INDIAN INSTITUTE OF TECHNOLOGY MANDI

KAMAND, DISTT. MANDI – 175075 (HIMACHAL PRADESH)

MINUTES OF 53RD BOARD OF ACADEMICS MEETING

VENUE	:	GUEST HOUSE (NC)CONFERENCE ROOM + ONLINE
DATE	:	22nd December, 2023 (FRIDAY)
TIME	:	2:30 P.M.

Following members attended the meeting

1.	Dean Academics I/c	Dr. Amit Jaiswal
2.	Associate Dean (Research)	Dr. Amit Jaiswal
3.	Nominee-1: School of Computing and Electrical Engineering	Dr. Padmanabhan Rajan
4.	Nominee-2: School of Biosciences and Bioengineering	Dr. Kasturi Prasad
5.	Nominee-1: School of Mathematical and Statistical Sciences	Dr. Rajendra K Ray
6.	Nominee-1: School of Mechanical and Materials Engineering	Dr. Gaurav Bhutani
7.	Nominee-2: School of Humanities & Social Sciences	Dr. Ramna Thakur
8.	Nominee-2: Centre of AI and Robotics	Dr. Jagadeesh
9.	Deputy Registrar (Academics): Secretary	Mr. Suresh Rohilla

Following members could not attend the meeting

Sl. No.		Name	
1.	Associate Dean (Courses)	Dr. P Anil Kishan	Member
2.	Chairman Senate Library Committee	Prof. Aniruddha Chakraborty	Member
3.	Nominee-2: School of Computing and Electrical Engineering	Dr. Gopi Shrikanth Reddy	Member
4.	Nominee-1: School of Physical Sciences	Dr. Arko Roy	Member
5.	Nominee-2: School of Physical Sciences	Dr. Gargee Sharma	Member
6.	Nominee-1: School of Chemical Sciences	Dr. Bhaskar Mondal	Member
7.	Nominee-2: School of Chemical Sciences	Dr. Garima Agrawal	Member
8.	Nominee-1: School of Biosciences and Bioengineering	Dr. Sumit Murab	Member
9.	Nominee-2: School of Mathematical and Statistical Sciences	Dr. Syed Abbas	Member
10.	Nominee-1: School of Civil and Environmental Engineering	Dr. Maheshreddy Gade	Member
11.	Nominee-2: School of Civil and Environmental Engineering	Dr. Prasanna Rousseau	Member
12.	Nominee-2: School of Mechanical and Materials Engineering	Dr. Sudhir Pandey	Member
13.	Nominee-1: School of Humanities & Social Sciences	Dr. Rajeshwari Dutt	Member
14.	Nominee-1: Centre of AI and Robotics	Dr. Narendra Dhar	Member

15.	Nominee-1: IKSHMA	Dr. Aniruddha Chakraborty	Member
16.	Nominee-2: IKSHMA	Dr. Sumit Murab	Member
17.	Industry Member – 1	Dr. Nadeem Akhtar	Member
18.	Academic Affairs Secretary	Ms. Dishti Oberai	Member
19.	Research Affairs Secretary	Mr. Saurabh Patel	Member
20.	PG Academic Secretary	Mr. Sudama Babu Singhal	Member

Special Invitee

Sl. No.	Name	
1	Dr. Akhaya Nayak	Asso. Prof. SoM
2	Dr. Anjan Kumar Swain	Prof., SoM
3	Dr. Deepak Swami	Asso. Prof. SCENE
4	Dr. Ramajayam Govindaraji	Asst. Prof. IKSMHA

PART-A

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

53.1 Confirmation of the minutes of 52nd meeting of the Board of Academics:

The minutes of the 52nd meeting of the Board of Academics held on 2nd November, 2023 were confirmed.

53.2 To consider the new courses from SMME:

Dr. Gaurav Bhutani, SMME presented the proposal of the following new courses from SMME as placed at **Annexure-A**. After due deliberations, the BoA approved the following courses in new format with minor modifications and the same shall be reported to the Senate.

Sl.No.	Course No.	Course Name	Credits
1	ME-212	Product Manufacturing Technology	2-0-3-3
2	ME-213	Engineering Thermodynamics	3-1-0-4
3	ME-215	Manufacturing Engineering -1	3-0-0-3
4	ME-315	Manufacturing Engineering -2	3-0-0-3
5	IC-202P	Design Practicum	0-0-6-3
6	ME-210P	Thermo-Fluids Lab	0-0-2-1
7	ME-100	Reverse Engineering	0-0-2-1

53.3 To consider the new courses from SOM:

The agenda Item is not presented by the proposer.

53.4 To consider the new course from IKSMHA:

Dr. Ramajayam presented the proposal for 1-credit Research Methodology course from IKSMHA Centre. After due deliberations, the BoA suggested to revise the proposal to be distinct from the course on "Research methods and statistics for contemplative science" and submit the revised proposal in new format and the same shall be reported to the Senate.

The course descriptions are placed as **Annexure- B**.

Sl. No.	Course No.	Course Name	Credits
1	IK-509	Research Methodology	(1-0-0-1)

53.5 To consider the revision of M.Tech. (Biotechnology) Curriculum:

Dr. Kasturi Prasad, Nominee SBB, presented the revision of M.Tech. (Biotechnology) Curriculum. After due deliberations, the BoA recommended the proposal with minor modifications for consideration of the Senate and its approval.

The modified proposal is placed as **Annexure – C.**

53.6 To consider the new courses from SBB:

Dr. Kasturi Prasad, Nominee SBB presented the proposal for following new courses from the School of Biosciences & Bioengineering. After due deliberations, the BoA approved

the following courses in new format with minor modifications and the same shall be reported to the Senate.

The course descriptions are placed as **Annexure- D**.

Sl. No.	Course No.	Course Name	Credits
1	BY-600	Research Methodology	1-0-0-1
2	BY-529	Mechanobiology of the Cell (MBoC)	3-0-0-3

53.7 To consider the revision of MBA DS&AI and IMBA curriculum:

Dr. Akhaya Nayak, Nominee SOM, presented the proposal for revision of MBA DS&AI and I-MBA curriculum. After due deliberations, the BoA recommended the proposal with modifications for consideration of the Senate and its approval.

The modified proposal is placed as **Annexure – E.**

53.8 Any other item with the permission of the Chair:

Dr. Padmanabhan Rajan, Nominee SCEE, presented the proposal of course to the Board of Academics. After due deliberations, the BoA approved the following courses in new format with minor modifications and the same shall be reported to the Senate.

The modified proposal is placed as **Annexure – F.**

Sl. No.	Course No.	Course Name	Credits
1	EE223P	Reverse Engineering	0-0-2-1

PART-B

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

-NIL-

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

5/1/2024

Chairman, Board of Academics

Secretary, Board of Academics

Academic Office <acadoffice@iitmandi.ac.in>

Minutes 53rd BoA for signatures/recommendatios

AD Research <adresearch@iitmandi.ac.in> Thu, Jan 4, 2024 at 3:51 PM
To: Academic Office <acadoffice@iitmandi.ac.in>
Cc: DR Academics <dracad@iitmandi.ac.in>

Recommended.

Regards,
Amit

On Thu, Jan 4, 2024, 3:49 PM Academic Office <acadoffice@iitmandi.ac.in> wrote:

> Dear SIr
>
> Please see attached herewith the Minutes of 53rd BoA for your kind recommendations/approval
>
> Regards
>
> SONIA

ACad

Annexure A

IIT Mandi
Proposal for a New Course

Course number : **ME 212**
Course Name : **Product Manufacturing Technology**
Credit : **3**
Distribution : **2-0-3-3**
Intended for : **UG (Core for B.Tech Mechanical)**
Prerequisite : **None**
Mutual Exclusion : (*courses with high similarity not allowed to credit by the students after or along with this course*)

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1. Preamble:

Product Manufacturing Technology (PMT) combines market requirements, technological capabilities, and resources to define new products, their designs and the requisite manufacturing and field support processes. This course will cover product manufacturing technology related to metals, ceramics and polymers. Experiments will provide hands on experience w.r.t. various product manufacturing technologies.

