, frequency analysis etc. In a nutshell, I suggest the syllabus must end at Oscillators. Please devote remaining hours from excluded parts to fundamental topics.
2. I think we should at least spend some hours on simple op-amp design: maybe, only one op-amp configuration.

For VL402 (RFIC):

I was thinking if we could include one chapter on an overall transceiver architecture that talks about baseband to RF frequency and vice-versa conversions in RF modules of transmitter and receiver, respectively, then it would be really helpful to the students. In this chapter, we can teach fundamental receiver architectures like heterodyne, superheterodyne, direct conversion and direct sampling receiver architectures. Some concepts of link budgeting can be also covered.

For VL-326 (Computer Organization and SoC Fundamentals):

Minor: In "von", the character "v" must be "V".

Major:
1. In this syllabus, I genuinely feel that there is almost nothing related to Computer Organization. But it is extremely good content for contemporary processor architecture and SoC design. Hence, I suggest changing the name of this course to "Fundamentals of Processor Architecture for SoC Design" or "Fundamentals of Processor Architecture and SoC Design", both sound apt for this syllabus.
2. I have one suggestion for this syllabus: please include the DMA concept as well in it.

Thanks and best regards,

Rahul

On Tue, Nov 4, 2025 at 7:47 AM Hitesh Shrimali <hitesh@iitmandi.ac.in> wrote:
— VL402 looks fine to me.
— for VL211, the comment is as follows:
The syllabus is difficult to cover till data converters, oscillators (multi-vibrators), and PLL. Therefore, it is suggested to remove differential amplifiers and frequency response from the course. Both are covered in depth, in the next core course EE512 (CMOS Analog IC design). With this, the last part can be increased with the required teaching hours accordingly.

Thanks and regards,

--

Hitesh Shrimali
Professor
School of Computing and Electrical Engineering
Indian Institute of Technology Mandi, HP
Contact - +91-1905-267902 (O)

On Tue, 4 Nov 2025 at 12:06AM Bikram Paul <bikram@iitmandi.ac.in> wrote:

Dear All,

The syllabus for the following courses has been prepared and is attached for your review:

- **VL402 (RF IC Design)** – prepared by **Prof. Animesh Sir**
- **VL211 (Analog Circuit Design)** – prepared by **Dr. Abhishek**
- **VL326 (Computer Organization and SoC Fundamentals)** – prepared by **myself**

Kindly go through the attached syllabi and share your feedback or comments before we present them in the upcoming **BoA** meeting.

Note:

- **VL402 (3-0-0-3)** is currently being offered by Prof. Animesh Sir to the B.Tech. (VLSI) 5th semester students.
- The newly proposed **VL211 (3-0-2-4)** and **VL326 (3-0-2-4)** courses will replace the existing **EE211** and **EE326** courses in the B.Tech. (VLSI) curriculum.

All the proposed syllabi are attached with this email.

--

Best Regards,

School of Computing and Electrical Engineering, IIT Mandi
Phone: +911905267046; +919774143767;

--

Dr. Rahul Shrestha, PhD, SMIEEE
Associate Professor
School of Computing and Electrical Engineering
Indian Institute of Technology Mandi
Profile Link: http://faculty.iitmandi.ac.in/~rahul_shrestha/

Srinivasu Bodapati <srinivasu@iitmandi.ac.in> Thu, Nov 6, 2025 at 10:25 AM
To: Rahul Shrestha <rahul_shrestha@iitmandi.ac.in>
Cc: Hitesh Shrimali <hitesh@iitmandi.ac.in>, Bikram Paul <bikram@iitmandi.ac.in>, Abhishek Sharma <abhishekshrma@iitmandi.ac.in>, Shubhajit Roy Chowdhury <src@iitmandi.ac.in>, Kunal Ghosh <kunal@iitmandi.ac.in>, Robin Khosla <robin@iitmandi.ac.in>, Satinder Sharma <satinder@iitmandi.ac.in>, Animesh Biswas <animesh@iitmandi.ac.in>

My feedback on VL 326, as follows.
- The syllabus is too heavy, and it does not have the regular computer organization contents.
- You can include DMA, interrupts.
- You can cover any one processor architecture (Intel or ARM) and its instruction set, its decoding, and execution phases.
-- The syllabus is too good, we can have a separate course on SoC fundamentals.

regards
srini

[Quoted text hidden]

--

Regards
B.SRINIVASU
Assistant Professor,
School of Computing and Electrical Engineering
Indian Institute of Technology Mandi
Mandi-175005, Himachal Pradesh

Updated

Indian Institute of Technology Mandi
Kamand, Himachal Pradesh - 175075

भारतीय प्रौद्योगिकी संस्थान मण्डी
कमांद, हिमाचल प्रदेश - 175075

IIT Mandi
Proposal of New Course

Course Number: VL 402
Course Name: RFIC Design
Credit Distribution: L-T-P-C (3-0-0-3) 3 Credits
Intended For: Discipline Core for B.Tech in VLSI and Microelectronics Engineering Students.
Prerequisites: VL 211: Analog Circuit Design and EE 202: Electromagnetic and Wave Propagation
Mutual Exclusion: None

1. **Permeable:-**

In today's rapidly evolving world, wireless communication is transforming industries and daily life. From Bluetooth devices and video game controllers to GPS navigation and satellite TV, radio frequency (RF) integrated technology powers it all. As RF Engineering reshapes global connectivity, there has never been a more exciting time to master this field with the essential skills to excel in both the commercial and military sectors. Learn how to design cutting-edge on-chip RF circuits that are energy-efficient, high-performance, and cost-effective, enabling the next generation of wireless technology. This program equips you with hands-on knowledge to create RF subsystems, design integrated circuits, and master the fundamentals of RF systems. By the end of this program, you will: a) Understand the unique design requirements at RF frequencies, b) Differentiate between RF circuit, integrated circuit (IC), and system design needs, c) Master the design of RF blocks and systems, including calculating system characteristics.

2. **Course Modules with Quantitative Lectures Hours:**

I. **Microwave Network Representations (3 hours):-** ABCD parameters, Scattering parameters, Relationship with other representations and General block diagram of RFIC chip.

II. **Planar Transmission Line(6 hour):-** Microstrip transmission line in layered medium, Analysis using variational techniques, Strip transmission line and their closed form expression, Analysis of Multiconductor transmission line to identify coupling properties at RF frequency.

III. **Lumped Elements Integrated Circuit Technology in RF Frequency (3 hours):-** Design of lumped elements (resistor, inductor, and capacitor) and measurement of their parameters.

IV. **Bipolar/MOS Models for Integrated Active Device (2 hours):-** Large signal model (BJT), Small signal model (BJT).

V. **Integrated Circuit Technology (2 hours):-** Basic process in integrated circuit, Bipolar integrated circuit fabrication, Bi-CMOS technology.

VI. **Transistors Circuit Topology (6 hours):-** Current source, Different bias circuits and active load, Two transistor amplifier stages (Emitter coupled pair), Emitter follower as an output stage, Analog multiplier using bipolar transistors, Phase lock loop, Multi-tanh (hyperbolic) circuit.

VII. **Basic Concept of RF Design (7 hours):-** Nonlinearity and time variance, Inter symbol interference, Characterization of different noises and its measurement techniques, Sensitivity and Dynamic range, Passive impedance transformation.

VIII. **Low Noise Amplifier and Mixer (5 hours):-** General consideration, Bipolar LNA and input matching. Down conversion mixer; General consideration, Bipolar mixer, Cascaded stage revisited.

IX. **Oscillator (4 hours):-** LC oscillator topology, Phase noise, Bipolar oscillator.

X. **Power Amplifier (4 hours):-** Class A/B amplification, Class C amplifier, Biasing techniques, Class D, E, and F amplifier.

3. **Text Books:**
   a. Analysis and Design of Analog Integrated Circuits: P. R. Gray, and R. G. Meyer,
   b. RF Microelectronics: B. Razavi,

4. **References:**
   c. Computer-aided design of microwave circuits : K.C. Gupta,
   d. Solid State Radio Engineering: Herbert L. Krauss

5. **Similarity with Existing Course:**
   (Similarity content is declared as per lecture hours on similar topics)

Sl. No.	Course Name	Course code	Similarity content	Approx % of content

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

Approval:

Faculty interested in teaching this course:- Prof. Animesh Biswas

Proposed By:- Prof. Animesh Biswas School: SCEE

Signature: Date: 03-11-2025

The following faculty discussed on 02-11-2025 and approved the proposal on .....

Sl. No.	Faculty Name	Signature
1.	**Prof. Hitesh Shrimali**	
2.	**Dr. Rahul Shrestha**	
3.	**Dr Abhishek Sharma**	

School Chair:
School:
Date:
The proposal is reported in.....th Board of Academics on.....
Dean Academic:
Date:

Note: School is responsible for the course code. Academic office provides the IC course code:

Indian Institute of Technology Mandi

Animesh Biswas <animesh@iitmandi.ac.in>

MY SUGGESTIONS: Review of New Course Syllabi: VL402, VL211, and VL326

2 messages

Rahul Shrestha <rahul_shrestha@iitmandi.ac.in> Thu, Nov 6, 2025 at 10:19 AM
To: Hitesh Shrimali <hitesh@iitmandi.ac.in>
Cc: Bikram Paul <bikram@iitmandi.ac.in>, Abhishek Sharma <abhisheksharma@iitmandi.ac.in>, Srinivasu Bodapati <srinivasu@iitmandi.ac.in>, Shubhajit Roy Chowdhury <src@iitmandi.ac.in>, Kunal Ghosh <kunal@iitmandi.ac.in>, Robin Khosla <robin@iitmandi.ac.in>, Satinder Sharma <satinder@iitmandi.ac.in>, Animesh Biswas <animesh@iitmandi.ac.in>

Dear Colleagues,

The syllabi attached in the trailing mail are really competitive and look really good. If you could agree to include some of my suggestions as below then it would slightly improve them.

For VL211 (Analog Circuit Design):

Minor: There is a typo error: BJT is written as "BTJ".

Major:
1. I think this course should not be extended upto PLL and Data Converter. Here, we must focus more on strengthening the very fundamentals of analog circuit concepts and spend more hours in amplifier designs, feedback architectures, frequency analysis etc. In a nutshell, I suggest the syllabus must end at Oscillators. Please devote remaining hours from excluded parts to fundamental topics.
2. I think we should at least spend some hours on simple op-amp design: maybe, only one op-amp configuration.

For VL402 (RFIC):

I was thinking if we could include one chapter on an overall transceiver architecture that talks about baseband to RF frequency and vice-versa conversions in RF modules of transmitter and receiver, respectively, then it would be really helpful to the students. In this chapter, we can teach fundamental receiver architectures like heterodyne, superheterodyne, direct conversion and direct sampling receiver architectures. Some concepts of link budgeting can be also covered.

For VL-326 (Computer Organization and SoC Fundamentals):

Minor: In "von", the character "v" must be "V".

Major:
1. In this syllabus, I genuinely feel that there is almost nothing related to Computer Organization. But it is extremely good content for contemporary processor

architecture and SoC design. Hence, I suggest changing the name of this course to "Fundamentals of Processor Architecture for SoC Design" or "Fundamentals of Processor Architecture and SoC Design", both sound apt for this syllabus.
2. I have one suggestion for this syllabus: please include the DMA concept as well in it.

Thanks and best regards,

Rahul

On Tue, Nov 4, 2025 at 7:47 AM Hitesh Shrimali <hitesh@iitmandi.ac.in> wrote:
— VL402 looks fine to me.
— for VL211, the comment is as follows:
The syllabus is difficult to cover till data converters, oscillators (multi-vibrators), and PLL. Therefore, it is suggested to remove differential amplifiers and frequency response from the course. Both are covered in depth, in the next core course EE512 (CMOS Analog IC design). With this, the last part can be increased with the required teaching hours accordingly.

Thanks and regards,
--
Hitesh Shrimali
Professor
School of Computing and Electrical Engineering
Indian Institute of Technology Mandi, HP
Contact - +91-1905-267902 (O)

On Tue, 4 Nov 2025 at 12:06 AM Bikram Paul <bikram@iitmandi.ac.in> wrote:
Dear All,

The syllabus for the following courses has been prepared and is attached for your review:

- **VL402 (RF IC Design)** – prepared by **Prof. Animesh Sir**
- **VL211 (Analog Circuit Design)** – prepared by **Dr. Abhishek**
- **VL326 (Computer Organization and SoC Fundamentals)** – prepared by **myself**

Kindly go through the attached syllabi and share your feedback or comments before we present them in the upcoming **BoA** meeting.

Note:

- **VL402 (3-0-0-3)** is currently being offered by Prof. Animesh Sir to the B.Tech. (VLSI) 5th semester students.
- The newly proposed **VL211 (3-0-2-4)** and **VL326 (3-0-2-4)** courses will replace the existing **EE211** and **EE326** courses in the B.Tech. (VLSI) curriculum.

All the proposed syllabi are attached with this email.

--
Best Regards,

Indian Institute of Technology Mandi
Dr. Bikram Paul
Assistant Professor
School of Computing and Electrical Engineering(SCEE)
Phone: +911905267046; +919774143767;

Updated.

IIT Mandi

Proposal for a New Course

Course Number **VL-405**

Course Name Design for Testability

Credit L-T-P-C (3-0-2-4) 4-Credits

Intended for Discipline Core for BTech in VLSI & Microelectronics Engineering Students
Discipline Elective for B.Tech in Electrical Engineering students
Free Elective for other B.Tech students

Prerequisite Digital System Design (EE 210) or equivalent

Preamble:
In the modern era of complex systems and rapid product development, the ability to test effectively and efficiently has become a cornerstone of engineering excellence. Testability is not an afterthought—it is a deliberate design philosophy that ensures systems can be validated, faults can be diagnosed, and quality can be guaranteed throughout the product lifecycle. This course on *Design for Testability* introduces participants to the principles, strategies, and practices that make systems easier to test, maintain, and evolve. By embedding testability into the design process, engineers reduce costs, accelerate debugging, and improve reliability.

Course topics:
1. Introduction to design for testability – Testing during VLSI life cycle, challenges, yield and reject rate. 1 hour

2. Overview of fault models – Stuck at faults, transistor faults, open and short faults, delay faults and crosstalk, pattern sensitivity and coupling faults. 3 hours

3. Testability measures – SCOAP testability analysis, controllability and observability, probability based testability analysis, simulation based testability analysis, RTL testability analysis. 6 hours

4. Adhoc testing Architectures - Design techniques, scan design, test point insertion. 2 hours

5. Logic built in self test – BIST design rules, test pattern generation, output response analysis, signature analysis, logic BIST architectures, fault coverage enhancement. 5 hours

6. Random access scan design – random access scan (RAS) flip flop, PRAS design, STAR design, RAS applications, 2 hours

7. Logic Simulation – logic models, logic model implementation, hardware description languages, true value simulations, delay modeling. 2 hours

8. Test Compression – test stimulus compression, code based schemes, linear decompression based schemes, broadcast scan based schemes. 2 hours

9. Test-benches – objectives, stimulus and response, assertion and report generation 2 hours

10. Fault Simulation – serial fault simulation, parallel fault simulation, deductive fault simulation, parallel pattern fault simulation. 2 hours

11. Linear Feedback Shift Register and its applications on test architectures – design and analysis of linear feedback shift registers, test pattern generation using linear feedback shift registers, output response capture. 5 hours

12. Memory testing – SRAM and DRAM fault models, reduced functional model, address decoder faults, coupling faults, March test elements. 2 hours

13. Test vector generation – notion of ATPG, structural versus functional ATPG, random test generation, D algorithm 2 hours

14. Boundary Scan testing - digital boundary scan, boundary scan for advanced networks, test access port, bus protocols. 2 hours

15. Analog and mixed signal testing - Issues with analog testing, difference from digital testing, test parameters, analog fault models, analog test bus. 2 hours

16. Testing technologies and recent trends – Coping with physical failures, soft errors and reliability issues, FPGA testing, MEMS testing, high speed I/O testing, RF testing. 2 hours

Laboratory work:
Laboratory assignments covering the fundamentals in testing techniques and design of testable architectures. Typical experiments include but not limited to fault model generation and fault detection of combinational and sequential digital logic circuits of varying complexity, verification of testing protocols and standards, etc.
28 hours

Books:

A. Text Book:
   1. VLSI Test Principles and Architectures: Design for Testability (2024) by Laung-terng Wang, Cheng-Wen Wu, and Xiaoqing Wen, Morgan Kaufmann

B. Reference Books:
   1. Digital Systems Testing and Testable Design (1994) by Miron Abramovici, Melvin A. Breuer, Wiley.
   2. Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits (2013) by Michael Bushnell and Vishwani D. Agrawal, Springer.

Similarity checks:

a) **Similarity with existing courses:** None
(similarity content is declared as per the number of lecture hours on similar topics)

Sl. No.	Course Name	Course Code	Similarity Content	Approx % of Content

b) Justification of new course proposal if cumulative similarity content is >30%: **NA**

Approvals:

Proposed by:

Prof. Shubhajit Roy Chowdhury

School: SCEE

Signature Shubhajit Roy Chowdhury Date 27.01.2026

The following faculty discussed and approved the proposal on 28-01-2026

Sl. No.	Faculty Name	Signature
1.	Dr. Rahul Shrestha	
2.	Prof. Hiteshbhai Kantilal Shrimali	
3.	Dr. Bikram Paul	
4.	Dr. Srinivasu Bodapati	

Comments attached

School Chair

Date:

This Proposal is reported in _____ Board of Academics on _____

Dean Academics

Date:

Note: School is responsible for course code. Academic Office provides IC courses code.

Recommended/Not Recommended, with Comments:

_____ Date: _____

Chairman, CPC Approved / Not Approved

_____ Date:_____

Chairman Senate

Hitesh Shrimali <hitesh@iitmandi.ac.in>

Re: Course Proposal on Design for Testability (VL405)

Hitesh Shrimali <hitesh@iitmandi.ac.in> Wed, Jan 28, 2026 at 7:21 PM
To: "Prof. Shubhajit Roy Chowdhury" <src@iitmandi.ac.in>
Cc: Bikram Paul <bikram@iitmandi.ac.in>, Srinivasu Bodapati <srinivasu@iitmandi.ac.in>, Rahul Shrestha <rahul_shrestha@iitmandi.ac.in>, Animesh Biswas <animesh@iitmandi.ac.in>, Kunal Ghosh <kunal@iitmandi.ac.in>, Robin Khosla <robin@iitmandi.ac.in>, Satinder <satinder@iitmandi.ac.in>, Abhishek Sharma <abhi@iitmandi.ac.in>

I request all of us to give comments for VL405. The course needs to be presented on Jan 30. So, I request to respond it by tomorrow.

My comments: the course is very well formulated. The proposal looks good to me.

Thanks and regards,
--
Hitesh Shrimali
Professor
School of Computing and Electrical Engineering
Indian Institute of Technology Mandi, HP
Contact - +91-1905-267902 (O)

On Wed, 28 Jan 2026 at 6:19 PM Prof. Shubhajit Roy Chowdhury <src@iitmandi.ac.in> wrote:

> Dear colleagues,
> Please find attached the course proposal on Design for Testability.
> This is for your approval or otherwise.
> Thank you.
> Kind regards,
> Shubhajit

Prof. Shubhajit Roy Chowdhury,

Professor,

School of Computing and Electrical Engineering,

Indian Institute of Technology Mandi.

Phone: +91 1905 267915

Website: http://faculty.iitmandi.ac.in/~src/

Orcid link: https://orcid.org/0000-0003-1878-6657

Indian Institute of Technology Mandi

Hitesh Shrimali <hitesh@iitmandi.ac.in>

Course Proposal on Design for Testability

Rahul Shrestha <rahul_shrestha@iitmandi.ac.in> Thu, Jan 29, 2026 at 10:04 AM
To: "Prof. Shubhajit Roy Chowdhury" <src@iitmandi.ac.in>
Cc: Bikram Paul <bikram@iitmandi.ac.in>, Srinivasu Bodapati <srinivasu@iitmandi.ac.in>, "Dr. Hitesh Shrimali" <hitesh@iitmandi.ac.in>

Hi Shubhajit,

The course structure is systematically formulated. However, I don't think it is officially a DE for B. Tech. EE.

Thanks and regards

Rahul

On Wed, Jan 28, 2026 at 6:19 PM Prof. Shubhajit Roy Chowdhury <src@iitmandi.ac.in> wrote:

> Dear colleagues,
> Please find attached the course proposal on Design for Testability.
> This is for your approval or otherwise.
> Thank you.
> Kind regards,
> Shubhajit

Prof. Shubhajit Roy Chowdhury,

Professor,

School of Computing and Electrical Engineering,

Indian Institute of Technology Mandi.

Phone: +91 1905 267915

Website: http://faculty.iitmandi.ac.in/~src/

Orcid link: https://orcid.org/0000-0003-1878-6657

--

Dr. Rahul Shrestha, PhD, SMIEEE
Associate Professor
School of Computing and Electrical Engineering
Indian Institute of Technology Mandi
Profile Link: http://faculty.iitmandi.ac.in/~rahul_shrestha/

Hitesh Shrimali <hitesh@iitmandi.ac.in>

Course Proposal on Design for Testability

Bikram Paul <bikram@iitmandi.ac.in> Wed, Jan 28, 2026 at 9:26 PM
To: Hitesh Shrimali <hitesh@iitmandi.ac.in>
Cc: Srinivasu Bodapati <srinivasu@iitmandi.ac.in>, Rahul Shrestha <rahul_shrestha@iitmandi.ac.in>, Abhishek Sharma <abhisheksharma@iitmandi.ac.in>, Satinder <satinder@iitmandi.ac.in>, Robin Khosla <robin@iitmandi.ac.in>, Kunal Ghosh <kunal@iitmandi.ac.in>, Animesh Biswas <animesh@iitmandi.ac.in>, Abhishek Sharma <abhi@iitmandi.ac.in>, Subhojit Roy Chaudhry <src@iitmandi.ac.in>

Dear colleagues,

The course proposal appears to be well structured and provides a comprehensive span across the intended course content. The overall formulation is clear and appropriately aligned with the learning objectives.

Thank you.

[Quoted text hidden]

--

Best Regards,

Indian Institute of Technology Mandi
Dr. Bikram Paul
Assistant Professor
School of Computing and Electrical Engineering(SCEE)
Phone: +911905267046; +919774143767;

IIT Mandi
Proposal for a New Course

Course number : **MA255**
Course Name : **Number Theory**
Credit : **3**
Distribution : ***3-0-0-3***
Intended for : **B.Tech. in Mathematics and Computing**
Elective or core : **Discipline elective**
Prerequisite : **None**
Mutual Exclusion: **MA552**

1. Preamble:

Elementary Number Theory is a fundamental area of mathematics that develops deep insight into the structure and properties of integers. Concepts originating from number theory form the theoretical backbone of several areas in modern mathematics and computing, including algorithms, cryptography, coding theory, and computational complexity. The proposed course on Elementary Number Theory is designed to introduce students to core topics such as divisibility, prime numbers, greatest common divisors, congruences, modular arithmetic, Diophantine equations, and arithmetic functions. Emphasis is placed on rigorous reasoning, proof techniques, and the development of algorithmic methods for solving number-theoretic problems.

2. Course Modules with quantitative lecture hours:

Unit 1: Divisibility, The greatest common divisor, The fundamental theorem of integers, Basic properties of congruences, Some special congruences, Polynomial congruences and their solutions, Primitive roots **(16 Hours)**

Unit 2: Quadratic residues and their basic properties, The Gauss Lemma, The law of quadratic reciprocity, Applications to Diophantine equations, Multiplicative arithmetic functions, The Mobius inversion formula, Perfect and Amicable numbers. **(16 Hours)**

Unit 3: Integer representation and algorithms, Hashing functions, Pseudorandom numbers, Check digits, Introduction to classic cryptography. **(10 Hours)**

Laboratory/practical/tutorial Modules:

3. Text books:

(1). William W. Adams, Larry J. Goldstein, Introduction to Number Theory, Princeton-Hall Inc., 1976

(2). Kenneth H. Rosen, Discrete Mathematics and its applications, 8th edition, 2021.

4. Similarity with the existing courses:

(Similarity content is declared as per the number of lecture hours on similar topics)

S. No.		Course Code	Similarity Content	Approx. % of Content
1.		MA552		60%

6. Justification of new course proposal if cumulative similarity content is >30%: The course MA552 is intended for M.Sc. students, which is a theoretical course. This course includes the applications of Number theory, making it suitable for B.Tech in Maths and computing students.

