

उनतालीसवीं सिनेट बैठक का कार्यवृत्त

**MINUTES OF THE 39th SENATE MEETING OF
IIT MANDI**

25th April, 2023



भारतीय प्रौद्योगिकी संस्थान मण्डी
कमांद – 175075, हिमाचल प्रदेश

**INDIAN INSTITUTE OF TECHNOLOGY MANDI
KAMAND – 175075, HIMACHAL PRADESH**

**INDIAN INSTITUTE OF TECHNOLOGY MANDI
KAMAND, HIMACHAL PRADESH**



39th SENATE MEETING OF IIT MANDI

TUESDAY, 25th April, 2023

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INDIAN INSTITUTE OF TECHNOLOGY MANDI

Minutes of the 39th Senate Meeting of IIT Mandi held on 25th April, 2023 at 10:30 AM in Conference Room, C.V. Raman Guest House, IIT Mandi, Kamand.

The following were present:

In the Chair

Prof. Laxmidhar Behera, Director, IIT Mandi

Members:

Prof. Siddhartha Mukhopadhyay, Dept. of Electrical Engineering, IIT Kharagpur
Prof. Sandeep Verma, Dept. of Chemistry, IIT Kanpur & Secretary (SERB).
Prof. Chayan Kanti Nandi, Professor, SCS and Dean (Resource Gen. and Alumni Relations), IIT Mandi
Prof. Pradeep C. Parameswaran, Professor & Chairperson, SCS, IIT Mandi
Prof. Rajeev Kumar, Professor, SMME and Dean (I&S), IIT Mandi
Prof. Rahul Vaish, Professor, SMME and Dean (Academics), IIT Mandi
Prof. Arti Kashyap, Professor, SPS and SCEE (dual appointment), IIT Mandi
Prof. Manoj Thakur, Professor, SMSS and Chairperson, SoM, IIT Mandi
Prof. Syed Abbas, Professor, SMSS & Dean (SRIC & IR), IIT Mandi
Prof. Rajendra K. Ray, Professor, SMSS, IIT Mandi
Prof. Aniruddha Chakraborty, Professor, SCS, IIT Mandi
Prof. Venkata Krishnan, Professor, SCS, IIT Mandi
Dr. Viswanath Balakrishnan, Dean (F&A), IIT Mandi
Dr. Hitesh Shrimali, Dean (Students), IIT Mandi
Dr. Samar, Chairperson, SCEE, IIT Mandi
Dr. Atul Dhar, Chairperson, SMME, IIT Mandi
Dr. Shyamasree Dasgupta, Chairperson, SHSS, IIT Mandi
Dr. Muslim Malik, Chairperson, SMSS, IIT Mandi
Dr. Shyam Kumar Masakapalli, Chairperson, SBB, IIT Mandi
Dr. Dericks P. Shukla, Chairperson, SCENE, IIT Mandi
Dr. Prosenjit Mondal, Co-ordinator, Bio-X Centre, IIT Mandi
Dr. C.S. Yadav, Co-ordinator, AMRC, IIT Mandi.
Dr. Varun Dutt, Chairperson, IKSMHA, IIT Mandi
Dr. Rahul Shrestha, Associate Professor, SCEE, IIT Mandi
Dr. Satyajit A. Thakor, Associate Professor, SCEE, IIT Mandi
Dr. Deepak Swami, Associate Professor, SCENE, IIT Mandi
Dr. Kala Venkata Uday, Associate Professor, SCENE, IIT Mandi
Dr. Bhaskar Mondal, Assistant Professor, SCS, IIT Mandi
Dr. Satvasheel R. Powar, Associate Professor, SMME, IIT Mandi
Dr. Amit Prasad, Associate Professor, SBB, IIT Mandi
Dr. Surya Prakash Upadhyay, Associate Professor, SHSS, IIT Mandi
Dr. Nitu Kumari, Associate Professor, SMSS, IIT Mandi
Dr. Puran Singh, Associate Professor, SoM, IIT Mandi.
Dr. Narendra Kumar Dhar, Assistant Professor, SCEE & CAIR, IIT Mandi
Mr. Hemachandra Bhat, General Manager and Practice Head, Robotics Platforms, Wipro
Dr. P. Anil Kishan, Associate Dean (Courses), IIT Mandi
Dr. Amit Jaiswal, Associate Dean (Research), IIT Mandi
Dr. Tushar Jain, Head, CCE, IIT Mandi
Mr. Naresh Singh Bhandari, Deputy Librarian, IIT Mandi
Dr. Tulika Srivastava, Associate Professor, SBB, IIT Mandi
Mr. Suresh Rohilla, Deputy Registrar (Academics), IIT Mandi
Student Research Affairs Secretary, IIT Mandi (Special Invitee)
Student General Secretary, IIT Mandi (Special Invitee)

Student Academic Affairs Secretary, IIT Mandi (Special Invitee)
 Prof. Satinder Sharma, Professor, SCEE, Dean (Faculty), Co-ordinator C4DFED, and Registrar I/c & Secretary,
 Senate IIT Mandi

Following Senate members/Special invitees could not attend the meeting due to prior commitments:

Prof. Binay Kumar Pattnaik, Dept. of HSS, IIT Kanpur
 Prof. Prem Felix Siril, Professor, SBS, IIT Mandi.
 Prof. Suman Kalyan Pal, Professor & Chairperson, SPS, IIT Mandi.
 Prof. Bharat Singh Rajpurohit, Professor, SCEE, IIT Mandi.
 Prof. Subrata Ghosh, Professor, SCS, IIT Mandi
 Dr. Amit Shukla, Chairperson, CAIR, IIT Mandi
 Dr. Jinesh Machchar, Assistant Professor, SCEE, IIT Mandi
 Dr. Bindu Radhamany, Associate Professor, SPS, IIT Mandi.
 Dr. Arnab Bhavsar Vinayak, Associate Professor, SCEE & IKSMHA, IIT Mandi.
 Mr. Rajesh Sinha, Chief Scientist & Head- Smart Machines Research Program, TCS.
 Dr. Devika Sethi, Assistant Professor, SHSS, IIT Mandi

Following faculty attended the meeting as an Invitee:

Dr. Srinivasu Bodapati, Assistant Professor, SCEE, IIT Mandi.

The Chairman, Senate extended a warm welcome to all the Senate members and Invitees attending the 39th Senate meeting of the Institute. He welcomed Prof. Aniruddha Chakraborty, newly appointed as Dean (Academics) to the Senate and appreciated the services rendered by Prof. Rahul Vaish, outgoing Dean (Academics).

Thereafter, following agenda items were taken up.

Item No. 39.1: To confirm the minutes of the 38th Senate meeting held on 8th February, 2023.

The minutes of the 38th Senate meeting held on 8th February, 2023 at IIT Mandi were circulated to members of the Senate on 11th April, 2023 (through email) for comments, if any. No comments have been received on the minutes. Therefore, minutes of the 38th Senate meeting held on 8th February, 2023 were confirmed as circulated.

Item No. 39.2: To receive a report on the actions taken for the decisions taken in the 38th Senate meeting held on 8th February, 2023.

The Senate noted the actions taken on the decisions taken in its 38th meeting held on 8th February, 2023.

Item No. 39.3: To consider the proposal of BS credit structure.

Prof. Pradeep Parameswaran, Chair SCS presented the proposal of BS credit structure in BS Chemical Sciences. After discussion, the Senate resolved to approve the proposal as placed at **Annexure – A; Page No. 12 to 35.**

Item No. 39.4: To consider the proposal of B.Tech. in General Engineering branch.

Dr. Satvasheel Powar, presented the proposal to start a new branch in B.Tech. in General Engineering. School is advised to finalize at least two specialization options (within a year) for students to spend a year with a

collaborating institute. After discussion, the Senate resolved to approve the proposal as placed at **Annexure – B; Page No. 36 to 42.**

Item No. 39.5: To consider the proposal of five years Integrated MBA programme.

Dr. Manoj Thakur, Chairperson, SoM presented the proposal to start a five years Integrated MBA programme. After discussion, the Senate resolved to approve the proposal as placed at **Annexure – C; Page No. 43 to 55.**

Item No. 39.6: To consider the guidelines for eligibility of Ph.D. programme and its scholarship.

Dr. Amit Jaiswal, Associate Dean (Research), presented the proposal of guidelines for eligibility of Ph.D./M.Tech (Research) programmes and their scholarships. After discussion, the Senate approved the proposal with minor modifications as given below:

1. General eligibility criteria for Ph.D./M.Tech. (Research) Admission in all Schools/Centres:

Qualifying Degree:

1. Master's or equivalent degree in Engineering/Technology
2. Bachelor's degree in Engineering/Technology*
3. Master's or equivalent degree in Science/Arts/Commerce/Management (or allied subjects) *

***For qualifying degree listed under (2) & (3) candidates must also fulfil ONE of the following additional requirements:**

- a) Qualified GATE / NET including lectureship (Assistant Professorship) or any other equivalent National level examination.
- b) Selected through a National level examination conducted by MoE or its agencies /Institutions such as UGC/ IIT/ IISc. / IISER/ IIIT etc.
- c) Minimum of TWO years of professional experience (acquired after obtaining the qualifying degree and completed before the starting of the semester in which admission is sought)

***Exemption from mandatory requirements of Valid GATE or National Level examination:**

- (i) B.Tech/B.E./B.S. (or equivalent) degree from CFTI (Centrally Funded Technical Institute)/ any of the top 100 institutes according to NIRF ranking (overall category) at the time of application / any Himachal Pradesh Govt. Institutions/Universities, with CGPA/CPI at least 7.5 (on a scale of 10) or equivalent.
- (ii) BS-MS/M.Sc/MA/MBA/equivalent from IITs, IISERs, IISc, IIMs or any of the top 100 institutes according to NIRF ranking (overall category) at the time of application with a CGPA/CPI of at least 7.5 (on a scale of 10) or equivalent.
- (iii) NIRF Ranking (within top 100) should be in overall category granted for the year during which admission is sought.

*Accordingly, similar exemption criteria will be applicable for M.Tech. (Research)/MA (Research)/MS (Research) programmes.

2. Financial Support:

Students joining the Ph.D. Regular program may be considered for the HTRA Fellowship (subjected to availability of fund) based on the above admission norms, if recommended by the selection committee.

Based on these approved guidelines, the ordinance and regulations for PhD/M.Tech (Research) at IIT Mandi may be revised.

Item No. 39.7: To consider the proposal of Committee on guidelines of B.Tech. (Honours) in UG Programme.

Dr. Shyam K Masakapalli, Committee Chair, presented the proposal on guidelines of B.Tech. (Honours) in UG programme. After discussion, the Senate approved the proposal with minor modifications as placed below:

Eligibility for Award of the B.Tech. (Honours), B.S (Honours) Degree

- 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.
- B.Tech./B.S./B.Tech. Students must complete 8-credits of DP401P & DP402P: Major Technical Project 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.
- Student should not have received an 'F' grade throughout the program.
- On fulfilling the above relevant requirements, student can obtain the Honours degree by satisfying either of the modes below:
 - **Mode A** : Have a CGPA of 8.5 or more out of the total credits completed
 - **Mode B** : 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 Q1 SCI journal or Patent granted in relevant discipline (i.e 160 credits of B.Tech/BS + one Q1 SCI Journal (Q1 at the time of submission/acceptance) Article/Patent Granted as per guidelines below:

"Incase of student is not eligible for Honours degree and he/she has accepted/published research article (SCI Journal) on the recommendation of MTP evaluation Committee. The Committee may recommend for additional work during MTP-1 evaluation and can be graded by school/centre committee."

- **Honours degree would be awarded as follows -**
 - a. For B.Tech./B.S. students: B.Tech. (Honours) / B.S. (Honours) in <Branch>
 - b. For IDD students: B.Tech. (Honours) and M.Tech. / B.S. (Honours) and M.S.
 - c. For B.Tech. Double Major students : B.Tech. (Honours) in <Parent Branch> with Second Major in <Second Branch>

Guidelines for considering Journal articles/Patent granted:

- Article should be submitted and accepted during student registration in 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.
- Research article/patent should be published with IIT Mandi affiliation.
- Student should be the first author of the journal article. In case of patent granted the student should be one of the main inventors as declared by other co-inventors.

- Same research article/patent will not be considered for academic requirements by more than one student.

Item No. 39.8: To consider the proposal of attendance criteria in classes.

Dr. P Anil Kishan, Associate Dean (Courses), presented the proposal of minimum attendance criteria in each registered course. After discussion, the Senate approved the proposal with minor modifications as placed below:

A student is expected to attend 100% classes, tutorials, practicals etc. However, to accommodate various situations, a minimum attendance criterion of 80% is to be set by the institute.

The senate deliberated to increase the minimum attendance criterion to 80% from the existing 70%. Along with this, senate also approved the following points.

- Senate approved attendance (80%) is the minimum. Individual faculty can set a higher criterion than this. In the case of higher attendance criterion, instructor should inform the students at the beginning of the course.
- Recording of attendance is must for all courses.
- Every faculty, for all courses which he/she is teaching, should record the attendance and maintain the attendance registers.
- It is the student's responsibility to check the attendance periodically. Instructor may/may not post the intermediate attendance.
- Faculty should inform the students about the final attendance status, after all the classes are completed.
- Faculty will share the students' list, with attendance lower than the minimum attendance criterion, with the Academic Section before the end exams.
- A student, with attendance less than minimum specified, will not be permitted for the end exams and 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.
- 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.
- Academic section will inform the parents regarding the failure of meeting the minimum attendance requirement.

Item No. 39.9: To consider the proposal of Thesis credit structure for M.Tech.(R) programme.

Dr. P Anil Kishan, Associate Dean (Courses), presented the proposal of thesis credit structure for M.Tech. (Research) programme. After discussion, the Senate approved the proposal with minor modifications as placed below:

- (i) The students of M.Tech. (Research)/M.Sc. (Research)/MA (Research) programs need to complete 60 thesis credits to fulfill the requirement of the degree in addition to the prescribed course credits as applicable for individual programs.
- (ii) The course name will be "M.Tech. Thesis" with code XX699P, for the M.Tech. (Research)/M.Sc. (Research)/MA (Research) programs where 'XX' represents the relevant school/center/discipline code. The thesis course will appear in the transcript every semester till a thesis is formally submitted.

- (iii) The thesis course needs to be registered by the student every semester until the thesis submission and the supervisor needs to evaluate it as Satisfactory (P)/ Unsatisfactory (F) during grade submission.
- (iv) The course will be shown as 'IP' (in Progress) in the grade report of each semester with awarded performance grade P or F. The total credit for the thesis will be added only in the final grade report. Thesis credit will not be counted towards the grade points (i.e., SGPA/CGPA).
- (v) The supervisor's evaluation of the thesis credit at the end of every semester is in addition to the evaluation by the concerned APC as applicable.
- (vi) If a student of M.Tech. (Research)/M.Sc. (Research)/MA (Research) programs receive 2 (two) 'F' grades (in M.Tech (R)/MS (R)/MA (R) thesis) during the entire program duration, s/he will be terminated.
- (vii) If a student's performance is unsatisfactory on medical grounds, maternity leave, semester withdrawal etc., the student may take approval, through the APC, of the competent authority to drop the thesis credit from that semester.
- (viii) Fellowship duration for M.Tech. (Research)/M.Sc. (Research)/MA (Research) programmes will be of 2.5 yrs. Maximum duration of the program is 3 yrs. Part time/ERP programmes will get one additional year i.e., maximum duration is 4 years.
- (ix) Students should compulsorily complete 15-24 credits (may vary for various specializations) with minimum overall CGPA of 7.00. Students will be graded as same as in UG programs.

Sample of the grade report given below for reference.