2. Course Modules with quantitative lecture hours:

Introduction: Engineering materials, their classification, manufacturability and applications **(5 Hours)**

PMT for Structural Applications (Metals & Alloys): Casting (sand casting, permanent mold casting, investment casting), forming (Rolling, Forging, Extrusion, Sheet metal operations), machining (drilling, lathe, milling), joining of metals (welding, riveting, nut-bolt assembly etc) **(8 Hours)**

PMT for Light weight applications (Polymers): Classifications of plastics, blow molding, injection molding, extrusion, compression molding, vacuum forming, Additive manufacturing (3D printing and its types), laser machining, joining methods for plastics. **(6 Hours)**

PMT for High Temperature Applications (Glasses and Ceramics): Powder manufacturing, mixing and blending, compacting, Sintering (with SPS), hot iso-static pressing, glass blowing **(4 Hours)**

PMT for High Performance Applications (Composites): Compression molding of composites **(3 Hours)**

Laboratory Modules:

S.No.	Equipment	Experiment	Turns
1.	Lathe	Turning and grooving operations on mild steel rod	1
2.	Milling, shaper machine	Facing operations on mild steel block	1
3.	Compression molding	To demonstrate manufacturing of composites	1
4.	Fitting	To make fillet, chamfer, drilling and tapping on mild steel flat sample	1
5.	Welding	To perform arc welding, gas welding and spot welding and FSW	1
6.	Sheet metal	To perform shearing, bending and riveting of galvanised iron sheet	1
7.	Foundry	To sand cast an aluminium rod	1
8.	CNC lathe and milling	To machine objects using CNC machining processes	1
9.	Laser machining	To demonstrate laser machining of an acrylic sheet	1
10.	Glass blowing	To demonstrate blowing of glass	1
11.	Additive manufacturing	To create objects using 3D printing processes	1
12.	Injection molding	To understand the plastic injection molding process	1
			12

3. Text books:

1. Groover, M.P., 2020. Fundamentals of modern manufacturing: materials, processes, and systems. John Wiley & Sons.
2. Kalpakjian, S. and Schmid, S.R., 2018. Manufacturing engineering and technology, 2001. New Jersey: Prientice Hall

4. References:

NA

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

S. No.		Course Code	Similarity Content	Approx. % of Content
1.		IC141	Entire	100%

6. Justification of new course proposal if cumulative similarity content is >30%:
The course code IC141 (2-0-3-4) has been discontinued. The same course with minor additions/ modifications is being proposed with the name PMT (ME212) which will be a ME core course having the credit structure 2-0-3-3.

Approvals:

Faculty interested in teaching this course: –

- **Dr. Sunny Zafar**
- **Dr. Prateek Saxena**
- **Dr. Swati Sharma**
- **Dr. Mrityunjay Doddamani**

Proposed by: Dr Swati Sharma **School: SMME**

Signature: **Date: 1 Nov 2023**

The following faculty discussed on…17th August 2023……and approved the proposal on the same day.

Sl. No	Faculty Name	Signature
1	Swati Sharma	E-mail
2	Mrityunjay Doddamani	E-mail
3	Sunny Zafar	

School Chair:

School: SMME

Date: 2/11/2023

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

Dean Academics

Date:

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

SMME Office <smmeoffice@iitmandi.ac.in

Signature and approval on Proposal for a New Course ME-212.

3 messages

SMME Office <smmeoffice@iitmandi.ac.in> Wed, Nov 1, 2023 at 5:21 P
To: Swati Sharma <swati@iitmandi.ac.in>, Mrityunjay R Doddamani <mrityunjay@iitmandi.ac.in>

Dear Sir/Ma'am,
Please find an attachment for your approval.

Thanks and Regards
Sumeet
JA
School of Mechanical & Materials Engineering
33-04- A-11 Building
Indian Institute of Technology Mandi
Mandi (Himachal Pradesh) - 175075
Office:-01905 267138

PROPOSAL FOR A NEW COURSE ME 212.pdf
85K

Swati Sharma <swati@iitmandi.ac.in> Wed, Nov 1, 2023 at 5:26 P
To: SMME Office <smmeoffice@iitmandi.ac.in>
Cc: Mrityunjay R Doddamani <mrityunjay@iitmandi.ac.in>

Approved.
[Quoted text hidden]

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Dr. Swati Sharma
School of Mechanical and Materials Engineering
Indian Institute of Technology Mandi
A4-207 South Campus
Kamand HP, India
Phone: +91 1905267830
Website: www.carbonlab.weebly.com

Mrityunjay Doddamani <mrityunjay@iitmandi.ac.in> Wed, Nov 1, 2023 at 5:41 P
To: SMME Office <smmeoffice@iitmandi.ac.in>
Cc: Swati Sharma <swati@iitmandi.ac.in>

Approved
[Quoted text hidden]

01 Nov - 05

IIT Mandi
Proposal for a New Course

Course number : **ME213**
Course Name : **Engineering Thermodynamics**
Credit : **4**
Distribution : ***3-1-0-4***
Intended for : **Core for B.Tech (Mechanical)**
Prerequisite : **None**
Mutual Exclusion: (Specify the equivalent courses in other schools. These *Courses (with high similarity) are not allowed to credit by the students after or along with this course.*)

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1. Preamble:

Thermodynamics is a subject which relates different forms of energies and energy conversions. Thermodynamics gives the possible direction of a process. The power and other energy conversion cycles are basis for the various systems in our daily life. At the end of the course, the students will be able to analyze and evaluate various thermodynamic cycles used for energy production- work and heat, within the natural limits of conversion.

2. Course Modules with quantitative lecture hours:

Unit 1: Introduction and Fundamental Concepts: Applications of Thermodynamics and Brief History, Macroscopic versus Microscopic Approach, Thermodynamic Systems and Control Volumes, Properties and State of a System, Thermodynamic Processes and Cycles, Primary Measurable Properties: Specific volume and density, Pressure, Temperature and its equality, Measurement of Temperature. **(3 Hours)**

Unit 2: Properties of Pure Substance: Pure Substance and its Different Phases, Phase Boundaries, Property Diagrams, Property Tables: Saturated liquid and saturated vapour states, Saturated liquid-vapour mixture, Superheated vapour states, Compressed or subcooled liquid states, Reference states for developing steam tables, Ideal Gas States, Compressibility Factor, Other Commonly Used Equations of State. **(3 hours)**

Unit 3: Energy and the First Law of Thermodynamics: Energy and Its Different Forms, Constituents of internal energy, Heat and work, Heat versus Work, Different Forms of Work Transfer: Displacement work, Shaft work, Spring work, First Law of Thermodynamics, Enthalpy: A Thermodynamic Property, Specific Heats, Internal Energy, Enthalpy and Specific Heats of Solids and Liquids, Internal Energy, Enthalpy and Specific Heats of Ideal Gases. **(8 Hours)**

Unit 4: Energy Analysis for Control Volumes: Conservation of Mass for a Control

Volume, Conservation of Energy for a Control Volume, Energy Analysis of Steady-Flow Processes, Examples of Steady Flow Devices: Nozzles and diffusers, Turbines and compressors, Mixing chambers, Heat exchangers, Throttle, Energy Analysis of Transient Processes. **(4 Hours)**