Approvals:

Faculty interested in teaching this course: –

Proposed by: Dr. Sampat Kumar Sharma **School: SMSS**

Signature: sampat **Date: 28th February, 2026**

The following faculty (at least 3 faculty) discussed on……and approved the proposal on……..

This course was discussed during a faculty meeting and is floated as per school need.

Sl. No	Faculty Name	Signature

School Chair: 29/01/2026 (F/C) (Prof. Manoj Thakur)

School: SMSS

Date: 29.1.2026

This proposal is reported in ……..th Board of Academics on ……

Dean Academics

Date:

Note: School is responsible for the Course Code. Academic Office provides the IC Course Code.

IIT Mandi
Proposal for a New Course

Course number	: MA561
Course Name	: Fluidics and Microfluidics
Credit	: **4**
Distribution	: ***3-0-2-4***
Intended for	: BTech Maths and Computing 3rd year, 4th year, MSc, PhD, Elective for other disciplines.
Elective or core	: Elective
Prerequisite	: MA220 (PDE), MA221 (Numerical Analysis) or equivalent
Mutual Exclusion	: ME507

---

1. Preamble:

The objective of this course is to provide students with a thorough understanding of fluid dynamics ***from fundamentals to microscale applications****. Emphasis is placed on developing computational proficiency using* ***COMSOL Multiphysics****, a modern simulation platform widely used in research and industry, to model and analyze* ***microfluidic, interfacial, and electrohydrodynamic*** *flow phenomena.*

2. Course Modules with quantitative lecture hours:

Unit 1: Fundamentals of Fluid Dynamics: (12 Hours)

Review of fluid properties: viscosity, density, surface tension, compressibility; Control volume and differential formulations; conservation of mass and momentum; Reynolds transport theorem; Navier–Stokes and Energy equations (steady and unsteady forms); Pressure-driven flows: exact solutions for Couette and Poiseuille flows; Stokes drag on a sphere, creeping flow, laminar flow approximations.

Lab: Basics of Finite Difference; Numerical modelling of 1D pressure driven flows such as Couette flow, Poiseuille flow, Hagen- Poiseuille flow.

Unit 2: Introduction to Microfluidics and its applications: (10 Hours)

Origin, definition, motivation, benefits, challenges, and applications; Physics of miniaturization, dimensional analysis, and scaling laws; Continuum hypothesis; Boundary conditions: slip theory, entrance effects, low Re regimes; Applications: Drug delivery and diagnostics; Biosensing and lab-on-a-chip systems.

Lab: An overview of solving Navier-Stokes via any discreate numerical methods (understanding the sensitivity of pressure); Basics of COMSOL Multiphysics: model

building, geometry, physics, mesh, study, post processing (result plotting 1D, 2D, and 3D). Fluid flow module- Flow past a sphere.

Unit 3: Capillary Flows: (10 Hours)

Surface tension and interfacial energy; Young–Laplace equation, contact angle, capillary rise and capillary length; Interfacial boundary conditions; Marangoni effect; capillary flows.

Lab: COMSOL: Laminar two-phase flow: (level set, phase field) Young–Laplace droplet on a flat substrate (2D axisymmetric); Capillary rise in a tube (2D axisymmetric); Marangoni-driven flow along an interface (thermocapillary and solutal marangoni).

Unit 4: Electrohydrodynamics & Microchannel Flows: (10 Hours)

Fundamentals of electrohydrodynamics and species transport; Poisson–Boltzmann equation, Debye layer, thin EDL approximation; Electroosmosis: ideal Electroosmotic Flow (EOF), EOF with back pressure; EO devices- micropumps, micromixers, microvalve; EOF of power-law fluids.

Lab: COMSOL: Lid driven cavity combined with mass transport and heat transport, Electric field in a dielectric or leaky dielectric fluid, Electrostatic deformation of a droplet (leaky dielectric model), Electroosmotic flow in a microchannel, Electroosmotic flow in a microchannel connected reservoir, EOF of power-law fluids.

Laboratory/practical/tutorial Modules:
Mentioned with the corresponding theory units.

3. Text books:

(Latest, Only 2)

1. Bruus, Henrik. "*Theoretical microfluidics*". Vol. 18. Oxford university press, 2007.
2. White, Frank M. "Fluid mechanics". *International Edition, McGraw-Hill* (2015).

4. References:

1. Kirby, B. J. – *Micro- and Nanoscale Fluid Mechanics: Transport in Microfluidic Devices*, Cambridge University Press.
2. Tabeling, P. – *Introduction to Microfluidics*, Oxford University Press.
3. Nguyen, N.-T. & Wereley, S. T. – *Fundamentals and Applications of Microfluidics*, Artech House.
4. Batchelor, George Keith. *An introduction to fluid dynamics*. Cambridge university press, 2000.
5. Chaurasia, Ashish S. *Computational fluid dynamics and comsol Multiphysics: A step-by-step approach for chemical engineers*. Apple Academic Press, 2021.
6. Multiphysics, COMSOL. "Introduction to comsol multiphysics®." *COMSOL Multiphysics, Burlington, MA, accessed Feb* 9.2018 (1998): 32.

5. Similarity with the existing courses:

(Similarity content is declared as per the number of lecture hours on similar topics)

S. No.		Course Code	Similarity Content	Approx. % of Content
1.		ME 507	Micro and Nanoscale Fluid Mechanics	45
2.		ME603	Advanced Fluid Mechanics	25
3.		ME210	Fluid Mechanics	25
4.		ME514	Fundamentals of Multiphase Flow	20

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

- The School of Mathematical and Statistical Science (SMSS) currently does not offer any dedicated course in fluid dynamics; hence, this course fills an important curricular gap and is expected to attract students from the *MSc in Applied Mathematics* programme by emphasizing mathematical modeling and applications.
- While there is partial overlap with similar courses offered by the School of Mechanical and Materials Engineering (SMME), the proposed course places greater emphasis on mathematical formulation, analytical techniques, and scaling analysis rather than engineering-oriented treatment.
- The course uniquely includes hands-on training using COMSOL Multiphysics, which is not part of any existing similar course at the institute and provides valuable computational skills relevant to both research and industry.

Doyel Pandey

28/01/2026

Revised as suggested in the BoA meeting.

Approvals:

Faculty interested in teaching this course: – Doyel Pandey

Proposed by: Doyel Pandey **School: SMSS**

Signature: Doyel Pandey **Date:** 06/11/2025

Proposal for a New Course

The following faculty (at least 3 faculty) discussed on… .....and approved the proposal on……..

Sl. No	Faculty Name	Signature
1.	Prof. Saptarshi Basu, IISc Bangalore	Saptarshi Basu
2.	Prof. Pranab Kumar Mondal, IIT Guwahati	Pranab Kumar Mondal
3.	Prof. Steffen Hardt, TU Darmstadt, Germany	St. Hardt

School Chair:

School: (HC) SMSS 29/01/2026. (Prof. Manoj Thakur)

Date: 29.1.2026

This proposal is reported in …… .th Board of Academics on ……

Dean Academics

Date:

Note: School is responsible for the Course Code. Academic Office provides the IC Course Code.

Proposal for a New Course

IIT Mandi
Proposal for a New Course

Course number : **MA 562**
Course Name : **An Introduction to Bayesian Analysis**
Credit Distribution : **3-0-2-4**
Intended for : **B.Tech 3rd and 4th year/ MS/MSc/PhD**
Elective or core : **Elective**
Prerequisite : **Probability and Statistics (MA 524) and/or IC 252**
Mutual Exclusion : **NA**

---

1. Preamble:

Bayesian Analysis provides a principled framework for statistical inference under uncertainty, treating unknown quantities as random variables and updating beliefs using observed data. This course offers a foundational introduction to Bayesian thinking, modeling, and computation, with an emphasis on clarity, interpretability, and practical data analysis. Unlike advanced Bayesian courses that focus on research-level modeling or project-based exploration, this course is designed to build strong conceptual and computational foundations. The course progresses gradually from the philosophical and probabilistic basis of Bayesian inference to standard Bayesian models and basic computational tools. The emphasis is on understanding core ideas, posterior reasoning, and implementation using simple computational techniques, without delving into advanced or specialized models. Overall, the course equips students with a basic of Bayesian inference, preparing them for advanced research and practical applications in statistics, machine learning, and related fields

2. Course Modules with quantitative lecture hours:

Module 1: Bayesian Foundations and Probability Review (6 Lectures)
Review of probability concepts relevant to Bayesian inference, conditional probability and Bayes' theorem, Bayesian versus frequentist paradigms, likelihood principle and subjective probability, Simple motivating examples

Module 2: Bayesian Inference and Prior Specification (6 Lectures)
Bayesian inference framework, prior, likelihood, and posterior distributions, types of priors:

informative, weakly informative, and non-informative priors, Conjugate priors and analytical posteriors, posterior summaries: mean, median, credible intervals

Module 3: Bayesian Models for Standard Data Types (6 Lectures)
Bayesian inference for discrete data (Binomial, Poisson models), Bayesian inference for continuous data (Normal model), Predictive distributions, posterior predictive checks (basic ideas), interpretation of Bayesian results

Module 4: Bayesian Computation and Simulation (8 Lectures)
Motivation for Bayesian computation, Deterministic approximation methods (basic overview), introduction to Monte Carlo methods, Markov chain Monte Carlo (MCMC), Metropolis–Hastings algorithm, Assessing convergence and Monte Carlo error

Module 5: Bayesian Linear Regression Models and Model Comparison (6 Lectures)
Bayesian multiple linear regression, Random effects and shrinkage interpretation, Prior choices for regression parameters, Model comparison and model selection, Bayes factors and information criteria (introductory level)

Module 6: Approximate Bayesian Methods and Hierarchical Modeling (10 Lectures)
Motivation for hierarchical modeling in complex data, Motivation for approximate Bayesian inference, Approximate inference for hierarchical models, Laplace approximation and normal approximations to the posterior, variational Bayes: basic ideas and mean-field approximation, expectation propagation (conceptual overview), approximate Bayesian computation (ABC): intuition and simple algorithms, Strengths and limitations of approximate Bayesian methods

Lab Class: The laboratory sessions focus on implementing Bayesian methods using statistical computing tools such as R and basic Bayesian software. Students will compute posterior distributions, generate posterior samples, summarize uncertainty, and analyze real and simulated datasets corresponding to the lecture material.

Project and Case Studies: This course will give a certain weight to project and case studies, implementing Bayesian hierarchical models using MCMC and approximate methods in day-to-day real-life problems.

3. Text Books:

1. **Gelman, A., Carlin, J., Stern, H., Dunson, D., Vehtari, A., & Rubin, D.** *Bayesian Data Analysis*. Chapman & Hall/CRC (2013).
2. **Robert, C. P., & Casella, G.** *Monte Carlo Statistical Methods*. Springer (2004).

4. Reference:

1. **Marin, J.-M., & Robert, C. P.**. *Bayesian Essentials with R*. Springe (2014).

2. **Ghosh, J. K., Delampady, M., & Samanta, T.** *An Introduction to Bayesian Analysis.* Springer (2006).

5. Similarity with the existing courses:
(Similarity content is declared as per the number of lecture hours on similar topics)

Similarity contents are less than < 20 %

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

Other Faculty interested in teaching this course:

Proposed by:

Dr. Rishikesh Yadav, Prof. Manoj Thakur & Dr. Tanmay Kayal

School:
School of Mathematical and Statistical Sciences

Signature: Rishikesh yadav **Date:** Jan 29, 2026

The following faculty (at least 3 faculty) discussed on……and approved the proposal on……..

Sl. No	Faculty Name	Signature
1	Dr. Arnab Hazra Assistant Professor (IIT Kanpur)	Email attached
2	Dr. Tanmay Kayal Assistant Professor (IIT mandi)	
3	Dr. Manoj Thakur Professor (IIT Mandi)	

School Chair: HC 29/01/2026 (Prof Manoj Thakur)

School: SMSS

Date: 29.1.2026

This proposal is reported in ……..th Board of Academics on ……

Dean Academics

Date:

Note: School is responsible for the Course Code. Academic Office provides the IC Course Code.

Recommended/Not Recommended, with Comments:

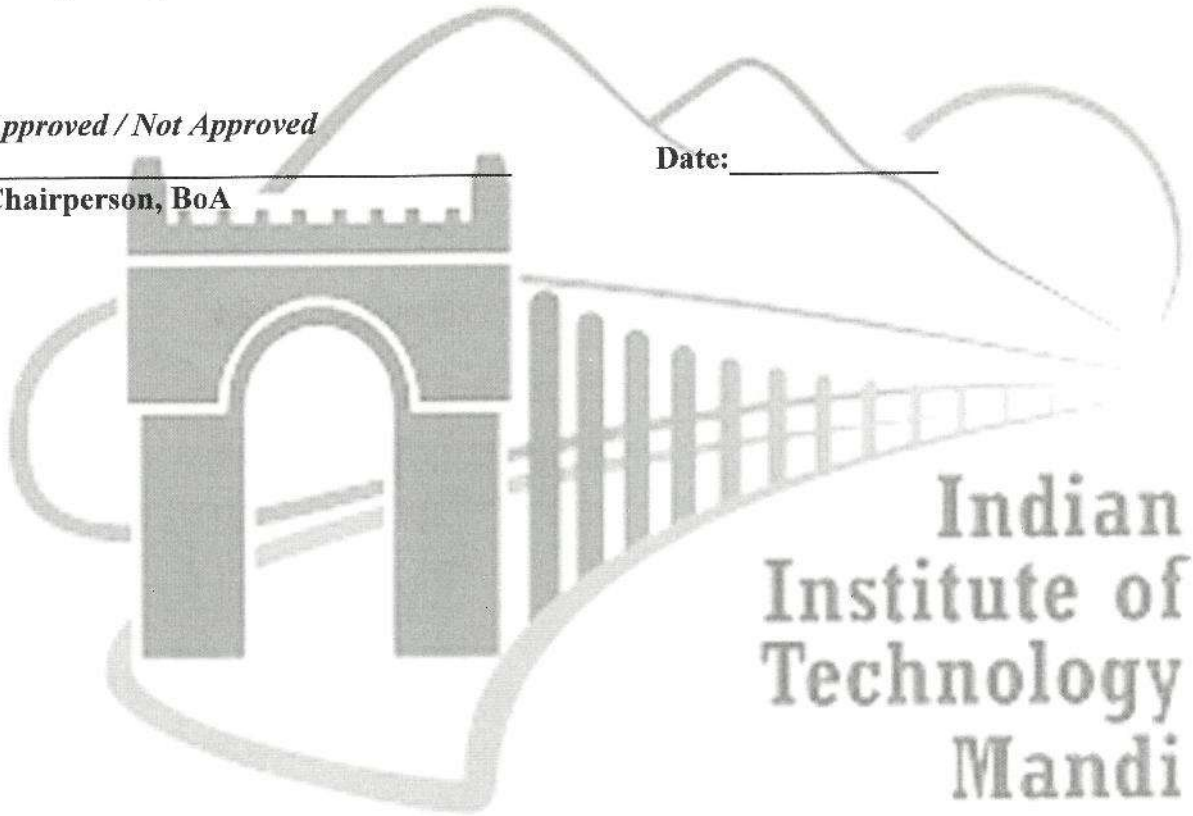
_____ **Date:**_____

Chairperson, CPC

Approved / Not Approved

_____ **Date:**_____

Chairperson, BoA



IIT Mandi
Proposal for a New Course

Course number	**: MA 563**
Course Name	**: Statistical Computation and Simulation**
Credit Distribution	**: 3-0-2-4**
Intended for	**: B.Tech 3rd and 4th year/ MS/MSc/PhD**
Elective or core	**: Elective**
Prerequisite	**: Probability and Statistics (MA 524) and/or IC 252**
Mutual Exclusion	**: NA**

1. Preamble:

Statistical computation and simulation play a key role in modern statistical analysis, data science, and machine learning, particularly when analytical solutions are unavailable or impractical. This course is designed to introduce students to fundamental computational tools in statistics, with a strong emphasis on simulation-based methods and optimization techniques that are routinely used in statistical modeling and inference. The course balances theoretical foundations with practical implementation, enabling students to understand both why computational methods work and how to apply them effectively. Starting from random number generation and simulation of random variables, the course progressively introduces Monte Carlo methods, resampling methods, and algorithmic approaches such as EM. Special emphasis is placed on Bayesian computational approaches, including Monte Carlo methods and Markov chain Monte Carlo (MCMC) techniques, which are essential for modern Bayesian inference. Overall, the course equips students with a unified computational perspective on statistical inference, optimization, and simulation, preparing them for advanced research and practical applications in statistics, machine learning, and related fields.

2. Course Modules with quantitative lecture hours:

Module 1: Random Number Generation and Simulation Foundations (8 Lectures) Pseudo-random number generators, uniform and non-uniform random variable generation, Inverse transform method, acceptance–rejection method, Box–Muller transformation, ratio-of-uniforms method, diagnosing randomness, and simulation error.

Module 2: Monte Carlo Methods (8 Lectures)
Monte Carlo estimation and integration, law of large numbers and Monte Carlo error, crude Monte Carlo, importance sampling (simple & weighted), variance reduction ideas (basic level), and practical Monte Carlo diagnostics.

Module 3: Resampling and Simulation-Based Statistical Inference (10 Lectures)
Bootstrap principles, parametric vs nonparametric bootstrap, Cross-validation, Jackknife (brief), Simulation-based uncertainty quantification, Computational trade-offs, likelihood-based inference via simulation, Parametric simulation for inference, Confidence intervals via simulation, Hypothesis testing using Monte Carlo, Permutation tests, Bootstrap-based inference (deep dive), Simulation vs asymptotic inference

Module 4: Iterative Computational Algorithms (6 Lectures)
Role of simulation in iterative inference, stochastic approximation ideas, Likelihood-based computation, MM (Majorization–Minimization) algorithms, Mixture models (Gaussian mixtures), EM algorithm, Simulation-based interpretation of EM

Module 5: Bayesian Computation and MCMC (10 Lectures)
Basics of Bayesian Inference, computational motivation for Bayesian inference, Monte Carlo methods in Bayesian statistics, Markov chains and stationary distributions, Metropolis–Hastings algorithm, Gibbs sampling (basic structures), posterior diagnostics and convergence assessment

Lab Class: The lab component of this course focuses on the practical application of concepts via hands-on implementation with real and simulated datasets. It aims to enhance students' understanding of concepts and strengthen their ability to use statistical simulation and computational approaches.

Project and Case Studies: This course will give a certain weight to project and case studies, applying statistical computing methods in day-to-day real-life datasets.

3. Text Books:

1. **Ross, S. M.** *Simulation (5th ed.).* Academic Press (2012).
2. **Robert, C. P., & Casella, G.** *Monte Carlo Statistical Methods.* Springer (2004).

4. Reference:

1. **James, G., Witten, D., Hastie, T., & Tibshirani, R.** *An Introduction to Statistical Learning.* Springer (2013).
2. **Efron, B., & Tibshirani, R. J.** *An Introduction to the Bootstrap.* CRC Press (1994).

5. Similarity with the existing courses:

(Similarity content is declared as per the number of lecture hours on similar topics)

Similarity contents are less than < 20 %

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

Other Faculty interested in teaching this course:

Proposed by:

Dr. Rishikesh Yadav, Prof. Manoj Thakur & Dr. Tanmay Kayal

Signature: Rishikesh yadav **Date: 29.01.2026**

School:
School of Mathematical and Statistical Sciences

The following faculty (at least 3 faculty) discussed on……and approved the proposal on……..

Sl. No	Faculty Name	Signature
1	Dr. Arnab Hazra Assistant Professor (IIT Kanpur)	Email attached
2	Dr. Tanmay Kayal Assistant Professor (IIT mandi)	
3	Dr. Manoj Thakur Professor (IIT Mandi)	

School Chair: 29/01/2026 (Prof. Manoj Thakur)

School: SMSS

Date: 29.1.2026

This proposal is reported in ……..th Board of Academics on ……

Dean Academics

Proposal for a New Course

Date:

Note: School is responsible for the Course Code. Academic Office provides the IC Course Code.

Recommended/Not Recommended, with Comments:

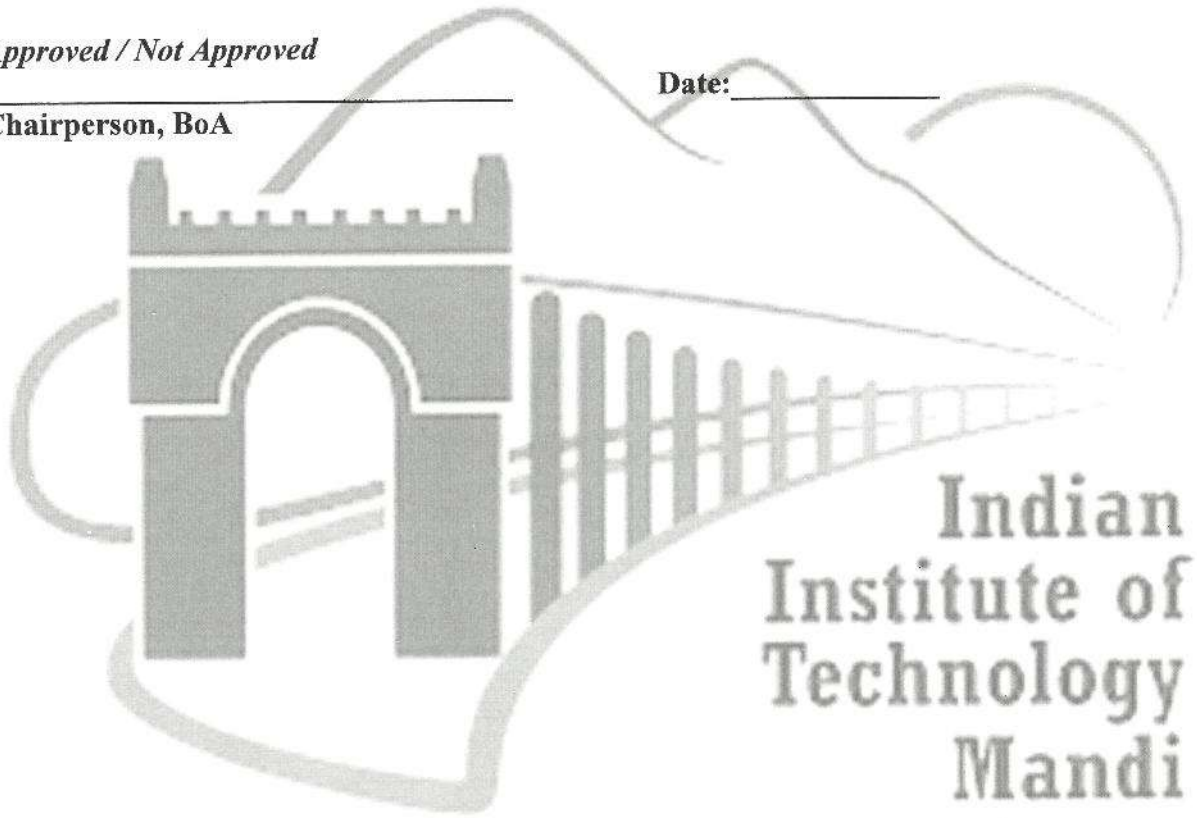
_____ **Date:**_____

Chairperson, CPC

Approved / Not Approved

_____ **Date:**_____

Chairperson, BoA



Rishikesh Yadav <rishikesh@iitmandi.ac.in>

Seeking Your Suggestions on a Newly Designed Course: Introduction to Bayesian Analysis

3 messages

Rishikesh Yadav <rishikesh@iitmandi.ac.in> Sat, Jan 3, 2026 at 3:27 PM
To: Arnab Hazra <ahazra.iitk@gmail.com>
Cc: Manoj Thakur <manoj@iitmandi.ac.in>, Tanmay Kayal <tanmay@iitmandi.ac.in>

Dear Dr. Arnab Hazra,

We (Prof. Manoj Thakur and Dr. Tanmay Kayal, copied in the email) are reaching out to you regarding your suggestions on a newly designed course titled **"An Introduction to Bayesian Analysis."**

The course is planned as a full semester course: **14-week**, consisting of **42 lectures** and a **2-hour laboratory session each week**. It is designed as a **foundational course** and intended for a **general audience**, not limited to students with a strong statistics background. This is particularly important for us, as we currently do not have a dedicated statistics department, and the course needs to be accessible to students from diverse academic backgrounds.