Indian Institute of Technology Mandi (GRADE REPORT)

ROLL NO. : S16XXX		PROGRAMME : Master of Technology (by Research)				
NAME : TEST STUDENT		SCHOOL : SCHOOL OF BIOSCIENCES & BIOENGINEERING				
ACADEMIC YEAR/ SEMESTER	SUBJECT CODE	TITLE OF SUBJECT	CREDIT	GRADE OBTAINED	SGPA	CGPA
2016-17 (EVEN)	BY-505	NANOBIOTECHNOLOGY	3	O		
	BY-514	ANALYTICAL BIOTECHNIQUES	3	A		
	BY-518	DIASE BIOLOGY	3	A	9.33	9.33
	RM-600*	RESEARCH METHODOLOGY	1	P		
	BE-699P*	M.TECH. THESIS	60 (IP)	P		
2016-17 (ODD)	CY-554	SCIENCE AND TECHNOLOGY OF NANO MATERIALS	3	A		
	BY515	MOLECULAR BIOTECHNOLOGY	3	A	9.00	9.20
	BE-699P*	M.TECH. THESIS	60 (IP)	F		
2017-18 (EVEN)	BE-699P*	M.TECH. THESIS	60 (IP)	P	0.00	9.20
2017-18 (ODD)	BE-699P*	M.TECH. THESIS	60 (IP)	P	0.00	9.20
2018-19 (EVEN)	BE-699P*	M.TECH. THESIS	60 (IP)	P	0.00	9.20
2018-19 (ODD)	BE-699P*	M.TECH. THESIS	60	P	0.00	9.20
TOTAL CREDITS EARNED & FINAL CGPA			76			9.20

NOTE:

- I. * This course is not considered for final SGPA/CGPA calculations.
- II. Please see overleaf for details of Grading System and SGPA/CGPA calculations.

RESULT: The student has successfully completed all requirements for the award of Doctor of Philosophy Degree.

Date:

Prepared By:

Checked By:

Deputy Registrar
(Academics)

Item No. 39.10: To consider the proposal to establish a new Centre Human-Computer Interaction (HCI) at IIT Mandi.

Dr. Varun Dutt, presented the proposal of establishment of new Centre Human-Computer Interaction (HCI) at IIT Mandi. After discussion, the Senate resolved to recommend the proposal as placed at **Annexure – D; Page No. 56 to 62** to the Board of Governors (BoG) for approval.

Item No. 39.11: To consider the proposal of revision of Comprehensive Examination in Ph.D. programme.

Dr. Shyamasree Dasgupta, Chair SHSS presented the proposal of revision of Comprehensive Examination in Ph.D. programme. After discussion, the Senate approved the proposal with minor modifications as placed below:

"The objective of the Comprehensive Examination is to test the general capability of the research scholar and the breadth of their knowledge in their discipline and depth in areas related to their field of research. A School or Center at IIT Mandi can design its own Comprehensive Examination Guidelines with leading participation of the supervisor or the candidate appearing for the comprehensive examination. The School/Center Guideline for Comprehensive Examination and any changes in the guideline will be prior approved by BoA/Dean Academics. The syllabi, dates, duration of examination, etc. must be communicated to the research scholar at least 02 months prior to the date of examination."

Item No. 39.12: To consider the proposal of revision in Early Induction of M.Tech.(Rsh)/Ph.D. programme for Young Researchers.

Dr. Amit Jaiswal, Associate Dean (Research), presented the proposal of revision in Early Induction of M.Tech. (Rsh)/Ph.D. programme for Young Researchers. After discussion, the Senate approved the proposal with minor modifications as placed below:

During the first ad-hoc senate meeting held on April 2nd, 2011, a proposal was agreed upon to allow for the early admission of B.Tech/Masters students from other universities into MS/PhD programs. It was determined that the specific rules and regulations for this policy would be developed by the Dean (Academics).

In the 39th Senate, it was recommended to:

- revise the MS program to include MTech(R)/ MS(R)/ MA(R).
- The universities mentioned in the original proposal as partnering institutions may be replaced by universities ranked within the top 100 in the NIRF for the corresponding year of admission. NIRF Ranking (within top 100) should be in overall category granted for the year during which admission is sought.

The detailed rules and regulations for this revised program will be developed and presented during the Senate meeting.

Item No. 39.13: To consider the proposal of minor revision in B.Tech. Ordinances and Regulations.

The item was deferred for consideration in subsequent Senate meeting.

Item No. 39.14: To consider the proposal of B.Tech. in Maths and Computing branch.

Dr. Muslim Malik, Chair SMSS presented the proposal to start a new branch in B.Tech. in Mathematics and Computing. After discussion, the Senate

suggested that courses (other than IC) till 2nd year may be of 200/300 level and resolved to approve the proposal with minor modifications as placed at **Annexure – E; Page No. 63 to 70.**

Item No. 39.15: Any other agenda item with the permission of the Chairman, Senate.

With the permission of the Chair, the Senate deliberated on the following points:

- (i) Dr. Srinivasu Bodapati, presented the proposal to start a new branch in B.Tech. in Microelectronics and VLSI. After discussion, the Senate resolved to approve the proposal with minor modifications as placed at **Annexure – F; Page No. 71 to 77.**
- (ii) The Senate has approved the compulsory requirements of 18 talks/seminars per year to all full-time students for the fulfillment of their degree requirements.

Dean (Academics) will present the comprehensive guidelines in subsequent Senate meeting and constitute a committee to prepare guidelines for seminars.

Item No. 39.16: To report decisions/action taken by the Chairman, Senate.

The Senate noted the decisions taken by the Chairman, Senate on behalf of the Senate, as given in the agenda. The senate also noted the following:

- (i) **39.16 (xii)** In addition to the reported withdrawal list, the withdrawal request of the following students was also approved by the Chairman, Senate during 24-04-2023:

Sl. No.	Roll No.	Student Name	School /Branch	Program	Date of Joining	Date of Resignation Accepted
1	D22003	Ashok Kumar	SCEE	Ph.D.	10-08-2022	24-04-2023
2	MB22010	Nikhil Kapoor	SOM	MBA	09-09-2022	24-04-2023
3	V21044	Love Kumar Meena	SCS	M.Sc.	09-08-2021	24-04-2023

- (ii) **39.16 (xv)** In addition to the reported provisional certificate issued to Ph.D., the following students were also issued Provisional Degree Certificate during 24-04-2023:

Sl. No.	Roll No.	Student Name	Program	School	Date of Joining	Provisional Certificate issued on
1	D15044	Rais UI Majid	Ph.D.	SHSS	01-02-2016	24-04-2023
2	D19033	Priyanka Choudhary	Ph.D.	SCS	07-08-2019	24-04-2023

- (iii) **39.17 (xix)** To report the Cancellation of registration from the program during 24-04-2023:

Sl. No.	Roll No.	Student Name	Program	School	Date of Joining	Registration cancelled date
1	D21067	Vikash Singh	Ph.D.	SCEE	15-02-2022	24-04-2023

- (iv) **39.17 (xx)** To report the closing of M.Tech. in Mechanical Engineering with specialization in Energy Systems programme:

Dr. Atul Dhar, Committee Chair presented the proposal of closing of M.Tech. in Mechanical Engineering with specialization in Energy Systems programme from AY 2023-24 and resources will be used for increasing seats in M.Tech. (Research). **(Approved on 24-04-2023 and Notified vide Notification No.IIT Mandi/Acad/Senate/2023/535-538 dated 28-04-2023)**

- (v) **39.17 (xxi)** To report the seat matrix of UG programme for AY 2023-24. **(Approved on 24-04-2023)**

Programme		Open 40.5 %	Open-PwD	SC 15 %	SC-PwD	ST 7.5 %	ST-PwD	OBC-NCL 27%	OBC-NCL-PwD	Gen-EWS 10%	Gen-EWS-PwD	Total (including Female Supernumerary)	Total PwD * 5%	Total Branch Capacity	Foreign Nationals Supernumerary 10%
B.Tech in Civil Engg.	Gender Neutral	15	1	6	0	2	1	11	0	4	0	40	2	50	5
	Female	3	1	1	0	1	0	3	0	1	0	10 (including "4" Supernumerary)	1		
B.Tech in Computer Science and Engg.	Gender Neutral	25	1	9	1	4	1	17	0	6	0	64	3	80	8
	Female	7	0	2	0	1	0	3	1	2	0	16 (including "6" Supernumerary)	1		
B.Tech in Electrical Engg.	Gender Neutral	22	1	7	1	4	0	15	0	5	1	56	3	70	7
	Female	6	0	1	1	1	0	4	0	1	0	14 (including "3" Supernumerary)	1		
B.Tech in Engineering Physics	Gender Neutral	10	0	3	0	2	0	6	1	2	0	24	1	30	3
	Female	2	0	1	0	0	0	2	0	1	0	6 (including "0" Supernumerary)	0		
B.Tech in Mechanical Engg.	Gender Neutral	18	1	7	0	4	0	13	0	4	1	48	2	60	6
	Female	5	0	2	0	1	0	2	1	1	0	12 (including "6" Supernumerary)	1		
B.Tech in Data Science and Engg.	Gender Neutral	16	0	5	1	3	0	10	1	4	0	40	2	50	5
	Female	3	1	1	0	1	0	3	0	1	0	10 (including "0" Supernumerary)	1		
B.Tech in Bio Engg.	Gender Neutral	10	0	4	0	3	0	4	1	2	0	24	1	30	3
	Female	2	0	1	0	0	0	2	0	1	0	6 (including "0" Supernumerary)	0		
B.Tech in General Engg.	Gender Neutral	9	1	4	0	2	0	6	0	2	0	24	1	30	3
	Female	2	0	1	0	0	0	2	0	1	0	6 (including "0" Supernumerary)	0		

B.Tech in Materials Science and Engg.	Gender Neutral	10	0	4	0	2	0	5	1	2	0	24	1	30	3
	Female	2	0	1	0	0	0	2	0	1	0	6 (including "0" Supernumerary)	0		
B.Tech in Microelectronics & VLSI	Gender Neutral	9	1	4	0	2	0	5	1	2	0	24	2	30	3
	Female	2	0	1	0	0	0	2	0	1	0	6 (including "0" Supernumerary)	0		
B.Tech in Mathematics and Computing	Gender Neutral	10	1	3	0	2	0	6	0	1	1	24	2	30	3
	Female	2	0	1	0	0	0	2	0	1	0	6 (including "0" Supernumerary)	0		
BS in Chemical Sciences	Gender Neutral	9	1	4	0	2	0	6	0	2	0	24	1	30	3
	Female	2	0	1	0	0	0	2	0	1	0	6 (including "0" Supernumerary)	0		
Total		201	10	74	4	37	2	133	7	49	3	520	26	520	52

*PwD reservations @ 5% will be horizontal (i.e., PwD candidates will consume seats from their birth category quota).

Item No. 39.17: Issues to be discussed by the Senate without Student Members being present.

None.

The meeting concluded with a vote of thanks to the Chair and to the Members.

U. Belkacem
20/6/23
Chairman, Senate

Z. Sattin
20-6-2023
Registrar I/c & Secretary-Senate

Academic Plan
for
4-Year Bachelor (BS) with Optional 1-Year Masters
(MS)
in
Chemical Sciences
with
Specialization in
Organic, Inorganic, Physical, and Materials Chemistry and
Minor in
(Computer Science & Engineering, Communication
Engineering, Management, German Language, etc.)



School of Chemical Sciences (SCS)
Indian Institute of Technology Mandi
Mandi, HP-175075

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1. Introduction

1.1. Preamble of the Program

The discipline of Chemical Sciences as an integral part of Basic Sciences serves as the basis of critical developments for value-added chemicals, pharmaceuticals, novel materials, understanding biological processes, and establishing the theoretical basis of natural phenomena. The 4-year BS with an optional 1-year MS program (BS-MS) in Chemical Sciences is designed to prepare graduates with a strong foundation in fundamental Chemistry along with Engineering for today's research and technology-driven world. The program creates a perfect harmony between Chemistry and Engineering branches by bridging the gap between chemical, physical, mathematical, computational, data, and engineering sciences. Particularly, owing to the "true" cross-disciplinary nature of the program, it can help advance the knowledge ranging from atomic-level understating of the chemical and biochemical phenomena to designing and developing new molecules, materials, and devices. As the barrier between Basic Sciences and Engineering is fast disappearing with modern innovations and their applications, the BS-MS program in Chemical Sciences can perfectly inculcate the young minds in academia to develop and deploy chemistry-based technologies for the modern world.

1.2. Objective of the Program

The major objective of this program is to train the graduates with fundamental concepts of both Chemistry and Engineering, thereby, equipping them for taking up diverse roles in industry and academia. The program particularly aims at training young minds to creatively think about research and innovation at a very early stage through a diverse range of hands-on projects. The perfect fusion of chemistry and engineering along with specializations and minors in different branches is the goal that will prepare the students for industry and academia and motivate them toward research and innovation.

1.3. Uniqueness of the Program

The BS-MS program offers specialization in chemistry branches, minors in engineering and humanities branches, and is highly research-oriented, which makes the program one of its kind. Particularly, it offers,

- Option for specialization in major chemistry branches, organic, inorganic, physical, and material chemistry through discipline elective courses in the 3rd and 4th year of BS.
- Option for minors in different branches including Computer Science Engineering, Communication Engineering, Electronics Engineering, Measurement and Instrumentation, Management, German Language, etc.

Due to the research-oriented nature of the program, the graduates get good exposure to research in the desired area as early as in their 4th year of the BS program. In addition, the 5th year of MS is primarily research-focused with specialized theory courses. Thus, the program presents a unique opportunity for graduates to pursue a research career just after completing the BS.

1.5. Placement Prospects

The BS-MS Chemical Sciences program graduates will have placement opportunities in various chemical, pharmaceutical, and technology industries. In addition, after completing the MS, they will have the opportunity to pursue a research career in a specialized field.

2. Details of the Program

2.1. Admission procedure

The admission has been primarily planned through Joint Entrance Examination (Advanced).

2.2. Intake strength

As decided by the Institute.

2.3. Duration

BS: 4 years, minimum 8 semesters

BS-MS: 5 years, minimum 10 semesters

2.4. Credits to be earned

A minimum of 163 credits needs to be earned for the BS degree and a minimum of 201 credits needs to be earned for the BS-MS dual degree in Chemical Sciences.

2.5. Branch change policy

The existing B.Tech. branch change policy at IIT Mandi will be applicable to students enrolled in the BS Chemical Science program.

2.6. Exit option

There will be an exit option available after the 4th year completing eight semesters for a BS degree in Chemical Sciences.

2.7. Graduation requirements

A student can complete the BS degree in Chemical Science by earning a total of 163 credits comprising,

- 52 Credits of Institute Core (IC)
- 59 Credits of Discipline Core
- 23 Credits of Discipline Elective
- 15 Credits of Free Elective
- 14 Credits of Research Communication and Project*/Discipline Elective

*Project is optional and can be fulfilled with discipline electives.

In addition, a student can complete the BS-MS degree in Chemical Sciences by earning an additional 38 credits comprising of,

- 6 Credits of Discipline Elective
- 32 Credits of MS Project

To avail of one of the following specializations in organic, inorganic, physical, and material chemistry, a minimum of 12 credits of elective courses in the required area must be completed with a minimum CGPA of 7.0.

To successfully complete a minor, a student needs to take at least 9 credits out of the courses defined in the corresponding minor basket with a with a minimum CGPA of 7.0.

3. Overview of the Program and Credit Distribution

3.1. Overall credit distribution

The overall credit distribution is tabulated below following the proposed general credit structure of the IIT Mandi BS-MS Regulation (R.3.7).