Unit 5: Second Law of Thermodynamics: Need for the Second Law of Thermodynamics, Heat Engines, Refrigerators and Heat Pumps, Second Law of Thermodynamics, PMM1 and PMM2, Reversible Process, Factors responsible for irreversibility, Internal and external reversibility, Carnot Cycle, Propositions Regarding the Efficiency of Carnot Cycle, Thermodynamic Temperature Scale, Ideal and Real Machines. **(6 Hours)**

Unit 6: Entropy: Clausius Inequality, Entropy, Entropy of a Pure Substance, Entropy Change for Internally Reversible Processes, Thermodynamic Property Relations, Entropy Change for Solids and Liquids, Entropy Change for an Ideal Gas, Property Diagrams Involving Entropy, Entropy Change for an Irreversible Process and Entropy Equation, Principle of Increase of Entropy, Entropy Rate Equation for a Closed System, Entropy Rate Equation for a Control Volume, Shaft Work for Steady Flow Devices, Isentropic Efficiency of Different Steady Flow Devices, Physical Inferences of Entropy. **(5 Hours)**

Unit 7: Exergy: Introduction to Exergy, Exergy Associated with Different Modes of Energy Transfer, Exergy Transfer by Heat, Exergy Transfer by Work, Exergy Potential of a Closed System, Exergy Potential of a Flowing Stream, Decrease of Exergy Principle, Exergy Balance Equation, Second Law Efficiency. **(3 Hours)**

Unit 8: Vapour Power Cycles: Introduction to Power Systems, Carnot Cycle, Rankine Cycle, Effect of Pressure and Temperature on the Rankine Cycle, Reheat Cycle, Regenerative Cycle and Feedwater Heaters, Deviation of Actual Cycles from Ideal Cycles. **(4 Hours)**

Unit 9: Air Standard Power Cycles: Air-Standard Power Cycles, Carnot Cycle, Brayton Cycle, Simple Gas-Turbine Cycle with a Regenerator, Gas-Turbine Power Cycle Configurations, Air-Standard Cycle for Jet Propulsion, Reciprocating Engine Power Cycles, Otto Cycle, Diesel Cycle, Dual Cycle. **(4 Hours)**

Unit 10: Refrigeration Cycles: Different Refrigeration Techniques, Carnot cycle,

Vapour Compression Refrigeration Cycle. **(2 Hours)**

Laboratory/practical/tutorial Modules:

Tutorial 1: Fundamental Concepts **(1 Hour)**

Tutorial 2: Properties of Pure Substances and Heat and Work Interactions **(2 Hours)**

Tutorial 3: Energy and the First Law of Thermodynamics **(2 Hours)**

Tutorial 4: First Law of Thermodynamics for Open Systems **(2 Hours)**

Tutorial 5: Second Law of Thermodynamics and Entropy **(2 Hours)**

Tutorial 6: Exergy **(1 Hour)**

Tutorial 7: Vapour Power Cycles **(2 Hours)**

Tutorial 8: Air Standard Power Cycles **(1 Hour)**

Tutorial 9: Refrigeration Cycles **(1 Hour)**

3. Text books:

1. Borgnakke, C. and Sonntag, R.E., Fundamentals of Thermodynamics, Vol. 8, Wiley, New York, 2013.
2. Cengel, Y.A. and Boles, M.A., Thermodynamics: An Engineering Approach, 8th edition, McGraw-Hill, Singapore, 2015. (eBook available at: https://www.expresslibrary.mheducation.com/product/thermodynamics-7e-sie)

4. References:

- Moran, M.J., Shapiro, H.N., Boettner, D.D. and Bailey, M.B., Fundamentals of Engineering Thermodynamics. John Wiley & Sons, 2010.
- Nag, P.K., Engineering Thermodynamics, Tata McGraw-Hill Education, 2013.
- Kumar, P. and Dhar, A., Basics of Thermodynamics, AICTE, 2023. (Softcopy available at: https://ekumbh.aicte-india.org/book.php)

5. Similarity with the existing courses:

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

S. No.		Course Code	Similarity Content	Approx. % of Content
1.		IC142	Entire	100%

6. Justification of new course proposal if cumulative similarity content is >30%: The course code IC142 has been discontinued.

Approvals:

Faculty interested in teaching this course: – Dr. P Anil Kishan, Dr. Atul Dhar, Dr. Gajendra Singh, Dr. Sarthak Nag

Proposed by: Dr. Parmod Kumar **School: SMME**

Signature: Parmod **Date: 30/10/2023**

The following faculty (at least 3 faculty) discussed on 31/10/2023 and approved the proposal on 31/10/2023.

Sl. No	Faculty Name	Signature
1.	Dr. P. Anil Kishan	P Anil Kishan
2.	Dr. Atul Dhar	Atul
3.	Dr. Parmod Kumar	Parmod

School Chair: Atul 1/11/2023

School: SMMLE

Date: 1/11/2023

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

Dean Academics

Date:

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

3:50 8-12-23

IIT Mandi
Proposal for a New Course

Course number : **ME-2~~xx~~ 215**
Course Name : **Manufacturing Engineering-1**
Credit : **3-0-0-3**
Distribution : ***L-T-P-C***
Intended for : **UG**
Prerequisite : **None**
Mutual Exclusion: *courses with high similarity not allowed to credit by the students after or along with this course*

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1. Preamble:

This course will cover fundamentals of manufacturing engineering with respect to casting processes, forming, machining processes, advanced machining processes, joining processes, and finishing processes.

2. Course Modules with quantitative lecture hours:

- **Casting Processes and Foundry:** Sand casting processes, sand testing, molding processes, gating systems, cooling and solidification phenomena, special casting processes, casting defects and remedies, riser design, calculation of solidification times, inspection of casting. **(7 Hours)**
- **Forming Processes:** Plastic deformation and yield criteria, relationship between tensile and yield criteria, mechanics of forming processes, various forming processes, hot and cold forming, friction and lubrication in metal forming, defects in metal forming. **(6 Hours)**
- **Machining Processes:** Single point and multipoint cutting tools, chip formation mechanism, cutting tool geometry, orthogonal and oblique machining, Merchant's circle, force, velocity, shear angle and power consumption, tool wear, machinability and its measure, cutting tool materials, economics of machining. **(10 Hours)**
- **Advanced Machining Processes:** Process principle, equipment, analysis and application of advanced machining processes- abrasive Jet Machining, ultrasonic machining, water jet machining, electro chemical machining, chemical machining, electro discharge machining, electron beam machining, laser beam machining, microwave machining. **(7 Hours)**

- **Joining Processes:** Introduction, principle of fusion welding, heat flow characteristics, gas metal reactions, cooling of fusion weld, principles of solid phase welding, various joining processes-arc welding, GTAW, GMAW, FCAW, SAW, EBW, TW, soldering and brazing, adhesive bonding, mechanical assembly methods, weld defects and inspection. **(7 Hours).**
- **Finishing Processes:** Principle and applications of grinding, nomenclature of grinding wheel, honing, superfinishing, lapping, polishing, buffing, peening and burnishing, economics of finishing processes. **(5 Hours)**

Laboratory/practical/tutorial Modules: None

3. Text books:

- Groover, M.P., 2020. Fundamentals of modern manufacturing: materials, processes, and systems. John Wiley & Sons.
- Kalpakjian, S. and Schmid, S.R., 2018. Manufacturing engineering and technology, 2001. New Jersey: Prentice Hall

4. References: None

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

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

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

Approvals:

Faculty interested in teaching this course: –

- **Dr. Sunny Zafar**
- **Dr. Prateek Saxena**
- **Dr. Swati Sharma**
- **Dr. Mrityunjay**
- **Dr. Satvasheel**

Proposed by: Dr. Sunny Zafar 7/12/23 **School: SMME**

Signature: **Date:**

The following faculty (at least 3 faculty) discussed on 7/12/23 and approved the proposal on 7/12/23