We would be very grateful if you could kindly review the course structure and contents and share your suggestions on how it can be improved, especially in terms of balance, depth, and suitability for such a broad audience.

Thank you very much for your time and guidance.

Best regards,

Rishi
--

Dr. Rishikesh Yadav
Assistant Professor
School of Mathematical and Statistical Sciences (SMSS)
North Campus, IIT Mandi-175005
Himachal Pradesh, India

Website: https://sites.google.com/view/yadav-rishikesh
GitHub: https://github.com/yadavrishikesh
LinkedIn: https://www.linkedin.com/in/rishikesh-yadav-69ab371b7/

An Introduction to Bayesian Analysis.pdf
208K

Arnab Hazra <ahazra.iitk@gmail.com> Mon, Jan 5, 2026 at 10:38 PM
To: Rishikesh Yadav <rishikesh@iitmandi.ac.in>
Cc: Manoj Thakur <manoj@iitmandi.ac.in>, Tanmay Kayal <tanmay@iitmandi.ac.in>

Dear Rishikesh,

Thank you for your email. The course structure looks great. Here are only a few comments:

1. Usually, during a regular semester, we miss a few dates due to holidays, and so eventually we get 37-38 lectures. It may be different at IIT Mandi, and so adjust accordingly if needed.
2. I think one lab hour every week is sufficient for the course. Specifically, at the beginning of the course, we generally do not require lab classes, and they become more useful only after the mid-semester, when Bayesian computing concepts are covered in more detail.
3. Module 6 focuses more on the computational aspects and covers a few essential but advanced topics. As a result, modeling aspects do not get space. The significant popularity of Bayesian statistics today is mainly due to its flexibility in

modeling complex data structures, which primarily stems from Bayesian hierarchical models. Maybe you can keep that side at least partially.
4. The Book of Reich and Ghosh has a new edition https://bayesian-statistical-methods.wordpress.ncsu.edu/. You could include that as a potential reference. The good side is that the book is from the angle of a one-semester course targeted towards UG stduents.
5. The final aim of the course should focus on the fact that the BTech/BS students studying at IIT should be able to apply Bayesian methods in their jobs in an understandable way. Hence, focusing on case studies would be crucial. Therefore, if any change is required from that perspective, please incorporate that.

The above comments are from my perspective and may not necessarily align with someone else's. Please feel free to include/exclude.

Best,

Arnab

[Quoted text hidden]

Rishikesh Yadav <rishikesh@iitmandi.ac.in> Tue, Jan 6, 2026 at 12:00 PM
To: Arnab Hazra <ahazra.iitk@gmail.com>
Cc: Manoj Thakur <manoj@iitmandi.ac.in>, Tanmay Kayal <tanmay@iitmandi.ac.in>

Thank you so much, Arnab, for your detailed comments and very helpful suggestions on the proposed contents. We totally agree with all your comments and will modify the course contents accordingly.

Best regards,
Rishikesh
[Quoted text hidden]

New Course

Approval: 61st BoA

Course Number	: CY-559
Course Name	: **Machine Learning in Chemistry**
Credit Distribution	: **2-0-2-3 (L-T-P-C)**
Distribution	: Elective (Odd/Even)
Intended for	: BS 3rd/4th Year, MSc, PhD
Prerequisite	: No prior experience in artificial intelligence and programming is required–just curiosity, passion, and a willingness to experiment with data and molecules.
Mutual Exclusion	: None

---

1. Preamble:

The course Machine Learning for Chemistry introduces the fundamental concepts and methodologies of machine learning with a strong focus on practical applications in chemical sciences. Rather than emphasizing only theoretical aspects, the course adopts a hands-on, example-driven approach designed for students eager to apply machine learning techniques to real chemical problems.

It is aimed at a broad audience, from theoretical chemists interested in exploring data-driven approaches, to experimental chemists looking to integrate machine learning into their research workflows.

The course begins with a concise overview of the core principles of machine learning, followed by a discussion of how chemical systems can be represented computationally, including molecular representations and the role of symmetry. Students will then explore key learning paradigms (supervised and unsupervised learning) and major model architectures, ranging from linear regression and kernel methods to artificial neural networks.

Throughout the course, theoretical insights will be anchored in practical examples drawn from modern chemical research, such as materials discovery, catalyst design, spectroscopy, and microscopy image analysis, demonstrating how machine learning is reshaping the way we study and innovate in chemistry.

Bhaskar Mondal

2. Course Modules with quantitative lecture/interaction hours:

Module 1: Foundations (7 hours)

What is Machine Learning? Types of ML (supervised, unsupervised), Basic ML workflow (data → model → validation → deployment), Data in chemistry: sources, structure, and challenges, Basic Python data handling: NumPy, pandas, matplotlib, Introduction to chemical data representation (SMILES, InChI, molecular graphs)

Practical: Handling small chemical datasets (e.g., solubility, boiling points), Exploratory Data Analysis (EDA) using pandas and matplotlib.

Module 2: Data Representation in Chemistry (7 hours)

SMILES and Molecular Graphs, Molecular descriptors and fingerprints (MACCS, Morgan), RDKit and descriptor generation, Feature scaling, dimensionality reduction (PCA, t-SNE), Feature selection and correlation analysis.

Practical: Generating and visualizing molecular fingerprints, Applying PCA on chemical property datasets

Module 3: Unsupervised Learning (6 hours)

Clustering: k-Means, hierarchical clustering, DBSCAN, Dimensionality reduction revisited (PCA, t-SNE, UMAP), Outlier detection in experimental datasets, Chemical space visualization and diversity analysis.

Chemical Applications: Clustering of similar compounds in drug/molecule libraries, Reaction space analysis and catalyst clustering

Practical: Visualizing chemical space using PCA/t-SNE, Cluster analysis of organic molecules

Module 4: Supervised Learning (9 hours)

Linear regression, Polynomial regression. Regularization (Ridge, Lasso), overfitting, logistic regression, k-NN, decision trees, random forest, and SVM. Model training (Cross-validation, train-test split, hyperparameter tuning) and evaluation metrics (MAE, RMSE, R^2, accuracy, ROC, confusion matrix).

Chemical Applications: Predicting molecular solubility, QSAR (Quantitative Structure–Activity Relationships), Spectral data classification (IR/NMR peak prediction)

Practical: Building regression models to predict physical properties (e.g., solubility, boiling points), Model performance comparison using scikit-learn.

Module 5: Neural Networks and Deep Learning (6 hours)

Basics of Artificial Neural Networks (ANNs), Activation functions, loss functions, optimization, Introduction to TensorFlow/PyTorch, Deep learning for chemistry: property prediction, spectra, and reaction yield prediction, Concept of graph neural networks (GNNs) and message-passing networks.

Chemical Applications: Predicting molecular energy from SMILES or graphs, Spectra prediction (IR/Raman), Reaction outcome prediction (introductory level).

Practical: Building a simple feedforward neural network using TensorFlow/Keras.

Module 6: Case Studies and Advanced Topics (7 hours)

ML in materials discovery and catalysis, ML in computational chemistry (potential energy surfaces, molecular dynamics), ML for spectroscopy and image analysis (microscopy, IR maps), Interpretability of ML models (SHAP, LIME), Data ethics, reproducibility, and bias in chemical ML.

Practical: Mini project: students choose a dataset (e.g., QM9, MoleculeNet), Train, validate, and interpret a simple ML model

Laboratory/practical/tutorial Modules: Practical components are Included in the respective modules.

3. Textbooks:

(i) Introduction to Machine Learning with Python – A. Müller & S. Guido

(ii) Machine Learning in Chemistry: The Impact of Artificial Intelligence – Hugh M. Cartwright

(iii) Machine Learning in Chemistry – Jon Paul Janet and Heather J. Kulik, American Chemical Society, 2020

(iv) Machine Learning in Chemistry: Data-Driven Algorithms, Learning Systems, and Predictions – Edward O. Pyzer-Knapp1snd Teodoro Laino, American Chemical Society, 2019.

Bhaskar Mondal

4. References:

Online Resources: MoleculeNet datasets, DeepChem tutorials, RDKit documentation, MIT's "ML for Materials" course notes

Data Sets: MolGPT: https://github.com/devalab/molgpt

MolDis: https://moldis.tifrh.res.in/

Bhaswar Mondal

New Course (CY-559: Machine Learning in Chemistry) review response

Reviewer #1

Prof. Balasubramanian Sundaram,
Chemistry and Physics of Materials Unit
JNCASR, Bangalore

Comments:
I went through your syllabus in earnest and find it to be quite comprehensive, yet unintimidating. I think your BS/MS students will like it very much & will find it very useful.

You may want to use several datasets generated by fellow Indian chemists during the Practical sessions.

For instance, check out the works of Deva Priyakumar (MolGPT), Raghunathan Ramakrishnan at TIFR-Hyderabad, Anant Govindarajan, Chemical Engg., IISc and many more.

Good luck! It is a timely & highly relevant course.

Response: We have now included references to the mentioned datasets for practical sessions.

Reviewer #2

Prof. Raghavan B. Sunoj
Department of Chemistry
IIT Bombay

Comments:

I have attached a commented/edited version.

Response: The suggestions are included in the revised curriculum document.

Bhaskar Mondal

IIT Mandi
Proposal for a New Course

Course number : IK 518
Course Name : **Ancient Indian Materials and Chemistry**
Credit Distribution : *3-0-0-3*
Intended for : UG/PG/PhD
Prerequisite : None
Mutual Exclusion : None

---

1. Preamble:

This course interlinks the science of materials in ancient India to modern knowledge. It explores how early practices in metallurgy, chemistry, medicine, and engineering laid the foundation for today's materials science. The course emphasizes both historical depth and modern interpretation, showing how ancient insights continue to inspire sustainable and innovative approaches in science and technology. This course brings together UG and PG students from engineering, materials science, chemistry, and related disciplines, along with the students of IKSMHA centre. Care has been taken to present the materials in a gradual manner to instill confidence in the minds of the students.

2. Course Modules with quantitative lecture hours:

Unit 1: Foundations of Ancient Indian Science **(6 hours)**
Basic principles of scientific thought and technological practice in ancient India, emphasizing how material innovations, experimental techniques, and design philosophies shaped early engineering and craftsmanship. Overview of key materials such as iron, ceramics, textiles, and construction practices that evolved from empirical observation and indigenous knowledge systems. Reflection on how these traditions resonate with contemporary materials science, sustainable design, and circular-economy approaches. A brief comparison with Greek and Roman materials and technologies will provide a broader civilizational perspective.

Unit 2: History of ancient Chemistry and metallurgy **(14 hours)**
Alchemical traditions and their connections to metallurgy, medicine, and philosophy. Chemical operations described in classical texts: distillation, sublimation, calcination, incineration, and alloying. Early theories of matter, including *Panchamahabhutas* and their analogies to chemical elements. Rasashastra growth as an experimental science, developing formulations for ailments such as, respiratory, skin, musculoskeletal etc. Mining practices and mineral extraction. Major metals and alloys in ancient India. Iron in the Vedic period and the innovation of Wootz steel. Zinc extraction and distillation techniques unique to India.

Unit 3: Glass, Ceramics, and Organic Materials **(8 hours)**
Development of glass technologies, highlighting how artisans mastered high-temperature reactions, flux control, and coloring techniques. Ceramic traditions from Harappa to later periods, including Harappan bricks, mortars, and concretes, with emphasis on optimization of

clay composition and firing conditions. Pigments, dyes, and mordants in textile chemistry, including natural dyes, resins, gums, and textiles from plant and animal sources. Organic-inorganic composites in arts and crafts. Scientific analysis of artifacts and approaches to preservation. Selected theoretical approaches for studying ancient materials and technologies. The unit links ancient synthesis, thermal processing, and surface chemistry with modern materials science concepts such as vitrification, sintering, and polymer chemistry.

Unit 4: Environment, Sustainability, and Modern Relevance (14 hours)
Ancient engineering practices in the context of sustainability, including stone processing, plastering, and waterproofing techniques. Principles of green materials and circular economy as reflected in traditional construction and craft practices. Environmental consciousness in ancient India, applications of modern tools such as spectroscopy, and surface analysis to study ancient artifacts. Interpreting traditional knowledge through the lens of materials science. Relevance to nanoscience, coatings, biomedicine, and sustainable technologies. Brief comparative insights from other ancient civilizations will be added to highlight shared sustainable practices.

Laboratory/practical/tutorial Modules: The course will involve assignments.

Textbooks:

1. Ray, P. C. (1902–1909). *A history of Hindu chemistry: From the earliest times to the middle of the sixteenth century A.D.* (Vols. 1–2). Calcutta: The Bengal Chemical and Pharmaceutical Works.
2. Chattopadhyaya, D. (1986–1991). *History of science and technology in ancient India* (Vols. 1–3). Calcutta: Firma KLM.
3. Tripathi, V. (2008). *History of iron technology in India (from the beginning to pre-modern times).* Delhi: Rupa & Co.
4. Agrawal, D. P. (2000). *Ancient metal technology and archaeology of South Asia: A pan-Asian perspective.* New Delhi: Aryan Books International.

3. References:

1. Narain, S., & Chandra, N. (2023). *Archaeometallurgy of India from Rigveda to Vālmīki Rāmāyaṇa.* Roorkee: AG Tech Publishing.
2. Divakar, R., Murty, S. V. S. N., Srikanth, S., & Gokhale, A. A. (2023). *Indian Metallurgy: The Platinum Years*. Singapore: Springer.
3. Biswas, A. K. (2005). *Science in Archaeology and Archaeo-materials*. D.K. Printworld Pvt. Ltd.

4. Similarity with the existing courses:
(Similarity content is declared as per the number of lecture hours on similar topics)

S. No.	Course Name	Course Code	Similarity Content	Approx. % of Content
1.	History of Science and	IC182	Ancient science in India,	<10%

	Technology		architecture, metallurgy, planning .	
2.	Materials Science for Engineers	IC241	Economic considerations, sustainability and green chemistry, classes of engineering materials	<10 %

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

NA

Approvals:

Other Faculty interested in teaching this course: –
Prof. Viswanath Balakrishnan
School of Mechanical and Materials Engineering, IIT Mandi

Prof. Aditi Halder
School of Chemical Sciences, IIT Mandi

Proposed by: Dr. Neha Thakur
School: Indian Knowledge System and Mental Health Applications Centre

Signature: **Date:** Proposed on: 24th Sept 2025 & **Revised** on 23th Jan 2026
(after 61st BoA meeting feedback)

29/01/2026

Recommended/Not Recommended, with Comments:

_____ **Date:**_____
Chairperson, CPC

Approved / Not Approved

_____ **Date:**_____
Chairperson, BoA

IIT Mandi

Proposal for a New Course

Introduction to Indian classical music (IICM) IK 519

Course number : IK 519

Course Name : Introduction to Indian classical music (IICM)

Credit : 3 credits

Distribution : *2-0-2-3*

Intended for : B.Tech/MTech/MS/Msc/PhD

Prerequisite : None.

Mutual Exclusion : There are no equivalent or overlapping courses across schools.

1. Preamble:

This course offers a holistic foundation for understanding, experiencing, and engaging with the living traditions of Indian classical music. It familiarizes students with essential technical terms, the rāga system, major musical forms, and the contributions of renowned Vāgēyakāra-s and composers. Emphasis is placed on exploring the rich aesthetic values, philosophical ideas, and cultural principles that shape musical expression in both the Karnātak and Hindustāni systems. Drawing from Indian Knowledge Systems (IKS), **the course highlights how music in India evolved through oral traditions, pedagogy, spirituality, and community practices**. Students will gain the ability to listen analytically, appreciate performance nuances, and understand the conceptual frameworks that continue to sustain Indian classical music as a timeless and dynamic art form.

2. Course Modules with quantitative lecture hours:

Unit 1: Technical Terms in Indian Classical Music (6 Hours)

Nāda, Śruti, and Svara, Rāga, stāyi, Ārohanam and Avarōhana, Tāla

Unit 2: The Melodic System of Rāga in Indian Classical Music (6 Hours)

Concept and foundations of rāga, rāga lakṣaṇa and identity features, rāga classification, structural principles of rāga, aesthetic dimensions, comparative approaches across Karnātak and Hindustāni traditions.

Unit 3: Structural Musical Forms and Compositional Types in Indian Classical Music (6 Hours)

Karnāṭak System: Gītam (Abyāsa Gāna), Varṇam, Kṛti, Padam & Jāvali, Tillāna (Sabha Gāna), Hindustāni System: Dhrupad, Khayāl, Tarāna, Thumri, Comparative Study: Compositional Types Across Both Traditions

Unit 4: Eminent contributors to Indian classical music (5 Hours)

Regional and Cultural Influence of the Bhakti Movement on Indian Music. Ālwār-s and Nāyanmār-s, North Indian Bhakti Saints, Purandara Dasa and Annamachārya, Karnātak Music Trinity, Early Hindustani Pioneers.

Unit 5: Musical Instruments of Indian classical music (5hours)

Overview of major Karnātak and Hindustāni instruments, covering construction, types, playing techniques, and performance roles; includes melodic instruments (veena, violin, flute, sitar, sarod), rhythmic instruments (mridangam, tabla, pakhavaj), and drone/support instruments (tanpura), providing a foundation in India's classical instrumental heritage.

Practical Modules:(14 hours of practical. Practical components are delivered in extended sessions 2 contact hours counted as 1 practical hour)

Practical sessions include teaching svara exercises (Svaravali-s), singing simple musical forms like Gītam-s & Svarajathi-s, Karnātak devotional forms like Tēvaram and Divyaprabhanda-s, and select Hindustani bhajan-s. **Guided Music Listing sessions** involves the explorations in Karnātak improvisation (Ālāpana, Neraval, Kalpanasvaram, Rāgam-Tānam-Pallavi) and Hindustani forms (Dhrupad, Khayāl, Thumri, Tarāna). Sessions also involve **listening and analysis** of rāga, tala, and compositional structures, **discussions** on Vāgēyakāra-s, and understanding the cultural and historical context of South and North Indian music.

Text books:

1. Sambamurthy. P, South Indian Music, Vol: 1-13, Indian Music Publishing House, Madras, 1973
2. Chelladurai P. T, The Splounder of South Indian Music, Vaigarai Publishers, 2000.
3. Aadinath Upadhyaya, हिन्दुस्तानी संगीत गायन-संपूर्ण: Hindustani Music Vocal –Comprehensive, Kishore Vidhya Nikethen, Varanasi, 2003.

3. References:

1. Seetha s. Tañjāvūr as a Seat of Music. University of Madras, 2001.
2. Gowri Kuppuswamy and Hariharan M. *Music in Indian Royal Kingdoms*. Delhi: B.R. Rhythms, 2015. Print.
3. Brahmaśri Subbarāma Dīkṣita. *Saṅgīta Sampradaya Pradarśini (English)*. Vol. 1, The Music Academy, Chennai, Jan 2011.

4. Similarity with the existing courses:

(Similarity content is declared as per the number of lecture hours on similar topics)

S. No.	Course Code	Similarity Content	Approx. % of Content
1.	IK 513, IK 508, IK 609	Core concepts of Indian classical music theory, rāga, tala, basic compositions, and practical exercises	~20-25%

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

- Although there is some overlap (~20–25%) with existing Musopathy-focused graduate courses in basic music theory and practical exercises, the **new course is distinctly designed for foundational understanding of Indian classical music**, covering **both Karnātak and Hindustāni systems, prominent contributors, and instruments**, which is **not addressed in the graduate Musopathy courses**.
- It serves as a **core preparatory course for undergraduate or new graduate students** to build strong classical music skills before advancing to applied or research-based Musopathy programs.
- Emphasizes **comprehensive practical exposure** and historical-cultural context, making it **unique and necessary** in the curriculum.

Approvals:

Faculty interested in teaching this course: –

Dr. P. Nirmal Harish.

Proposed by: Dr. P. Nirmal Harish **School:** IKSHMA

Signature: P.Nirmal **Date:** 29/01/2026

School Chair:

School: IKSHMA Centre

Date: 29/01/2026

The following faculty (at least 3 faculty) discussed on……and approved the proposal on……..

Sl. No	Faculty Name	Signature

This proposal is reported in ……..th Board of Academics on ……

Dean Academics

Date:

Note: School is responsible for the Course Code. Academic Office provides the IC Course Code.

Reviewers for the course proposal IK 519- Intoduction to Indian classical music proposed by Dr. P. Nirmal Harish, Assistant Professor, IKSHMA Center, IIT Mandi, Himachal Pradesh

Reviewer 1- Prof RNS Saileswari, Head, Dept of Music,Dance & Fine Arts, Sri Padmavati Mahila Visvavidyalayam Tirupati, Andhra Pradesh

Review for Introduction to Indian Classical Music Course External Inbox ×

P. Nirmal Harish 12:35 PM (9 hours ago)

Namaste , I hope you are well. I am writing to request your kind review and feedback on the draft of the proposed course on Introduction to Indian classical Mus

Saileswari Rani 4:17 PM (5 hours ago)

to me

Dr. P. Nirmal Harish,

I have gone through the contents of the course "Introduction to Indian Classical Music (IICM)" with Course Code: IICM- IK 519 and Credits: 3 proposed by you . This open elective course is suitable for all students from different disciplines .It is so designed to give basic awareness to Indian Music among students. I am sure it definitely enhances the student interest towards Indian music . All the very best for the introduction of the course .

Regards

0

Prof RNS Saileswari

Head

Dept of Music,Dance & Fine Arts

Sri Padmavati Mahila Visvavidyalayam

Tirupati,Andhra Pradesh

9347326062

Reviewer 2- Dr Archi Baneerji, Assistant Professor, IKSHMA centre, IIT Mandi, Himacal Pradesh

Request to Review the Couse Ik 519 Inbox ×

P. Nirmal Harish Fri, Jan 23, 10:36 AM (2 days ago)

Namaste , I hope you are well. I am writing to request your kind review and feedback on the draft of the proposed course on Introduction to Music. Your comments

Archi Banerjee Fri, Jan 23, 11:17 AM (2 days ago)

to me

Dear Dr. Harish,

This course is one of its kind in teaching the basics of Indian classical music to beginners who are insteresred in learning the traditional Indian music with a focus on Carnatic music, the legendary composers and musicians and important instruments. This course does not need the students to have any prior musical training or expertise. I believe intriduction of this course at IIT Mandi to give the students here a good exposure to the world of Indian classical music and how the practice of the same can benefit one spiritually, psychologically, emotionally in both theoretical and practical aspects.

Thanks and regards
Dr. Archi Banerjee
Assistant Professor
Indian Knowledge System and Mental
Health Applications (IKSMHA) Centre
IIT Mandi, Himachal Pradesh, India - 175075
Former DST CSRI Postdoctoral Fellow, IIT Kharagpur
PhD, Jadavpur University, Kolkata, India

...

Reviewer 3- Dr. Lakshmi Suriya Teja, Assistant Professor, Department of Fine and Performing Arts, Gitam University, Vishakhapatnam.

P. Nirmal Harish Sun, Jan 25, 2:41 PM (2 days ago)

Namaste . I hope you are well. I am writing to request your kind review and feedback on the draft of the proposed course on Introduction to Indian classical Mus

Lakshmi Surya Teja Bhavaraju Mon, Jan 26, 11:40 AM (12 hours ago)

to me

Namaste,

Course Review: Introduction to Indian Classical Music

I'm delighted to share my thoughts on this comprehensive course, designed to introduce students to the rich world of Indian classical music. The curriculum is thoughtfully structured with theoretical and practical concepts taught together which is an essential teaching learning process of Indian Classical Music.

This provides an introduction to the rich world of Indian classical music, both Hindustani and Karnātak genres, covering essential technical terms like the Rāga System, Musical forms, Composers, and Musical instruments. The blend of theoretical and practical components ensures a well-rounded understanding, making it an ideal starting point for further exploration.

The course syllabus is well-designed, incorporating Sadhana and Listening aspects that play a crucial role in shaping students' understanding of Indian Classical Music, providing a solid foundation for further exploration.

I wish all the best to the faculty and students of IIT Mandi for a successful journey in the Indian Classical Music.