Division	Sub-Division	BS Credit	BS-MS Credit
Institute Core Courses (IC)	IC Compulsory	As per the institute's 1 st -year B.Tech. curriculum with IC-I (Chemistry and Biotech. courses Compulsion) and IC-II (Physics Compulsion)	
	IC Basket		
	Humanities and Management		
	IKSMHA		
Discipline Courses	Discipline Core	59	59
	Discipline Electives (DE)	23	29
Free Electives and Research Projects	Free Electives (FE)	15	15
	Research Communication and Projects/DE	14	46
Total Credit		163	201

3.2. Semester-wise course distribution**

The semester-wise credit distribution is tabulated below

1 st and 2 nd Year (Total Credit: 84)			
Semester-I		Semester-II	
• Math-I Calculus (IC)	2	• Math-III Linear Algebra (IC)	2
• Math-II Complex and Vector Calculus (IC)	2	• Math-IV ODE & Integral Transform (IC)	2
• Graphics for Design (IC)	4	• Applied Electronics (IC)	3
• Computing and Data Science (IC)	4	• Applied Electronics Lab (IC)	2
• IC-I Basket (Chemistry Compulsion)	3	• Data Science II (IC)	4
• HSS Course (HSS Basket)	3	• IC-II Basket (Physics Compulsion)	3
• IKSMHA (IKS)	3	• Foundations of Design Practicum (IC)	4
		• Physics Practicum (IC)	2
	21		22
Semester-III		Semester-IV	
• Understanding Biotech. and Its Application (IC-I)	3	• Discipline Elective II (DE)	2
• Physical Chemistry-I (CY)	3	• Physical Chemistry-II (Quantum & Spec.) (CY)	3
• Basic Organic Chemistry (CY)	3	• Analytical Chemistry (CY)	3
• Principles of Inorganic Chemistry (CY)	3	• Discipline Elective III (DE)	3
• Discipline Elective I (DE)	3	• Organic Chemistry Lab (CY, Lab-II)	2
• Physical Chemistry Lab (CY, Lab-I)	2	• Inorganic Chemistry Lab (CY, Lab-III)	2
• HSS Course (HSS Basket)	3	• HSS Course (HSS Basket)	3
		• Free Elective I (FE)	3
	20		21
3 rd and 4 th Year (Total Credit: 79)			
Semester-V		Semester-VI	
• Organic Reactions & Mechanisms (CY)	3	• Photochemistry & Pericyclic Reactions (CY)	3
• Chemistry of Main Group Elements (CY)	3	• Chemistry of Transition Elements (CY)	3
• Advanced Quantum Chemistry (CY)	3	• Symmetry and Group Theory (CY)	3
• Discipline Elective IV (DE)	3	• Discipline Elective V (DE)	3
• Physical Chemistry Laboratory (CY)	3	• Discipline Elective VI (DE)	3
• Inorganic Chemistry Laboratory (CY)	3	• Organic Chemistry Laboratory (CY)	3
• Research Literature Presentation I (P)	P/F(1)	• Research Literature Presentation II (P)	P/F(1)
	19		19
Semester-VII		Semester-VIII	
• Discipline Elective VII (DE)	3	• Reaction Dynamics, Kinetics & Catalysis (C)	3
• Chemical & Statistical Thermodynamics (C)	3	• Heterocyclic Chemistry (C)	2
• Introduction Organometallic Chemistry (C)	3	• Discipline Elective VIII (DE)	3
• Free Elective II (FE)	3	• Free Elective IV (FE)	3
• Free Elective III (FE)	3	• Free Elective V (FE)	3
• Undergraduate Research Project I* (P)	6	• Undergraduate Research Project II* (P)	6
	21		20

*Research Lab I and II in the 7th and 8th semesters is optional, students can opt for discipline electives in place of the research lab if they wish to.

5 th Year (Total Credit: 38)			
Semester-IX		Semester-X	
• Discipline Elective IX (DE)	3	• Discipline Elective X (DE)	3
• Postgraduate Project - I (PGP-I)	16	• Postgraduate Project - II (PGP-II)	16
	19		19

*The two discipline elective courses at the MS level 9th and 10th semesters (6 credits) can be completed before without violating the maximum allowed credit in a semester to have more time for MS projects in the 5th year.

**Specific course names, content, and credit structure (L-T-P-C) for the 1st and 2nd year CY courses are being worked out.

3.3. Required courses for chemistry specializations

For specialization in a specific chemistry branch, students need to complete at least *12 credits* from discipline electives with the following mandatory courses (to be updated) specific to a branch.

Organic	Organic Spectroscopy Natural Product Synthesis Asymmetric Organic Synthesis Reagents in Organic Synthesis
Inorganic	Advanced Inorganic Spectroscopy Bioinorganic Chemistry -
Physical	Computational Chemistry Basic and Applied Electrochemistry Numerical Methods, Computer Programming, Data Analysis -
Material	Science and Technology of Nanomaterials Introduction to Polymer Science & Technology Hydrogen Generation and Storage Applied Polymer and Material Chemistry

3.4. List of Available Discipline Electives (DE) for BS-MS

Senate Approved Courses

1. CY241: Nanoscale Science and Technology
2. CY342: Nanoscience: Understanding Small Systems
3. CY344: Food Chemistry Processing: Preservation and Storage
4. CY541: Fundamentals of Organic Chemistry
5. CY522: Computational Chemistry
6. CY556: Organic Spectroscopy
7. CY515: Advanced Inorganic Spectroscopy
8. CY547: Chemical Crystallography
9. CY540: Bioinspired Materials
10. CY552: Hydrogen Generation and Storage
11. CY554: Science and Technology of Nanomaterials
12. CY555: Introduction to Polymer Science & Technology
13. CY641: Polymer Synthesis
14. CY642: Molecular and Bio-electronics
15. CY643: Advanced Analytical Techniques
16. CY644: Bioinorganic Chemistry
17. CY645: Reagents in Organic Synthesis
18. CY670: Fluorescence Spectroscopy, Microscopy and Applications

To Be Proposed

19. CYXXX: Numerical Methods, Basic Computer Programming and Data Analysis in Chemistry
20. CYXXX: Applied Polymer and Materials Chemistry

3.5. Suggested courses for minors

As per the institute's B.Tech. curriculum requirements. Students can select the free electives as per the minor requirements to obtain minor in a specific branch.

Ordinances and Regulations

Bachelor of Science (BS) & Bachelor of
Science-Master of Science (BS-MS)

March 2023



Indian Institute of Technology Mandi
V.P.O. Kamand, Mandi-175005, Himachal Pradesh

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ORDINANCES AND REGULATIONS

Bachelor of Science (BS) & Bachelor of Science-Master of Science (BS-MS)

ORDINANCES

- O.1 Each academic session is divided into two regular semesters and two vacation semesters (Winter & Summer) and follows a Senate approved schedule of academic activities.
- O.2 Admission to BS degree program will be made through a Joint Entrance Examination (Advanced) (JEE (Adv)) conducted by Joint Admission Board (JAB) on behalf of all IITs.
- O.3 Admission to a particular branch of study shall be as decided by the JAB.
- O.4 The duration of the BS program will be of minimum 8 semesters and maximum 12 semesters. The duration of the BS-MS program will be of minimum 10 semesters and maximum 14 semesters.
- O.5 The award of merit scholarships to the BS/BS-MS students will be governed by the regulations framed by the Senate from time to time.
- O.6 Student can opt for MS at the end of the fifth or sixth semester of BS program subject to the conditions prescribed by the Senate from time to time.
- O.7 The award of the BS/BS-MS degree shall be in accordance with the regulations of the program approved by the Senate.

REGULATIONS

R.1 Academic Calendar

As per the institute's academic calendar.

R.2 Admission

- R.2.1 The maximum number of students to be admitted in each branch of the BS program will be decided by the Senate. The actual number of students to be admitted in each academic year will be decided by the Dean's Committee based on operational reasons. Statutory and legally mandated reservations will be followed as per Government of India orders from time to time.
- R.2.2 Admission to the BS programs in any year will be based on the results of a Joint Entrance Examination (Advanced) of that year by the IITs and allocations made by the Joint Seat Allocation Authority (JoSAA).
- R.2.3 The eligibility criteria for appearing at the Joint Entrance Examination (Advanced) in any year will be decided by the Joint Admission Board (JAB). The criteria will be set out in an Information Brochure to be made available to the applicants along with the relevant application forms.
- R.2.4 The JAB will decide on the procedure for conducting the Joint Entrance Examination (Advanced) and preparing merit lists subject to minimum performance criteria in the examination. The JAB will offer admission from these lists to candidates, considering the choice of branch indicated by the candidate and the available seats in each branch in various IITs.
- R.2.5 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 specified in the JEE (Advanced) Information Brochure of that year.
- R.2.6 A candidate must fulfill the medical standards required for admission as set out in the Information Brochure of JEE (Advanced) examination.
- R.2.7 The selected candidate will be admitted to the BS program after he/she fulfills all the admission requirements as indicated in the letter of admission, after payment of the prescribed fees.
- R.2.8 In the matters of admission to the BS program, the decision of the Joint Admission Board is final.
- R.2.9 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.
- R.2.10 Students admitted to the BS Program can opt for an MS degree during the

fifth or sixth semester in accordance with the eligibility criteria defined by the Senate from time to time. As per the current criteria, a student may opt for an MS program if she/he has a CGPA of 6.5 or more and no 'F' grade till the fourth or fifth semester.

- R.2.11 A limited number of foreign nationals and other categories can be admitted on a supernumerary basis to the BS programs as per the norms laid down by the JAB from time to time.

R.3 Structure of the BS/BS-MS Program

- R.3.1 The curriculum consists of courses mainly in the following categories: Institute Core courses, Discipline Core and Discipline Elective courses, Free Electives and Research Projects (Undergraduate and Postgraduate Research Projects). The courses belonging to these categories are grouped into various baskets as given in R.3.7. In each basket, the student must earn a minimum number of credits as prescribed by the Senate-approved curriculum to graduate the BS/BS-MS program.

- R.3.2 Every branch of the BS program will have a curriculum and course contents approved by the Senate.

The curriculum of any branch of the BS program is designed to have a minimum credit requirement of 160 credits. For BS-MS, the minimum credit requirement is 192 credits.

- R.3.3 Although the minimum requirement of credits under various course baskets adds up to 160 for a regular BS degree and 192 for a BS-MS degree, range of 160-163 credits is generally prescribed for a regular BS degree and 192-201 for BS-MS. These ranges are prescribed to accommodate the varying number of credits for different courses. Students are permitted to take extra credits, beyond 163 for regular BS and beyond 201 for BS-MS.

The final CGPA will be calculated based on Senate-approved regulations.

- R.3.4 The extra credits earned by a student over and above the minimum credit requirements of a particular basket (as given in R.3.7) will be accounted for in the final CGPA calculation.

- R.3.5 A student must register for a minimum of 12 credits and up to a maximum of 22 credits in a regular semester. The number of credits can be less than 12 credits in a vacation semester. Any exception to this requires the permission of the Dean (Academics).

- R.3.6 BS-MS students can register for additional courses from the Discipline Elective basket over and above the courses prescribed in the regular BS curriculum from the 5th semester onwards in consultation with the Faculty Adviser. Students registered for the MS program are permitted to register for

more than 22 credits in a semester.

- R.3.7 Every course of the BS/BS-MS program will be placed in one of the course baskets listed in the table below:

Division	Sub-Division	BS Credit	BS-MS Credit
Institute Core Courses (IC)	IC Compulsory	As per the institute's 1 st -year B.Tech. curriculum with courses from IC/HSS/Management baskets as per the requirements of a specific BS program.	
	IC Basket		
	Humanities and Management		
	IKSMHA		
Discipline Courses*	Discipline Core	Min. 50	Min. 50
	Discipline Electives (DE)	Min. 12	Min. 18
Free Electives and Research Projects	Free Electives (FE)	Min. 12	Min. 12
	Research Communication and Projects/DE	Min. 12	Min. 38
Total Credit		160-163	192-201

*Total credits for Discipline Core and Electives should not exceed 85.

- R.3.8 Research Projects: Undergraduate Research Project

BS Students are highly encouraged to opt for undergraduate research projects aligned with their specific research and scientific interest in the 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.

- R.3.9 Research Projects: Post-Graduate Project (PGP)

Post-graduate projects (PGP) must be opted for by the students registered for the BS-MS program. The project will be a single project spanned over the 9th and 10th 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.

- R.3.10 The medium of instruction for BS/BS-MS is English. The examinations will be conducted in English and the project report, theses, practical records, etc. must be submitted in English.

R.4 Definition of Credit System

The institute's credit system will be followed for the BS and BS-MS programs.

R.5 Faculty Adviser

To help the students in planning their courses of study and for getting general advice on the academic program, the concerned School will assign students branch-wise to a faculty member who will be called their Faculty Adviser. Generally, a Faculty Adviser shall have responsibility for a particular batch of students from their first year until graduation.

R.6 Class Committee

As per the Institute's existing regulations.

R.7 Change of Branch

The Senate-approved B.Tech. branch change regulations shall be followed for the BS program.

R.8 Enrolment and Registration

R.8.1 Enrolment

From the second semester onwards, all students will have to report and register/enroll on a day specified in the Academic Calendar at the beginning of the semester. A student will be eligible for enrolment only if he/she satisfies the conditions under R.11 and will be permitted to enroll only if he/she has cleared all dues to the institute up to the end of the previous semester, provided he/she is not debarred from enrolment, on disciplinary grounds.

- a) If a student fails to report on the specified date, he/she may be allowed by the Dean (Academics) to enroll within one week from the reporting date with a fine. The amount of the fine will be specified from time to time.
- b) Under exceptional circumstances, a student may be allowed to enroll after one week of the enrolment date with permission from Chairperson, Senate through Faculty Adviser and Dean (Academics).

R.8.2 Registration

Except for the first semester, course pre-registration for other semesters will be done during a specified week before the end-semester examination of the previous semester.

Pre-registration is to be done through an online portal of the office automation system (OAS) of the institute.

Students should have successfully completed the courses of (n minus 4)th semester to register for courses in the nth semester. For example, to register for courses in the 5th, 6th, 7th & 8th semesters of BS program, the student

should have successfully completed all the courses of 1st, 2nd, 3rd, and 4th semesters respectively, as prescribed in the curriculum of the concerned branch of study.

- a) For students who have backlog courses under the n-4 rule; the registration of courses shall be restricted to the average credit clearance capacity in the last two semesters. The student must register for the backlog courses first giving priority to the oldest backlogs.
- b) The semester used by a student to clear only the backlog course(s), will not be treated as effective for reckoning the number of semesters spent by the student with respect to the maximum permissible limit (R.12).

R.9 Course Add/Drop

If a student wants to modify the pre-registered courses, he/she may do so by adding or dropping courses after the start of the semester within the course add or drop deadline mentioned in the Academic Calendar with the approval of the Faculty Adviser and the concerned course instructors. However, the student should ensure that the total number of credits registered in any semester should enable him/her to earn the minimum number of credit requirements as specified under R.3.5 and R.11.1.

R.10 Summer/Winter Vacation Semesters

- R.10.1 The summer/winter vacation semester courses will be offered to clear the backlog courses of the students and for students who wish to spend a semester off-campus based on the availability of the course instructors.
- R.10.2 No student should register for more than three vacation semester courses during a particular vacation semester.
- R.10.3 A student has to pay a fee for each credit registered in the vacation semester.
- R.10.4 The assessment procedure for a course will be similar to that of a regular semester course.
- R.10.5 Withdrawal from a vacation semester course is not permitted.

R.11 Minimum Requirement to Continue the Program

R.11.1 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). Any student who

is not in good academic standing is performing unsatisfactorily. 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.