Sl. No	Faculty Name	Signature
1.	Dr. Prateek	
2.	Dr. Mrityunjay Doddamani	Email attached
3.	Dr. Sunny Zafar	7/12/23

School Chair: for 07 Dec 2023

School: SMME

Date:

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

Dean Academics

Date:

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

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

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

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

Approvals:

Faculty interested in teaching this course: –

- **Dr. Sunny Zafar**
- **Dr. Prateek Saxena**
- **Dr. Swati Sharma**
- **Dr. Mrityunjay**
- **Dr. Satvasheel**

Proposed by: Dr. Sunny Zafar **School: SMME**

Signature: **Date:**

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

Sl. No	Faculty Name	Signature
1.	Dr. Prateek	
2.	Dr. Mrityunjay Doddamani	

School Chair:

School:

Date:

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

Dean Academics

Date:

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

3:50 8.12.23

IIT Mandi
Proposal for a New Course

Course number : **ME-3~~xx~~ 315**
Course Name : **Manufacturing Engineering-2**
Credit : **3-0-0-3**
Distribution : ***L-T-P-C***
Intended for : **UG**
Prerequisite : **None**
Mutual Exclusion: *courses with high similarity not allowed to credit by the students after or along with this course*

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1. Preamble:

This course will cover fundamentals of manufacturing engineering with respect to powder metallurgy, rapid prototyping processes, jigs and fixtures, metrology, integrated manufacturing systems, production planning and control.

2. Course Modules with quantitative lecture hours:

- **Powder Metallurgy:** Characterization of Engineering Powders, Production of metallic powders, conventional pressing and sintering, alternative pressing and sintering techniques, hot isostatic pressing, metal injection molding, powder injection molding. **(7 Hours)**
- **Rapid Prototyping Processes:** Introduction to rapid prototyping and rapid tooling, solid state methods (FDM, LOM), liquid-based (SLA, SGC), powder-based (3DP) RP processes **(8 Hours)**
- **Jigs and Fixtures:** Usefulness of Jigs and Fixtures, design principles of jigs and fixtures, principle of location and clamping, types of locating and clamping devices, examples of jigs and fixtures used in lathe machine, milling, boring, shaping, welding and grinding, economics of jigs and fixtures, loading and unloading time, modular fixturing. **(7 Hours)**
- **Metrology:** Dimensions and Tolerances, inspection types and principles, radius and taper measurements, measurement of screw threads gears, limits, fits, dimensional tolerances, Conventional measuring instruments and gages, surfaces, measurements of surfaces. **(7 Hours)**
- **Integrated Manufacturing Systems:** Material handling, fundamentals of production lines, manual assembly lines, automated production lines, cellular manufacturing,

flexible manufacturing systems and cells, computer integrated manufacturing. **(7 Hours).**

- **Production Planning and Control:** Aggregate Planning and master production schedule, inventory control, material and capacity requirements planning, Lean production, shop floor control. **(6 Hours)**

Laboratory/practical/tutorial Modules: None

3. Text books:

- Groover, M.P., 2020. Fundamentals of modern manufacturing: materials, processes, and systems. John Wiley & Sons.
- Kalpakjian, S. and Schmid, S.R., 2018. Manufacturing engineering and technology, 2001. New Jersey: Prentice Hall

4. References: None

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

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

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

Approvals:

Faculty interested in teaching this course: –

- **Dr. Sunny Zafar**
- **Dr. Prateek Saxena**
- **Dr. Swati Sharma**
- **Dr. Mrityunjay**
- **Dr. Satvasheel**

Proposed by: Dr. Sunny Zafar 7/12/23 **School: SMME**

Signature: **Date:**

The following faculty (at least 3 faculty) discussed on 7/12/23 and approved the proposal on 7/12/23

Sl. No	Faculty Name	Signature
1.	Dr. Prateek	
2.	Dr. Mrityunjay Dodamani	Email attached
3.	Dr. Sunzafar	

for School Chair: 07 Dec 2023

School: SMME

Date:

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

Dean Academics

Date:

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

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

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

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

Approvals:

Faculty interested in teaching this course: –

- **Dr. Sunny Zafar**
- **Dr. Prateek Saxena**
- **Dr. Swati Sharma**
- **Dr. Mrityunjay**
- **Dr. Satvasheel**

Proposed by: Dr. Sunny Zafar **School: SMME**

Signature: **Date:**

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

Sl. No	Faculty Name	Signature
1.	Dr. Prateek	
2.	Dr. Mrityunjay Dadaamai	

School Chair:

School:

Date:

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

Dean Academics

Date:

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

IIT Mandi
Proposal for a New Course

Course number : IC202P
Course Name : Design Practicum
Credit : 3
Distribution : *0-0-6-3*
Intended for : UG
Prerequisite : IC202P – Design Practicum
Mutual Exclusion : NA

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1. Preamble:

In this course, the teams are asked to design a prototype based on commercially-off- the-shelf (COTS) hardware or software (Preferably open source). Prototypes are used to gather requirements and are especially useful in visualizing the look and feel of an application and the process workflow. The prototype can be used as the basis for developing the final solution. The goal when developing such prototypes is to capture the functions and appearance of the finished product. These prototypes are used for testing and evaluation and provide useful information for the user to rank the products or the features.

2. Course Modules with quantitative lecture hours:

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

3. Text books:

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

4. References:

NA

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

NA

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

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

NA

Approvals:

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

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

Signature: **Date:**

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

S. No	**Faculty Name**	**Signature**

School Chair: Dr Atul Dhar

School: SMME

Date:

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

Dean Academics

Date:

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

IIT Mandi
Proposal for a New Course

Course number : ME210P
Course Name : Thermo-Fluids Lab
Credit : 1
Distribution : *0-0-2-1*
Intended for : UG
Prerequisite : ME210 – Fluid Mechanics
Mutual Exclusion : NA

---

1. Preamble:

To introduce students to different fluid systems and their evaluation.

2. Course Modules with quantitative lecture hours:

NA

Laboratory/practical/tutorial Modules:

1) **Flow Visualization**
2) **Validation of Bernoulli's Theorem**
3) **Application of Flow Measuring Devices**
4) **Major & Minor Losses in Pipes**
5) **Measurement of Pipe Friction Factor**
6) **Identifying Losses in Pipe Fittings**
7) **Static Pressure Measurement in a Wind Tunnel**
8) **Performance Analysis of Francis & Pelton Turbine**
9) **Determination of Metacentric Height**
10) **Measurement of Lift & Drag on an Aero-foil**
11) **Calibration of Various Notches**
12) **Momentum Eqn. Verification Using Jet Impaction**
13) **Vortex Flow Measurement**
14) **Pitot Static Tube Calibration**

3. Text books:

- J. P. Holman, Experimental Methods for Engineers, 7th edition, Tata McGraw-Hill 2001.
- T.G. Beckwith, J.H. Lienhard V, R. D. Marngoni, Mechanical Measurements, 5th edition, Pearson Education, 2010.
- E.O. Doebelin, Measurement systems, Application and Design, 5th edition, Tata McGraw-Hill, 2008
- Fox and Mc Donald, Introduction to Fluid Mechanics, 7th Edition, John Wiley, 2009

4. References:

NA

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

NA

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

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

NA

Approvals:

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

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

Signature: **Date:**

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

S. No	**Faculty Name**	**Signature**

School Chair: Dr Atul Dhar

School: SMME

Date:

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

Dean Academics

Date:

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

IIT Mandi
Proposal for a New Course

Course Number **ME 100**
Course Name: **Reverse Engg.**
Intended for: **B.Tech**
Credit: **1 credit**
Distribution: **0-0-2-1**

Mutual Exclusion: (Specify the equivalent courses in other schools. These *Courses (with high similarity) are not allowed to credit by the students after or alongwith this course.*)

---

1. Preamble:

This course provides an introduction to the basic concepts and techniques of engineering and reverses engineering, the process of design, analytical thinking and ideas, basics and development of engineering drawing, application of engineering drawing with computer aide.