Regards,

Dr Bhavaraju Lakshmi Surya Teja
Assistant Professor, Carnatic Music
Fine and Performing Arts
GITAM School of Humanities and Social Sciences
Visakhapatnam
M +91 9440658033
www.gitam.edu

Annexure G

Proposal

for

Master of Technology in Geotechnical Engineering

School of Civil and Environmental Engineering,
Indian Institute of Technology Mandi (IIT Mandi),
Mandi, Himachal Pradesh, India

TABLE OF CONTENTS

LIST OF TBALES

1. INTRODUCTION

The Indian infrastructure sector is undergoing a massive change to cater the infrastructure needs of our growing and evolving population. Several challenging infrastructure projects such as tunnels, dams, high-speed railways, expressways, power plants, embankments etc. are coming up rapidly in metros and also in the places of highly inaccessible and difficult terrain. The role of geotechnical engineers in building and maintaining these critical facilities in a safe and sustainable way is immense. In view of this, a postgraduate program with specialization in Geotechnical Engineering is proposed here in the School of Civil and Environmental Engineering. Considering the vulnerability of the local Himalayan terrain to geohazards such as earthquakes and landslides, the development of state of the art experimental and computational facilities and skilled workforce through the proposed program will show the commitment of the institute in contributing to the local, national, and international needs.

The School of Civil and Environmental Engineering (SCENE) is already running one Master of Technology (M.Tech.) program in Structural Engineering. Whereas this proposed program will be the second M.Tech. program in Civil Engineering next to M.Tech. in Structural Engineering. The details of the proposed program are elaborated in the following sections.

1.1. Name of the Degree Program

Master of Technology (M.Tech.) in Geotechnical Engineering.

1.2. Objectives of the Program

Upon completion of this M.Tech program, the students are expected to have a strong technical background in geotechnics and be able to solve complex ground engineering problems encountered in the world. The core courses of this program are designed to equip the students with the basics of geotechnical and foundation engineering whereas the elective courses are designed to allow the students to focus on particular research areas like geohazards, geotechnical earthquake engineering, constitutive modelling in geomechanics, offshore geotechnics etc. The major goals of this M.Tech program are:

- To enable the students to characterize the static and dynamic properties of the soil through exposure to the state-of-the-art laboratory and in-situ testing facilities
- To enable the students to identify the various problems in soil mechanics and foundation engineering such as slope stability, soil liquefaction, landslide hazards etc.
- To enable the students to develop innovative design solutions and mitigation procedures to build a sustainable and resilient infrastructure.

Through fulfilling these outlined objectives, this M.Tech program will not only create highly skilled engineers and researchers but the leaders in the field of geotechnical engineering and geohazards.

1.3. Need and Relevance of the Program:

Geotechnical engineers play a vital role in the design, construction and maintenance of any infrastructure projects ranging from a small residential apartment to megastructures such as tunnels, power plants, dams, mines etc. As our country is undergoing a massive infrastructure transformation, the demand for highly skilled and motivated geotechnical engineers is immense in order to build a resilient and sustainable infrastructure. Therefore, as an institute of national importance, it is the responsibility of the institute to develop a program which will cater the growing demand of geotechnical engineers and researchers in the Indian infrastructure industry.

1.4. Uniqueness of the Program:

The uniqueness of the location of IIT Mandi in this fragile Himalayan environment provides uniqueness to this proposed M.Tech program. The state of Himachal Pradesh comprises steep terrain, mountainous region, and valleys. This region is vulnerable to natural hazards such as intense rainfall, landslides, and earthquakes. Due to the action of climate change, the occurrence of geohazards such as landslides, soil liquefaction and slope stability due to heavy precipitation is going to be more common. Therefore, this program aims to give priority to make students understand the basic characteristics of soil encountered in the Himalayan terrain, identification of various triggering mechanisms of geohazards, mitigation measures to be adopted to alleviate the risks due to geohazards.

1.5. Placement Prospect:

The graduate students of the proposed M.Tech. program will have good career prospects in both academia and industry. The courses relevant to the current design practices in the field and hands-on experience on the state-of-the-art laboratory facilities will make them readily employable in both industry and research laboratories. After M.Tech, there are immense opportunities for graduate students to pursue PhD across various eminent universities in the world. Students can also take up active research careers in any of the national laboratories such as (i) Central Building Research Institute (CBRI), Roorkee (ii) Central Road Research Institute (CRRI), New Delhi (iii) National Institute of Ocean Technology (NIOT), Chennai etc. There are several opportunities available in Public Sector Undertaking (PSU) firms such as Engineers India Limited (EIL), Nuclear Power Corporation of India (NPCIL) and several other Maharatna, Navratna and Miniratna enterprises which actively recruit geotechnical engineers. Apart from these, there are ample opportunities available in numerous Indian and Global consulting firms which actively hire geotechnical engineers to carry out specialized works such as design and construction of tunnels, tailing dams, mines, power plants etc. Some of the specialized consulting firms are: Tata Consulting Engineers (TCE), WSP, Atkins global, Fugro, Stantec, Keller, Larsen and Toubro, Afcons etc.

2. DETAILS OF THE PROGRAM

Herein, salient features of the program are presented. All other details are in accordance with the ordinance and regulation for M.Tech./M.Sc. program of IIT Mandi.

2.1 Categories of Admission:

Candidates are to be admitted to the M.Tech. program under one of the following categories:

(i) Regular full time with Half-Teaching Research Assistantship (HTRA).
(ii) Regular full-time students without HTRA.
(iii) Full Time students, sponsored by the industries / established institutes / research and development organization / national laboratories etc., without HTRA.

2.2. Duration:

The minimum and maximum duration of these programs are two and three years respectively. Each year consists of two regular semesters, one winter term and one summer term. However, the duration of assistantship (e.g., HTRA) will be governed as per the Institute's (IIT Mandi) norms.

2.3. Credits to be Earned:

The students must earn a minimum of 70 credits for the degree of M.Tech. in Geotechnical Engineering. For more details about the required credit distribution, please refer to ordinance and regulations for M.Tech./M.Sc. of the Institute.

2.4. Eligibility:

Following eligibility criteria are to be considered for admission to the M.Tech. in Geotechnical Engineering program:

(i) Candidates who have qualified for the bachelor's degree (B.E. or B.Tech.) from a recognized university or institute in Civil Engineering / Infrastructure Engineering or equivalent, and qualified for Graduate Aptitude Test in Engineering (GATE) with valid score in relevant discipline are eligible to apply for the admission.
(ii) For B.Tech. graduates from IITs [in the disciplines mentioned in point (i)] with a Cumulative Grade Point Average (CGPA) 8.0 or above, the requirement of GATE qualification is waived off.
(iii) Candidates with bachelor's degree in engineering / technology [in the disciplines mentioned in point (i)] and sponsored by the industries / established institutes / research and development organization / national laboratories etc. are eligible to apply for this program on a full-time basis without GATE score. The institute will not provide any financial assistantship to such students.
(iv) A candidate with associate membership of professional bodies equivalent to B.E./B.Tech. degree prior to 2023 (as pet the approved norms) [in the disciplines mentioned in point (i)], and having valid GATE score, shall also be eligible to apply for admission to this program with HTRA, subject to regulation approved by the Senate of the Institute.

Note: For more details on eligibility criteria, please refer to ordinance and regulations for M.Tech./M.Sc. of the Institute.

2.5. Selection:

The admission to this program will be based on the GATE score and performance in bachelor's degree of the applicant. The school (School of Civil and Environmental Engineering) will adopt qualifying criteria for preparing the merit list of the eligible candidates. However, the School may shortlist and call the eligible applicants for an interview/test for preparing the merit list. In the latter case, the school will adopt shortlisting criteria based on the application from the candidates.

2.6. Number of Seats:

Total number of students to be admitted to the program is limited to 10 with HTRA and 3 others. The number of students may change depending on the demand and the infrastructure availability.

2.7. Assistantship (HTRA):

The award of the assistantship shall be in accordance with the prevailing norms of the Institute.

2.8. Award of the Degree:

Award of this M.Tech. degree shall be in accordance with the regulation of the Senate in relation to the requirement of the given program.

2.9. Conversion of M.Tech. to Ph.D. Program:

Meritorious students who are performing well in the M.Tech. program can convert from M.Tech. to Ph.D. program. The procedure for this conversion is as per the ordinance and regulation for M.Tech./M.Sc. of the Institute.

2.10. Campus Stay:

Students admitted to this program are required to stay on campus, and to participate and complete all the requirements of the program.

2.11. Assessment Procedures:

Assessment of courses and performance evaluation and all other related matters shall be in accordance with the regulation of the Senate in relation to the requirement of the given program.

2.12. Leave Rules:

The leave rules will be as per the Institute leave norms for the students.

2.13. Exception:

Any exception to the above clauses will require approval of the Senate or by the Chairman, Senate.

3. Overview of the Program Structure and Credit Distribution:

Categorical distribution of the credits (minimum) to be completed in two years is presented in Table 1.

Table 1: Categorical distribution of the credits

Sl. No.	Course Category	Credits
1	Discipline Core (DC)	15
2	Mathematics Core (MC)	03
3	Discipline Electives (DE)	12
4	Free Electives (ODE)	06
5	Technical Communication (TC)	01
6	Mini Project and Design Practicum/Internship/ Credit Seminar	02
7	Post Graduate Project (PGP)	31
	Total Credits	**70**

3.1. Suggested Semester Wise Credit Distribution and Courses:

Details of the suggested courses and credit distribution in various semesters to fulfill the degree requirement are presented in Table 2. It has been tried to distribute the credits as evenly as possible across the semesters.

Table 2: Details of the suggested courses and credit distribution

Semester – I (19 Credits)					
Sl. No.	**Course Title**	**Credit Structure**			
		L	**T**	**P**	**C**
1	Advanced Soil Mechanics (DC)	3	0	0	3
2	Slope stability and Retaining structures (DC)	2	1	0	3
3	Discipline Elective-I (DE)	3	0	0	3
4	Mathematical Core (MC)	3	0	0	3
5	Discipline Elective-II (DE)	3	0	0	3
6	Free Elective - I (ODE)	3	0	0	3
7	Technical Communication (TC)	1	0	0	1
Semester – II (21 Credits)					
Sl. No.	**Course Title**	**Credit Structure**			
		L	**T**	**P**	**C**
1	Mini Project (Supervised Research) [*Continued from Winter Term -1*]	0	0	2	1
2	Advanced Foundation Engineering (DC)	3	0	2	4
3	Discipline Elective-II (DE)	3	0	0	3
4	Discipline Elective-III (DE)	3	0	0	3
5	Discipline Elective-IV (DE)	3	0	0	3
6	Advanced Geotechnical Experimental & Computational Laboratory (DC)*	0	0	4	2
7	Free Elective -II (ODE)	3	0	0	3
Semester – III (13 Credits)					
Sl. No.	**Course Title**	**Credit Structure**			
		L	**T**	**P**	**C**
1	Industrial/Research Internship [*To be completed during Summer Term -1*]	0	0	2	1
2	Post Graduate Project - I	0	0	26	13
Semester – IV (17 Credits)					
Sl. No.	**Course Title**	**Credit Structure**			
		L	**T**	**P**	**C**
1	Post Graduate Project - II [*Continued from previous semester*]	0	0	36	18

3.2. Suggested Discipline Core (DC) Courses:

(i) Advanced Soil Mechanics (CE512)*
(ii) Slope stability and Retaining structures (CE504)*
(iii) Finite Element Analysis in Engineering (CE563)*
(iv) Advanced Foundation Engineering (CE513)*
(v) Advanced Geotechnical Experimental & Computational Laboratory (CE5XXP)$

3.3. Suggested Mathematical (MC) Course:

(i) Numerical Methods for Engineering Computation (ME504)*
(ii) Any suitable courses with prior permission of the faculty advisor and the course instructor

3.4. Suggested Discipline Elective (DE) Courses:

(i) Engineering of Ground Modification (CE505)*
(ii) Geosynthetics Applications (CE551)*
(iii)Soil Dynamics (CE560) *
(iv) Engineering Seismology and Seismic Hazard Assessment (CE605)*
(v) Constitutive Modeling of Frictional Material (CE606)*
(vi) Unsaturated Soil Mechanics (CE613)*
(vii) Rock Mechanics (CE514)*
(viii) Uncertainty Analysis in Civil Engineering (CE 516) *
(ix) Any other courses with prior permission of the course advisor and the course instructor

* **Approved and being offered, $Newly proposed; #Under CPC consideration**

4. REQUIREMENTS OF SPACE, MANPOWER, AND BUDGET:

The course "Advanced Geotechnical Experimental & Computational Laboratory" needs several specialized instruments, computational tools, dedicated laboratory space and trained manpower. The focus will be on exposing the students to the state-of-the-art lab, field and computational facilities. Requirements of Space, Manpower and Budget are presented below. More details can be found in Annexure-B.

Total space requirement: **300 m^2**
Manpower: **One Technician**
Total budget requirement: **3,65,50,000 (Three crores sixty five lakhs and fifty thousand Indian rupees only)**

5. REVIEWERS OF THE PROPOSED M. TECH PROGRAM

5.1 Reviewers from India

1. Prof. Deepankar Choudhury, IIT Bombay
2. Prof. B V S Viswanadham, IIT Bombay
3. Prof. Ramanathan Ayothiraman, IIT Delhi
4. Prof. Jagdish Prasad Sahoo, IIT Kanpur
5. Prof. Subhadeep Banerjee, IIT Madras
6. Prof. Sreedeep Shekaran, IIT Guwahati
7. Prof. Adimoolam Boominathan, IIT Madras
8. Prof. M R Madhav, Honorary Professor, IIT Hyderabad
9. Prof. G L S Babu, IISc Bangalore
10. Prof. Madhavi Latha G, IISc Bangalore
11. Prof. Sireesh Saride, IIT Hyderabad
12. Prof. Amit Prashant, IIT Gandhinagar

5.2 International Reviewers

1. Prof. Siva Sivathayalan, Carleton University, Canada
2. Prof. Sai Vanapalli, University of Ottawa, Canada
3. Prof. Jamie Standing, Imperial College, London, U.K.
4. Prof. David Toll, Durham University, U.K.
5. Dr. Krishna Kumar, University of Texas Austin, USA
6. Dr. Ning Guo, Zhejiang University, China
7. Dr. Mehdi Pouragha, Carleton University, Canada
8. Prof. Vikas Thakur, NTNU Norway
9. Prof. Sabatino Cuomo, University of Salerno, Italy
10. Prof. Krishna R Reddy, UIC, Chicago

5.3 Industrial Reviewers

1. Dr. Mathan V. Manmatharajan, P.Eng., WSP Global Inc., Canada
2. Dr. Loges Paramaguru, WSP Global Inc., Australia
3. Dr. Balaji Paramasivam, Fugro, California, USA
4. Mr. Chang-Gyun Jeong, P.Eng., BGC Engineering Inc., Canada
5. Dr. P. Subramaniam, Technip India Ltd., Chennai.
6. Dr. Suresh Kumar Gupta, Jacobs India, Hyderabad.
7. Dr. Ratnakar Mahajan, Maccaferri India
8. Ms Sneha Jayanth, Jacobs India, Hyderabad
9. Mr. Sridhar Valluri, Keller India, Mumbai.
10. Mr. Kedar Birid, Technomonte, Mumbai.
11. Dr. Apoorba Mondal, NPCIL, Mumbai.
12. Dr. R.P. Singh, NHSRCL, Mumbai
13. Dr. Sujatha Manoj, MotMacdonald, Australia
14. Dr. Jaykumar Shukla, Geodynamics, Baroda

ANNEXURE-A1: DETAILS OF THE DISCIPLINE CORE COURSES WITH CONTENTS

A1-1. Advanced Soil Mechanics (Approved)

Course Number : CE-512
Course Name : Advanced Soil Mechanics
Credits : 3-0-0-3
Prerequisites : Geotechnical Engineering I (CE302) or Equivalent
Intended for : UG and PG
Distribution : Elective (UG)/ Core (PG)
Semester : Odd/Even

Preamble: The underlying soil stratum being the basic support system for any civil engineering structure, it becomes imperative to understand the soil behavior in detail. Soil being a three-phase complex system, its strength and deformation behavior significantly gets influenced by the flow of water through the soil medium and evolution of pore water pressure under applied loading. Keeping these aspects in focus, the proposed Advanced Soil Mechanics course will discuss steady state and transient flow through soil along with the stress state and stress-strain behavior of soil under different loading conditions. It will also include interpretation of different laboratory tests for estimation of shear strength of soil and various factors influencing its shear strength response.

Course Modules with Quantitative Lecture Hours:

Module 1: Steady State Flow through Soil (8 hours)
Laplace's Equation of Continuity; Permeability; Flow net, use and method of obtaining flow net; Numerical solution for 2D steady state flow in soil; Examples of 2D and 3D seepage in soil, seepage in anisotropic soil.

Module 2: Transient Flow in Soil (8 hours)
Compressibility and rate of consolidation; Primary, secondary, and tertiary consolidation; Consolidation theories: Terzaghi and Biot's formulation, numerical solution of governing consolidation equation; Laboratory consolidation test and its interpretation.

Module 3: Strength and Deformation Behavior of Soil (11 hours)
Introduction to stress-strain behavior of soils, principal stresses, Mohr diagrams; Shear strength of cohesive and cohesionless soils, various failure criteria, drained and undrained shear strength of soils; Determination of shear strength from various laboratory tests, e.g. direct shear, triaxial, simple shear, true triaxial, hollow cylinder test, interpretation of various triaxial test results, significance of pore pressure parameters; Concept of critical void ratio; Dilation in sands.

Module 4: Stress Path Pertaining to Various Loading Conditions (4 hours)
Stress paths drained and undrained stress path; Stress path with respect to different initial state of the soil; Stress path for different practical situations.

Module 5: Critical State Concept (11 hours)
Critical state soil mechanics, concept of soil yielding, critical state parameters; Critical state for normally consolidated and over consolidated soil; Significance of Roscoe and Hvorslev state boundary surface, drained and undrained plane, complete state boundary surface.

Textbooks:
(i) Muni Budhu, Soil Mechanics and Foundations, John Wiley & Sons, Inc., 2010.
(ii) T.W. Lambe and R.V. Whitman, Soil Mechanics, John Wiley & Sons, 1991

References:
(i) Jonathan Knappett and R.F. Craig, Craig's Soil Mechanics, CRC Press, 2012.
(ii) B.M. Das, Advanced Soil Mechanics, CRC Press, 2013.
(iii) James K. Mitchell, Kenichi Soga, Fundamentals of Soil Behavior, John Wiley & Sons, 2005.
(iv) J.H. Atkinson, The Mechanics of Soils and Foundations, CRC Press, 2007.
(v) Holtz, R. D., and Kovacs, W. D., An Introduction of Geotechnical Engineering, Prentice Hall, 1981.
(vi) Parry, R. H. G., Mohr Circles, Stress Paths and Geotechnics, CRC Press, 2004.
(vii) David Muir Wood, Soil Behaviour and Critical State Soil Mechanics, Cambridge University Press, 1991.
(viii) Andrew Schofield and Peter Wroth, Critical State Soil Mechanics, McGraw Hill, 1968.
(ix) Potts, D.M. and Zdravkovic, L., Finite Element Analysis in Geotechnical Engineering: Theory, Thomas Telford, USA, 1999

Similarity content declaration with existing courses:

Sl. No.	Course Code	Similarity Content	Approximate % of Content
1	CE301 Geotechnical Engineering	Introductory concepts of Seepage, Consolidation and Shear Strength	< 20%
2	CE606 Constitutive Modeling of Frictional Material	Concepts of stress-strain behavior of soils	< 5%

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

Not Applicable.

A1-2. Slope Stability and Retaining Structures (Approved)

Course Number: CE504
Course Name: Slope Stability and Retaining Structures
Credits: 2-1-0-3
Prerequisites: CE302 - Geotechnical Engineering
Intended for: UG/PG
Distribution: Elective (UG)/ Core (PG)
Semester: Odd/Even

Preamble: This course is designed for graduate students with understanding of soil mechanics and shear strength theories. The subject introduces design and analysis concepts related to retaining walls. In addition to this, the analysis of stability of slopes and ascertain the soil and

slope stability. With the knowledge from the subject, the students would be able to analyze, and design retaining structures and also evaluate the stability of slopes.

Course Modules with Quantitative Lecture Hours:

Module 1: **(7 hours)**
Earth pressure, Rankine and Coulomb Earth Pressure theory, stresses and pressures for different conditions.

Module 2: **(12 hours)**
Slope stability, types of slopes, theories of slope stability, seepage effects, theory of infinite slope stability, stabilization methods.

Module 3: **(8 hours)**
Design of retaining structures: gravity, cantilever, semi-gravity.

Module 4: **(8 hours)**
Soil reinforcement, earth retaining structures, design and analysis.

Module 5: **(7 hours)**
Lateral earth pressure in braced cuts, Design of various components, Stability of braced cuts, base heave and stability, yielding and settlement of ground surrounding excavation. Diaphragm walls, slurry support; Soil Nailing.

Textbooks:
(i) B. M. Das, 'Principles of Foundation Engineering', Cengage learning, 2011.
(ii) J. E. Bowles, 'Foundation Analysis & Design', McGraw-Hill Higher Education, 2001.
(iii)V.N.S. Murty, 'Geotechnical Engineering', CRC press, 2002.

References:
(i) S. Hansbo – Geotechnical Engineering, Elsevier, 1994
(ii) Hsai-Yang Fang – Foundation engineering handbook, Springer Science, 1991.

Similarity content declaration with existing courses:

Sl. No.	Course Code	Similarity Content	Approximate % of Content
-	-	-	-

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

Not Applicable.

A1-3. Soil Dynamics (Approved)

Course Number: CE560
Course Name: Soil Dynamics
Credits: 3-0-0-3

Prerequisites: Geotechnical Engineering I (CE 302), Geotechnical Engineering II (CE 402) or Equivalent course.
Intended for: UG/PG
Distribution: Elective (UG)/ Core (PG)
Semester: Odd/Even

Preamble: In the undergraduate curriculum, the basic course on Geotechnical Engineering introduces students to the fundamentals of the engineering behaviour of soil under static loading. The aim of this course "Soil Dynamics" is to explore, in some detail, the behaviour of soil when it is subjected to time-dependent cyclic loading. Starting with the principle of wave propagation in the soil media, this course takes the student through the estimation of dynamic soil properties by laboratory and in-situ methods of testing. The student will learn the geotechnical site characterisation, site response analysis and the methods for evaluation of liquefaction potential of a site. A part of this course is dedicated to explaining the modes of vibration and design of machine foundation.

Course Modules with Quantitative Lecture Hours:

Module 1: Introduction to soil dynamics (8 hours)
Importance of soil dynamics, nature and types of dynamic loading, concept of dynamic loading, Simple harmonic motion, degrees of freedom, types of vibration, free and forced vibration, decay of motion, vibration measuring instruments.

Module 2: Wave propagation in elastic half space (6 hours)
Elastic response of continua, Wave propagation in soil media, Earthquake waves, Seismic travel time curve, Three-circle method of estimation of earthquake epicentre.

Module 3: Dynamic soil properties (6 hours)
Stresses in soil element, concept of soil stiffness, damping ratio and plasticity properties of soil, techniques for estimation of dynamic soil properties from field (intrusive and non-intrusive testing) and laboratory testing. Correlation for obtaining various geotechnical parameters.

Module 4: Site response analysis (6 hours)
Transfer function, homogeneous and layered un-damped and damped soil resting on rigid block, equivalent and non-linear approach of ground response analysis, convolution and deconvolution of the earthquake wave, site classification.

Module 5: Liquefaction and lateral spreading (6 hours)
Concept of liquefaction (static and cyclic), cyclic mobility, estimation of liquefaction potential of soil from field and laboratory testing data, cyclic stress ratio of soil and its importance, post liquefaction lateral spreading of soil, effect of liquefaction on various geotechnical structures.

Module 6: Design of machine foundations (10 hours)
Types of machine foundation, Mass-spring dashpot model, concept of vibration isolation, Tschebotarioff's reduced natural frequency method; Elastic half space method; Vertical, sliding, torsional (yawing) and rocking (and pitching) modes of oscillations; Design guidelines as per codes; Typical design problems.

Textbooks:

(i) Shamsher Prakash "Soil Dynamics", McGraw Hill Book Company (1981).
(ii) Steven L. Kramer, "Geotechnical Earthquake Engineering", Prentice Hall Inc (2003).