- a) A student will be placed on Academic Warning if, in any semester, any two of the following conditions hold:
- (i) he/she fails to secure at least 15 credits
 - (ii) his/her SGPA is less than 5.0
 - (iii) his/her CGPA is less than 5.0

During the term of the Academic Warning, a student will not run for or hold any office concerning any student activity.

- b) 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:
- (i) he/she fails to secure at least 12 credits
 - (ii) his/her SGPA is less than 4.0
 - (iii) his/her CGPA is less than 4.0

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.

- c) The terms of the probation shall be that, in the following semester,
- (i) he/she shall secure at least 15 credits
 - (ii) his/her SGPA should be at least 5.0
 - (iii) any other special condition(s) laid down by the Senate

During the term of the Academic Probation, a student shall not run for or hold any office concerning any student activity.

R.11.2 Termination of Program

- a) The academic program of a student will be automatically terminated if he/she fails to graduate within the maximum permissible duration of the program. For the BS and BS-MS programs, the maximum permissible duration is 12 and 14 semesters, respectively, not counting semester withdrawal(s) for medical reasons or academic reasons (e.g., special internship). The semester used by a student to clear only the backlog course(s), will not be treated as effective for reckoning the number of

semesters spent by the student with respect to the maximum permissible limit (vide R.12). If a student is suspended for any semester, or withdraws voluntarily from any semester, that semester will be counted.

- b) The academic program of a student will be terminated if he/she fails to fulfill the terms of Academic Probation.
- c) A student's academic program will also be automatically terminated if he/she fails to register, on the scheduled registration date, in any given semester or fails to sit for the end-semester examinations without clear and specific permission, or if he/she is absent from classes for a significant part of the semester, normally three weeks.
- d) A student's academic program may also be terminated on grounds of unacceptable conduct. In such instances, the Students' Welfare & Discipline Committee (SWDC), or a similar committee empowered by the Senate, will deliberate on the violation and make a recommendation to the Senate.

R.11.3 Readmission

A student whose academic program is terminated under any of the above conditions may appeal to the Chairperson, Senate through Faculty Adviser and Dean (Academics) for mercy and a second chance to re-enroll in the program. The Chairperson, Senate may take appropriate decisions on such applications on behalf of the Senate and the same shall be reported to the Senate.

R.12 Minimum and Maximum Duration of the Program

The minimum duration of the BS. and BS-MS programs is 8 and 10 semesters, respectively. However, a student may complete the program at a slower pace, but in any case, not more than 12 and 14 semesters, respectively, for BS and BS-MS programs, excluding semesters withdrawn on medical grounds, etc. as per R.13. However, the students will have to satisfy R.11.1 every semester, failing which their registration will be cancelled.

R.13 Semester Break/Temporary Withdrawal from the Program

A student may be permitted by the Dean (Academics) to obtain semester break or temporary withdrawal from the program for a semester or longer duration for reasons of ill health or other valid reasons. Normally, a student will be permitted to withdraw from the program only for a maximum continuous or intermittent period of two semesters during the whole program duration.

R.14 Discipline

- R.14.1 Every student is required to observe discipline and decorous behavior both inside and outside the campus and not to indulge in any activity which will bring down the prestige of the Institute.
- R.14.2 Any act of indiscipline by a student shall be referred to a Students' Welfare & Discipline Committee (SWDC). The Committee shall enquire into the charges and recommend suitable punishment if the charges are substantiated. Dean (Academics) will consider the recommendations for minor punishments and warnings and take appropriate action accordingly. In case of major punishment, Senate will take appropriate decision.
- R.14.3 Appeal: The student may appeal against the disciplinary action to the Chairperson, Senate, whose decision will be final in such matters.
- R.14.4 Ragging of any dimension is a criminal and non-bailable offence in our country. The current State and Central legislations provide for stringent punishment, including imprisonment. Once the involvement of a student is established in ragging, the offending student will be dismissed from the institute and will not be re-admitted. Avenues also exist for collective punishment, if individuals cannot be identified in this inhuman act. Every student at the institute, along with his/her parent, shall give an undertaking at the time of admission in this regard.

R.15 Attendance

The latest Senate approved attendance norms of the Institute shall be followed.

R.16 Assessment Procedure – Tests and Examinations

The latest Senate-approved assessment regulations shall be followed.

R.17 Grading System

The latest Senate-approved grading system shall be followed.

R.18 Method of Awarding Letter Grades

A final meeting of the Class Committee without the student representatives will be convened within seven days after the last day of the end semester examination. The letter grades to be awarded to the students for different courses will be finalized in such meetings.

R.19 Declaration of Results

After finalization by the Class Committee, the course instructor will submit the letter-grades awarded to the students in a course to the academic office in prescribed format. The academic office will compile all the results and

announce the same to the students through E-mail or through OAS portal of the institute.

R.20 Re-evaluation of Answer Papers

If a student has grievances about the result of a particular course, he/she can contact the concerned course instructor within one week from the commencement of the regular semester immediately following the announcement of the results. If the course instructor feels that the case is genuine, he/she may re-examine the case and submit a revised grade, if applicable. Any request to re-consider the grade after one week of the start of the subsequent regular semester will not be considered.

The course instructor will return answer scripts to the students after evaluation, as part of the learning process. If any student does not collect his/her answer script by the 1st week of the subsequent regular semester, the course instructor may discard it.

The evaluation pattern and all assignments, quizzes, exams etc. used in evaluation shall be posted on the course Moodle page.

R.21 Supplementary Examination

- R.21.1 A student who earns an F grade in a Core course must secure a pass grade in that course.
- R.21.2 A student who gets "F" grade in a Core course is eligible to seek a Supplementary Examination in a subsequent semester to clear the backlog, provided he/she satisfies the minimum attendance criteria of the course. For taking such Supplementary Examination, the student need not attend classes of that course again.
- R.21.3 A student is eligible for only one Supplementary Examination in a course to clear the backlog. In case a student fails in the Supplementary Examination, he/she has to register for that course again in a regular semester/vacation semester and repeat the course by attending regular classes and exams.
- R.21.4 The Supplementary Examination may be offered by the same instructor who offered the course earlier or the instructor who offers the course in the current semester.
- R.21.5 The Supplementary Examination can be held along with the regular students of the subsequent semesters or during the make-up exam slots of the subsequent semesters or at the convenience of the course instructor.
- R.21.6 Generally, the end semester exam alone is given as the Supplementary Examination and the sessional marks (i.e. quiz marks, etc.) earned by the

student in the original semester will be taken into account for calculating the final marks. The grade cut-off used in the original semester shall be used for finalizing the grade.

- R.21.7 A student securing an F grade in an Elective course may also attempt the Supplementary Examination option as per the conditions (R.21.2–R.21.6) mentioned above in the case of a Core course to get a successful grade in that course.

However, a student may replace a failed Elective course with an Equivalent course approved by the Faculty Adviser. In such cases, the student has to declare in advance that a particular course he/she doing in a particular semester is an Equivalent course in place of a failed Elective course taken in a previous semester. This declaration has to be done before the course drop deadline of that semester given in the Academic Calendar by submitting the relevant form.

- R.21.8 A course successfully completed cannot be repeated/improved. In case a student passed all the required Core and Elective courses but failed to earn the required minimum CGPA of 5.0 for graduation, the student may be permitted to repeat the Core and Elective courses to earn the minimum CGPA required to pass the program.

R.22 Grade Sheet

- R.22.1 The grade sheet issued at the end of a semester to each student will contain the following:

- a) the course number, course name, and the credits for each course registered in that semester.
- b) the letter grade obtained in each course.
- c) the total number of credits earned by the student up to the end of that semester.
- d) the Semester Grade Point Average (SGPA, see R.22.4) for that particular semester.
- e) the Cumulative Grade Point Average (CGPA, see R.22.5) of all the courses taken from the first semester.

- R.22.2 At the end of the program, a final Transcript containing details of all the courses taken by the student mentioning the overall CGPA will be issued along with the Degree certificate.

- R.22.3 The record of the F grade(s) obtained for a course will be retained in the Grade

Sheets and final Transcript.

R.22.4 Semester Grade Point Average (SGPA)

The performance of a student in a semester is indicated by SGPA, which is a weighted average of the grades in all the courses done by the student in the given semester. The SGPA is calculated as follows:

$$SGPA = \frac{\sum_{i=1}^n c_i g_i}{\sum_{i=1}^n c_i}$$

where c_i stands for the credit in a course and g_i the point equivalent of the grade obtained in that course. The summation is over the number of registered courses n in the semester.

R.22.5 Cumulative Grade Point Average (CGPA)

The performance up to any time in the course of the student's program is indicated by the student's CGPA, which is also calculated by the formula used for SGPA calculation, except that the averaging is done over all of the courses and credits that the student has taken during his/her entire program up to that point. This includes F grades as well, if not cleared.

R.23 Discipline Specialization

R.23.1. A minimum of 12 credits needs to be completed from the designated course baskets to fulfill the specialization requirement.

R.24 Minor Program

R.24.1 A minor is intended for a student to gain expertise in an area outside his/her major BS discipline.

A specialist basket of at least 3 courses is identified for each Minor. Such course baskets 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 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.

R.24.2 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.

- R.24.3 A student is allowed to take any number of Minors, but a particular course cannot be counted for more than 1 Minor.
- R.24.4 The name of the Minor will appear on the Transcript and the degree certificate of the student.

R.25 Scholarships and Tuition Fee Exemption

- R.25.1 The details of various scholarships available for students shall be displayed on Institute Website from time to time.
- R.25.2 The number of Merit Cum Means (MCM) scholarships for each year and each branch will be limited to 25% of the strength of students in that particular branch in that year.
- R.25.3 The eligibility criteria and other conditions for the MCM scholarship shall be notified subject to terms and conditions and at the rates approved by the Government of India from time to time.
- R.25.4 The students who receive an MCM scholarship are exempted from paying tuition fees and will receive a monthly scholarship as specified from time to time.
- R.25.5 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.

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.

- R.25.6 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.

R.26 Eligibility for Award of the BS Degree

A student should be declared to be eligible for the award of the BS degree if he/she has:

- R.26.1 registered and successfully completed all the requirements as per the curriculum of the program.
- R.26.2 acquired a minimum of 160 credits satisfying all the course basket requirements and projects mentioned under R.3.7 and completed all other compulsory requirements.

- R.26.3 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.
- R.26.4 secured a minimum cumulative grade point average (CGPA) of 5.0 in passed subjects.
- R.26.5 no dues to the Institute, Hostels, Libraries, etc.
- R.26.6 no disciplinary action is pending against him/her.

R.27 Eligibility for Award of the BS-MS Degree

- R.27.1 In addition to the general eligibility criteria mentioned for the award of a regular BS degree under R.26, a student must earn an additional minimum of 32 credits (over and above the required 160 credits for a regular BS degree) as per the requirement of the program and as recommended by the Faculty Adviser to be eligible for a BS-MS degree.
- R.27.2 A student should not have received an 'F' grade throughout the BS program.
- R.27.3 A student should secure an overall CGPA of 5.0 or more out of 160-163 credits for BS and 192-201 credits for BS-MS.

R.28 Power to Modify

Notwithstanding all that has been stated above, the Senate has the right to modify any of the above regulations from time to time.

B. Tech. in General Engineering

School of Mechanical and Materials Engineering (SMME)
Indian Institute of Technology Mandi

Programme Details

Name of the New Proposed Program **BTech in General Engineering (Applied Engineering)**

I. **General Information:**

Name (s) of prosper schools/centres:

School of Mechanical and Materials Engineering.

II. **Program Description:**

- A. Provide a justification/rationale for the program. How does the program relate to the mission of the IIT Mandi?

IIT Mandi's mission is to create and disseminate knowledge in science, engineering, and other fields of study. The institution seeks to educate minds with a global perspective, capable of developing knowledge and technologies with a broad societal impact.

The program is intended to provide a comprehensive understanding of multiple core engineering disciplines, which will serve as the foundation for creating and disseminating knowledge. The core curriculum for the first two years gives students a solid foundation in fundamental engineering principles from various branches such as Mechanical Engineering, Civil Engineering, Data Science, and Computer Science.

The ability to choose a specialization later in the program allows students to tailor their educational journey to their interests and career goals. This option promotes independent thought, which is an important component of knowledge creation. The program ensures that students are always on the cutting edge of technology and knowledge by offering specializations that keep up with the evolving job market and new trends.

Furthermore, the option to obtain specialization from partnering institutions not only broadens students' perspectives but also instills a global perspective, as they have the opportunity to learn from diverse academic cultures. This global exposure is directly related to IIT Mandi's mission of cultivating a global perspective in its students.

Finally, the program aligns with IIT Mandi's goal of broad societal impact by encouraging interdisciplinary studies. Engineers trained in multiple disciplines will be able to develop technologies and solutions that address a wide range of societal challenges, thereby advancing the institution's mission.

In essence, the General Engineering program not only fulfills but also expands on IIT Mandi's mission by emphasizing comprehensive knowledge, flexibility, global exposure, and interdisciplinarity. This mission, as well as the new education policy, are perfectly aligned with the new BTech program in general engineering.

B. SWOT analysis of the program

Strength:

- A broad range of engineering skills, allowing them to be adaptable and competitive in the job market.
- An interdisciplinary approach to learning that enables students to tackle complex problems and develop innovative solutions.
- wide range of career opportunities in fields such as consulting, design, research and development, project management, and more
- General engineering programs allow students to tailor their education to their interests and goals, enabling them to pursue careers in various fields of engineering.
- Focus on applied courses and labs
- Compulsory internship (business/research) for interactions with industry and/or academia
- The job market for engineers is rapidly changing, which may make it easier for general engineering graduates to keep up with new developments and emerging trends through specializations

Weakness

- Due to the broad nature of the program, it may be challenging for students to stand out from other engineering graduates who have specialized training
- In the absence of adequate knowledge, the variety of options available to students may cause confusion.
- Coordination with various institutions for student exchanges and management of such arrangements may present logistical challenges.

Threats

- Competition with 1st gen IIT's
- Considering it is a new program, attracting the best quality students would be a challenge, initially only.
- Competition from specialized engineering programs
- Most of the specializations are dependent on the partner Institutes. The relationships with these institutes will drive the partnership. Changes in relations or economic conditions may have an effect on partnerships with institutions.

Opportunities

- Advancements in technology provide opportunities for general engineering graduates to specialize in nascent engineering fields such as renewable energy, smart cities, and biotechnology
- Growing demand for interdisciplinary experts
- Availability of alumni network.

- Industry focus and one year internship/exchange programme will give them a broader vision on the specialization field

C. Justification with respect to New National Education Policy (NEP) mandates

The New Education Policy requires multidisciplinary courses, and the proposed course perfectly fits into this goal of the NEP by providing a multifaceted education that suits most industries and aids in the creation of a skilled workforce. Furthermore, in accordance with NEP, the course will provide multiple entry and exit points through programs such as diplomas, certificates, and degrees.

D. Provide a mission statement for the program. Include educational and learning objectives

The Bachelor of Technology (BTech) program in General Engineering at IIT Mandi aims to provide students with a comprehensive understanding of core engineering principles while also allowing them to specialize in emerging or traditional fields of interest. Our program aims to motivate students to embrace interdisciplinary approaches, adapt to changing technologies, and prepare them to be global leaders in engineering and technology.

E. Credit Structure of the program

The typical credit structure of the institute will be followed as shown below. The credit structure may vary depending on the specialization.

Division	Sub-Division	Credits
Institute Core (IC) Courses	IC Course	39
	Basket of IC Course	6
	Humanities & Social Sciences (HSS) Courses	12
	Indian Knowledge System (IKS)	3
Discipline (DC) Courses	Discipline Core	36
	Discipline Electives	33
Electives	Free Electives	22

	Interactive Socio-Technical Practicum (ISTP)	4
	Major Technical Project (MTP)	8
	Specialization Basket	30
Total		160

F. List of courses proposed

Currently, we have planned specializations through agreed partner institutes. The list of institutions and specializations includes:

National Institute of Fashion Technology (NIFT): Fashion Design & Technology; Product Design; Animation.