2. Laboratory Modules:

Need of reverse engineering, Methodologies for Reverse Engineering, understanding of Reverse Engineering through example, reasons for reverse engineering, process for Reverse Engineering, Phases of Reverse. Engineering, conceptual System Reasons for Reverse Engineering, Difficulties in Reverse Engineering, Levels of abstraction: Application level, Functional level, Structural level.
Detailed study of Reverse Engineering for Branch Specific learning Dissemble the existing selected artefact/ product/ component/ process/ system to study technical aspects and design detail.
Students will be assigned a their specialization specific product to do hands on of Reverse Engg and to draft a comprehensive report. An suggestive list of products that will be studied through reverse engineering will be compiled as reference for course instructor.

3. Course Outcomes: After completion of this course, student will be able to

1. Understand the problem in the existing process.
2. Collect the large number of data/ information for the product
3. Depth analyze of the products and extraction of real time data
4. Understand the principles behind the design of the product, ways to redesign and improve the performance of the system.

4. Text books

Reverse Engineering: Mechanisms, Structures, Systems & Materials, Robert W. Messler Jr., McGraw Hill, (2014)

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

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

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

Approvals:

Faculty interested in teaching this course: Dr. Gajendra Singh, Dr. Prateek Saxena, Dr. Satvasheel Powar

Proposed by: Prof. Rahul Vaish **School:**

Signature: **Date:**

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

Sl. No	Faculty Name	Signature

School Chair: Atul Dhar

School: SMME

Date: 20 Dec 2023

This proposal is reported in ….53rd……..th Board of Academics on ….22 December

Dean Academics

Date:

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

Annexure B

IIT Mandi
Proposal for a New Course

Course number : **IK 509**
Course Name : **Research methodology**
Credit Distribution : (1-0-0-1) *(Lectures-Tutorial-Practical-Total credits)*
Intended for : **MTech(R) and PhD students**
Prerequisite : **None**
Mutual Exclusion: None

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1. Preamble:

Research methods and statistics are the foundation for scientific research. This course would enable the students/research scholars working on Indian knowledge systems and mental health applications (IKSMHA) to understand the concepts better from a Indian Knowledge system and mental health perspective.

2. Course Modules with quantitative lecture hours (14 hours)

Research Philosophies and paradigms (1 hour)

- Six systems of Indian Philosophy- Introduction
- Research paradigms in Indian philosophical system
- Eastern & western paradigms-critical overview

Research Ethics (1 hour)

- Ethics from Indian knowledge system perspective (IKS)
- Evolution of human research ethics

Literature review and referencing (1 hour)

- Review of classical scriptures of Indian philosophy
- Relevant modern science literature review

Sampling methods (1 hour)

- Non-probability sampling methods
- Probability sampling methods

Research designs (1 hour)

- Experimental designs
- Non-experimental designs

Clinical trial and control techniques (1 hour)

Confounders and control techniques

Controlled clinical trials (CCT)

Logic of hypothesis testing (1 hour)

Null hypothesis significance testing (NHST)

Steps of hypothesis testing

Data collection methods (1 hour)

Measurement errors and bias

First person subjective methods

Third person objective methods

Procedure for conducting research (1 hour)

Ethics committee approval

Clinical trial registration

Informed consent/assent

Pilot study- need and importance

Protocol- apriori design vs interim modifications

Managing adverse effects

Fundamentals of qualitative research (1 hour)

Major qualitative research approaches

Validity & reliability in qualitative research

Technical software for Research scholars (1 hour)

Itranslator- for Sanskrit transliteration

R & Jamovi-for statistical analysis

Zotero-for referencing

Statistics overview-1 (1 hour)

Descriptive statistics

Fundamentals of inferential statistics

Statistics overview-2 (1 hour)

Choosing the right statistical tests

Scientific writing (1 hour)

Classical scriptures perspective

Modern science perspective

3. Text books:

Aron A, Aron EN. Statistics for psychology (6th Ed). Pearson Education; 2013.

Gough AE, Cowell EB. The Sarva-Darsana-Samgraha: Or, Review of the Different Systems of Hindu Philosophy. DigiCat; 2022.

4. References:

Zar JH. Biostatistical analysis. Pearson Education India; 1999.

Creswell JW, Poth CN. Qualitative inquiry and research design: Choosing among five approaches. Sage publications; 2016

Radhakrishnan S, Moore CA, editors. A source book in Indian philosophy. Princeton University Press; 1957.

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

S. No.		Course Code	Similarity Content	Approx. % of Content
1.		HS550	Hypothesis testing	5%
2		HS 522	Literature review & Hypothesis formulation	5 %
3		IK 506	Literature review, Hypothesis testing, Research designs	20%

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

Approvals:

Faculty interested in teaching this course: – Dr. Varun Dutt, Dr. Arnav Bhavsar

Proposed by: Dr Ramajayam G **School: IKSMHA**

Signature: G. Ramajayam 29/12/23 **Date:**

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

Sl. No	Faculty Name	Signature

School Chair:

School:

Date:

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

Dean Academics

Date:

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

Annexure C

A proposal to revise the MTech (Biotechnology) curriculum

School of Biosciences and Bioengineering, IIT Mandi

The field of biotechnology is dynamic and rapidly evolving, with constant advancements in research and technology. To ensure that our M.Tech Biotech program remains at the forefront of these developments and continues to produce graduates equipped with the latest knowledge and skills, a curriculum revision is essential.

The revised curriculum provides students with a well-rounded education, and produce graduates who are not only technically proficient but also equipped to tackle the challenges of the evolving biotech industry.

The biotech research and development (both in academia and industry) places a strong emphasis on practical skills. With this revised curriculum, the students who opted for a specialization will do their dissertation work in the related domain of the specialization. This will help in enhancing the specific skills while reducing overall expenses.

The following changes are introduced in the curriculum

- Core subjects increased from 5 to 7.
- In the first semester one free elective is replaced with the mandatory research methodology course.
- IPR course (0 credit) is now merged with the research methodology course.
- Medical nanobiotechnology specialization is renamed as Medical biotechnology.
- There will be no labs for specialization electives. Instead, the students who opted for a specialization, will do their dissertation work in that domain.

Existing Curriculum (72 credits)

Semester 1

Foundation: Advanced Cell Biology
Core 1: Cell Physiology in health and disease
Core 2: Quantitative and Computational Biology
Core 3: Cellular Bioprocess Technology

Free elective 1: from other disciplines
Free elective 2: from other disciplines

Core Lab 1 - Cell Biology and Physiology
Core Lab 2 - Computational Biology and Cellular Bioprocess Technology
Credits: 20

Semester 2

Core 4: Analytical Biotechniques
Core 5: Molecular Biotechnology
Mandatory: Research Methodology
Mandatory: IPR and Biosafety

Specialization electives from BioX

- Systems Biology themes
- Medical and Nano-biotechnology themes
- Other electives: Offered by the SBB

Core Lab 3 - Analytical and Molecular Biotechnology
Core Lab 4 - Specialization Lab
Credits: 18

Semester 3

Seminar (BY525)
Post Graduate Project-1 (BY698P)
Credits: 17

Semester 4

Post Graduate Project-1 (BY699P)
Credits: 17

Proposed Revised Curriculum (72 credits)

Semester 1

Core-1: Advanced Cell and Molecular Biology (3)
Core-2: Computational Biology (4*)
Core-3: Analytical Biotechniques (3)
Core 4: Nanobiotechnology (3)