References:

(i) Robert W. Day, "Geotechnical Earthquake Engineering Handbook", McGraw Hill, New York. (2002)
(ii) Kenji Ishihara, "Soil Behaviour in Earthquake Geotechnics", Oxford University Press, USA. (1996).
(iii) G.V. Ramanna and B.M. Das "Principles of Soil Dynamics" CENGAGE Learning, USA. (2011).
(iv) Richart, F.E., Woods, R.D. and Hall, J.R. Vibrations of soils and foundations. Prentice-Hall, 1970.

Similarity content declaration with existing courses:

Sl. No.	Course Code	Similarity Content	Approximate % of Content
-	-	-	-

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

Not Applicable.

A1-4. Advanced Foundation Engineering (Approved)

Course Number : CE-513
Course Name : Advanced Foundation Engineering
Credits : 3-0-0-3
Prerequisites : Geotechnical Engineering II (CE302) or Equivalent
Intended for : UG and PG
Distribution : Elective (UG)/ Core (PG)
Semester : Odd/Even

Preamble: Any civil engineering structure requires a foundation to transfer the superstructure load safely to the underlying soil. In this regard, it is important to estimate the bearing capacity of the soil and settlement of the foundation under the applied load. The proposed course discusses various bearing capacity theories for both shallow and deep foundations in detail and it includes special scenarios like foundations resting on layered soil and sloping ground etc. It also deals with the estimation of settlement of such foundations and associated design principles.

Course Modules with Quantitative Lecture Hours:

Module 1: Bearing Capacity Theories for Shallow Foundation (4 hours)

Foundation classification, choice of foundations; Field investigations, soil data and design parameters; Bearing capacity theories, influence of water table, soil compressibility, inclined loading, one-way and two-way eccentricity on the bearing capacity of soil.

Module 2: Bearing Capacity for Special Cases (4 hours)

Bearing capacity for special cases of shallow foundations: foundations resting on layered soil, foundations supported by a soil with rigid base, foundations on sloping ground, closely placed foundations.

Module 3: Allowable Bearing Capacity and Settlement of Foundations (5 hours)

Vertical stress increase in a soil mass caused by different types of foundation load; Elastic settlement of foundations, settlement of sandy soil: use of strain influence factor and field test data; Consolidation settlement; Allowable bearing capacity from field load test; Rigid and flexible foundations, contact pressure and settlement distribution beneath footings; Construction issues such as dewatering methods and underpinning of shallow foundations; Foundations on difficult soil: collapsible soils, expansive soils, and sanitary landfills.

Module 4: Mat Foundations (7 hours)

Combined footings, mat/raft foundation; Bearing capacity and settlement of mat foundation; Design of mat foundation: rigid and flexible methods; Buoyancy raft or floating foundation; Skirted foundation

Module 5: Pile Foundations (18 hours)

Deep foundations; Load transfer mechanism for pile foundation, estimation of pile capacity, settlement of pile; Small strain and large strain dynamic tests in piles; Pile foundation design subjected to compressive load, uplift, lateral load; Design of pile groups; Pile raft; Concept of negative skin friction; Construction issues related to pile foundation, effect of adjacent constructions on existing pile foundations.

Module 6: Other Types of Deep Foundations (4 hours)

Well foundations, classification, physical characteristics: shape, size, scour depth, components of well foundations, allowable bearing pressure, forces acting on well foundation and its lateral stability; An introduction to caisson foundation: mechanism, type and construction.

Textbooks:

1. B.M. Das, Principles of Foundation Engineering, Cengage Learning, 2013
2. N.N. Som and S.C. Das, Theory and Practice of Foundation Design, Prentice-Hall of India Pvt.Ltd, 2004

References:

1. Joseph Bowles, Foundation Analysis and Design, McGraw Hill Education, 2017
2. J.H. Atkinson, The Mechanics of Soils and Foundations, CRC Press, 2007
3. Muni Budhu, Soil Mechanics and Foundations, John Wiley & Sons, Inc., 2010
4. B.M. Das, Shallow Foundations: Bearing Capacity and Settlement, CRC Press, 2019
5. Michael Tomlinson and John Woodward, Pile Design and Construction Practice, CRC Press, 2014

Similarity content declaration with existing courses:

Sl. No.	Course Code	Similarity Content	Approximate % of Content

1	CE402	Basic concept of bearing capacity, settlement and introduction to different types of foundations	<25%

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

Not Applicable.

A1-5. Advanced Geotechnical Experimental & Computational Laboratory (Proposed)

Course Number **:** CE 5XXP
Course Name **:** Advanced Geotechnical Experimental & Computational Laboratory
Credit Distribution **:** 0-0-4-2
Prerequisites **:** Geotechnical Engineering I (CE 302), Geotechnical Engineering II (CE 402) or Equivalent course
Intended for **:** UG and PG students

Course Preamble:
In the undergraduate curriculum, the basic course on Geotechnical Engineering introduces students to the fundamentals of the engineering behaviour of soil and introduces to various techniques to characterise the soil and obtain the engineering behaviour. The aim of this course "Advanced Geotechnical Experimental & Computational Laboratory" is to explore, in some detail, the various advanced geotechnical testing, and field monitoring and make them familiar with computational tools available to analyse various geotechnical problems. This course will take students through hands-on conducting various advanced soil testing and training them with computational and field monitoring tools.
Course outcome:
By the end of the course, the students will be familiar with the various methods available to characterise the soil, understand working with advanced geotechnical testing equipment, and monitoring tools and be trained in commercial numerical modelling software. It will help in preparing a background for further study, practice, and research in the area of geotechnical engineering and the related fields.

Laboratory modules

1. Basic characterization tests (sieve analysis, hydrometer)
2. Atterberg limits
3. Flexible wall permeability testing
4. Shear Strength Tests (Direct shear)
5. Triaxial Testing
6. Cyclic Triaxial Testing
7. Geochemical Analysis (Ec, pH, TDS, SSA)
8. Various Field Sensing and Analysing Techniques
9. Analysing shallow foundation behaviour using FEA
10. Analysing Pile foundation behaviour using FEA
11. Flow-coupled deformation analysis using FEA
12. Non-linear Free-Field Ground Response Analysis using FEA

Textbooks:

1. Various standards pertaining to Geotechnical Testing- ASTM, BIS, BS.
2. Steven L. Kramer, “Geotechnical Earthquake Engineering”, Prentice Hall Inc (2003).
3. Finite element analysis in geotechnical engineering by David M. Potts and Lidija Zdravković

References:

Journal papers and codal provision related to laboratory testing; field monitoring and numerical modelling.

Similarity content declaration with the existing course:

Not Applicable.

Justification for new course proposal if cumulative similarity content is more than 30%:

Not applicable.

Approvals:

Proposed by: Ashutosh Kumar School: School of Civil and Environmental Engineering

Signature: Date: 21.06.2022

Recommended / Not Recommended, with comments:

Chairman, CPC Date:

Approved / Not Approved:

Chairman, Senate Date:

ANNEXURE-A2: DETAILS OF THE DISCIPLINE ELECTIVE COURSES WITH CONTENTS

A2-1. Finite Element Methods in Engineering (Approved)

Course Number: ME513
Course Name: Finite Element Methods in Engineering
Credits: 3-0-2-4
Prerequisites: Linear Algebra (IC 111); Mechanics of Rigid Body (IC 240); Mechanics of Solids (ME 206)/Strength of Material (CE 301).
Intended for: UG/PG
Distribution: Elective (UG)/ Core (PG)
Semester: Odd/Even

Preamble: To provide the basic concepts of finite element method and its applications to a wide range of engineering problems. This course deals with various modeling techniques and uses different numerical methods for solving a system of governing equations over the domain of a continuous physical system (such as structural problem, thermal problem, fluid mechanics problem), which is discredited into simple geometric shapes called finite element

Course Modules with Quantitative Lecture Hours:

Module 1: Basic concept (8 hours)
Introduction, Engineering applications of finite element method, Rayleigh- Ritz method, Weighted residual methods: Galerkin's method, Principal of a minimum potential energy, Principle of virtual work, Boundary value problem, initial value and Eigenvalue problem, Gauss elimination method.

Module 2: Basic procedure (6 hours)
General description of Finite Element Method, Discretization process; types of elements 1D, 2D and 3D elements, size of the elements, location of nodes, node numbering scheme, half Bandwidth, Stiffness matrix of bar element by direct method, Properties of stiffness matrix, Pre-processing, post processing, One Dimensional Problems.

Module 3: Interpolation models (6 hours)
Polynomial form of interpolation functions- linear, quadratic and cubic, Simplex, Complex, Multiplex elements, Selection of the order of the interpolation polynomial, Convergence requirements, 2D Pascal triangle, Linear interpolation polynomials in terms of global coordinates of bar, triangular (2D simplex) elements, Linear interpolation polynomials in terms of local coordinates of bar, triangular (2D simplex) elements, CST element.

Module 4: Higher order and isoparametric elements (6 hours)
Lagrangian interpolation, Higher order one dimensional elements- quadratic, Cubic element and their shape functions, properties of shape functions, Truss element, Shape functions of 2D quadratic triangular element in natural coordinates, 2D quadrilateral element shape functions – linear, quadratic, Biquadric rectangular element (Noded quadrilateral element), Shape function of beam element. Hermite shape functions of beam element.

Module 5: (4 hours)

Derivation of element stiffness matrices and load vectors: for bar element under axial loading, trusses, beam element with concentrated and distributed loads, matrices, Jacobian, Jacobian of 2D triangular element, quadrilateral, Consistent load vector, Numerical integration.

Module 6: **(4 hours)**
Heat transfer and Fluid mechanics problems: 1D analysis for both heat transfer and fluid mechanics problem, heat conduction governing equation, boundary conditions, Galerkin approach, heat flux boundary condition, 1D heat transfer in thin fins.

Module 7: **(4 hours)**
Elasticity problems: Review of equations of elasticity, stress-strain and strain displacement relations, plane stress and plane strain problems.

Module 8: **(4 hours)**
Dynamic problems: Beam and Bar vibration; Natural frequency determination.

Laboratory Component: [28 Hours]

- Coding for the complete solution of any suitable problem, Such as Bar, Truss and Beam. [12 Hours]
- Introduction to ANSYS & ABAQUS. [4 Hours]
- Bar and truss problem and 2-D analysis (assuming plane stress and plane strain). [4 Hours]
- Introduction to OPEN-SOURCE PROGRAMS (like OpenSees, FEAP, Elmer etc.) [2 Hours]
- Some complex analysis using ANSYS or ABAQUS (complex material modeling or geometrical modeling). [6 Hours]

Textbooks:

(i) Hutton, D.V., "Fundamentals of Finite Element Analysis", TMH, 2005.
(ii) Logan, D. L., "A first course in the Finite Element Method", 6th edition, Cengage Learning, 2017.

References:

(i) Rao, S.S. "The finite element method in engineering", 4th edition, Elsevier, 2005.
(ii) Reddy, J.N., "An introduction to the finite element method", McGraw-Hill, 2005.
(iii) Huebner, K. H., Dewhirst, D. L., Smith, D. E. and Byrom, T. G., "The finite element method for engineers", 4th edition, John Wiley & Sons, 2001.
(iv) Chandrupatla, T.R., "Finite element analysis for engineering and technology", University Press (India) Pvt Ltd, 2004
(v) Fish, J. and Belytschko, T., "A first course in Finite Elements", Wiley 2007.

Similarity content declaration with existing courses:

Sl. No.	Course Code	Similarity Content	Approximate % of Content
1	ME206	Plane stress and plane strain	2

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

Not Applicable.

A2-2. Engineering of Ground Modification (Approved)

Course Number : CE505
Course Name : Engineering of Ground Modification
Credits : 3-0-0-3
Prerequisites : CE 302 - Geotechnical Engineering
Intended for : UG and PG
Distribution : Discipline Core/Elective (PG)
Semester : Odd/Even

Preamble: With the increasing issues and problems in ground, there is a requirement of ground improvement to ensure proper working of the structures and facilities to be provided on them. To suit the ground to the requirement, there is a requirement of the ground to be modified. The technique of ground modification depends on various conditions, according to which a suitable method needs to be adopted. The details of all the current modification techniques along with the application and adaptability conditions have been presented in this course.

Course Modules with Quantitative Lecture Hours:

Module 1: (**7 hours**)
Introduction to Engineering Ground Modification: Need and objectives, Identification of soil types, In-situ and laboratory tests to characterize problematic soils; Mechanical, Hydraulic, Physico-chemical, Electrical, Thermal methods and their applications.

Module 2: (**8 hours**)
Mechanical Modification – Principles of soil densification – Properties of Compacted soil, Compaction control tests, Specification of compaction requirements, Blasting Vibro Compaction, Dynamic Tamping and Compaction piles.

Module 3: (**8 hours**)
Hydraulic Modification – Objectives and techniques, traditional dewatering methods and their choice, Design of dewatering system, Electro-osmosis, Filtration, Drainage and seepage control with Geosynthetics, Preloading and vertical drains, Electro-kinetic dewatering.

Module 4: (**9 hours**)
Physical and Chemical Modification – Modification by admixtures, Shotcreting and Guniting Technology, Modification at depth by grouting, Crack Grouting and compaction grouting, Jet grouting, Thermal Modification, Ground freezing.

Module 5: (**7 hours**)
Modification by Inclusions and Confinement - Soil reinforcement, underpinning, In-situ ground reinforcement, ground anchors, rock bolting and soil nailing, sand bags, crib walls, bin walls, gabion walls.

Module 6: (3 **hours**)
Introduction to geosynthetics – Applications

Textbooks:
(i) Peter G. Nicholson, 'Soil Improvement and ground modifications methods', Elsevier, 2015.

(ii) P. Purushothama Raj, 'Ground improvement Techniques', Laxmi Publications, 2005.
(iii) Hausmann, M. R., 'Engineering Principles of Ground Modifications', McGraw Hill publication.

References:
(i) John A. Hudson, 'Ground Improvement Case Histories', Elsevier, 2005.
(ii) C. A. Raison, 'Ground and Soil Improvement', ICE publications, 2004.

Similarity content declaration with existing courses:

Sl. No.	Course Code	Similarity Content	Approximate % of Content
1	NIL	-	-

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

Not Applicable.

A2-3. Engineering Seismology and Seismic Hazard Assessment (Approved)

Course Number : CE605
Course Name : Engineering Seismology and Seismic Hazard Assessment
Credits : 3-0-0-3
Prerequisites : Structural Dynamics with Application to Earthquake Engineering (CE511)
Intended for : UG and PG
Distribution : Discipline Core/Elective (PG)
Semester : Odd/Even

Preamble: The goal of earthquake – resistance design is to produce a structure or facility that can withstand a certain level of shaking without excessive damage. The level of shaking is described by a design ground motion and its parameters. Estimation of design ground parameters is one of the most difficult and challenging problems in Engineering Seismology. The main objective of this course is to teach basic principles of engineering seismology and different methods to estimate region specific ground motions and its parameters. This course also discusses the uncertainties in size, location, and time of occurrence of earthquakes.
It is well known that Himalayan region is one of the seismically active regions in the world. This region has experienced many large earthquakes in the past and has the potential to produce many more in future. This course emphasizes seismic activity and hazard assessment of Himalayan region.

Course Modules with Quantitative Lecture Hours:

Module 1: **(5 hours)**
Introduction: Internal Structure of the Earth; Plate tectonics and boundaries; Faults; Focal mechanisms; Location of Earthquakes; Size of Earthquakes; Major Earthquakes in the world; Important Indian Earthquakes.

Module 2: **(11 hours)**

Wave Propagation in Elastic Medium: Waves in Infinite Medium; longitudinal and Shear waves; Waves in Semi – infinite medium; Reflection and refraction of waves; Rayleigh waves and Love waves; Response of an elastic Half – Space due to surface and buried forces. Seismic moment tensor. Time dependence.

Module 3: **(12 hours)**
Strong Ground Motion and Parameters: Strong – Motion measurement; International and Local strong motion networks; Synthetic strong ground motions; Stochastic seismological models; Empirical Green's Function method; One – Dimensional Ground response analysis; Ground motion parameters.

Module 4: **(14 hours)**
Seismic Hazard Analysis: Definitions- seismic hazard, disaster and risk; Deterministic seismic hazard analysis; Probability; Earthquake occurrence models; Estimation of maximum magnitude, maximum credible earthquake, design basis earthquake; Ground motion prediction equations; Return periods and strong motion exceedance rates; seismic Hazard curves; Deaggregation. Case studies/Project on estimating the seismic hazard of important Himalayan Cities.

Textbooks/References:
(i) S. L. Kramer, "Geotechnical Earthquake Engineering", 2nd Edition, Pearson Education.
(ii) K. F. Graff, "Wave Motion in Elastic Solids", Dover Publications Inc.
(iii)D. M. Boore (2003), "Simulation of Ground Motion Using the Stochastic Method", pure and Applied Geophysics, 160, 635 – 676.

Similarity content declaration with existing courses:

Sl. No.	Course Code	Similarity Content	Approximate % of Content
1	NIL	-	-

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

Not Applicable.

A2-4. Rock Mechanics (Approved)

Course Number: CE514
Course Name: Rock Mechanics
Credits: 3-0-0-3
Prerequisites: Geotechnical Engineering (CE 302) or Equivalent
Intended for: UG/PG
Distribution: Elective for UG and PG
Semester: Odd/Even

Preamble: India is rapidly marching towards modern and sustainable infrastructure. Most of the signature projects are being developed in hilly regions which include bridges (e.g., Chenab Bridge), tunnels (e.g., Rohtang Atal Tunnel), dams, buildings, etc. All these structures are either founded on rocks or are constructed in rocks. In view of this, it has become necessary to include a dedicated course on rock mechanics in the civil engineering curriculum. Therefore, a

course on 'Rock Mechanics' is being proposed with the following objectives: (i) to understand the engineering behaviour and properties of rocks, (ii) to broaden the view-point of geotechnical/structural engineering students who have already done a course on soil mechanics, (iii) to explain the challenges faced by geotechnical as well as structural engineers while designing/constructing structures in or on rocks, and (iv) to get the benefit of special location of IIT Mandi campus and initiate the process of developing IIT Mandi as a rock mechanics centre of excellence in future.

Course Modules with Quantitative Lecture Hours:

Module 1: (**5 hours**)
Introduction to rock engineering, basics of geology for rock engineers, engineering and index properties of intact rocks, demonstration of laboratory techniques, design implication of different properties of intact rocks.

Module 2: (**5 hours**)
Discontinuities in rocks, engineering behaviour and characterization of discontinuities, types and description of discontinuities, orientation and spacing, discontinuity modelling, roughness, aperture, joint stiffness, RQD estimation.

Module 3: (**5 hours**)
Various geological features of rock-mass and their application in rock-mass classification (RMR, RMi, Q, GSI), correlation between different rock-mass classifications, weathering of rock-mass and its classification.

Module 4: (**8 hours**)
Deformability characteristics of jointed rock-mass, different types of moduli, challenges/issues with in-situ deformability measurement, design implications, anisotropy in rock-mass deformability, scale-effect, empirical methods, and equivalent continuum approach.

Module 5: (**8 hours**)
Shear strength characteristics of jointed rock-mass, different rock failure criteria and strength models, anisotropy in strength, scale-effect, empirical methods, equivalent continuum approach.

Module 6: (**3 hours**)
In-situ stresses in rock-mass and their importance in design of underground caverns and tunnels, permeability of rock-mass.

Module 7: (**8 hours**)
Application of rock mechanics to key rock engineering problems such as rock slope failure and stability analysis, foundations on rocks, and application of rock-mass classification in preliminary tunnel support system design.

Textbooks:

1. Aydan, Ömer. Rock Mechanics and Rock Engineering: Volume 1: Fundamentals of Rock Mechanics. CRC Press, 2019.
2. Bieniawski, Zdzislaw T. Design methodology in rock engineering. CRC Press, 2020

References:

1. Jaeger, John Conrad, Neville GW Cook, and Robert Zimmerman. Fundamentals of rock mechanics. John Wiley & Sons, 2009.
2. Sivakugan, Nagaratnam, Sanjay Kumar Shukla, and Braja M. Das. Rock mechanics: an introduction. CRC Press, 2013.
3. Goodman, Richard E. Introduction to rock mechanics. Vol. 2. New York: Wiley, 1989.
4. Hudson, John A., and John P. Harrison. Engineering rock mechanics: an introduction to the principles. Elsevier, 2000.
5. Ramamurthy, T., ed. Engineering in rocks for slopes, foundations, and tunnels. PHI Learning Pvt. Ltd., 2010.
6. Pariseau, William G. Design analysis in rock mechanics. CRC Press, 2006.
7. Zhang, Lianyang. Engineering properties of rocks. Butterworth-Heinemann, 2016

Similarity content declaration with existing courses:

Sl. No.	Course Code	Similarity Content	Approximate % of Content
1	NIL	-	-

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

Not Applicable.

A2-5. Constitutive Modeling of Frictional Material (Approved)

Course Number: CE606

Course Name: Constitutive Modeling of Frictional Material

Credits: 3-0-0-3

Prerequisites: Geotechnical Engineering I (CE302) or Equivalent/ Mechanics of Solids (ME206) or Equivalent

Intended for: B.Tech. 4th year/ M.S./ M.Tech./ Ph.D.

Distribution: Open Elective

Semester: Odd/Even

Preamble: Constitutive modeling of geomaterial plays a pivotal role in numerical analysis and design of complex geotechnical structures. The course aims to develop a basic understanding of various constitutive models pertinent to pressure-dependent/frictional materials, such as soils, rocks and concrete, with focus on their underlying assumptions and limitations. Further, it also involves hands on implementation of different constitutive models for geomaterials, which serves the main backbone of material response in any finite element computation of complex geotechnical structures. Starting with the basic concepts of continuum mechanics, the macroscopic response of geomaterials will be discussed in relation to the constitutive modeling. Different elastic and elasto-plastic modeling concepts will be explained along with due consideration to the model calibration and implementation procedure. The course will be

concluded with discussions on advanced constitutive models which are relevant for mimicking material behavior under specific cases, for example, blasting, earthquake or unsaturated condition to name a few.

Course Modules with Quantitative Lecture Hours:

Module 1: Mathematical Background (**6 hours**)

Overview and importance of constitutive modeling; Preliminaries on tensor; Stress, strain and invariants; Principal stress space: triaxial and octahedral plane; Stiffness tensor; Voigt notation.

Module 2: Constitutive Behavior of Geomaterials (**3 hours**)

Different laboratory tests and various modeling aspects pertinent to the stress-strain behaviour of geomaterials subjected to shearing and volumetric compression, e.g., void ratio, pressure and stress path dependency, anisotropy and rate/time effects etc.

Module 3: Elasticity (**6 hours**)

Linear, nonlinear and anisotropic elastic models; Calibration of model parameters.

Module 4: Plasticity (**7 hours**)

Internal variable, yield criteria, flow rule, plastic potential, Drucker's stability postulate, convexity and normality rules, hardening/ softening, isotropic and kinematic hardening; Different failure criteria for yielding: Tresca, von Mises, Mohr-Coulomb, Drucker-Prager, Hoek and Brown etc.

Module 5: Critical State Models (**6 hours**)

Critical state concept; Stress-dilatancy theory; Strain hardening and/or work hardening plasticity models for sand: formulation, calibration and implementation to simulate drained and undrained triaxial test.

Module 6: Cam-Clay Models (**10 hours**)

Cam-Clay models: formulation and calibration; Implementation of Cam-Clay model to simulate single element tests: consolidation, drained and undrained triaxial test, Application of elasto-plastic models.

Module 7: Special topics (**4 hours**)

Other advanced constitutive models for frictional materials (e.g., damage plasticity/ visco-plasticity/ unsaturated soil model/ disturbed state model etc.)

Text Book:

1. David Muir Wood, Soil Behaviour and Critical State Soil Mechanics, Cambridge University Press, 1991.
2. Alexander Puzrin, Constitutive Modelling in Geomechanics, Springer, 2012.