IIT Bombay: Aerospace Engineering.

Dalarna University, Sweden: Energy Engineering; Information Systems

Central Manufacturing Technology Institute, Bengaluru: Manufacturing.

National Institute of Industrial Engineering, Mumbai: Industrial engineering; Supply chain management;; Operations research; Artificial intelligence & Machine Learning; A Dual Degree B Tech + MBA option

IIT Mandi: AI & Robotics, Advanced Manufacturing, e-Mobility, A Dual Degree B Tech + MBA option

The new specializations and their relevant courses will be added in due course, with the approval of the appropriate authorities.

G. Provide a list of any current courses that would be cross-listed with the program:

NA

H. What, if any, new courses will be required for the program? A separate course proposal is required for each new required course.

The new specializations and their relevant courses will be added in due course, with the approval of the appropriate authorities.

- I. Provide a sample academic plan for students completing the academic program being proposed.

The students can go into industries as well as higher education.

- J. If established at other institutions, please submit sample programs from those institutions.

IIT Hyderabad - Engineering Science (<https://es.iith.ac.in/index.html>)

Oxford University - Engineering Sciences

(<https://www.ox.ac.uk/admissions/undergraduate/courses/course-listing/engineering-science>)

Staffordshire University

(<https://www.staffs.ac.uk/course/general-engineering-beng>)

Nottingham Trent University

(<https://www.ntu.ac.uk/course/mansfield/ug/hnc-general-engineering>)

University of Arizona - Engineering Management

(<https://sie.engineering.arizona.edu/undergrad-programs/degrees>)

1. In what ways is this proposal consistent with those programs?

The program is offered in conjunction with other programs, with the core idea of providing hands-on experience in various fields of engineering and then allowing students to choose an area of specialization.

2. In what ways is this proposal different from those programs? Please explain those differences.

- Industry-focused curriculum
- Compulsory internship (business/research)
- Experiential learning

III. Faculty and Governance:

Provide a list of the faculty available to teach courses for this program.

1. Satvasheel R Powar
2. Mrityunjay Doddamani
3. Gajendra Singh
4. Atul Dhar
5. Surya Prakash Upadhyay

In the case of an interdisciplinary program, mention the governance and execution mechanisms of the program:

Students opting for specialization courses offered by partner institutes

Resources:

Additional requirements of laboratory space with justification (name of the labs).

Additional requirements of laboratory fund (recurring and non-recurring) with justification (name of the labs)

The new specializations, their relevant courses, and relevant laboratory requirements will be added in due course, with the approval of the appropriate authorities. The proposal will include lab space, and funding requirements.

Name of the Proposed Program: Five-year Integrated MBA (Bachelor of Business Administration & Master of Business Administration-Dual Degree) program

I. General Information:

Name (s) of proposer schools/centres: School of Management

II. Program Description:

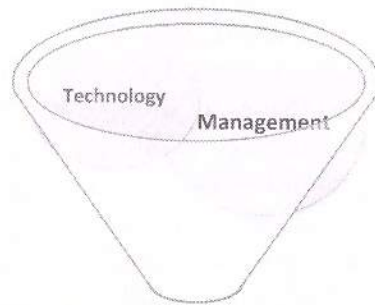
A. Provide a justification/rationale for the program. How does the program relate to the mission of the IIT Mandi?

Rationale:

The last decade saw a tremendous increase in uptake of technology by masses in India, particularly due to affordable access to internet and smart devices. In a game changing event, the pandemic amplified the adoption of digital solutions by businesses of every size. It has implications for the scalability of businesses that were earlier deemed to be unviable due to reasons that are now eliminated by high-tech interventions. The competitiveness of businesses has elevated multifold and minimum bar for business success has been raised very high. The larger businesses face competition from new ventures that leverage the modern advancements and continue to challenge former that have dominated the economic circles for long. On the demand side, consumers not only in urban areas, but also rural areas are resorting to technology enabled platforms. The consumers' comfort level with digital transactions has created many new business opportunities.

Therefore, the future belongs to those who will adopt the futuristic solutions in every sphere of doing business ranging from product design, customer awareness, customer acquisition, product delivery, and customer service. The above developments necessitate that the new age management curriculums educate the students on the application of latest high-tech in the traditional and contemporary functional areas of business.

In this context, the School of Management proposes a new *Integrated MBA Program* that will prepare the youth to be ready for the technology-based revolution that is underway. The proposed five-year *Integrated MBA Program* will blend the traditional business knowledge with the modern technology that business executives of tomorrow will require.



Integrated MBA Program

This program will create professionals capable of leading the development of innovative products and processes. The program will prepare the youth for the changing business

dynamics of future and meet the human resource requirements of businesses, in turn shaping the economic and business outcomes for the country.

Intake Strategy: Mode of Admission

We intend to admit students considering JEE/any other National Level Exam. Further, the selection may also include interview/Group Discussions/WAT (Written Ability Test) in addition to the JEE /any other National Level Exam.

The candidate is required to have studied Mathematics one of main subject at +2 level.

B. SWOT analysis of the program

IIT Mandi has a well-established reputation for providing innovative, practicum-based education at the undergraduate and graduate levels. The students of the proposed Integrated MBA Program would have an opportunity to get quality education from one of the premier technical institutes in the country. The students will get the opportunity to brush shoulders with B.Tech. and Masters students of IIT Mandi by means of engaging academically (in some of the courses) as well as by engaging in various extra-curricular and co-curricular activities. This would help them in building a competitive spirit along with the holistic development. In addition to the above, other points of SWOT are given below:

<p>Strengths:</p> <ul style="list-style-type: none"> ❖ The proposed innovative curriculum is having several differentiating propositions: ❖ It offers a blend of management education with the application of data science & AI tools. ❖ The uniquely designed curriculum and innovative pedagogy enables cross functional thinking and problem-solving in students. ❖ It offers a balanced education in technology and social sciences that will produce business leaders equipped with technical skills who have a strong understanding of business ethics, human behaviour, and life skills. ❖ It offers experiential learning through hands on training, semester long industrial internship, and project work. 	<p>Weaknesses:</p> <ul style="list-style-type: none"> ● Awareness of integrated MBA programs across the target segment is low. ● Availability of dedicated faculty in relevant techno-management areas to deliver the relevant course content using experiential pedagogy. ● The program will require periodical review of the latest developments in relevant fields to keep the curriculum updated, program execution relevant, and outcomes effective. ● The school will need to create international visibility and interest in the proposed program to attract overseas. ● The school will also need to establish collaborations with some of the international institutes to enable student exchange.
<p>Opportunities:</p>	<p>Threats:</p> <ul style="list-style-type: none"> ● We need to establish and communicate a clear differentiated position compared

<ul style="list-style-type: none">• IIT Mandi can have the first mover advantage among IITs in offering a Five-Year integrated MBA program.• The program has the potential to receive international interest from industry and academia which will benefit academic research, teaching and collaboration for IIT Mandi.• IIT Mandi has a deep industry connection to keep the course content relevant, enable internship and create placements opportunities for the students.	<p>to integrated management programs of IIMs. Therefore, the communication strategy must be well planned.</p> <ul style="list-style-type: none">• The first mover advantage may be short lived. The proposed program will face competition if other technical institutes also decide to enter this segment.
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C. Justification with respect to New National Education Policy (NEP) mandates

The proposed program well aligns with NEP's mandate of holistic and multi-disciplinary education. Some of the salient features of the proposed program that are in line with the NEP are as follows:

- The program is carefully designed with a blend of technology and management, and other courses that would integrate the holistic development of the management graduates.
- In the first three years of the proposed program, a strong base in Science, Technology, Engineering, and Mathematics (STEM) along with courses on management, communications, soft skills, personality development, humanities and social sciences would provide a good blend with the management education.
- The multidisciplinary curriculum would nurture the social, physical, emotional, moral, and intellectual growth of the students in a well-rounded manner.
- The program also offers credits to the courses related to the co-curricular activities, Arts, Music, Sports etc.
- The program offers multiple exit options to the students – BBA and BBA (Honors) after successful completion of third and fourth years, respectively.

D. Provide a mission statement for the program. Include educational and learning objectives.

Mission Statement:

Integrated MBA Program strives to foster creativity and leadership through a unique management education program that blends traditional business education with the application of technology across diverse business domains. The program will create future business leaders with a deep technology appreciation and effective cross-functional management acumen.

Educational and learning objectives:

1. To impart state of the art management education through coursework that blends the technology application into the traditional management courses. The focus of the program is to produce business leaders with capability to translate the broad surface level understanding of business problems to fine grained comprehension and interpretation by critically evaluating, analyzing to produce robust and adaptable solutions in changing business environment.
2. To make the learning more experiential, engaging, and hands-on with the help of lectures, classroom discussions, computing and business simulations labs, case studies, individual and group projects complemented by group discussions, role-plays, industrial internship to enable multifaceted professional and personal development of the students.
3. To develop management professionals with deep understanding of technology and management acumen that are capable of leading technology-oriented organizations in VUCA business world with the help of the experiential learning that inculcates leadership qualities and hones the managerial skills of future leaders to develop desired intent to create more sustainable businesses and socially responsible organizations.
4. To develop management professionals with resilience to face VUCA world and maintain well-being of self and others around them by applying knowledge gained through courses offered from time tested Indian Knowledge System.

E. Credit Structure of the programme

The program has a total of 191 credits across five years. The program will provide exit options to the student as follows:

- After successful completion of 3rd year, a student will be given a Bachelor of Business Administration (BBA) degree.
- After successful completion of 4th year, a student will be given a Bachelor of Business Administration (BBA) Honors degree.
- The students completing the 5-year program will be given Integrated MBA (DS & AI) degree.

The credit breakdown across the years is as follows:

a) The program has 129 credits in the first three years which are divided into discipline core and elective courses. The details are as follows:

Division	Sub division	Credits
Discipline Core	Management	115
	Economics	
	Indian Knowledge System	
	Data Science	
	Personality Development	
	Language	
	Social Sciences	
	Science and Engineering	
Discipline Electives	Elective Courses	14

b) The credits structure for the fourth years of the program is as follows:

Division	Credits
Industry Internship*	12
Discipline Core**	20

**See the courses offered in Semester 2 of MBA (DS & AI) program

*Industry internship After successful completion of the first three years program (minimum CGPA 6.0 on 10 points scale). After this, the students of the integrated MBA program would be going for a sixth month long industrial internship any time during June to January. These students will use Semester VII to complete their extended industry internship which is a unique proposition of the proposed program. The students will get 12 credits for the internship.

This unique proposition was validated by both industry and academic experts that were consulted. According to their comments, the industry prefers a long internship instead of the traditional 2-month internship. We also experienced the same during the current internship drive for our students of our existing MBA (DS & AI) program.

Salient features/benefits of the semester long internship are as follows:

- The courses offered to the two-year MBA students in their Semester I are covered by the Integrated MBA students in their first three years and hence the six months internship avoids the repetition of similar courses and utilizes this semester for essential industrial exposure.
- The internship will give the students an exposure to real business world and help relate better to the management courses in 4th and 5th year of the integrated MBA program.
- In the recent years an increasing requirement of six months long internship for the B.Tech. students at IIT Mandi is observed from the companies visiting the campus and found to provide higher chance of Pre-Placement Offers (PPO). It is highly likely that the longer industrial internships for the management students would also open the options of PPO.

c) The credits structure for the fifth year of the program is as follows:

Division	Credits
Core	18
Electives	12

In near future, SOM is also planning to offer a two-year MBA program in multiple specialization. The students of the integrated MBA program will then have the option of choosing one of the specializations. The criteria for allocation of one of the specializations would be formulated in future.

F. List of proposed Courses

The following are the details of courses for the first three years of the program

List of Core Courses

Core Courses	Credits
Differential Calculus	2
Introduction to Management	3
Python Programming	4
Introduction to Natural Science 1	2
Introduction to Indian Knowledge System	3
Introduction to Accounting	3
Basic Business Communication	3
Sports/Yoga/Physical Training	1
Integral Calculus	2
History of Indian Business	3
Linear Algebra	3
Micro-Economics	3
Basics of Psychology	3
Introduction to Data Structure for Business Application	3
Advanced Business Communication	3
Indian Art forms 1	1
Management Workshop 1	1
Business Statistics	3
Macro Economics	3
Philosophy and Management	3
Critical Thinking and Writing Skills	3
Mindfulness and Consciousness	3
Introduction to Natural Sciences 2	2
Introduction to Marketing	3
Sports/Yoga/Physical Training	1
Operations Research	3
Introduction to Databases	3
Foreign Language Level 1 (German/French etc)	3
Effective Public Speaking and Debating	3
Sustainable Business Practices	3
Spreadsheet Modelling	2
Management Accounting	3

Indian Art forms 2	1
Social immersion	0
Management Workshop 2	1
Web-Based Development	3
Business Research Methods	3
Management Lessons from Indian Knowledge System	3
Introduction to Engineering	2
Elective	6
Sports/Yoga/Physical Training	1
Game Theory	2
Capstone Project 1	1
Basic Econometrics	3
Decision Analysis	3
Elective	8
Ethics and Values	3
Management Workshop 3	1
Indian Art forms 3	1
Capstone Project 2	3

List of Elective Courses

Electives	Credits
Numerical Methods	3
Optimization	3
Multivariate Analysis	3
Time Series Analysis	3
Intellectual Property Rights	2
Indian Economy (Arthashastra)	2
Information System	2
International Trade	2
Money Banking and Finance	2
Cost Accounting	2
Business Regulatory Frameworks	2
Indian Financial System	2
Foreign Language level 2 (German/French etc.)	3
Foreign Language level 3 (German/French etc.f)	3
Visual Analytics	2
R Programming	2
Entrepreneurial Practicum	6
Vedic Mathematics	2
Ancient Arts and Architecture	2
Cognitive Psychology and Indian Thought System	2
Sanskrit	2

Note: The above is not exhaustive list

The following are the details of the courses for the last two years of the program:

The students of the integrated program will undertake a semester long internship in the seventh semester. The students will take the same courses as offered to MBA (DS & AI) students in their last three semesters.

Eligible students can also compete for semester exchange opportunities offered by international institutes, allowing them to gain valuable international experience and broaden their global perspective.

Interested students can also leverage the incubation facility of IIT Mandi to explore and initiate tech-based ventures that have the potential to shape the business landscape and create significant social and economic impact. Students with entrepreneurial aspirations can even take a sabbatical of up to one year to focus on developing their start-up idea.

The students can leverage the above opportunities subject to the prevailing norms and approval by the competent authority.

G. Provide a list of any current courses that would be cross-listed with the program:

The program has many courses in its first three years that have commonality with the existing courses of other undergraduate and postgraduate programs at IIT Mandi. However, many of existing courses in their present form may not be suitable for Integrated MBA program and will need to be designed afresh keeping in mind program focus.

Secondly, the proposed program aims to make learning more experiential and engaging with the help of following pedagogies that are not essentially used in the existing undergraduate courses at IIT Mandi:

- Hands-on computing and business simulations labs
- Business case studies
- Group discussions
- Management role-plays
- Course instructors from industry to bridge the gap between the academic training and industrial practices
- Projects

H. What, if any, new courses will be required for the program? A separate course proposal is required for each new required course.

The detailed course contents are under development. Review comments from the academic and industry experts have been taken into consideration for this purpose.