Free elective-1 (3)
Mandatory: Research Methodology (1*)

Core Lab 1 – Advanced Cell and Molecular Biology (1)
Core Lab 2 - Analytical Biotechniques (1)
Credits: 19

Semester 2

Core 5: Quantitative Biology and Data analytics (3)
Core 6: Immunotechnology (all life forms) (3)
Core 7: Cellular Bioprocess Technology (3)

Specialization electives (any 3) *(9)*

- Systems Biology
- Medical Biotechnology
- Other electives: Offered by the SBB

Core Lab 3- Immunotechnology (1)
Core Lab 4 - Cellular Bioprocess Technology (1)
Credits: 20

Semester 3

Seminar (1)
Post Graduate Project-1 (16)
Credits: 17

Semester 4

Post Graduate Project-2 (16)
Credits: 16

Specialization electives

Specialization-1: Systems Biology		
Special elective	Course	Credits
S1	Introduction to omics and Systems Analysis (BY516)	3-0-0-3
S2	Metabolic Systems Biology (BY504)	3-0-0-3
S3	Metagenomics, and Next Generation Sequencing Technologies (BY613)	3-0-0-3
S4	Proteomics (BY517)	3-0-0-3
S5	Biological Modelling and Simulation (BE506)	3-0-0-3
S6	Bioalgorithms	
S7	Practical Metabolomics	
S8		

Specialization-2: Medical Biotechnology		
Special elective	Course	Credits
M1	Cellular Fuel and Cellular Communication (BY503)	3-0-0-3
M2	Disease Biology (BY518)	3-0-0-3
M3	Protein Sciences in therapeutics (BY519)	3-0-0-3
M4	Gene silencing and genome editing: principles and applications (BY527)	3-0-0-3
M5	Sensory Biology	3-0-0-3
M6	Mechanobiology of the cell	3-0-0-3
M7	Biomaterials and Tissue engineering	3-0-0-3
M8		

BY600 Research Methodology

Course number : BY600
Course Name : Research Methodology
Credit Distribution : *1-0-0-1*
Intended for : Masters and PhD candidates
Prerequisite : NA
Mutual Exclusion : NA

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1. Preamble:

This course is designed to introduce fundamental principles and important aspects of scientific research. Mainly this course provides a broad knowledge on methods of research, data analysis, report writing, presentation, protecting intellectual property and ethical practices. After completion of this course, the students will be able to understand research methods, develop the skills of writing of research reports, develop ethical practices in research, and discuss research information within the scientific community and society.

Course modules (14 total hours):

1. What is research

The concept and objectives of research, types of research, research hypothesis.

2. Research planning or experimental design

Necessity to define research problem, research gap, working hypothesis, planning process, research design.

3. Lab and biosafety

Safe laboratory practices, biosafety levels, biological hazard information, labels, signs and storage of chemical and biological reagents, Classes and types of biosafety cabinets, inactivation and disposal of biological products, waste management, and incident response, report and risk management.

4. Data collection and analysis

Basics of statistics, data processing and analysis strategies and tools, hypothesis testing, interpretation of data.

5. Literature search, collection, storage and citation

Importance of literature review in defining a problem, literature review, online tools.

6. Writing research reports

Types of reports (articles, reviews, progress reports and thesis), formats, planning of report writing. Figure preparation and manipulation. Effective use of English language in scientific papers.

7. Science journals and the peer-review process

Types of journals, publication process, peer-review process, meaning of impact factor, H-index, etc.

8. Presentation skills

Preparation of slides for talks, preparation of posters. Presentation types and skills.

9. Research ethics

Ethical issues, citation and acknowledgement, plagiarism, reproducibility and accountability.

10. IPR

Intellectual property rights and patent law, commercialization, copy right, trademarks, royalty, trade related aspects of intellectual property rights and a few case studies.

11. Science popularization and outreach

Media coverage, lectures in public forums, circulation of scientific ideas and provoking thoughts, and the pros abs cons of these activities.

References:

- The Craft of Research. 4th edition by Wyne C. Booth, Colomb, William, University of Chicago Press.

- Doing Your Research Project. A Guide for First-time Researchers. By Judith Bell, Stephen Waters, publishers: McGraw-Hill Education (2014).
- Research Methodology: A Step-By-Step Guide For Beginners, by Ranjit Kumar, Publisher: Sage South Asia (2011).
- Research Methodology: Methods and Techniques, by C. R Kothari, Publisher: New Age International (2004).
- The Dissertation Journey, by Laura Hyatt, Carol Roberts, Publisher: Corwin (2023).
- How to Write a Scientific Paper: An Academic Self-Help Guide for PhD Students, by Jari Saramaki (2018).
- WIPO Intellectual Property Handbook (Web resources).
- The WHO Laboratory Biosafety Manual (LBM), 4th edition (online).

BY529 Mechanobiology of the Cell

Course number : BY529
Course Name : **Mechanobiology of the Cell (MBoC)**
Credit Distribution : ***3-0-0-3***
Intended for : B.Tech.-M.Tech. Integrated Dual Degree in Bio-Engineering, M. Tech Biotechnology and PhD candidates
Prerequisite : BE201 Cell Biology or Consent of Faculty Member
Mutual Exclusion : NA

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1. Preamble:

This course is designed to introduce fundamental principles of mechanobiology namely the mechanosensing molecules in the cell and the mechanics of cell behaviour (adhesion, migration, gene expression, tissue development). Subsequently, the mechanobiology of organ systems, namely cardiovascular, bone, cartilage, liver, and nervous system as well as mechanobiology of diseases namely cancer, muscular dystrophy, and laminopathies will be introduced. This course will also discuss the techniques used for studying mechanobiology, such as nanofabrication, organoids, microfluidics, and various microscopy techniques. Finally, some applications of mechanobiology principles in disease diagnostics and therapeutics will also be discussed.

Course Modules with quantitative lecture hours (42 total hours):

Unit 1: ***Introduction to Mechanobiology*** (2 Hours)

Why study mechanobiology, pioneering experiments in mechanobiology

Unit 2: ***Molecular Mechanisms of Mechanotransduction*** (6 Hours)

Mechanosensory molecules in focal adhesions, cell-cell junctions, cytoskeleton, and nucleus

Unit 3: ***Mechanobiology of cell behavior*** (8 Hours)

Rigidity sensing and mechanotransduction in adhesion, migration, gene expression, and tissue development

Unit 4: ***Mechanobiology of organ systems*** (8 Hours)

Cardiovascular, Bone, Cartilage, Liver, Nervous system

Unit 5: ***Mechanobiology of disease*** (6 hours)

Muscular dystrophy, cancer, laminopathy

Unit 6: ***Technology innovation for mechanobiology*** (6 Hours)

Optical microscopy, nanofabrication, microfluidics, organoids, organ-on-chip

Unit 7: ***Mechanobiology in medical diagnostics and therapeutics*** (6 hours)

Cell therapy, Cancer diagnostics, Immune profiling

Laboratory/practical/tutorial Modules: NA

2. Text books:

1. Introduction to Cell Mechanics and Mechanobiology by Christopher R. Jacobs, Hayden Huang, and Ronal Y. Kwon. Garland Science, Taylor & Francis Group, 2012
2. The Cell as a Machine by Michael Sheetz and Hanry Yu. Cambridge Texts in Biomedical Engineering, Cambridge University Press, 2018

3. References:

1. Mechanobiology: Methods and Protocols by Ronen Zaidel-Bar. Humana Press, Springer Protocols. Methods in Molecular Biology 2023
2. Mechanobiology in Health and Disease by Stefaan W. Verbruggen. Academic Press, Elsevier, 2018
3. MBInfo (https://www.mbi.nus.edu.sg/mbinfo/) This is a wiki-style repository of mechanobiology with the aim to inform and educate the wider scientific community about mechanobiology and how physics and mechanics impact biological processes.