References:

1. David Muir Wood, Geotechnical Modelling, CRC Press Taylor and Francis Group, 2004.

2. W.F. Chen and E. Mizuno, Nonlinear analysis in soil mechanics: theory and implementation, Elsevier Science Ltd, 1990.
3. Hai-Sui Yu, Plasticity and Geotechnics, Springer, 2006.
4. W.F. Chen and G.Y. Baladi, Soil Plasticity: Theory and Implementation, Elsevier Science Ltd, 1985.
5. C.S. Desai, Mechanics of Materials and Interfaces: The Disturbed State Concept, CRC Press Taylor and Francis Group, 2000.
6. N.S. Ottosen and M. Ristinmaa, The Mechanics of Constitutive Modeling, Elsevier Science, 2005.
7. J.C. Simo and T.J.R. Hughes, Computational Inelasticity, Springer, 2000.
8. E.A. de Souza Neto, D. Peric and D.R.J. Owen, Computational Methods for Plasticity: Theory and Applications, Wiley, 2008.
9. Allan F. Bower, Applied Mechanics of Solids, CRC Press Taylor and Francis Group, 2009.

Similarity Content Declaration with Existing Courses:

Sl. No.	Course Code	Similarity Content	Approximate % of Content
1	IC242	Tensor; Stress, strain and stiffness tensor; Invariants	<5%
2	ME206	Stress and strain definition; Theory of yielding	<3%
3	CE301	Concepts of stress and strain; Elastic constants and their relationships	<3%
4	CE302	Stress strain curve, Mohr-coulomb failure criteria, pore pressure, total and effective stress	<3%
5	ME607	Elastic deformation; The phenomenon of yield point and strain hardening.	<5%

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

Not Applicable.

ANNEXURE-B: DETAILS OF LAB EQUIPMENT AND SPARE REQUIREMENTS AND ESTIMATED FINANCIAL LIABILITIES

The course "Advanced Geotechnical Experimental & Computational Laboratory" needs several specialized instruments, computational tools, dedicated laboratory space and trained manpower. The focus will be on exposing the students to the state-of-the-art lab, field and computational facilities. The list of required experiments and computational facilities needed for this course is presented below:

S.No	Name and description of the facility	Budget
		Budget
Laboratory testing facilities		
2	*Cyclic triaxial testing systems with Bender element* It's used to characterize the dynamic behavior of soil under cyclic loads, estimate liquefaction potential and resilient modulus of soil under the different water content conditions	70
4	*Unsaturated triaxial testing soil- Hong Kong Method* This equipment is sought for performing the constant water content triaxial testing, understanding the volume change of the soil under the unsaturated condition during consolidation and while shearing (both monotonic and Cyclic) and obtaining the shear strength parameters of unsaturated soils.	120
5	*Strain gauges, pressure transducers, load cells and Accelerometers* These instrumentations will facilitate the continuous measurement of deformations, pore pressures, loads, acceleration during model tests carried out understand the behaviour of soil, foundation systems and soil-structure interaction systems	15
12	*Fabrication and instrumentation facilities* To conduct 1g model tests with necessary monitoring and measurement sensors for Foundation	20
Development of computational facility		
7	*FLAC 2D and 3D* FLAC is a finite difference tool extensively used by the Geotechnical community around the world to analyze and design various geotechnical structures such as slopes, embankments etc.	33
8	Plaxis 2D and 3D	27

	It is finite element based Geotechnical Engineering software used to perform analysis for the geotechnical structures subjected to static, hydraulic and dynamic loading. It has in-built constitutive models that can simulate the behavior of various soils to a reasonable accuracy.	
9	ABAQUS- Facility Procured by Institute This is a finite element based software used for modeling complex geotechnical engineering related problems with features to embed advanced soil constitutive models. Exposure to such advanced modeling and analysis techniques are imperative for the postgraduate students.	0
10	PFC 2D & 3D software suit This is a discrete particle-based analysis tool used for modeling geostructures with relevance to the particulate nature of soil, e.g. modeling landslides, debris flow, soil interface behavior, development of advanced soil constitutive model etc.	20
11	*Computational facilities- Facility Under Const within SCENE* Workstations are required to house the computational facilities and smoothly run for training the students and professionals	0
12	*Fabrication and instrumentation facilities* To conduct 1g model tests with necessary monitoring and measurement sensors for Foundation	20
Total funds requested (in lakhs)		305

Total space requirement: 300 m^2
Manpower: One Technician
Total budget requirement: 30,05,000 (Three crores sixty-five lakhs and fifty thousand Indian rupees only)

Resources:

Additional requirements of laboratory space with justification (name of the labs)

Name of the lab: Advanced Geotechnical Experimental & Computational Laboratory

The course "Advanced Geotechnical Experimental & Computational Laboratory" needs several specialized instruments, computational tools, dedicated laboratory space and trained manpower. The focus will be on exposing the students to the state-of-the-art lab, field and computational facilities. Requirements of Space, Manpower and Budget are presented below. More details can be found in Annexure-B.

Total space requirement: 300 m^2

Additional requirements of laboratory fund (recurring and non-recurring) with justification (name of the labs)

Name of the lab: Advanced Geotechnical Experimental & Computational Laboratory

Non-Recurring: INR 3,65,50,000 (Three crores sixty-five lakhs and fifty thousand Indian rupees)

This expenditure we need for setting up the new Advanced Geotechnical Experimental and Computational laboratory

Recurring: 22 to 25 Lakhs depending on the AMC charges.

This expenditure is required for maintenance and normal functioning of the Advanced Geotechnical Experimental and Computational laboratory

Additional requirements of faculty and non-teaching staff (Numbers and justification)

One technician for the smooth functioning of the Advanced Geotechnical Experimental and Computational laboratory

I. Origin and development of the proposal:

- Please mention the name of the faculty involved in developing this proposal.
  1. Dr. Ashutosh Kumar
  2. Dr. K. V. Uday
  3. Dr. Maheshreddy Gade
  4. Dr. Mousumi Mukherjee
  5. Dr. Sandip Kumar Saha

- Details of external industry experts and their recommendations (please include their evaluation)

The comments and suggestions of the experts listed below can be found here: https://docs.google.com/document/d/1psYNg8hsRHZAOgyrdnJTCiB8HzgPA3eemo3SDTsB8Og/edit?usp=sharing

1. Dr. Mathan V. Manmatharajan, P.Eng., WSP Global Inc., Canada
2. Dr. Loges Paramaguru, WSP Global Inc., Australia
3. Dr. Balaji Paramasivam, Fugro, California, USA
4. Dr. Kesab Sharma, BGC Engineering Inc., Canada
5. Mr. Chang-Gyun Jeong, P.Eng., BGC Engineering Inc., Canada
6. Dr. P. Subramaniam, Technip India Ltd., Chennai.
7. Dr. Suresh Kumar Gupta, Jacobs India, Hyderabad.
8. Dr. Ratnakar Mahajan, Maccaferri India
9. Ms Sneha Jayanth, Jacobs India, Hyderabad

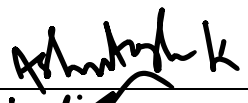
10. Mr. Sridhar Valluri, Keller India, Mumbai.
11. Mr. Kedar Birid, Technomonte, Mumbai.
12. Dr. Apoorba Mondal, NPCIL, Mumbai.
13. Dr. R.P. Singh, NHSRCL, Mumbai
14. Dr. Sujatha Manoj, MotMacdonald, Australia
15. Dr. Jaykumar Shukla, Geodynamics, Baroda

- Details of external academia experts and their recommendations (please include their evaluation):

The comments and suggestions of the experts listed below can be found here: https://docs.google.com/document/d/19QgTQcd_ZSqQMF7V10u7l4ppnOtJHRoFKwvgIUv3gYI/edit?usp=sharing

1. Prof. Siva Sivathayalan, Carleton University, Canada
2. Prof. Sai Vanapalli, University of Ottawa, Canada
3. Prof. Jamie Standing, Imperial College, London, U.K.
4. Prof. David Toll, Durham University, U.K.
5. Dr. Krishna Kumar, University of Texas Austin, USA
6. Dr. Ning Guo, Zhejiang University, China
7. Dr. Mehdi Pouragha, Carleton University, Canada
8. Prof. Vikas Thakur, NTNU Norway
9. Prof. Sabatino Cuomo, University of Salerno, Italy
10. Prof. Krishna R Reddy, UIC, Chicago
11. Prof. Deepankar Choudhury, IIT Bombay
12. Prof. B V S Viswanadham, IIT Bombay
13. Prof. Ramanathan Ayothiraman, IIT Delhi
14. Prof. Jagdish Prasad Sahoo, IIT Kanpur
15. Prof. Subhadeep Banerjee, IIT Madras
16. Prof. Sreedeep Shekaran, IIT Guwahati
17. Prof. Adimoolam Boominathan, IIT Madras
18. Prof. M R Madhav, Honorary Professor, IIT Hyderabad
19. Prof. G L S Babu, IISc Bangalore
20. Prof. Madhavi Latha G, IISc Bangalore
21. Prof. Sireesh Saride, IIT Hyderabad
22. Prof. Amit Prashant, IIT Gandhinagar

- Proposers faculty name and their signatures :

Name of Faculty members	**Signatures**
1. Dr. Ashutosh Kumar	
2. Dr. K.V. Uday	

Recommendations of Chairperson of School/ Centre

Signature with Date:

Dean (Students) recommendations on availability of hostels and other requirements

Signature with Date:

Associate Dean (Courses) recommendation on class rooms availability and other academic infrastructure requirements

Signature with Date:

Dean Finance recommendation on financial aspects (if any)

Signature with Date:

Dean Academics recommendations:

Recommended/Not Recommended

Signature with Date:

Please enclose additional information if any.

ANNEXURE H

INDIAN INSTITUTE OF TECHNOLOGY MANDI

Indian Institute of Technology Mandi

ORDINANCE

UG

IIT Mandi

This document specifies the rules and regulations pertaining to B. Tech. and B. S. programs offered at IIT Mandi. The admitted student has options for Minor/ Specialization / Honours / Second Major / M.Tech. IDD, etc.

About IIT Mandi

The Indian Institute of Technology Mandi (IIT Mandi) is one of the second-generation IITs, established in 2009 by the Government of India with the objective of advancing education, research, and innovation in science, engineering, and technology. Nestled in the mid-Himalayan region of Himachal Pradesh, the institute offers a unique academic environment that integrates rigorous scholarship with sustainability, interdisciplinary learning, and societal relevance. IIT Mandi is committed to nurturing technically competent, ethically grounded, and socially responsible graduates through outcome-based education, state-of-the-art infrastructure, and a strong culture of research and entrepreneurship.

Vision: ***To be a leader in science and technology education, knowledge creation and innovation, in an India marching towards a just, inclusive and sustainable society.***

Mission:

- To create knowledge through team effort and individually for the benefit of society.
- To impart education to produce professionals capable of leading efforts towards innovative products and processes for the development of the Himalayan region in particular and our country and humanity in general
- To inculcate a spirit of entrepreneurship and to impart the ability to devise globally recognized solutions for the problems of society and industry, particularly in the fragile eco-system of the Himalayas.
- To train teachers capable of inspiring the next generation of engineers, scientists and researchers.
- To work intensely with industry in pursuit of the above goals of education and research, leading to the development of cutting edge and commercially-viable technologies.
- To operate in an ambience marked by overriding respect for ability and merit.

Table of Contents

1 UG Admissions

1.1 Admission to the B.Tech./B.S. programs in any year will be based on the results of the JEE (Advanced) of that year and allocations made by the Joint Seat Allocation Authority (JoSAA).

1.2 The eligibility criteria for appearing for JEE (Advanced) in any year will be decided by the JoSAA. The criteria will be set out in an Information Brochure to be made available to the applicants along with the relevant application forms.

1.3 The JoSAA will decide on the procedure for conducting JEE (Advanced) and preparing merit lists subject to minimum performance criteria in the examination. The JoSAA will offer admission from these lists to candidates, taking into account the choice of branch indicated by the candidate and the available seats in each branch in various IITs.

1.4 At the time of admission, a candidate should have passed in the final examination of any of the qualifying examinations and fulfill other eligibility criteria (such as medical standards) specified as per the JoSAA guidelines of that year.

1.5 The maximum number of students to be admitted in each branch of the B.Tech./B.S. program will be decided by the Senate of IIT Mandi. Statutory and legally mandated reservations will be followed as per Government of India orders.

1.6 The selected candidate will be admitted to the B.Tech./B.S. program after they fulfill all the admission requirements as indicated in the letter of admission, after payment of the prescribed fees.

1.7 In the matters of admission to the B.Tech. / B.S. program, the decision of the JoSAA is final.

1.8 If, at any time after admission, it is found that a candidate has not fulfilled all the requirements stipulated in the Information Brochure and/or in the offer letter of admission, then the admission of the candidate may be cancelled and the matter shall be reported to the Senate.

1.9 A limited number of foreign nationals and other categories can be admitted on a supernumerary basis to the B.Tech./B.S. programs as per the procedure laid down by the JoSAA from time to time.

Table 1: UG Programs

Sr No	Programs
1.	Bachelor of Technology in Bio Engineering
2.	Bachelor of Technology in Civil Engineering
3.	Bachelor of Technology in Computer Science and Engineering

4.	Bachelor of Technology in Data Science and Engineering
5.	Bachelor of Technology in Electrical Engineering
6.	Bachelor of Technology in Engineering Physics
7.	Bachelor of Technology in General Engineering
8.	Bachelor of Technology in Mechanical Engineering
9.	Bachelor of Technology in Materials Science and Engineering
10.	Bachelor of Technology in Microelectronics & VLSI
11.	Bachelor of Technology in Mathematics and Computing
12.	BS in Chemical Sciences
13.	Integrated Master of Business Administration program (IMBA)

2 Structure of UG

The IIT Mandi B. Tech programme has been designed taking into consideration current and future changes in society and the nature of technology, and the Vision of IIT Mandi to have a direct impact on Indian society through academic endeavors. The context includes:

2.1 The Students: The scheme of admission based on JEE ensures that students who join IIT for UG programs are highly intelligent and are capable of hard work *if sufficiently motivated*. Students often do not have particular interest or aptitude for the branch to which they have been admitted. After graduation, our students go on to make their mark in a variety of ways: as researchers, design engineers and professors; as technical managers, public administrators, in NGOs and policy think tanks, venture capital funds, entrepreneurs, etc.

2.2 The Technology Milieu: Globalization and rapid march of science and technology have brought dramatic changes in the nature of the engineering profession. Increasingly, engineers are called upon to deliver technology to a wide variety of people in diverse socio-economic strata, cultures, geographies and political systems. The rapid advance of science and technology implies that much of the knowledge that a student learns during B.Tech. has a useful life time of only a few years. Conversely, much of the knowledge that an engineer will use during his/her career of 40-50 years will be learnt *only after graduation*. Only some very basic principles can be expected to remain current over the next half a century.

2.3 Expectations from IIT Mandi: As an Indian Institute of Technology, it is our duty to train leaders for the growth of India with a strong technology focus. This is reflected in our Vision and Mission that have been guiding IIT's strategy since inception. Of specific relevance to the B. Tech programme are the Mission

statements:

- *To impart education co produce professionals capable of leading efforts to- wards innovative products and processes for the development of the Himalayan region in particular and our country and humanity in general*.
- *To inculcate a spirit of entrepreneurship and to impart the ability to de- vise globally recognized solutions for the problems of society and industry, particularly in the fragile eco-system of the Himalayas*.

3 The Essence of IIT Mandi UG

Given the above context, our B.Tech programme is designed to give students a broad base to prepare them for their careers in the rapidly-changing future. Students who wish to specialise and pursue an area to great depth may do so at the Masters and PhD levels

The necessary and desirable characteristics of all our B.Tech. graduates are:

1. Self-motivated with a passion to contribute in national development and societal betterment.
2. Practicum and projects (learn-by-doing) throughout the 4 years to develop the ability to learn quickly and devise innovative solutions.
3. A solid foundation in basic principles coupled with substantial practical hands-on experience through experiential learning approach.
4. Sufficient specific knowledge to be immediately productive in industry The IIT Mandi B.Tech curriculum consists of 3 major components:
   - **Foundations** of all B.Techs. are: facility in design and innovation; strong understanding of common scientific and engineering principles and methods; and breadth of knowledge outside science and engineering i.e. in the humanities, social sciences and management.
   - **Core** of knowledge in the student's chosen branch. This is kept to the bare minimum, with principles and techniques being learnt in theory courses, in labs or in practicums.
   - **Specialist Baskets**. Many of these are interdisciplinary. In each basket, the horizontal line divides the basic from the advanced courses.

4 UG Curriculum

Every branch of the B.Tech./B. S. program will have a curriculum and course contents

approved by the Senate.

4.1 Credit Requirements for the Program: The minimum total credit requirements that has to be satisfactorily completed for the award of a B.Tech. degree is 160 credits, and that for a B.S. degree is 163 credits. A student doing Honours / Second Major / M.Tech. IDD may have to complete additional credits to earn these, which are mentioned in their respective sections. On an average, a student is supposed to do 20 credits in a semester.

The curriculum consists of courses mainly in the following categories: Institute Core courses, Institute Elective courses and Discipline Core and Disci- pline Elective courses. Along with these, there will be free electives and HSS courses. The courses belonging to these categories are grouped into various baskets as given in R.3.7. In each basket, the student has to earn a mini- mum number of credits as prescribed by the Senate approved curriculum to graduate the B.Tech./B.Tech. (Honours) program.

In addition, a student should satisfactorily complete Internship (Industry/Research) and NSO/NSS/Hiking & Trekking requirements as well.

4.2 Credit Limits in a Semester: A student has to register for a minimum of 12 credits and up to a maximum of 22 credits in a regular semester. However, student may register for a maximum of 25 credits in 4th semester and onwards. The number of credits can be less than 12 credits in a vacation semester or during the semester-long internship. Any exception to this requires the permission of AD (Courses) / Dean (Academics). The permission in such cases is based on individual case, after considering the necessity, past performance etc. If a student is opting for a course, by visitors, in the middle of the semesters, it should be within the approved 12-25 credits. Student should obtain per- mission from the Dean Academics / AD Courses, if the number of credits is more than 25. If a student opts for Audit course, the total number of cred- its, including the audit course, should not be more than 28. If students opt for extra credits without approval from Dean Academics, Academic section will remove such excess credits, without any intimation. Permission for extra credits should be obtained before the add/drop dates. If One Time Approved Courses are offered in the middle of the semester, permission should be obtained before the commencement of the courses. Post dated permissions will not be given.

4.2.1 If a student is undergoing a semester long internship (onsite / off campus), the minimum credits to be registered is relaxed to 9.

4.2.2 The final CGPA, calculated upon the completion of all credit requirements towards the fulfilment of a degree, includes all credits earned against a letter grade, including those credits that are in excess of the minimum requirements.

4.2.3 The Semester Grade-sheet includes 'F' grade earned, if any. However, the final CGPA calculation shall not include any 'F' grade once all the earned credit requirements are completed, (including the minimum credit requirement per basket such as IC / DC / DE / FE etc).

4.2.4 Every course of the B.Tech./B.Tech. (Honors)/B. S program will be placed in one of the course baskets listed in the table below:

Table 2: B. Tech Credit Distribution (Ref: 37th Senate)

S.No.	Category	B. Tech (2022 and 2023 batches)	B. Tech (2024 batch onwards)
1.	**Institute Core courses**	60	60
	IC Compulsory	39	32
	IC Basket	6	6
	Humanities and Social Sciences	12	12
	Indian Knowledge System	3	3
	Internship / Entrepreneur-ship Practicum Stage - 1	2	2
2.	Discipline Core and Discipline Electives	66	66
	Discipline Core	Minimum 33	Minimum 33
	Discipline Electives	Minimum 12	Minimum 12
3.	**Elective Courses**	34	41
	MTP, IC-102P (or equivalent DE)	12(12)	12(12)
	ISTP, IC202P (or equivalent FE)	7(7)	7(7)
	Free Electives	22	22

4.2.5 From 2024 batch onwards, IC 102P are compulsory for all UG students.However, IC 202P is mandatory for SMME, SCEE and UG Mathematics and Computing.

4.2.6 Maximum credits under HSS courses will be 20. Any credits completed beyond this limit will not be counted for graduation requirements. Students are required to do those many extra credits, if they do more than 20 credits.

4.2.7 These additional 8 HSS Credits (other than 12 under HSS) are counted

under free elective.

4.2.8 If a student opts out of the courses under electives, the following substitutive courses are to be done:

Table 3: Course Alternatives (Ref: 49th BoA)

Course	Substitute(s)
IC 102P (Foundations of Design Practicum; FDP)	Discipline Course(s)
IC 202P (Design Practicum; DP)	Free Elective(s)
DP 301 (Interactive Socio Technical Practicum; ISTP)	Free Elective(s)
Major Technical Project-1, 2 (MTP-1, MTP-2)	Discipline Elective(s)

*Number of credits DC and DE is different for each B.Tech. branch. *(Refer to table 4 for split-up of various branches.*)

4.2.9 Students can choose the courses of their choice from parent discipline (or from the list available). They are counted under the Discipline Electives.

4.2.10 Students can choose the courses of their choice across various disciplines or schools, including their parent school or discipline. These are counted under free electives. A Discipline Course (DE) can become a free elective, but not vice versa.

4.2.11 The discipline core and discipline elective distribution for various branches are:

Table 4: Discipline Core and Elective Distribution

Branch	Discipline Core	Discipline Electives	Reference
BS	62	23	59th BoA
BE	42	24	56th BoA
CE	49	21	59th BoA
CSE	39	31	42nd BoA
DSE	38	28	56th BoA
EE	52	20	56th BoA
EP	37	30	50th BoA
MC	55	15	59th BoA
ME	50	16	59th BoA
MSE	45	22	38th Senate
VLSI	54	12	39th Senate
GE	36	30	59th BoA

4.2.12 Every course of the B.S. program will be placed in one of the course baskets listed in the table below:

Table 5: BS Credit Structure (Ref: 59th BoA)

S.No.	Category	B.S. Credits	B.S.-M.S. Credits
1.	**Institute Core Compulsory**	27	27
	IC Basket	6	6
	IKS	3	3
	HSS	12	12
2.	**Discipline Core and Discipline Electives**	B.S. program 85	B.S. program 85
	Discipline Core	62	Min. 59
	Discipline Electives	24	Min. 29
3.	**Elective courses**		
	Free Electives*	Min. 15	Min. 15
	Research Communication and Projects	Min. 14	Min. 46
	Total	**163**	**201**

*In addition to the credits of the courses classified as Free Electives, extra credits earned in Discipline Elective basket can also be considered for satisfying the credit requirement of Free Elective basket.

4.3 Foundations of Design Practicum

The course gives an outline of the steps in solving an engineering design problem through an example of a robot building. The course is multidisciplinary of its kind and will be used to bring out the multidisciplinary aspects of a typical engineering design problem. The course unravels the different steps of engineering problem solving culminating in the development of a robot.

4.4 Design Practicum

In this course, the teams are asked to design a prototype based on commercially-off-the- shelf (COTS) hardware or software (Preferably open source). Prototypes are used to gather requirements, and are especially useful in visualizing the look and feel of an application and the process workflow. The prototype can be used as the basis for developing the final solution. The goal when developing such prototypes is to capture

the functions and appearance of the finished product. These prototypes are used for testing and evaluation, and provide useful information for the user to rank the products or the features.

4.5 Interactive Socio-Technical Practicum (ISTP)

Indian Institute of Technology Mandi encourages interactive academic culture and the curriculum is substantially oriented towards design and innovation. One of the signature courses under the Design & Innovation Practicum stream is the Interactive Socio-Technical Practicum (ISTP), which is offered to the 3rd year B.Tech. students only. This is an elective course for regular B.Tech. If a regular B.Tech. student (2022 B. Tech and earlier batches) opts to substitute ISTP with other elective courses, he/she should opt 3 credits from Discipline Electives and 1 credit from Free Electives to complete the basket requirements. From 2023 B.Tech. onwards, if a student opts to substitute ISTP with other elective courses, he/she should opt all 4 credits from Free Electives to complete the basket requirements.

4.6 Major Technical Project (MTP)

4.6.1 MTP is the capstone of the 4-year B.Tech. program and of the 4-course Design & Innovation Practicum sequence.

4.6.2 The project will be a single project extended over 7th and 8th semesters. The project will be an individual project.

4.6.3 There will be one principal guide and co-guides (if required) for a project. Faculty members from all the schools can be part of the guidance of MTP projects.

4.6.4 As the project is expected to have a major technical contribution in the student's discipline, faculty members whose expertise is in other disciplines are expected to co-opt a colleague having expertise in the student's discipline as a co-guide.

4.6.5 MTP is an elective course under Design & Innovation Practicum bas- ket, under elective component, for regular B.Tech./B.S.

4.6.6 Since MTP is under Discipline Elective, student must work in the core area towards the MTP works. If a student does MTP in non-core areas, it will be counted under Free Elective credits.