I. Provide a sample academic plan for students completing the academic program being proposed.

a) Semester 1

Courses	Credits
Differential Calculus	2
Introduction to Management	3
Python Programming	4
Introduction to Natural Science 1	2
Introduction to Indian Knowledge System	3
Introduction to Accounting	3
Basic Business Communication	3
Sports/Yoga/Physical Training	1

b) Semester 2

Courses	Credits
Integral Calculus	2
History of Indian Business	3
Linear Algebra	3
Micro-Economics	3
Basics of Psychology	3
Introduction to Data Structure for Business Application	3
Advanced Business Communication	3
Indian Art forms 1	1
Management Workshop 1	1

c) Semester 3

Courses	Credits
Business Statistics	3
Macro Economics	3
Philosophy and Management	3
Critical Thinking and Writing Skills	3
Mindfulness and Consciousness	3
Introduction to Natural Sciences 2	2
Introduction to Marketing	3
Sports/Yoga/Physical Training	1

d) Semester 4

Courses	Credits
Operations Research	3
Introduction to Databases	3
Foreign Language Level 1 (German/French etc.)	3
Effective Public Speaking and Debating	3
Sustainable Business Practices	3
Spreadsheet Modelling	2
Management Accounting	3
Indian Art forms 2	1
Social immersion	0
Management Workshop 2	1

e) Semester 5

Courses	Credits
Web-Based Development	3
Business Research Methods	3
Management Lessons from Indian Knowledge System	3
Introduction to Engineering	2
Elective	6
Sports/Yoga/Physical Training	1
Game Theory	2
Capstone Project 1	1

f) Semester 6

Courses	Credits
Basic Econometrics	3
Decision Analysis	3
Elective	8
Ethics and Values	3
Management Workshop 3	1
Indian Art forms 3	1
Capstone Project 2	3

Annexure A

Curriculum of 2 years MBA DS & AI at program IIT Mandi

The proposed **MBA (DS & AI)** program is a blend of management of contemporary concepts, softer skills towards developing individuals, and relevant applications of data science tools. **MBA (DS & AI)** is a 2-year long full-time Masters programme, distributed in 4 semesters. The credit requirement is 70. The program aims to provide an in-depth exposure on data science tools and techniques like analytics, artificial intelligence machine learning, deep learning, natural language processing, and neural networks with a strong emphasis on problem solving approach.

The course structure has three major components as detailed below:

Discipline Cores (46 credits):

Discipline Cores are designed to give the students appropriate exposure to different thoughts and theories of 'management' and 'Data science'. These include course in managerial competence such as communication skills, Legal aspects of business, HR management, creative thinking problem solving and decision making, organizational behaviour; as well as data science course such as Neural networks fundamentals for business, Mathematical foundations, disruptive technologies for data science, Introduction to AI and automation etc.

Electives (8+4 credits):

A pool of discipline and free elective courses help students to go deeper into selected areas of application of data science and artificial intelligence in business. While discipline cores are more theme oriented and interdisciplinary in nature, the discipline electives have greater disciplinary grounding. The pool of discipline electives courses is dynamic in nature and more courses may be added in the future depending upon suitability. Students also have to take 4 credits offered in the institute from outside the pool of discipline electives for the **MBA (DS & AI)** Programme.

Project and internship (12):

Students would get exposure to real world problems, research methodology and industry experience through the Qualitative research workshop, social immersion project, Industry internship and two semester long Management project.

Curriculum:

The distribution of credits across types of courses is proposed to be the following:

1	Discipline Core	46
2	Discipline Electives	8
3	Free Electives	4
4	Project and Internship	12
Total		70

Sl. No.	Semester I	Break	Semester II	Break	Semester III	Break	Semester IV
1	Principles of Management	Im- mer- sion (0 cred- its)	Qualitative Research	Indu- stry Inter- nshi- p (2 credi- ts)	Legal Aspects of Business		Electives (6 – 10 credits)
2	Communication Skills for Managers		Fundamentals of Data and Analytics		Neural Networks fundamentals for Business		
3	Financial Statement Analysis		Human Resource Management		Digital Business Strategy, Models and Transformations		
4	Mathematical Foundations for DS and AI		Disruptive Technologies for Data Science		Entrepreneurship		
5	Managerial Economics		Strategic Management		Electives (2 – 6 credits)		
6	Marketing Management		Machine Learning for Business				
7	Decision Analysis		Introduction to AI and Automation		Management Project I (4 credits)		
8	Probability and Statistics		Financial Management				
9	Python Programming		Organizational Behavior				
10	Creative Thinking, Problem Solving and Decision Making						
Credits	20	2	18	2	14-18		12 - 16
Summary	20 credits compulsory		18 credits compulsory		12 credits compulsory		6 credits compulsory
Total Credits earned	20	20	38	40	54-58		70

The following is the tentative list of the elective courses. It is not an exhaustive list and may be modified based on students request and faculty interest.

Discipline Elective Minimum 2 courses each in 3rd and 4th semester

Sl No	Course Title	Credits
1	AI in Marketing	2
2	Causal Analytics	2
3	AI for Finance	2
4	Fintech	2
5	Blockchain for Business	2
6	Deep Learning for Business Application	2
7	Natural Language Processing for Business	2
8	Intelligent Automation	2
9	Fuzzy logic for business decision making	2
10	Evolutionary computation for business solutions	2
11	Operations Management	2

Free Electives One course each in 3rd and 4th semester

Sl No	Course Title	Credits
1	Product Management	2
2	Design Thinking	2
3	Social Analytics	2
4	Cloud Computing for Business	2
5	Cyber Securities, Ethics and Privacy	2
6	Negotiation Analysis	2
7	Data Strategy	2
8	AI Strategy and Implementation	2
9	Leadership	2

The above list is not exhaustive and it may vary based on student requirement and faculty interest.

Proposal for a Human-Computer Interaction (HCI) Centre at IIT Mandi

Introduction

Allen Newell, Herbert A. Simon, and Alan J. Perlis documented a letter to the journal *Science* in 1967 entitled "What is Computer Science?" In this letter, these researchers articulated that computer science, a novel discipline, should include an investigation of the phenomena surrounding computers, not just the theory and design of the computation devices themselves. The interdisciplinary field of Human-Computer Interaction (HCI) investigates this phenomenon surrounding computers. HCI is a field of study that focuses on designing, developing, and evaluating computer systems and other interactive technologies that people use. It is an interdisciplinary field that combines concepts and methods from computer science, cognitive science, AI, design, engineering, and other related fields. HCI aims to create computer systems and other interactive technologies that are easy to use, efficient, and effective for human users. This includes designing user interfaces that are intuitive and user-friendly, developing input devices and interaction techniques that are appropriate for the user's needs, and evaluating the system's usability. The scope of HCI is broad, ranging from desktop and mobile applications to augmented and virtual reality environments and from social media platforms to medical devices and applications. HCI researchers and practitioners focus on various topics, such as user experience design, user interface design, usability testing, accessibility, AI, and cognitive science.

Given the importance of HCI as a discipline and the emerging technologies that interact with human users, **it is proposed to have a Human-Computer Interaction (HCI) Centre at IIT Mandi.** The HCI Centre would be a research centre that would significantly impact academia and industry by advancing research in the field of HCI, creating new technologies, and improving the user experience for a wide range of applications.

Most recently, IIT Mandi iHub and HCI Foundation (iHub), a section-8 company, was created by the Government of India on the IIT Mandi campus with a mission to make IIT Mandi a "go-to" place in India for technology development, skill development, translation, and commercialization in the HCI area. **While the iHub focuses on technology development, skill development, incubation of start-ups in HCI and collaborating with industry partners, technology translation, and commercialization in the HCI area, the HCI Centre at IIT Mandi would provide an academic and research environment that would focus on research and prototype development in the HCI area, graduate programs in the HCI areas, and collaborative research with industry via faculty in the HCI area.** Thus, the HCI Centre would actively collaborate with the iHub and **provide the academic and research foundation for several of the outward/industry adoption and societal activities executed by the iHub.** A few motivations for establishing an HCI Centre at IIT Mandi include

- **Interdisciplinary Collaboration:** HCI research requires a broad range of expertise, including computer science, cognitive science, psychology, design, AI, and engineering. An HCI Centre at IIT Mandi would encourage collaboration among researchers with different backgrounds and skill sets, leading to a more comprehensive understanding of the field and the development of industry-relevant innovative solutions.
- **Addressing Societal Challenges:** HCI can address real-world problems, such as accessibility, health, education, defense and security, environment, and sustainability. An HCI Centre at IIT Mandi could focus on creating technology solutions to address industry problems that would positively impact society and potentially improve the lives of people around the world.
- **Industry Partnerships:** An HCI Centre at IIT Mandi could establish partnerships with industry leaders, providing opportunities for students and researchers to work on real-world problems and gain experience applying HCI research to industry settings. Such partnerships (including those with the iHub) can also provide funding for research and help bring new technologies to market.
- **Education and Training:** An HCI Centre at IIT Mandi could provide educational opportunities at the Certificate, Master, and Ph.D. levels for students and professionals in the field of HCI. This would include degree programs that could help to build the next generation of HCI researchers and practitioners.

Overall, an HCI Centre at IIT Mandi could play a significant role in advancing the field of HCI, developing new technologies, and improving the user experience for a wide range of applications.

Objectives

The HCI Centre at IIT Mandi will have the following objectives:

Outcome-based Research: One of the primary objectives of the HCI Centre is to conduct outcome-based research in human-computer interaction that address societal needs. The Centre can undertake research projects to develop innovative technologies, user interfaces, and interaction techniques. The research can focus on cognitive technologies, brain-computer interfaces, cognitive enhancement, different modalities of smell, taste, and touch, virtual and augmented reality, social computing, machine learning, and intelligent user interfaces.

Train Students and Professionals: Another objective of the HCI Centre is to train the next generation of HCI researchers and practitioners. The Centre can offer Certificate, Master, and Ph.D. programs, specializations, training programs, and workshops to students and professionals in the field of HCI. The Centre can also provide opportunities for students to gain practical experience through internships, research projects, and industry collaborations.

Foster Collaborations: The HCI Centre will foster collaboration among researchers, academics, industry professionals, and other stakeholders. The Centre can host seminars, conferences, and workshops to bring together experts in the field of HCI and provide a platform for exchanging ideas and sharing knowledge. This can promote interdisciplinary collaboration, essential for solving complex problems in HCI.

Improve User Experience: The HCI Centre will work towards improving the user experience of interactive technologies. The Centre can conduct usability studies, user experience evaluations, and accessibility testing to identify and address issues that may hinder the usability and effectiveness of interactive systems.

Address Societal Challenges: The HCI Centre will address societal challenges by developing HCI solutions that positively impact society. The Centre can focus on accessibility, health, education, defense and security, environment, sustainability, etc., and develop technologies that can significantly impact people's lives.

Resource Generation: The HCI Centre will try to generate monetary resources via teaching, skill development, research, and leasing the bleeding-edge lab equipment and other facilities to become self-sustaining over time eventually.

Overall, the HCI Centre at IIT Mandi will have several objectives, including conducting research, and training students and professionals, fostering collaborations, improving user experience, addressing societal challenges, and resource generation. These activities of the HCI Centre are planned to be undertaken independently or in conjunction with the iHub in HCI.

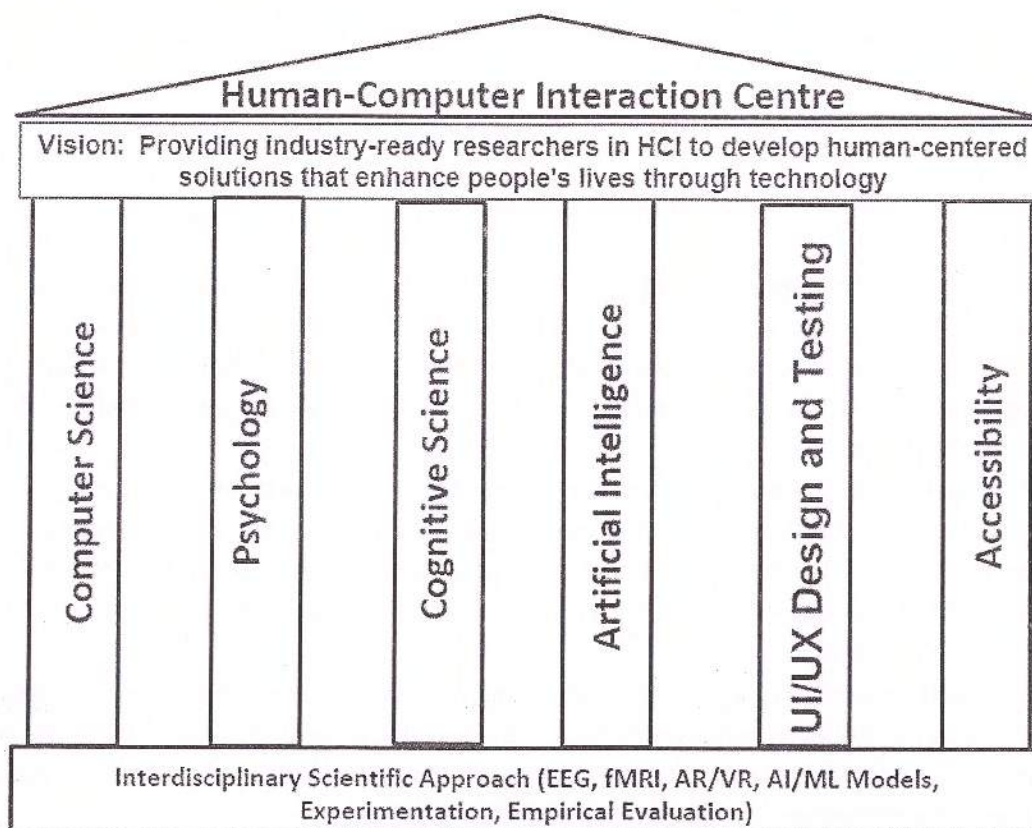


Figure 1. The HCI Centre at IIT Mandi is envisioned to provide industry-ready researchers in HCI to develop human-Centered solutions that enhance people's lives through technology. The pillars provide foundational areas where an interdisciplinary scientific approach is utilized for research.

As shown in Figure 1, the HCI Centre is envisioned to provide industry-ready researchers in HCI to develop human-centered solutions that enhance people's lives through technology. The research and teaching under the Centre would include the following HCI areas: computer science, human factors, psychology, cognitive science, neuroscience, artificial intelligence (AI), user experience design, user interface design, interaction techniques and input devices, accessibility, universal design, and virtual and augmented reality. The Centre's research would be grounded in interdisciplinary scientific methods and involve several methodologies from design, psychology, cognitive science, neuroscience, AI, and computer science.

Uniqueness

The proposed Centre will be unique because of the following:

1. It will be the first-of-its-kind Centre focused on the Himachali communities with its challenges due to geographical location.
2. It will be the first of its kind Centre at an IIT in India.
3. It will be the first of its kind Centre that brings interdisciplinary topics concerning HCI under a common umbrella.
4. It will be the first of its kind Centre that offers an interdisciplinary mix of faculty and programs in HCI.

Salient points

The HCI Centre at IIT Mandi has the following salient points:

1. **Interdisciplinary Focus:** IIT Mandi has a strong focus on interdisciplinary research and education, which can be leveraged to create a unique HCI Centre that brings together expertise from multiple fields. By integrating insights from computer science, psychology, design, engineering, and other disciplines, the centre can develop innovative approaches to human-computer interaction.
2. **Emphasis on Social Impact:** IIT Mandi is strongly committed to social impact, and the HCI Centre at the institute can reflect this emphasis by focusing on developing HCI solutions that positively impact society. By addressing societal challenges such as healthcare, education, accessibility, and sustainability, the centre can contribute to the well-being of people in the region and beyond.
3. **Regional Context:** IIT Mandi is located in the Himalayan region of India, which presents unique challenges and opportunities for HCI research and development. The HCI Centre at the institute can leverage the regional context to develop technologies tailored to the needs of people in the area while also addressing broader global challenges.