Annexure E

Program Proposal Form

Name of the New Proposed Program: Integrated Master of Business Administration Program (IMBA Program)

I. General Information:

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

II. Program Description:

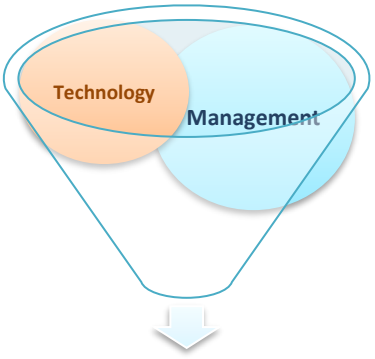
A. Provide a justification/rationale for the program. How does the program relate to the mission of the IIT Mandi?

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.



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 through JEE Mains. Those who qualify to appear in JEE Advance (approximately 2.5 Lakhs) will be eligible to apply for the program. Given the technological orientation of the program, students with a science background would be ideal. In contrast, most of the management institutes admit students into their integrated programs through a written exam (generally open to candidates from all streams), the number of students writing these exams is limited.

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 master's degree students of IIT Mandi by means of engaging academically (in the initial 2 years) 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:

Strengths:	**Weaknesses:**
❖ The proposed innovative curriculum has 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.	● 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

❖ The fee structure of the proposed program is likely to be lower than the Integrated Programs offered by IIMs/other premier institutions, making our program more economic proposition for the prospective applicant. This estimation is based on the fee structure of our ongoing MBA program.	international institutes to enable student exchange. ●
Opportunities: ● IIT Mandi can have the first mover advantage among IITs in offering a Five-Year integrated MBA program. ● A pre-existing and robust annual pipeline of 2.5 lakh prospective students through JEE Mains -who have qualified for JEE advance (B.E. /B. Tech). ● 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.	**Threats:** ● We need to establish and communicate a clear differentiated position compared to integrated management programs of IIMs. Therefore, the communication strategy must be well planned. ● The first mover advantage may be short lived. The proposed program will face competition if other technical institutes also decide to enter this segment.

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 courses related to the co-curricular activities, Arts, Music, Sports, Yoga, personality development, outbound activities, etc.
- The program offers multiple exit options to the students – BBA Analytics and BBA Analytics (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 program

The program has a total of 200 credits across five years. The program will provide exit options to the student as follows:

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

The credit breakdown across the years is as follows:

a) The program has 130 credits in the first three years which are divided into discipline core and elective courses. The details are as follows:

Division	Subdivision	Credits
IC Compulsory, IC Baskets, and Core courses from other Relevant Disciplines	Engineering, Science, Mathematics & Statistics, Data Science, and Computer Science	54
Discipline Core	Management, Economics, Indian Knowledge System, Language and Communication, Social Sciences, and Data Science and AI	71
Discipline Electives	Skills such as Life Skills, Technical Skills, Professional Skills, and Art Forms	5

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

Division	Credits
Internship*	12
Discipline Core	20

*Internship will happen after successful completion of the first three years of the program. In the semester VII, the students of the integrated MBA program would be going for a sixth month long extended industrial internship anytime during June to January. This is a unique proposition of the proposed program. The students will get 12 credits for the internship. This period can also be utilized for semester exchange or exploring entrepreneurship (start-up in an incubation center).

The program will have a provision to allow students interested in setting up their own start-ups to go for a one-year sabbatical to do so immediately after semester VII. After one year, the student needs to rejoin semester VIII of the program.

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	10
Discipline Electives	12
Free Electives	6
Management Project	10

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.

d) Criteria for program completion:

The minimum requirement to continue the program and passing criteria will be the same as B. Tech program as mentioned in B. Tech ordinance R.11. 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). The rules for Academic Warning, Academic Probation and Completion of the program will be the same as B. Tech. as mentioned in B. Tech. ordinance. The maximum duration of the integrated program is 10 semesters and maximum duration will be 14 semesters excluding semester withdrawn on medical ground.

F. List of proposed Courses

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

List of Core Courses

Course Title	Credit
Calculus	2
Introduction to Python and Data Science (Previously DS I)	4
Understanding Biotechnology and its Application	3
Introduction to Consciousness and Wellbeing (IKSMHA)	3
Microeconomics	3
Foundations of Business Management	4
Management Workshop I	1
Linear Algebra	3
Probability and Statistics (Previously DS II)	4
Foundations of Design Practicum	4
Macroeconomics	3
Written and Verbal Communication	4
Ethics and Values	3
Management Workshop II	1
Data handling and Visualization	3
Design Practicum	3
Machine Learning (Previously DS III)	3
Mathematical Foundation of Computer Science/data science	4
Environmental Science	3
Data Structures and Algorithms	3
Management Workshop III	1
Management Workshop IV	1
Optimization for Data Science	4
Statistical Foundation of Data Science	4
Matrix Computations for Data Science	4
Introduction to Accounting	3
Psychological Foundations of Business Management	3
Business Government and Society	3
Management Workshop V	1
Business Communication	3
Introduction to Marketing	3
Introduction to Operations Management	3
Foreign Language 1	3
Business Research Methods	3
Data Base for Managers	4
Financial statement analysis	3

Problem solving and Decision Making for Managers	**3**
Mathematics for Business Management	**3**
Introduction to Financial Management	**3**
Indian Art Form	**2**
Public Speaking and debating	**3**
Sustainable Business Practices	**3**
Management Lessons from Indian Knowledge System	**3**
Indian Economy	**3**

List of Elective Courses/Workshops

Skill Baskets	**Suggestive Title of Courses**	**Credits**
Technical Skills	Basic Excel	1
	Advanced Excel	1
	Programming languages	1
	Software training	1
	Impactful Presentation	1
		1
Soft Skills	Personality Development	1
	Written Communication	1
	Verbal Communication	1
		1
Professional Skills	Business Etiquettes	1
	Story Telling with Data	1
	Preparing for Interview	1
	Time Management	1
		1
Art forms	Dramatics	1
	Music	1
	Dance	1
	Painting	1
		1
Life Skills	Yoga	1
	Outbound Activities	1
	Physical Training	1

Note: The above is not an 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 industry internship in the seventh semester. For the remaining semesters, the students will take the same courses as offered to MBA (DS & AI) students in their last three semesters. See the Section I for the complete list of courses.

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. Following is a list of courses that are common with other UG programs of the institute.

Course Title	Credit
Calculus	2
Introduction to Python and Data Science (Previously DS I)	4
Understanding Biotechnology and its Application	3
Introduction to Consciousness and Wellbeing (IKSMHA)	3
Linear Algebra	3
Probability and Statistics (Previously DS II)	4
Foundations of Design Practicum	4
Data handling and Visualization	3
Design Practicum	3
Machine Learning (Previously DS III)	3
Mathematical Foundation of Computer Science/**data science**	4
Environmental Science	3
Data Structures and Algorithms	3
Optimization for Data Science	4
Statistical Foundation of Data Science	4
Matrix Computations for Data Science	4

Additionally, 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:

- Business case studies
- Management role-plays
- Course instructors from industry to bridge the gap between the academic training and industrial practices.

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.