4.6.7 If a regular B.Tech student (2023 batch onwards) opts to substitute MTP with other elective courses, he/she should replace all 8 credits of MTP, with Discipline Electives to complete the basket requirement. For earlier batches (2022 and earlier), student should opt 6 credits from Discipline Electives and 2 credit from

Free Electives to complete the basket requirements, or in the ratio of 3:1 (Discipline Electives: Free Electives).

4.6.8 MTP-1 will have 4 credit and MTP-2 will have 4 credits, both in cumulative 8 credits.

4.6.9 Students may opt MTP 2 in 8th semester if they not enrolled in MTP 1 in the 7th semester. In this case, student must complete equivalent credit of MTP 1 as Discipline elective.

4.6.10 If a student opts to do MTP, but obtain grade point 6 or below in the first stage of MTP-1, he/she will not be allowed to continue on to the second stage of MTP-2. The grade earned by the student in MTP-1 will be included in the grade sheet and transcript. The student will have to make up for the remaining MTP credits by taking 5 credits from the Discipline Electives basket. For earlier batches (2022 and earlier), student should opt 6 credits from Discipline Electives and 2 credit from Free Electives to complete the basket requirements, or in the ratio of 3:1 (Discipline Electives: Free Electives).

However, if such a student wishes to continue doing the MTP, he/she may appeal giving justification to the Dean (Academics) with the recommendation of the MTP guide(s) and Faculty Advisor.

4.6.11 If a student has earned a grade point of 7 ('B-' grade) or above in MTP- 1, they will be required to continue on to MTP-2.
However, if such a student wishes not to pursue MTP-2, he/she may appeal to Dean (Academics) through the Faculty Advisor and the guide(s), with strong justification from both student and guide(s). For earlier batches (2022 and earlier), student should opt 6 credits from Discipline Electives and 2 credit from Free Electives to complete the basket requirements, or in the ratio of 3:1 (Discipline Electives: Free Electives).

4.6.12 Since huge efforts are put by the guide also(s) in MTP, dropping MTP- 2 is Highly discouraged and rarely permission will be given for dropping MTP-2.

4.6.13 If allowed to drop MTP-2, the grade earned by the student in MTP-1 will be included in the grade sheet and transcript. The student will have to make up for the remaining MTP credits by taking 5 credits from the Discipline Electives basket.

4.6.14 If MTP completely in a different discipline, they would be awarded 8 credits from Free Elective basket.

4.6.15 MTP1 and MTP2 must be done in campus physical mode. In any case MTP shall not be allowed in online/remote mode.

4.7 Research Projects: Undergraduate Research Project

B.S. Students are highly encouraged to opt for undergraduate research projects aligned with their specific research and scientific interest in their 7th and 8th semesters. This research-based learning provides a great opportunity for the students to learn research methodology and instrumentation, which can be aligned to the stream specialization or minors. The research-based learning is optional, and if not opted for, the credit requirements need to be fulfilled through discipline elective courses.

4.8 Research Projects: Post-Graduate Project (PGP)

4.8.1 Post-graduate projects (PGP) must be done by the students who opt for theB. Tech - M. Tech or B.S. - M.S. program. The project will be a single project spanned over the 9th and 10th semesters or last two semesters. Each student will be assigned to a supervisor(s) at IIT Mandi to pursue the project. An external co-supervisor can be opted for as per the Institute's Senate approved norms. After completion of the project, students need to submit a detailed project report.

4.8.2 All courses, other than Discipline core in a parent branch will be by default discipline electives. For outside discipline courses, a separate list is available in the respective curriculum.

4.8.3 Any discipline elective course, beyond the minimum limit may also be counted as free elective.

References:

1. 2nd Senate (Perspective of B. Tech)
2. R.3 B. Tech Ordinance
3. 20th Senate Annexure-B
4. Item 37.11, https://insite.iitmandi.ac.in/circulars/ show.php?ID=F.No.IITMandi/Acad/Senate/2022/4641-45
5. https://insite.iitmandi.ac.in/circulars/show.php?ID=No.IITMandi/ AR(Acad)/2019/6783-93
6. https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/RO-01/ 2016/5085-89
7. 32.16, Senate Minutes (only for one time)

8. https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/SM-44/ 2024/471-477
9. https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Acad/ Senate/2022/4062-65
10. https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Acad/ Senate/2021/3259-63
11. https://insite.iitmandi.ac.in/circulars/show.php?ID=F.No.IITMandi/ Acad/BoA/2023/5006-10
12. https://insite.iitmandi.ac.in/circulars/show.php?ID=F.No.IITMandi/ Acad/BoA/2023/269-73
13. Item 6.6, 6th Senate
14. https://insite.iitmandi.ac.in/circulars/show.php?ID=F.No.IITMandi/ Acad/BoA/2023/259-63
15. https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Acad/ BoA-54/2024/8051-55

5 Attendance Criterion/Leave Rules

There is no leave concept for the UG Students. They are expected to attend 100% classes of each and every course. Students missing the classes in the middle of semester is highly discouraged. However, 20% relaxation is provided to them to meet various unforeseen situations. This relaxation is not extendible. Students cannot carry forward the surplus attendance to other courses either in the same semester or for subsequent semesters.

5.1 Recording of attendance is must for all courses.

5.2 Every faculty, for all courses which he/she is teaching, should record the attendance and maintain the attendance registers.

5.3 It is the student's responsibility to check the attendance periodically. Instructor may/may not post the intermediate attendance.

5.4 A student, with attendance less than minimum specified, will not be permitted for the end exams and will be will be awarded a 'FS' grade, which is fail due to short attendance. A student, with 'FS' grade in a course, needs to repeat the course.

5.5 A student, who fails to secure minimum attendance in an Audit Course may not be allowed to appear for the exams. They will be awarded 'AF' grade and will be reflected in grade sheet.

5.6 Students representing official events of IIT Mandi outside the campus, must seek prior leave approval from Dean (Acad), such official leave will be counted towards minimum 80% attendance. However, in such case any missed evaluation part like quiz and assignment will be responsibility of the student.

5.7 Medical leave will be grants on actual basis against the medical report submitted by the student. In such case, only government hospital records/IIT Mandi Health center recommendation will be entertained.

5.8 Before leaving the campus for any reason, student should inform the FA about the absence. On a stretch, a student can be absent for a maximum of 20 days (which corresponds to 80% of classes in a semester). They may need to inform the warden of their hostel about their absence. If a student goes on medical emergency, they need to inform the FA and Dean (Acad) within a week of their departure from campus.

5.9 If there is a necessity for the long leave, students can exercise the option of Semester Leave.

5.10 Fifth / Final Year IDD students, are governed by the M. Tech leave rules.

6 Vacation Semesters

Provision for the Vacation Semesters is made to clear the backlogs of the IC Courses and Discipline Core or Discipline Elective courses. This provision is also extended to the graduating students, in order to complete their studies / graduation on time.

Typically, the instructors who taught the course during the regular semester will conduct the vacation courses. School/Center Chairs may nominate other faculty, in case original instructors are not available, during vacation.

6.1 Students can register for courses during Vacation Semesters up to a maximum 15credits, on payment of registration fee at prescribed rates.

6.2 All students with 'F' or 'FS' grade during regular semester must take the vacation semesters' courses to clear the Course backlogs.

6.3 Institute may run vacation semesters, in case of shortened regular semesters/regular semesters with reduced credits.

6.4 Vacation semesters will run during vacations provided a faculty member is available for running the course and a minimum of 5 students are registered for the course.

6.5 Graduating students can approach the faculty for the vacation semesters' courses. For graduating students' courses, there is no restriction on number of registrations.

6.6 The Vacation Semester typically runs for 4-8 weeks, during semester break.

6.7 The total number of contact hours for the courses remains the same as that

during the regular semesters, and therefore the courses run at accelerated pace.

6.8 The evaluation and grading patterns also remain the same as during the regular semesters.

6.9 Minimum 80% attendance is must for all the courses taken during the vacations.

6.10 Courses offered in vacation semester will be treated as equivalent to a regular semester course for all accounting purposes.

6.11 No supplementary exams are allowed for the Vacation Semester Courses

6.12 If a student registers for a course and does not fulfill the attendance requirement, an "FS" grade will be awarded for the course.

6.13 A single final CCM for all vacation courses will be held (Chaired by Associate Dean (Courses)/Dean Academics) prior to the start of the following semester. The grade submission will then be done following the CCM.

References

1. https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Acad/ Notf./2014-15/947
2. 7th Senate

7 Scholarships and Tuition Fee Exemption

7.1 The details of various scholarships available for students shall be displayed on Institute Website from time to time.

7.2 The number of Merit Cum Means (MCM) scholarship for each year and each branch will be limited to 25% of the strength of students in that particular branch in that year.

7.3 The eligibility criteria and other conditions for MCM scholarship shall be notified subject to terms and conditions and at the rates approved by the Government of India from time to time.

7.4 The students who receive MCM scholarship are exempted from paying tuition fee and will receive a monthly scholarship as specified from time to time.

7.5 In the cases of scholarships provided by private organizations, the rates and terms and conditions for the award of such scholarship shall be as approved by the Senate.

7.6 In the case of the SC/ST candidates, all are exempted from payment of tuition fees. The award of scholarships and other benefits will be in accordance with the rules framed or amended by the Government of India from time to time.

7.7 The Dean (Academics) will lay down the administrative procedures to be followed in the selection of students for the award of various scholarships consistent with existing Government regulations if any. The number and names of the candidates selected for various scholarships will be reported to the Senate.

7.8 Dhawan Fellowship for Himachali Female Students is also available.

7.9 For the purpose of scholarships (only), the following norms are followed, regarding the passing of the course.

7.9.1 **External Scholarships**

The Senate in its 44th meeting held on September 17, 2024, vide Item No. 44.3.11 has approved the following guidelines for processing various external online/offline scholarships.

If the student obtains CGPA >= 5 (B. Tech., M. A., M. Sc.,) with/without 'F' grade and has been promoted to next semester, then he/she will be considered passed for eligibility for scholarship only.

OR

If the student obtains a CGPA <5 with/without 'F' grade then he/she will NOT be considered passed for the eligibility of scholarship.

OR

If the student obtains CGPA >= 6 (M. Tech., M. B. A., M. Tech (R). M. Sc. (R), M. A. (R), I.Ph.D, Ph. D) with/ without F grade and has been promoted to next semester, then he/she will be considered passed for eligibility of scholarship only.

OR

If the student obtains a CGPA <6 with/without 'F' Grade then he/she will NOT be considered passed for the eligibility of scholarship.

Monthly scholarship of B.Tech-M.Tech Integrated Dual Degree in Bioengi- neering students will provided in 5th / final Year. The students have to maintain CGPA of 6.5 or above as per prevailing norms for continuation of fellowship.

References

1. MCM for M. Sc. https://insite.iitmandi.ac.in/circulars/show.php?ID=IIT%20Mandi/RO-01/2015/6348-52
2. https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/

Acad/Senate/2022/4838

3. Institute assisted Fellowship, https://insite.iitmandi.ac.in/circulars/show.php?ID=F.No.IITMandi/Acad/Notf./2023/857-861
4. MCM for MA students, https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/RO-01/2018/6329-32
5. Fee remission, https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Acad/Fees/2017-DS-9963-68
6. Scholarship for IDD students, https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Academics/B.Tech-M.TechDualDegree/2024/6504-08
7. Criterion for Applying Scholarship, https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/SM-44/2024/532-538
8. Minimum performance, https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Acad/Senate/2022/52-56
9. Regarding submission of Income Certificate for availing exemption of fees by B. Tech Students. 14th Senate
10. https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/SM-44/ 2024/532-538
11. https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Academics/ B.Tech-M.TechDualDegree/2024/6504-08
12. MCM for UG Students
13. Scholarships for UG Students

8 Internship

As part of the curriculum, students are allowed to do internships of 2 types

(a) Compulsory Internship (Vacation Internship)
(b) Semester-long Internship

Duration of the internships, corresponding credits and mode are provided in the following table.

Table 6: Duration and Credits for Internships

Mode of Internship	Time frame (mini-mum)	Credits	Valid Semester(s)	Remarks
Vacation Internship	6 weeks	2	Vacations, after completion of the 5th Semester and before the commencement of the 8th semester	This can be done online/offline as per the offer.
Semester Internship Onsite (Not on campus)	14 weeks	9	During 6th or 7th Semesters	Students are not permitted to do any offline/online Courses during the internship period.
Semester Internship Remote (student chose to stay at IIT Mandi)	14 weeks	6	During 6th or 7th or 8th Semester	Students can do a maximum of 9 credits along with 6 credits of online internship

Students are allowed to semester internships either in the industry, research or in academia both inside or outside. However, academic semester internships at IIT Mandi are not allowed since students can opt for MTP, ISTP, etc. More details are given in the next section.

The eligibility criteria and approval process for internships would be declared by the Career and Placement Cell (CnPC), IIT Mandi and/or the IIT Mandi Senate from time to time.

8.1 Vacation Internship:

8.1.1 B.Tech students are required to do either a vacation internship of at least 6 weeks duration, or Phase-1 of Entrepreneurship Practicum (as mentioned later).

8.1.2 This internship needs to be done only during vacations. This internship cannot

be done during the regular semester.

8.1.3 This internship needs to be done after completion of fifth semester, but before the beginning of eighth semester.

8.1.4 For the two-credit academic internship, the subject of your internship needs to be verified by the Faculty Advisor before applying for the internships. Only after the approval and after the completion of internship students will be awarded the 2 credits.

8.1.5 Permitted in core domain and may be done in AIIMs/TIFR/IISc/IITs/IISERs/ISI/reputed center funded research institute / state or central government departments. It can be also permitted in reputed private firms.

8.1.6 The credits are only given at the sole judgement of respective faculty advisor, if there is any conflict Dean (Acad) will take final decision on this matter.

8.1.7 The internship evaluation can be done by report submission of the work done by the student to group of FAs of the program discipline which will be chaired by FA of the student, if needed external expert can be invited by the FA of the student.

8.1.8 Students are advised to get their faculty advisor's consent before applying for internships. This is particularly important for general / non-core company.

8.1.9 If you are going for an off-campus internship, please make sure that it fulfills the institute's requirements, as you will be required to submit the internship certificate in the format specified by the institute.

8.1.10 2 P/F credits would be awarded to B.Tech. students on successful completion of the internship. These would count under the IC Compulsory basket requirement.

8.1.11 Grades for this internship will be awarded as part of 8th semester grade sheet.

8.1.12 These are optional for B.S. students, and if done, no credits would be awarded.

8.2 Semester Long Internship

8.2.1 B.Tech./B.S. students will be allowed to go on a semester internship after the completion of 5th semester. This internship has to overlap with regular semester of IIT Mandi.

8.2.2 This work may be done in core or non-core areas; however, the authenticity of offered organization should be verified by CnP cell.

8.2.3 The minimum duration for a semester internship is 14-16 weeks. This internship may be on-site / remote.

8.2.4 If a student holds an onsite / offsite semester internship offer, they may be allowed to do at most 9 P/F credits in one semester (relaxing the 6 P/F

credits per semester limit).

8.2.5 For any particular semester in which a student is doing their onsite / offline semester internship, the minimum 12 credits per semester limit, as mentioned in ordinance will be relaxed to 9 credits. Students may combine / club with this internship with the mandatory 2 credit internship, subjected to the fulfilment of other rules.

8.2.6 Applicable fee for the semester must be paid by the student.

8.2.7 Student needs to register for Semester Long internship course DP399xxx for 9 credits or DP396xx for 6 credits.

8.2.8 Students are not allowed to register for the courses during the off campus/on- site internship.

8.2.9 Students undergoing online internships are permitted to take 2-3 courses with maximum credit of 9. Evaluation is as per the institute norms.

8.2.10 The internship can be done in recognized and reputed industries/companies, R&D institutions or academic institutions in India or Abroad. FA with help of CnP cell (if needed) may confirm whether the company or industry is reputed or not and recommended/ approved internships.

8.2.11 Internships at the startups or non-registered companies are not permitted.

8.3 Evaluation

8.3.1 The student must intimate the name and contact details of a mentor from the organization where the internship is to be carried out, within 2 weeks of starting the internship to their FA and/or CnP Cell as applicable.

8.3.2 A report on the work done during internship should be submitted by the student to their Faculty Advisor. The student needs to include a duly signed certificate of internship completion from the mentor in the report submitted to the FA.

8.3.3 The internship evaluation can be done by presentation of the work done by the student to group of FAs of the program discipline which will be chaired by FA of the student, if needed external expert can be invited by the FA of the student.

8.3.4 Any further requirement for evaluation if deemed necessary by the Faculty Advisor may be included in the evaluation pattern. The evaluation outcomes can be either Satisfactory (P grade) or Unsatisfactory (F grade).

Grading based on Company Feedback Process:

(a) The FA can choose the scheme of evaluation for internship credit which is Pass/Fail.

(b) If a company shares negative feedback due to the underperformance of

the student throughout the internship, then the following steps would be taken:

i. The company and students' feedback form will be considered before validating the company's remarks.

ii. A committee, including FA, Advisor CnP, Dean Academics/representative, and designated CnPC coordinators, will be formed to investigate the cases.

iii. If a student's work is insufficient, he will be given partial or no credits.

- **Important Note**

Ideally, all students are expected to complete their semester internship. Dropping the semester internship is highly discouraged and would only be allowed in very exceptional circumstances at the discretion of the Faculty Advisor and Advisor (CnP Cell), for which the barrier would be high. No credits will be awarded for any partially completed semester internship.

Internship drop is allowed before mid-semester in case of stressed or negative feedback from students on discontinuation, which will be evaluated accordingly.

9 Entrepreneurship Practicum

9.1 With Entrepreneurship Practicum (EP), IIT Mandi provides students an opportunity to pursue their entrepreneurial ventures while earning credits for the same.

9.2 To implement EP, the Institute may engage with institute incubator through an MoU that details both parties' financial and operational responsibilities.

9.3 B.Tech./B.S. students interested in starting a venture can register for this course any time after the end of their 4th semester by submitting a proposal in a prescribed format that would be evaluated by the incubator.

9.4 EP is structured as 2 phases

9.4.1 Phase-1: The students learn the basics of starting a venture during a span of at least 6 weeks, through offline / online lectures / workshops/ training sessions amounting to at least 14 hours. At the end of this phase, students are expected to do user research and develop their problem statement. It is in lien of 2 credit internship.

9.4.2 Phase-2: The students start implementing their venture idea during a span of at least 14-16 weeks. The funding for the venture may come from IIT Mandi / Incubator / external sources with appropriate approvals. For on-site or offline internships, 9 credits would be given and or off-site or online internships, 6 credits would be given, on successful completion.

This internship is based on call only.

9.5 Evaluation

An Entrepreneurship Practicum Evaluation Committee (EPEC) is constituted to evaluate the performance of students, with the following composition

(a) EP Coordinator (Faculty In Charge of Incubator)

(b) At least one technology/business expert from IIT Mandi/Incubator

(c) Any other invitee(s) by EP Coordinator

The EPEC would evaluate students as follows:

(a) At the end of Phase-1, the EPEC would assess the students' understanding of the problem, problem validation, execution plan, etc.

i. If performance is satisfactory, students are awarded 2 P/F credits and allowed to continue to Phase-2 of EP. Students may decide whether to continue or not.

ii. If performance is unsatisfactory, students are not awarded any credits and can't progress to Phase-2 of EP

(b) For the students who continued to Phase-2, the EPEC would evaluate their performance at the end of Phase-2

i. If the performance is satisfactory, students are awarded 9 P/F credits

ii. If performance is unsatisfactory, students are not awarded any credits.

References

1. 13th Senate Internship policy (13.5)
2. Foreign Internships, 20th Senate (20.10)

3. M. Tech Internships, 22nd Senate (22.7), https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMANDI/(ACAD)/M.Tech/2018/DS-2705-0944
4. https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Acad/Senate/2021/1719-26
5. https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Acad/Senate/2021/104-111
6. https://insite.iitmandi.ac.in/circulars/ show.php?ID=IITMandi/SM-44/2024/463-470
7. Field Trips, https://insite.iitmandi.ac.in/circulars/show.php?ID= IITMandi/Acad/2018/DS-1275-80
8. EP, 35th Senate, https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Acad/Senate/2022/3670-71
9. https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/RO-01/ 2017/6125-29
10. https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/SM-42/ 2024/802-09

10 Minor Program

10.1 A minor is intended for a student to gain expertise in an area outside his/her major B.Tech. discipline. Minor can be in HSS or outside parent branch. There will not be minor in parent branch.

10.2 A specialist basket of at least 9 credit or as per the approved courses are identified for each Minor. Such a course basket may rest on one or more foundation courses.

10.3 A basket may have sequences within it, i.e. advanced courses may rest on basic courses in the basket. In order to successfully complete a Minor, a student needs to take at least 9 credits with a CGPA of 7.0 out of the courses defined in that Minor basket.

10.4 The area of the Minor must be different from the Major discipline of the student; the courses that are part of the Common Core (including HSS), or the Discipline Core/Electives cannot be counted towards a Minor. However, the 5 credits earned under Humanities Electives may be counted for Minor requirements if needed.

10.5 A student is allowed to take any number of Minors, but a particular course cannot be counted for more than 1 Minors.

10.6 The name of the Minor will appear on the Transcript and the degree certificate of the student.

10.7 These courses are either under HSS or under Free Electives.

References

1. 2nd Senate (2.7)
2. 3rd Senate
3. 4th Senate (4.8)
4. 9th Senate (9.4)
5. 17th Senate (17.4)
6. 28th Senate (28.12)
7. 35th Senate (37.8)
8. CSE minor, 37th Senate (37.8)
9. 33rd Senate (33.5)
10. 42nd Senate
11. Execution of minor, https://insite.iitmandi.ac.in/circulars/show.php?ID=F.No.IITMandi/Acad/BoA/2023/254-58
12. Updated list of CSE minor, https://insite.iitmandi.ac.in/circulars/show.php?ID=F.No.IITMandi/Acad/Senate/2022/4554-57
13. Modification in Minor in German, https://insite.iitmandi.ac.in/circulars/show.php?ID=F.No.IITMandi/Acad/Senate/2022/3659-62
14. Minor in management, https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Acad/Senate/2022/4058-61
15. Minor in Management 2020, https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Acad/OM/2020/12563-68
16. Minor in German, https://insite.iitmandi.ac.in/circulars/show.php?ID=F.No.IITMandi/Acad/BoA/2023/5000-05
17. Modification in Management Minor, https://insite.iitmandi.ac.in/circulars/show.php?ID=F.No.IITMandi/Acad/BoA/2023/5011-15
18. Minor in Robotics, https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Acad/BoA-57/2024/12242-46
19. Minor in Physics, https://insite.iitmandi.ac.in/circulars/show.php?

ID=IITMandi/Acad/BoA-54/2024/8051-55

20. Additional courses for Minor in Management, https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Acad/BoA-54/2024/8066-71

21. Minor in Intelligent Systems, https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/RO-01/2018/6552-55

22. Addition of courses for Minor in Management, https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Acad/BoA-54/2024/8072-77

23. https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Acad/Senate/2020/16319-324

11 Specialization

11.1 A specialization is intended for a student to gain expertise in a specific area in their major B.Tech./B.S. discipline.

11.2 A specialist basket of at least 15 credits is identified for each Specialization. Such a course basket may rest on one or more foundation courses. A basket may have sequences within it, i.e. advanced courses may rest on basic courses in the basket. In order to successfully complete a Specialization, a student needs to take at least 15 credits with a CGPA of 7.0 out of the courses defined in that Specialization basket.

11.3 The name of the Specialization will appear on the Transcript and the degree certificate of the student.

11.4 On completion of Specilization, a student would be awarded a degree of B. Tech in . . . with Specialization in . . ..

References

1. Specialization, https://insite.iitmandi.ac.in/circulars/show.php?ID=F.No.IITMandi/Acad/Senate/2023/232-236

12 Honours

12.1 Students admitted to B.Tech./B.S. program can opt for Honours degree during the fourth or fifth semester if they did not earn any ‘F’ grade till fourth or fifth semester.

12.2 B.Tech./B.S./B.Tech.-M.Tech. Students must complete 8-credits of MTP- 1 &

MTP-2: Evaluation of Major Technical Project should be done in their own (parent) discipline. Since the students of integrated dual degree leading to B.Tech-M.Tech., B.S.-M.S. are required to do PGP, the requirement of 8 credits of MTP is waived off. Grades in MTP should be 'B' or above.