4. **Industry Collaboration:** IIT Mandi has established partnerships with industry leaders, which can be leveraged to create a unique HCI Centre closely connected to industry needs and trends. By collaborating with industry partners, the centre can ensure that its research and education are relevant to real-world problems and can have a practical impact.
5. **Entrepreneurship:** IIT Mandi strongly focuses on entrepreneurship, which can be leveraged to create a unique HCI Centre that fosters innovation and creativity. By providing opportunities for students and researchers to develop new technologies and start-up companies, the centre can contribute to the growth of the technology ecosystem in the region and beyond.

Overall, the HCI Centre at IIT Mandi can be unique by leveraging the institute's strengths in interdisciplinary research and education, social impact, regional context, industry collaboration, and entrepreneurship. By combining these factors, the centre can develop innovative approaches to human-computer interaction that positively impact society and the economy.

Research and Labs

The Centre would establish research labs like UI/UX and design lab, EEG/MEG lab, Neurostimulation lab, Eye-tracking lab, AR/VR and Motion lab, Psychology, data collection, AI/ML lab, and teaching labs. The Centre would also cater to several specializations and degree programs at the undergraduate and postgraduate levels, respectively. The undergraduate programs may include B. Tech. in Computer Science (with specializations in HCI). Furthermore, some of the postgraduate programs include M.Tech. programs in HCI/Cognitive Science/user-Centered design/AI and ML. Finally, the Centre would include a Ph.D. program in all HCI areas. The teaching programs would be supported via certain teaching labs.

Deliverables

The HCI Centre at IIT Mandi plans to deliver a variety of outputs and outcomes, depending on its goals and objectives. Here are some possible deliverables of such a Centre:

Research publications: The HCI Centre will conduct high-quality research in the field of human-computer interaction and publish their findings in top-tier conferences and journals. This can contribute to developing new knowledge and insights that can be applied to the design and development of interactive systems.

Design solutions: The HCI Centre will create design solutions that are tailored to specific user needs and contexts. This can include the development of prototypes, mockups, and user interfaces that can be tested and evaluated with real users to ensure their usability and effectiveness.

Education and training: The HCI Centre can offer courses, workshops, and training programs to students, professionals, and researchers in the field of human-computer interaction. This can help to build a skilled workforce that can design and develop interactive systems that are user-friendly, efficient, and effective.

Toolkits and frameworks: The HCI Centre can develop toolkits, frameworks, and libraries that designers and developers can use to create interactive systems more efficiently and effectively. This can include software libraries, design patterns, and other resources that can streamline the development process and improve the quality of the final product.

Consulting services: The HCI Centre can offer consulting services to industry partners and government agencies to help them design and develop interactive systems that are user-friendly and effective. This can include user research, design evaluation, and usability testing services that can provide valuable insights into user needs and preferences.

Start-up companies: The HCI Centre can encourage and support the creation of start-up companies focused on developing innovative solutions in the field of human-computer interaction. This can contribute to the growth of the technology ecosystem in the region and create new job opportunities for students and researchers.

Overall, the HCI Centre at IIT Mandi can deliver a range of outputs and outcomes that can contribute to developing high-quality research, innovative design solutions, a skilled workforce, and practical applications of human-computer interaction.

Academic and Industry Collaborations

Some of the Institutes in India and abroad that have expressed interest in collaborating with the HCI Centre include

1. IIT Mandi iHub and HCI Foundation
2. IIT Mandi Catalyst
3. IISc Bangalore
4. IIT Delhi
5. IIT Bombay
6. IIT Guwahati
7. INMAS, DRDO
8. AIIMS Bilaspur
9. PGIMER Chandigarh
10. Indian Airforce
11. Carnegie Mellon University, USA
12. The University of Texas, El Paso, USA
13. Unity 3D
14. Epic Games
15. Furhat Robotics
16. Rubiscape
17. Think Design
18. Naxon Labs

19. Neuphony
20. ITRA
21. Neuroleap
22. Icuro
23. Revenue Mantra

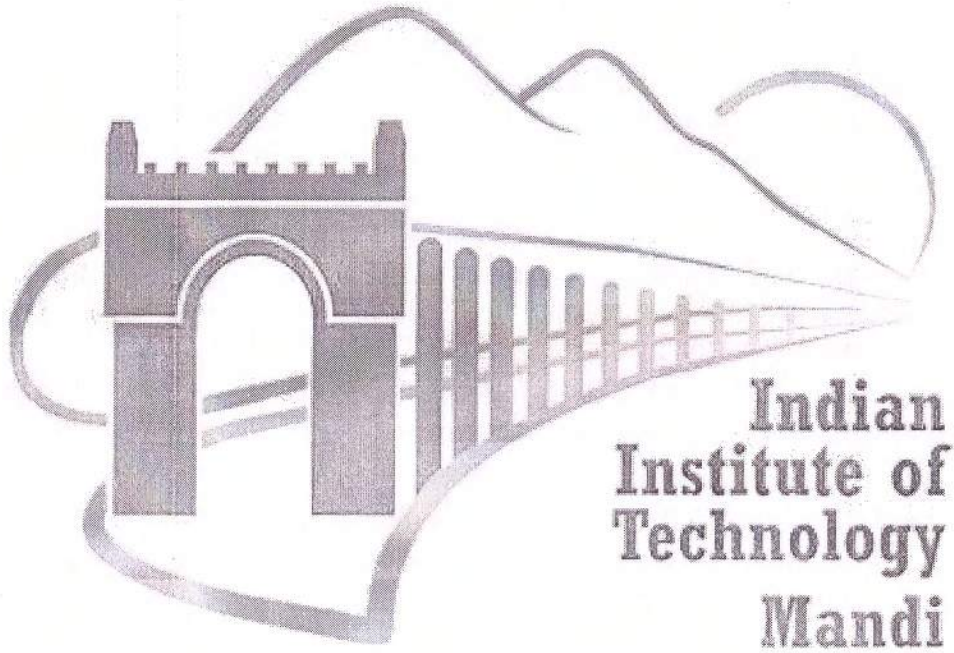
IIT Mandi Faculty Involved

Several faculty at IIT Mandi has expressed interest in participating in the HCI Centre. These include

Prof. Arnav Bhavsar
Prof. A D Dileep
Prof. Aditya Nigam
Prof. Satyajit Thakor
Prof. Shubhajit Roy Chowdhury
Prof. Gopi Shrikanth Reddy
Prof. Erwin Fuhrer
Prof. Dinesh Singh
Prof. Narendra Dhar
Prof. Radhe Shyam Sharma
Prof. Varun Dutt
Mr. Somjit Amrit, CEO, iHub
Postdocs, Faculty Fellows, and Research Staff at iHub

Other faculty, including newer faculty, will be invited from time-to-time to become a part of the proposed HCI Centre.

B. Tech. in Mathematics and Computing



School of Mathematical and Statistical Sciences
(SMSS)

Indian Institute of Technology Mandi

Name of the New Proposed Program: B.Tech. in Mathematics and Computing (Four Years Undergraduate Program)

I. General Information:

Name (s) of prosper school: School of Mathematical and Statistical Sciences (SMSS)

II. Program Description:

A. Provide a justification/rationale for the program. How does the program relate to the mission of the IIT Mandi?

The Bachelor of Technology (B.Tech.) program in Mathematics and Computing is a comprehensive course that integrates the principles of mathematics and computing. This program is designed to equip students with a strong foundation in mathematics, computing, and computational thinking, enabling them to develop and apply analytical and problem-solving skills in a variety of fields in science and engineering. The aim of this program is two-fold, one to provide strong mathematical background for strong logical thinking, and other to prepare students for strong computing skills. The mathematics part will also give them strong foundation which enable them to be leader in the field. The program is design in such way that after important foundational courses, students can choose courses as per their interest in a particular domain.

The program aims to produce graduates who are well-versed in a broad range of mathematical and computational concepts, techniques, and tools. With the help of these skills, students can handle complex real-world problems. It will also enhance the ability of the students looking for solving new challenges in the society. With a focus on both theoretical and practical aspects of mathematics and computing, this program prepares students for a wide range of careers in industries, academia and research & development.

B. SWOT analysis of the program

The purpose of SWOT analysis is to see how B.Tech. in Mathematics and Computing can be implemented in the IIT Mandi's education system.

ADVANTAGES (Strengths-Opportunities)	DISADVANTAGES (Weakness - Threats)
This program is designed to equip students with a strong foundation in mathematics, computing, and computational thinking, enabling them to develop and apply analytical and problem-solving skills in a variety of fields in science and engineering.	Needs to recruit more faculty members in the core areas of Computational Mathematics and Scientific Computing.
The program aims to produce graduates who are well-versed in a broad range of mathematical and computational concepts, techniques, and tools, through which they can handle complex real-world problems. So, the program is design in such way that after important foundational courses, students can	Dedicated teaching labs for providing hands on training to UG students in computational aspects of different engineering branches.

choose courses as per their interest in a particular domain.	
With a focus on both theoretical and practical aspects of mathematics and computing, this program prepares students for a wide range of careers in industries, academia and research & development.	
Very good job market in the core areas of Scientific Computing and Numerical Computing and soft computing.	

C. Justification with respect to New National Education Policy (NEP) mandates

One of the major key points of the new national education policy (NEP) is transformational reforms in school and higher education systems in the country and also to foster interdisciplinary education, and learning by doing. In the proposed B.Tech. program, greater emphasis is given to connection between the fundamentals and analytical abilities, critical thinking, and real-life problem solving. The program is designed in such a way that students should get a strong foundation in mathematics, scientific computing, and computational thinking, which will enable them to develop and apply analytical and problem-solving skills in a variety of fields in science and engineering.

The proposed program aims to produce graduates who are well-versed in a broad range of mathematical and computational concepts, techniques, and tools. With the help of these skills, students can handle complex real-world problems. It will also enhance the ability of the students looking for solving new challenges in the society. With a focus on both theoretical and practical aspects of mathematics and computing, this program prepares students for a wide range of careers in industries, academia and research & development.

D. Provide a mission statement for the program. Include educational and learning objectives

The Bachelor of Technology in Mathematics and Computing program's mission is to prepare graduates who are well-versed in a broad range of mathematical and computational concepts, techniques, and tools, which can enable the students to solve complex real-world problems. With a focus on both theoretical and practical aspects of mathematics and computing, this program will prepare students for a wide range of careers in industries, academia and research & development.

The educational and learning objectives of the B.Tech. in Mathematics and Computing program are:

- Our graduates will be equipped with a strong foundation in mathematics, computing, and computational thinking, which will enable them to develop and

apply analytical and problem-solving skills in a variety of fields in science and engineering.

- Our graduates will be trained to become world leaders in the field of scientific computing with strong fundamentals and analytical abilities, and critical thinking.
- With a focus on both theoretical and practical aspects of mathematics and computing, this program will prepare graduates for a wide range of careers in industries, academia and research & development.

E. Credit Structure of the program.

The typical credit structure of the institute will be followed as shown below.

Division	Sub division	Credits
Institute Core	IC Compulsory	39
	IC Baskets	06
	Humanities and Social Sciences (HSS)	12
	Indian Knowledge System (IKS)	03
Discipline	Discipline Core (DC)	51
	Discipline Electives (DE)	15
Electives	Free Electives (FE)	22
	Major Technical Project (MTP)	08
	Interactive Socio Technical Practicum (ISTP)	04
	TOTAL	160

The credit structure will be followed as per the existing norms of the institute. Out of 160 credits, 52 credits will be dedicated to discipline core courses and 15 credits will be assigned for discipline electives. Total of 67 credits will be maintained for discipline (i.e., DC (52 credits) and DE (19 credits)) courses while the rest of the credits will be kept for IC and other institute level courses (93 credits). The semester wise distributions of all the courses along with credits details are given below:

B.Tech. in Mathematics & Computing –1st Semester						
S.No	Code	Course Name	Lecture	Tutorial	Practical	Credit
1	ICXXX	Calculus	2	0	0	2
2	ICXXX	Complex variables and Vector Calculus	2	0	0	2
3	IC140	Engineering Graphics	2	0	3	4
4	IC152	Introduction to Python and Data Science	3	0	2	4
5	IC131	Understanding Biotechnology & its Applications (basket - 1)	3	0	0	3
6	IC241	Data Structure & Algorithms (basket-2)	3	0	0	3
7	YYXXX	IKSMHA Course	3	0	0	3
8	ICXXX	Data Structure & Algorithm Lab	0	0	2	1

Total Credits: 22

B.Tech. in Mathematics & Computing –2nd Semester

S.No	Code	Course Name	Lecture	Tutorial	Practical	Credit
1	ICXXX	Linear Algebra	2	0	0	2
2	ICXXX	ODE & Integral Transforms	2	0	0	2
3	IC161	Applied Electronics	3	0	0	3
4	IC 161P	Applied Electronics Lab	0	0	3	2
5	IC252	Probability and Statistics	3	0	2	4
6	ICXXX	Foundations of Design Practicum	1	0	6	4
7	IC221P	Physics Practicum	0	0	3	2
8	HSXXX	HSS Course	3	0	0	3

Total Credits: 22

B.Tech. in Mathematics & Computing –3rd Semester

S.No	Code	Course Name	Lecture	Tutorial	Practical	Credit
1	IC201P	Design Practicum	0	0	6	3
2	IC272	Machine Learning	2	0	2	3
3	MAXXX	Real and Complex Analysis	2.5	0.5	0	3
4	CS208	Mathematical Foundation of Computer Sciences	3	1	0	4
5	MAXXX	Ordinary Differential Equation	3	1	0	4
6	FE	Free Elective				4

Total Credits: 21

B. Tech. in Mathematics & Computing – 4th Semester

S.No	Code	Course Name	Lecture	Tutorial	Practical	Credit
1	MAXXX	Partial Differential Equation	3	1	0	4
2	CS201	Computer Organization	3	0	0	3
3	CS201P	Computer Organization Laboratory	0	0	2	1
4	MAXXX	Numerical Analysis	3	1	0	4
5	MAXXX	Applied Mathematics Programming	3	1	0	4
6	HSXXX	HSS Course				3
7	MAXXX	Discipline Elective Basket -I (Foundation Module)				3

Total Credits: 22

B.Tech. in Mathematics & Computing – 5th Semester

S.No	Code	Course Name	Lecture	Tutorial	Practical	Credit
1	MAXXX	Matrix Computation & Lab	3	0	2	4
2	CS304	Formal Language and Automata Theory	3	0	0	3
3	CSXXX	Design of Algorithms	3	0	2	4
4	DE	Discipline Elective				3
5	MAXXX	Mathematical Modelling	3	0	0	3
6	HSSXXX	HSS or Management course				3
7	MAXXX	Reverse Engineering				1

Total Credits: 21

B.Tech. in Mathematics & Computing – 6th Semester

S.No	Code	Course Name	Lecture	Tutorial	Practical	Credit
1	CS207	Applied Databases Practicum	0	0	3	2
2		Discipline Elective Basket-II (Advance Modelling Module)	3	0	0	3
3	MAXXX	Numerics of PDE	3	0	0	3
4	FE	Free Elective	3	0	0	3
5	HSSXX	HSS or Management course				3
6	ISTP	ISTP				4
7	MAXXX	Applied Graph Theory	3			3

Total Credits: 21

B.Tech. in Mathematics & Computing – 7th Semester

S.No	Code	Course Name	Lecture	Tutorial	Practical	Credit
1	DE	Discipline Elective				3
2	FE	Free Elective				3
3	FE	Free Elective				3
4	MTP-1	MTP-1				4
5	IC 010	Internship				2

Total Credits: 15

B.Tech. in Mathematics & Computing –8th Semester

S.No	Code	Course Name	Lecture	Tutorial	Practical	Credit
1	DE	Discipline Elective				3
2	FE	Free Elective				3
3	FE	Free Elective				3
4	FE	Free Elective				3
5	MTP-2	MTP-2				4

Total Credits: 16

Grand Total: 160 credits for B. Tech. in Mathematics and Computing

Two discipline elective baskets are proposed for two discipline electives to give a flexibility to the students to choose their free electives in a particular direction.