12.3 For Second Major students, MTP should be in the parent branch only.

12.4 Student should not have received an 'F' grade throughout the program.

12.5 On fulfilling the above relevant requirements, student can obtain the Honours degree by satisfying either of the modes below:

(a) **Mode A:** Have a CGPA of 8.5 or more out of the total 160 credits completed

(b) **Mode B:** Have a CGPA of 8.0 or more out of the total 160 credits completed along with

Either an original research article published/accepted in a prestigious SCI/SCIE journal OR Patent granted in relevant discipline (i.e 160 credits of B.Tech or 163 credits for BS + one SCI/SCIE Journal Article/Patent Granted as per guidelines below:

"In case of student is not eligible for Honours degree and he/she has accepted/published research article (SCI/SCIE Journal), the MTP Evaluation Committee may recommend for additional work during MTP-1 evaluation and can be graded by school/centre committee." MTP evaluation committee may also recommend the work for MTP-1, if found suitable.

Patent's relevance to discipline will be judged by MTP evaluation committee.

12.6 Honours degree would be awarded as follows -

i. For B.Tech. / B.S. students: B.Tech. (Honours) / B.S. (Honours) in

ii. For IDD students: B.Tech. (Honours) and M.Tech. / B.S. (Honours) and M.S.

iii. For B.Tech. Second Major students: B.Tech. (Honours) in with Second Major in

12.7 Guidelines for considering Journal articles/Patent granted:

(a) Article should be submitted and accepted during student registration at IIT Mandi and should be declared by student to Academic office (duly recommended by supervisor/FA/Chairperson) before the last date of Grade submission of 8th Semester.

(b) Research article/patent should be published with IIT Mandi affiliation.

(c) Faculty mentor may decide the contribution/sharing of credits for the research article/patent.

References

1. 10th Senate (10.7)
2. 11th Senate (11.6, 11.8)
3. 39th Senate (39.7)
4. https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Acad/Senate/2023/2067-71
5. https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/RO-01/ 2016/5906-11
6. https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMANDI/RO-01/ 2016/7803-06

13 Second Major

13.1 A B.Tech./B.Tech.- M.Tech. IDD student can opt to major in a secondary discipline by completing its core and elective courses by spending an extra year.

13.2 Eligibility Criteria and Application Process

13.2.1 CGPA ≥ 7.0, no more than one 'F' grade at the time of application

13.2.2 Application period would be end of

i. 6th semester for B.Tech. students

ii. 8th semester for B.Tech. - M.Tech. IDD students

13.2.3 Application must be recommended by the FA

Respective schools will decide on the number of seats for specific each year, based on various factors.

13.3 A committee would be constituted by the Dean (Academics) to decide the number of students to be admitted into the Second Major program. Students' applications would be considered on a merit basis using the CGPA at the time of application and other conditions as laid by the

committee and / or respective school.

13.4 Extra Coursework

13.4.1 A student needs to complete 36-40 credits of extra courses from a specified basket of courses consisting of DC and DE courses from the second discipline. This basket of courses is decided upon the School Chair of the respective discipline. These credits are in addition to 160.

13.4.2 These extra courses are to be done after 5th semester.

13.4.3 Fees for UG and PG are different. Fees for B. Tech, B. Tech with second major, B. Tech part of IDD etc. are same as that of B. Tech fees. IDD students will pay M. Tech students' fee during their final year.

13.4.4 A maximum of 12 FE credits may be used from the parent program to complete the extra credits required for the second major. In this case, additional 24-28 credits need to be completed from the second major. The remaining FE credits from the parent program should be used towards courses that do not count towards the second major basket requirement. However, these Free Elective Courses must be compensated.

13.4.5 Students may start doing these extra courses (even before they officially enrol into a Second Major program) and count them towards the Second Major requirements if they are accepted into this program, from sixth semester.

13.4.6 Courses that are a part of DC/DE/HSS requirements for the parent discipline cannot count towards the second major requirement.

13.4.7 Courses that count towards the second major can't be taken in P/F mode

After the successful completion of the extra coursework, the student would be awarded a joint degree as B.Tech./B.Tech - M.Tech. in <Parent Branch> with second Major in <Secondary Branch>. A single transcript with all courses of B.Tech. and second major would be provided, with a single CGPA calculated over all the courses as per the institute norms.

13.5 Exit from Second Major

13.5.1 Voluntary termination/exist from the program is not allowed.

13.5.2 However, a student would be terminated from the second major program if he/she gets 2 or more 'F' grades in the coursework for the program.

13.5.3 In case of termination, the extra coursework done can be counted towards the parent program (if required) and degree of the parent program can be awarded if the student has completed the minimum requirements for the parent program.

13.6 B.Tech. students enrolled in the Second Major program will compete with regular B.Tech. students graduating in the same year for all the Convocation medals.

13.7 B.Tech. (Honours) program will only be applicable to the parent Major discipline, and not in the second Major discipline.

13.8 A student cannot undertake a second Major and minor in the same discipline.

13.9 The student has to do MTP in the parent branch / discipline only. He/she cannot do MTP in outside parent branch / discipline. If the student does MTP in second major, it should be counted under Free Electives.

13.10 Student can do courses under second major during seventh to tenth semesters.

13.11 If student is undergoing IDD+ Second major, M. Tech part of IDD has to be done in the 6th year. Once the student enters the M. Tech, he/she cannot take any courses below 5 level. The student may need to pay B. Tech fee till fifth year. During sixth year, the M. Tech fee is applicable. Also, student is eligible for fellowship, as per the norms of M. Tech.

13.12 Before going to M. Tech part (wherever applicable), all the courses related to B. Tech must be completed. Once a student enters M. Tech part, B.Tech courses cannot be taken. Students should finish all the IC, DC and DE requirements of B. Tech / B. Tech with second major / B. Tech part of B. Tech - M. Tech before converting to the M. Tech programs.

References:

1. https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Acad/Senate/2021/3255-58
2. https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Acad/Senate/2022/1115-18
3. https://insite.iitmandi.ac.in/circulars/show.php?ID=F.No.IITMandi/Acad/Senate/2022/3667

14 Semester Exchange

14.1 IIT Mandi has memorandum of understanding (MoU) for semester exchange visits with some eminent academic institutions in India and abroad. Selection of candidates for such exchange visits will be done through a competitive process.

14.2 Selected students can go on exchange visit for one or two semesters. If the student goes on semester exchange visits for two semesters, these two semesters can be contiguous.

14.3 No student exchange visit will be allowed during the final (normally eighth or tenth or twelfth) semester.

14.4 Some of the signature courses of IIT Mandi (Foundations of Design Practicum, Design Practicum, ISTP, MTP and any others that are notified from time to time) must be completed at IIT Mandi. This is so as to preserve the character of IIT Mandi B.Tech. degree.

14.5 The semester exchange programs can only be undertaken with those institutes with whom IIT Mandi has an MoU for such visits.

14.6 Credits and grades earned during semester exchange visits will be converted to IIT Mandi equivalent credits and grades as per the Senate approved conversion criteria in each case.

14.7 Committee notified / authorized by the Senate confirm the equivalence of courses done during the semester exchange.

14.8 Attendance Rules for Semester Exchange Students

14.8.1 The students are permitted to register for the ongoing semester's courses at IIT Mandi, however, their attendance will count from the day they report to the institute. They need to fulfil the attendance criterion specified by the institute once they join the campus in person.

14.8.2 Since the students miss significant portion of the course before physically joining the course, instructors may impose 100% attendance, excluding medical absence.

14.8.3 The students may be provided with the video recordings of the classes (if available/made available), link for online classes, or equivalent courses on NPTEL/SWAYAM etc. The student(s) may work with the instructor and FA to identify the online courses, if available. Students will be attending the lectures / watching the lectures online till they are back on campus.

14.8.4 The mid sem exams for those students must be conducted during the makeup slots. They have to attend the end semester exam, as per the regular schedule. Awarding midsem marks on pro-rata basis of end semester exam is prohibited.

References

1. Semester Away, 7th and 8th Senates (7.8, 8.8)
2. Internships in Foreign industries, 20th Senate (20.10)
3. Alto University Grade Conversion, https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Acad/Notf./2017/DS-7597-99
4. ECTS to IIT Mandi, https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/AR(Academics)/2013-14/325
5. TU9 to IIT Mandi, https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/AR(Academics)/2014-15/737
6. Kyushu to IIT Mandi, https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Academics/Notf./2023-24/3482-86
7. NTNU to IIT Mandi, https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Academics/Notf./2023-24/3487-91
8. Attendance for semester exchange students, https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/SM-42/2024/833-41

15 Conversion to Integrated Dual Degree

15.1 A B.Tech. student can opt for an Integrated M.Tech. Dual Degree in the same discipline by spending an extra year and completing relevant coursework.

15.2 Criteria and Application Process

15.2.1 The duration of the dual degree programme is 5 years from the time the student enters IIT Mandi. Both degrees (B.Tech and M.Tech.) will be awarded at the end of the fifth year subject to satisfying necessary credit requirements. This duration (in general) will be +1 one for all others (Second Major, etc.)

15.2.2 All students that convert will be given MHRD HTRA in fifth year (or final year) which is at par with that given to students of M.Tech. program and will have to pay the fees as applicable to M.Tech. students.

15.2.3 The option to convert will be given at the end of the sixth semester (after grades are announced) till the beginning of the eighth semester (by course add / drop deadline).

15.2.4 A formal application with a supporting letter from the Faculty Advisor and School Chair must be made.

15.2.5 Conversion after add/drop in the eight semester will not be allowed.

15.2.6 Only students with no backlogs or incomplete grades are eligible.

15.2.7 Only students with a CGPA of 8 or better are eligible. For Honours students, the same CGPA rules apply even after conversion to receive a B.Tech. (Honours) + M.Tech. degree.

15.2.8 By the end of eight semester, all degree requirements to get B.Tech./B.Tech. (Honours) must be completed.

15.2.9 A criterion for getting HTRA is that students must have CGPA≥8.00 at the end of 8th semester or with valid GATE Score.

15.2.10 For students with CGPA less than 8 at the end of sixth or seventh semester:

15.2.10.1 Conversion is not possible.

15.2.10.2 Interested students are encouraged to appear for GATE for admission to the regular M.Tech. programme.

15.2.11 Extra Course Work

A total of 46 credits (5 or above level courses) must be completed (in addition to regular B.Tech./B.Tech. (Honours)/ Second Major degree requirements) to be awarded a dual degree M.Tech.

15.2.12 These credits are over and above 160 (for B. Tech), 163 (for BS) or others (as per the program).

15.2.13 PGP is must. MTP may be waived off as per the institute norms.

15.2.14 For specialization during M. Tech, schools will specify the number of credits under DC and DE.

15.2.15 Any extra course credits earned during B.Tech. program (5 or higher level) beyond what is required for the B.Tech./B.Tech. (Honours) degree (DC/DE provided they are in specialization basket), may be counted towards course credit requirements for M.Tech. degree.

15.2.16 The credit requirement into coursework and dissertation is as per the individual streams of M.Tech. awarding the degree. However following requirements should also be fulfilled:

15.2.16.1 All course work must ideally be completed within the fifth year.

15.2.16.2 Core courses in the stream of specialization must be completed.

15.2.16.3 Credit required for dissertation in the stream of specialization must be completed.

15.2.16.4 The School / centre will specify the course work under

specialization, subjected to the approvals of BoA and / or Senate.

15.2.16.5 In case the student decides to leave prior to completing the M.Tech. de- gree requirements, he/she may be awarded a B.Tech./B.Tech(Honours) degree provided all the necessary credit requirements are complete.

15.2.17 No reversal to B. Tech / B. Tech (Honors).

15.2.18 Rules for Honours degree would be as mentioned.

16 Conversion to M.S. Integrated Dual Degree

16.1 A B.S. student can opt for an Integrated M.S. Dual Degree in the same discipline by spending an extra year and completing relevant coursework.

16.2 Eligibility Criteria and Application Process

16.2.1 CGPA ≥ 8.0, with no 'I'/'F' grade at the time of application

16.2.2 Application period would be from the end of 6th semester to the be- ginning of 8th semester. Conversion after add/drop in the 8th semester will not be allowed

16.2.3 A formal application with a supporting letter from the Faculty Advisor and School Chair must be made.

16.3 Extra Coursework

16.3.1 A total of 38 credits must be completed as per requirements of the pro- gram (in addition to regular B.S./B.S. (Honours) degree requirements).

16.3.2 Any extra course credits earned during B.S. program beyond what is required for the B.S./B.S. (Honours) degree, may be counted towards course credit requirements for M.Tech. degree.

16.3.3 The Faculty Advisor School can use their discretion in deciding course work.

16.3.4 All course work must ideally be completed within the fifth year.

16.4 By the end of 8th semester, all degree requirements to get B.S./B.S. (Honours) must be completed. After the successful completion of the extra coursework, the student would be awarded a joint degree as B.S - M.S. in the respective discipline.

16.5 In case the student decides to leave prior to completing the M.S. degree requirements, he/she may be awarded a B.S./B.S. (Honours) degree provided all the necessary credit requirements are complete.

16.6 Rules for Honours degree would be as mentioned.

17 Conversion to M. Tech (R)

17.1 Extra 15-24 Credits of course work and 60 credits of research dissertation.

17.2 Rule of M.Tech-R will be applicable for the degree after UG degree requirement completion.

References

1. https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Acad/Senate/2020/13431-35
2. https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Acad/Senate/2022/4066-69
3. https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Acad/Senate/2022/1115-18
4. https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/RO-01/ 2018/162-66

18 Eligibility for Award of the UG Degree

18.1 B.Tech. Degree

A student should be declared to be eligible for award of the B.Tech. degree if he/she has:

18.1.1 Registered and successfully completed all the requirements as per the curriculum of the program.

18.1.2 Acquired a minimum of 160 credits satisfying all the course basket requirements and projects mentioned and completed all other compulsory requirements such as the Internship, DC, DE, FE etc. within the stipulated time as mentioned.

18.1.3 Satisfied the minimum residence requirement of eight (8) semesters. “Residence” implies being formally registered for academic work. Any time on a semester exchange at another institute/university, with the approval of the Dean (Academics), shall count towards this residence requirement.

18.1.4 Secured a minimum cumulative grade point average (CGPA) of 5.0 in passed subjects.

18.1.5 No dues to the Institute, Hostels, Libraries, NSS/NSO/H&T, Clubs, Dean (Student) office etc.

18.1.6 No disciplinary action is pending against him/her.

18.2 B.Tech. (Honours) Degree

18.2.1 B.Tech./B.S./B.Tech.-M.Tech. Students must complete 8-credits of MTP- 1 & MTP-2: Major Technical Project in their own (parent) discipline.

18.2.2 Student must do MTP-1 & MTP-2: Major Technical Project and DP-301P: Interactive Socio-Technical Practicum (ISTP) and obtain a grade of 'B' or above in these courses.

18.2.3 Student should not have received 'F' grade throughout the B.Tech. program.

18.2.4 Have a CGPA of 8.5 or more out of the total credits completed

OR

Have a CGPA of 8.0 or more out of the total credits completed along with either an original research article published/accepted in a prestigious SCI/SCIE journal OR Patent granted in relevant discipline (i.e 160 credits of B.Tech/BS + one SCI/SCIE Journal Article/Patent Granted

References

1. https://insite.iitmandi.ac.in/circulars/show.php?ID=IITMandi/Acad/Senate/2023/2067-71
2. BS ordinance
3. R.28 B. Tech Ordinance
4. M. Tech and M. Sc ordinance
5. M. A ordinance
6. M. B. A ordinance

19 Award of Convocation Medals

The following medals are awarded during the Convocation Ceremony to the graduating UG students who fulfill the eligibility criteria

19.1 **President of India Gold Medal**: This award is for outstanding academic performance among the batch of B.Tech. / B.S. students graduating. It shall be awarded to the graduating student with the best overall academic record in the B.Tech. / B.S. program, with Honours Students given preference.

19.2 **Director's Gold Medal**: This award is for outstanding all-round proficiency. It shall be awarded to the graduating student with a good academic record and proven leadership and excellence in extracurricular activities in all the four years of the B.Tech./B.S. program.

19.3 **Institute Silver Medals**: This award is for outstanding academic performance among the students graduating in a specific academic discipline. It shall be awarded to the graduating student with the best academic record, in a given B.Tech./B.S. discipline, with Honours Students given preference.

19.4 **Balasundaram Endowment Prize in German**: This award is for outstanding performance in the Minor in German Language from among the batch of B.Tech./B.S. students graduating and opting for the said minor. It shall be awarded to the graduating B.Tech./B.S. student with a Minor in German Language and having the best Grade Point Average in the courses comprising the minor. Instituted by: Prof. B. Subramanian in memory of his father Mr. G.R. Balasundaram.

19.5 **Rani Gonsalves Memorial Medal**: This award is for the female B.Tech./B.S. student who through her leadership and her exemplary accomplishments in academic and extracurricular activities, consistently throughout her B.Tech./B.S., has advanced the status of women in B.Tech. / B.S. program.

19.6 **Outstanding Academic Achievement Award**: A program-wise award for outstanding academic excellence will be given at the 4th year for the students seeking Second Major in addition to a 4-year B.Tech. degree, based on their performance in their parent program.

19.7 The following are the eligibility and candidature for awards for all the undergraduate programmes - If the number of graduating students in a particular discipline is:

19.7.1 Less than ten (10), then no overall academic prize (such as the Outstanding Academic Award or Institute Silver Medal) will be awarded.

19.7.2 More than or equal to 10 but less than 15, then the graduating student with the best overall academic performance will be awarded the Outstanding Academic Award in that discipline.

19.7.3 More than or equal to 15, then the graduating student with the best overall academic performance will be awarded the Institute Silver Medal in that discipline.

19.8 After the successful completion of the program, applications are invited from eligible students for the awards before the Convocation.

19.9 The Chairperson, Senate constitutes an Awards & Prizes Committee for every Convocation. The Committee evaluates all the applications received for the medals and recommends the awardees to the Senate.

References

1. 5th Senate (5.7)
2. 11th Senate (11.8(ii))
3. 18th Senate (18.9A)
4. Kiran Bala Award, 34th Senate (34.8)
5. Rani Gonsalves Award, 14th Senate (14.7)

20 Branch Change

There is no branch change option available at IIT Mandi. This facility has been discontinued with respect to B. Tech 2024 admitted batch.

21 Termination form UG Program

21.1 **Unsatisfactory Academic Performance:** A student is in good academic standing if he/she stays abreast of the credit requirement at any particular stage of his/her academic program and if his/her CGPA is at least the minimum required for graduation (5.0).

21.2 Any student who is not in good academic standing is performing unsatisfactorily or underperforming. Seriously unsatisfactory academic performance will attract strictures such as “Academic Warning” and “Academic Probation”, accompanied by conditions laid down by the Senate. If the student fails to meet these conditions, his/her program at IIT Mandi may be terminated prematurely.

21.3 A student will be placed on Academic Warning if, in any semester, any two of the following conditions hold:

21.3.1 he/she fails to secure at least 15 credits

21.3.2 his/her SGPA is less than 5.0

21.3.3 his/her CGPA is less than 5.0

21.4 During the term of the Academic Warning, a student will not run for or hold any office concerning any student activity.

21.5 A student will be placed on Academic Probation if, at the conclusion of any semester, he/she attracts a second consecutive Academic Warning or if any two of the following conditions hold:

21.5.1 he/she fails to secure at least 12 credits

21.5.2 his/her SGPA is less than 4.0

21.5.3 his/her CGPA is less than 4.0

21.6 A student on Academic Probation should sign an undertaking, countersigned by his/her parent, to the effect that his/her academic program will be terminated and he/she will cease to be a student of IIT Mandi if he/she fails to fulfil the terms of the probation.

21.7 The terms of the probation shall be that, in the following semester:

21.7.1 he/she shall secure at least 15 credits

21.7.2 his/her SGPA should be at least 5.0

21.7.3 any other special condition(s) laid down by the Senate

21.8 During the term of the Academic Probation, a student shall not run for or hold any office concerning any student activity

21.9 Due to Non-Registration / Enrolment

If the student does not register for courses / semester / reports at the institute till permitted dates of late fine registration, his/her registration from the program will be cancelled and the name will be struck off from the rolls of the Institute, without any further notice.

21.10 Due to Absence

If a student registered in the first year of the programme is continuously absent from the classes for more than three weeks without informing the Course Instructors, Faculty Advisor, the Instructors shall immediately bring it to the notice of school/centre chair, for informing the Academic Section. The names of such

students shall be removed from the Institute rolls and such absence during first year will render the student ineligible for re-admission.

22 Miscellaneous Points

22.1 The date of initial registration is the date on which a student formally registers for a program for the first time. This date shall be considered as the date of joining the programs for all intents and purposes.

22.2 A student may be granted scholarship/medals/assistantship etc. as per the regulations specified by the Senate or BoG of the institute or GoI. The rules may be modified from time to time.

22.3 The procedure for Admissions shall be decided by MoE / GoI or their representatives.

22.4 In case all the reserved seats for SC / ST / PC category are not filled even with relaxed admission norms, the students in this category who satisfy certain minimum norms specified for this purpose may be offered admission to one-year preparatory programme as per JoSAA norms. On successful completion of the preparatory course, these students may be offered direct admission against the unfilled quota of seats as provided for in the regulations.

22.5 The award of a Degree to an eligible candidate shall be made in accordance with the procedure laid down in the regulations.

22.6 A student admitted to IIT Mandi is governed by the rules and regulations of IIT Mandi and various subbodies of IIT Mandi, such as hostel, student's gymkhana, academic rules etc.

22.7 Notwithstanding anything contained in various Ordinances, no regulations shall be made in contravention of the decision of the BoG or Senate of the Institute and/or the direction of the Government of India.

22.8 In special circumstances, Chairman Senate on behalf of Senate approve amendment, modification, inclusion or deletion of any of the rules in the ordinances, which are necessary for smooth operation of a program. All such changes shall be reported to the Senate in the next meeting.

22.9 Maximum duration of the program includes the period of semester leave, absence and different kinds of leaves permissible to a student.

22.10 Maximum duration for IDD Program is 7 years and 8 years for Second Major+IDD students.

22.11 In case of any dispute, difference of opinion in interpretation of Regulations these regulations or any other matter not covered in these regulations, the decision of the Chairman, Senate and / or Senate shall be final.

23 Power to Modify

Notwithstanding all that has been stated above, the Senate and the Chairman Senate have the right to modify any of the above regulations from time to time.

Recommendations of the committee constituted for preparing guidelines for the issuance of Post-Graduate Diploma to M.Sc/M.Tech/M.A. students who exit their programs after completion of one year.

The committee recommends the following guidelines for issuing postgraduate diplomas to M.Sc/M.Tech./MA students who exit their program after completion of one year.

1. A Post-Graduate Diploma in the program of study can be awarded to the M.Sc./M.Tech./MA students after the completion of one year/2 semesters, subject to the fulfillment of the following criteria:
   a) The student has completed all the credit requirements of 2 semesters specified in the program curriculum
   b) The student should have earned a minimum CGPA of 5 in the 2 semesters
   c) The fulfilment of the above two criteria by the student should be verified by the Faculty Advisor/Course Coordinator of the program, and the School Chair should recommend the issuance of the diploma.
   d) The issuance of the diploma should follow all the criteria applicable to other academic degrees, such as clearance of dues, Senate approval etc.
   e) The title of the Post-Graduate Diploma can be 'Post-Graduate Diploma in *the program of study*'. For example, 'Post-Graduate Diploma in Chemistry', 'Post-Graduate Diploma in Physics', 'Post-Graduate Diploma in Development Studies', etc.
   f) The Post-Graduate Diploma award should include: a) Post-Graduate Diploma Certificate, and b) Transcript showing all the courses completed by the student in 1 year/2 semesters and the CGPA earned. These documents should be provided to all eligible students who leave the program after one year or two semesters.
   g) The institute may consider registering with the 'Academic Bank of Credit' (ABC), a national-level facility for facilitating the academic mobility of students across HEIs in the future.

Dr. Qaiser Jahan	Dr. Himanshu Misra	Dr. Neha Kaushik	Prof. Pradeep C. Parameswaran
(Member)	(Member)	(Member)	(Chair)

To,
Dean Academics