Discipline Elective Basket I: Foundation Module

Course Numbers	Course Titles	Credits
MAXXX	Abstract Algebra	3
MAXXX	Functional analysis	4
MAXXX	Measure Theory	4
MAXXX	Topology	4
MAXXX	Number Theory	3

Discipline Elective Basket II: Advance Modelling Module

Course Number	Course Titles	Credits
MAXXX	Climate Modelling	
MAXXX	Computational Financial Modelling & Lab	4
MAXXX	Modelling of infectious disease	
MAXXX	Mathematical Image Processing	
MAXXX	Mathematical Control Theory	
MAXXX	Modelling and Simulation	3
MAXXX	Modelling Population Dynamics	3

Students can take other discipline electives from the proposed list of the discipline electives. The list will be revised/modified time to time to include new discipline electives.

Discipline Electives: Discipline electives will be provided according to the requirement of the students and the availability of the faculties. The list of discipline electives is attached herewith. More elective courses will be added time to time as required. Overall, the credits distribution is as follows:

Sl. No.	Course No.	Course Name	Credits
1.	MA605	Statistical Data Analysis	3
2.	MAXXX	Mathematical Foundations of Financial Engineering	3
3.	MAXXX	Numerical Methods in Quantitative Finance	3
4.	MAXXX	Computational Fluid Dynamics	3
5.	MAXXX	Financial Engineering	3
6.	MAXXX	Stochastic Calculus for Financial Engineering	3
7.	MAXXX	Semigroup of Bounded Linear Operators	3
8.	MAXXX	Topics in Semigroup Theory	3
9.	MA765	Fractional Differential Equations	4
10.	CS502	Compiler Design	4
11.	CS562	Artificial Intelligence	3
12.	CSXXX	Computer Networks	4
13.	CSXXX	Operating Systems	4
14.	MAXXX	Time Series Analysis	3
15.	MAXXX	Mathematical Method for Signal Processing	4
16.	EE511	Computer Vision	4
17.	EE608	Digital Image Processing	4
18.	MAXXX	Advanced Data Structure and Algorithms	4
19.	MAXXX	Speech Processing	3
20.	CS669	Pattern Recognition	4
21.	MAXXX	Soft Computing	3
22.	BE304	Bioinformatics	4
23.	BE301	Biomechanics	4
24.	BE3XX	Genetic Engineering	4
25.	BE303	Applied Biostatistics	4
26.	CE352	Transportation Engineering	3
27.	CE352P	Transporting Engg. Lab	1
28.	CE251	Hydraulics Engineering	3
29.	CS302	Paradigms of Programming	4

30.	CS309	Information Systems and Databases	4
31.	DS201	Data Handling and Visualization	3
32.	DS302	Computing Systems for Data Processing	4
33.	DSXXX	Times Series Analysis and Applications / Bayesian Data Analysis and Applications	3
34.	DSXXX	Big Data: Management and Analytics	4
35.	EE203	Network Theory	3
36.	EEXXX	Signal & Systems	3
37.	EE301	Control Systems	3
38.	EP302	Computational Methods for Engineering	3
39.	ME2XX	Engineering Thermodynamics	4
40.	ME210	Fluid Mechanics	3
41.	ME303	Heat Transfer	3
42.	ME310	System Dynamics and Control	3
43.	MEXXP	Fluid Mechanics Lab	1
44.	MEXXP	Heat Transfer Lab	1
45.	MAXXX	Cellular Automata	3
46.	CS606	Computational Modeling of Social Systems	3

Total- 160 Credits

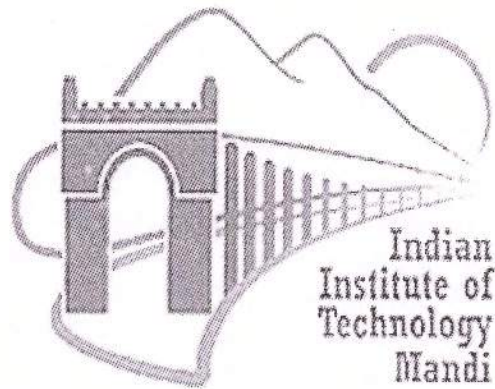
Discipline Core- 51 Credits

Discipline Elective- 15 Credits (out of which 6 credits would be chosen from two baskets)

Free Electives- 22 Credits

Institute Core & other required courses: 72

Bachelor of Technology in Microelectronics and VLSI Engineering



Programme Level	Under Graduate
Year of Commencement	2023
Minimum Duration	4 Years (8 semesters)
Maximum Duration	6 Years (12 Semesters)

Motivation :

India semiconductor mission is aiming to have a growth in the semiconductor industry in India. The conventional undergraduate courses such as electrical and electronics will give some foundations in the VLSI to pursue higher education in the area of VLSI. This program is designed to support the manpower for the semiconductor industry in the upcoming years with trained undergraduates. This course is designed to train the students in the core area of VLSI with industrial standard EDA tools to understand the current scenario and the state of the art. After undergoing this program, the students will acquire both theoretical knowledge and practical skills in VLSI specialization and chip designing. The curriculum is supported with the advanced courses of VLSI specialization in device level, design, fabrication and tools.

Course Structure :

Academic courses offered by IIT-Mandi for the B. Tech. / B. Tech. (Honors) program are classified as Institute Core (IC), Discipline Core (DC), Discipline Elective (DE) and Free Elective (FE) courses. As per IIT Mandi, a student must complete minimum credit requirements of 160 credits for regular B. Tech. and 172 credits for the B. Tech. with Honors. Hierarchically, IC courses provide a broader view of all engineering disciplines and IIT Mandi believes in making this learning process instrumental. Here, students are conceptualized with the fundamentals of these essential courses via theoretical approach and by conducting methodically structured experiments for the same. The majority of these IC courses are offered during 1st and 2nd semesters of B. Tech. program. In the third semester, the students will be introduced with basic courses in electronics for better foundation in the core field. In the 4th semester, students are offered with the design practicum course which is inspired by the practicum-based learning. Here, students are segregated into groups where each group contains students from various disciplines like computer science, electrical, mechanical, civil, physics etc. Each group is supposed to carry out an interdisciplinary project that solves real-world problems of the society and its cost is fully sponsored by IIT Mandi. In this era of interdisciplinary technology, students are encouraged to take courses apart from the core Microelectronics and VLSI engineering. The discipline core courses will be introduced in the 4th and 5th semester. The DC courses are more focused towards microelectronics and VLSI where the students are escorted deeper into core concepts. These are the fundamental knowledge that every engineer must have on their fingertips when they are working or pursuing higher studies. These DC courses are well structured and cover a wide range of areas in Device and Technology, circuit design and system design. Semiconductor Devices, Fabrication and Packaging will be taught as part of devices and technology. As part of circuits courses such as analog and RF circuit and digital circuits will be taught. As part of system design we consider courses such as RTL design and verification, Design for Testability.

From 6th semester onwards, discipline electives are offered to the students where they can opt for any of these courses with their own interest or by consulting with their faculty advisor(s). The list of DE courses is presented below in this document. They are advanced subjects designed to render in-depth understanding of specific areas in Microelectronics and VLSI engineering. DE courses have a wide variety and their contents are of state-of-the-art standard. These are the subjects which give them an edge while applying for the core-company jobs and makes them highly skilled assets of an organization.

Free Elective courses are offered from 6th semester onwards. Once again, the students can register for these courses based on their interest or the advice taken from faculty advisor(s).

Another flagship practicum course called Interdisciplinary Socio Technical Practicum is available as an elective during 6th semester. This course provides an invaluable opportunity for students to understand the real problems of local surroundings and come up with feasible solutions. In addition, students from IIT-Mandi collaborate with the international students while executing this course. It provides invaluable experience for them to work in multinational culture. The students will be given an opportunity to go for an industrial internship during their course work to get some industrial experience and exposure. Eventually, the students are given optional choice in 7th - 8th semester to carry out a major technical project (MTP) under the supervision of faculty member(s). It is a year-long project taken by B. Tech. students in their fourth year. The MTP is a capstone task which builds upon the previous three years of study taken by B.Tech. students.

Objectives:

- Very strong industry oriented curriculum
- Practicum based learning with industry oriented courses
- The chip designing EDA tools (Cadence, Mentor Graphics, Synopsys, Silvaco, Centaurus and Comsol) based learning. These tools are the latest one and used in all the VLSI industries.
- 100 Class and 1000 class clean room facility available at IIT Mandi for device fabrications.
- Sophisticated instrumentation facility available for device fabrications and characterizations
- Learning design as well as fabrication aspects of the chip,
- Generation of trained manpower for semiconductor design and upcoming fab-line in India.

B.Tech [Microelectronics and VLSI Engineering]			
Division	Category	No. of courses	No. of Credits
Institute Core (IC)	IC Compulsory	14	39
	IC Basket	2	6
	HSS Courses	4	12
	IKS Course	1	3
Discipline	Discipline core (DC)	16	54
	Discipline Elective (DE)	3/4	12
Electives	Free Elective	6	22
	MTP + ISTP or Electives		12

Total	160
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Semester wise distribution

(Minimum credit requirements for B.Tech. degree 160 credits)

SEMESTER I

S.No	Course Code	Course Name	L-T-P-C
1	ICxxx	Calculus	1.5-0.5-0-2
2	ICxxx	Complex and Vector Calculus	1.5-0.5-0-2
3	IC140	Engineering Graphics for Design	2-0-3-4
4	IC152	Introduction to Python and Data Science	3-0-2-4
5	ICXXX	IC Core basket – 1	2.5-0.5-0-3
6	HSXXX	HSS Course	3-0-0-3
7	IKS181	IKS Course	3-0-0-3
Total			21

SEMESTER II

S.No	Course Code	Course Name	L-T-P-C
1	ICxxx	Linear Algebra	1.5-0.5-0-2
2	ICxxx	ODE & Integral Transforms	2.5-0.5-0-2
3	IC161	Applied Electronics	3-0-0-3
4	IC 161P	Applied Electronics Lab	0-0-3-2
5	IC 252	Probability and Statistics	3-0-2-4
6	ICXXX	IC Core Basket	2.5-0.5-0-3
7	ICXXX	Foundations of Design Practicum	1-0-6-4
8	IC 221P	Physics Practicum	0-0-3-2
Total			22

SEMESTER III

S.No	Course Code	Course Name	L-T-P-C
1	IC 272	Machine Learning	3-0-0-3
2	EE 210	Digital System Design and Practicum	3-0-2-4
3	VLxxx	Electro Magnetic Theory and Transmission Lines	3-0-0-3
4	EE xxx	Signals and Systems	2.5-0.5-0-3
5	EE 301	Control Systems	3-0-2-4
6	EE 203	Network Theory	2.5-0.5-0-3
7	VL xxx	Semiconductor Devices for ICs	3-0-0-3
Total			22

SEMESTER IV

S.No	Course Code	Course Name	L-T-P-C
1	IC 201P	Design Practicum	0-0-6-3
2	EE 211	Analog Circuit Design	3-0-2-4
3	EExxx	Computer Organization and Design	3-0-2-4
4	VLxxx	CMOS Processing and Practicum	3-0-2-4

5	VLxxx	Reverse Engg (E-Waste Management and Recycling)	0-0-2-1
6	VLxxx	Electronic System Packaging	3-0-0-3
7	HSxxx	HSS course-1	3-0-0-3
Total			22

SEMESTER V

S.No	Course Code	Course Name	L-T-P-C
1	VLxxx	RF IC Design	3-0-0-3
2	VLxxx	Design for Testability	3-0-2-4
4	VLxxx	CMOS Digital IC Design	3-0-2-4
5	VL xxx	CMOS Analog IC Design	3-0-2-4
5	VLxxx	RTL Design and Verification	2-0-2-3
8	HS xxx	HSS course-1	3-0-0-3
Total			21

SEMESTER VI

S.No	Course Code	Course Name	L-T-P-C
1	HSxxx	HSS course-3	3-0-0-3
2	DP301 / DE -1	ISTP / DE-1	4
3	DE-2	DE-2	3-0-0-3
4	DE-3	DE-3	3-0-0-3
5	FE-1	FE-1	3-0-0-3
6	FE-2	FE-2	3-0-0-3
7	IC 010	Internship	2
Total			21

SEMESTER VII

S.No	Course Code	Course Name	L-T-P-C
1	DP401/DE -4	MTP-1/DE-4	3-0-0-3
2	DE-5	DE-5	3-0-0-3
3	DE-6	DE-6	3-0-0-3
4	FE-3	FE-3	4
5	FE-4	FE-4	4
Total			17

SEMESTER VIII

S.No	Course Code	Course Name	L-T-P-C
1	DP401/DE -7	MTP-II/DE-7	5
2	FE-5	FE-5	4
3	FE-6	FE-6	4

List of Core courses for B.Tech [Microelectronics and VLSI]

S.No	Course No	Course Name	L-T-P-C
1	EExxx	Signals and Systems	2.5-0.5-0-3
2	EE210	Digital System Design and Practicum	3-0-2-4
3	EE203	Network Theory	2.5-0.5-0-3
4	VLxxx	Semiconductor Device for ICs	3-0-0-3
5	EE301	Control Systems	3-0-2-4
6	VLxxx	Electro Magnetic Theory and Transmission Lines	3-0-0-3
7	EExxx	Computer Organization and Design	3-0-2-4
8	EE211	Analog Circuit Design	3-0-2-4
9	VLxxx	CMOS Processing and Practicum	3-0-2-4
10	VLxxx	RF IC Design	3-0-0-3
11	VLxxx	Electronic System Packaging	3-0-0-3
12	VLxxx	CMOS Analog IC Design	3-0-2-4
13	VLxxx	CMOS Digital IC Design	3-0-2-4
14	VLxxx	RTL Design and Verification	2-0-2-3
15	VLxxx	Design For Testability	3-0-2-4
16	VL xxx	Reverse Engineering	0-0-2-1

List of Elective Courses for B.Tech [Microelectronics and VLSI Engineering]

Digital VLSI Architecture	Biomedical Circuits and Systems
Low Power VLSI Design	Embedded Systems
Mixed Signal VLSI Design	Static Timing Analysis
Reconfigurable Computing	Memory Circuit Design
Microwave Integrated Circuits	system on chip architecture
Testing and Verification	VLSI Power Management Circuits
CAD for VLSI	Biomedical Circuits and Systems
VLSI Circuits for Signal Processing Algorithms	Memory Circuit Design
Processor Design	Static Timing Analysis
Formal Verification	Theoretical Physics
Neuromorphic Devices and Circuits	More than Moore Device and Circuits
MEMS and NEMS	Quantum Physics
Nano electronics and Microfabrication	Nano manufacturing
Power Semiconductor Devices	Packaging
Solar Cells and Photovoltaic Cells	Performance and Reliability of VLSI Circuits
Mathematical Physics	Advanced VLSI Interconnects
Low Voltage CMOS Circuit Operation	MOS Device Physics
Emerging NanoScale Devices/ Nano Scale Devices	Device & Circuit Interaction
Nanoscale Devices and Circuit Design	Technology of Nanoscale Device Fabrications and Characterisation
Nanoscale Materials	Nanomaterials and Technology