Semester I		
Course Code	**Course Title**	**Credit**
IC112	Calculus	2
IC152	Introduction to Python and Data Science (Previously DS I)	4
IC136	Understanding Biotechnology and its Application	3
IC181/ICXXX	Introduction to Consciousness and Wellbeing (IKSMHA)	3
DC*	Microeconomics	3
DC	Foundations of Business Management	4
DE	Management Workshop I	1
	Total Credits	**20**
Semester II		
IC114	Linear Algebra	3
IC252	Probability and Statistics (Previously DS II)	4
ICXXX/IC181	Foundations of Design Practicum	4
DC	Macroeconomics	3
DC	Written and Verbal Communication	4
DC	Ethics and Values	3
DE	Management Workshop II	1
	Total Credit	**22**
Semester III		
DS201	Data handling and Visualization	3
IC201P	Design Practicum	3
IC272	Machine Learning (Previously DS III)	3
CS208/**DS301**	Mathematical Foundation of Computer Science/**data science**	4
IC230	Environmental Science	3
CS202	Data Structures and Algorithms	3
DE	Management Workshop III	1
DE	Management Workshop IV	1
	Total Credit	**21**
Semester IV		
DS401	Optimization for Data Science	4
DS303	Statistical Foundation of Data Science	4
DS402	Matrix Computations for Data Science	4
DC	Introduction to Accounting	3
DC	Psychological Foundations of Business Management	3
DC	Business Government and Society	3
DE	Management Workshop V	1
	Total Credit	**22**

Semester V		
DC	Business Communication	3
DC	Introduction to Marketing	3
DC	Introduction to Operations Management	3
DC	Foreign Language 1	3
DC	Business Research Methods	3
DC	Data Base for Managers	4
DC	Financial statement analysis	3
	Total Credit	**22**
Semester VI		
DC	Problem solving and Decision Making for Managers	3
DC	Mathematics for Business Management	3
DC	Introduction to Financial Management	3
DC	Indian Art Form	2
DC	Public Speaking and debating	3
DC	Sustainable Business Practices	3
DC	Management Lessons from Indian Knowledge System	3
DC	Indian Economy	3
DC	**Total Credits**	**23**
Semester VII		
	Compulsory Industry Internship	12
		12
Semester VIII		
DC	Fundamentals of Data Analytics	2
DC	Disruptive Technology in Data Science	2
DC	Strategic Management	**2**
DC	Machine Learning for Business	**2**
DC	Introduction to AI and Automation	**2**
DC	Organizational Behaviour	**2**
DC	Decision Analysis	**2**
DC	Project Management	**2**
DC	Marketing Management II	**2**
DC	Ethical and Legal Aspects of Business	**2**
		20
Semester IX		
DC	Neural Network Fundamentals for Business	2
DC	Digital Business Strategy, Models and Transformations	2
DC	Entrepreneurship	**2**
DC	Business and Data Leadership	**2**
DC	Management Insights from Indian Knowledge System	**2**
DC	Discipline Elective 1	**2**
DC	Discipline Elective 2	**2**
DC	Free Elective 1	**2**
DC	Management Project I	**4**
		20

Semester X		
DC	Discipline Elective 1	**2**
DC	Discipline Elective 2	**2**
DC	Discipline Elective 3	**2**
DC	Discipline Elective 4	**2**
DC	Free Elective 1	**2**
DC	Free Elective 2	**2**
DC	Management Project II	**6**
DC		**18**

*DC referrers to Departmental Core

** DE refers to Departmental Elective

Credit distribution

Total Credit in First 3 Years (BBA Analytics)	130
Total Credit in First 4 Years (BBA Analytics (Honors))	162
Total Credit in Five Years (Integrated MBA)	200

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

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

At present five IIMs are offering an integrated management program. In addition, some of the renowned central and state government institutions and leading private institutions are also offering similar program. Notably, majority of these institutes have started the program in last 3-4 years (please refer table below for details). A recent focus of educational institutes on five-year integrated MBA program indicates its demand.

List of institutions offering an Integrated Management Program*

Institute Name	Starting Year	Intake
Indian Institute of Management Indore	2011	150
Indian Institute of Management Rohtak	2019	180
Indian Institute of Management Ranchi	2021	120
Indian Institute of Management Bodh Gaya	2021	60
Indian Institute of Management Jammu	2021	60
Indian Institute of Foreign Trade Kakinada	2022	50
NALSAR University of Law Hyderabad	2021	66
Kurukshetra University	2010	60
Mumbai University	2016	60
Kumaon University	2018	50
Maharshi Dayanand University	2008	120
OP Jindal University		
Manipal Academy of Higher Education		120
Nirma University		180

*Data collected from different web resources.

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

The five-year integrated MBA program offered by majority of the premier institutes focus mainly on the traditional management education such as finance, marketing, strategy, human resource management, and operations management. Most of these programs are not adequately inclined towards the growing role of technology in the changing business landscape. While few of these programs offer courses to educate students in analytics domain, but they seem to lack building advance analytical foundation to enable robust student learning.

On the other hand, the proposed program, in addition to these traditional courses, also includes courses that enable learning and experience on latest technology. Moreover, these courses and their pedagogy are intently designed to help students learn the application of these advance analytical tools in the realm of business domains. Particularly, the long-

duration internships and live industry projects embedded in the program would help students develop strong orientation towards the real problems facing industry and the use-cases of analytical tools. The students will take advantage of IIT ecosystem, and compete with students of other undergraduate branches in curricular and co-curricular activities.

In addition to the differentiated course curriculum, the program offers the students a unique enriching campus life in the lap of nature within the serene Himalayan ecosystem away from the hustle and bustle from cities. It offers the students opportunity for holistic development by engaging in various extra-curricular and co-curricular activities, along with the student of other streams at IIT Mandi. Further, students would have an opportunity to leverage start-up/incubator ecosystem of IIT Mandi and initiate tech-based ventures that can shape the business landscape and create social/economic impact.

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

The School of Management is recently having 8 regular faculty members along with several other adjunct faculty members, visiting faculty members, and distinguished Professors. In addition, the faculty members from other schools will be teaching the IC Compulsory and IC Basket courses during 1st years of the program. The school may utilize the service of some visiting faculty members from Industry and Academia as when necessary. The school is also hiring more regular faculty members in required areas.

In case of interdisciplinary program, mention governances and execution mechanism of the program:

During the first two years of the program, faculty members from other schools will be teaching the courses and students will study along with other B. Tech students. The next three years will be taught by faculty members from school of management and the industry experts.

Student interest:

What measures of student interest in the program are there? How/why are the proposers convinced that students would want to take this program of study? (Attach Career and Placement Cell recommendation or any other)

In the last five years, at least five IIMs, and several private and government universities have offered an integrated management program. It indicates growing student interest in such integrated programs. The proposed programs would be attractive for students for the following reasons:

- The unique curriculum cuts across different type of training and skills in the area of technology, management, and other courses offers a holistic learning experience for the management graduates in the pristine Himalayan environment.
- Several students spend one to two years in preparation for the competitive exams after their bachelor's degree. The integrated program by its design enables the student to peruse the bachelor's and master's degree and saves the time and cost spend in preparation for competitive exams.

- The proposed program will provide a long industrial internship opportunity for 3rd year students. The internship will provide the students an exposure to real business world and help relate better to the management courses in 4th and 5th year of the integrated program.
- Six months internship has been highly desired and accepted by the companies for the B.Tech. students and provides a much higher chance of getting Pre-Placement Offers (PPO). Many companies now a days look for management interns for a longer duration (up to six months or more) instead of the traditional 2-month internship. It is highly likely that the longer industrial internships for the management students would also open the options of PPO.
- The fee structure of the proposed program is likely to be lower than the Integrated Programs offered by other premier institutions, making our program more economic proposition for the prospective applicant. This estimation is based on the fee structure of our ongoing MBA program.
- The proposed program will also create national and international student exchange opportunities.
- The proposed program, in addition to mentoring from faculty advisor, will facilitate guidance/mentoring through engagement with industry professionals for better career guidance.
- The proposed students would also have an opportunity to leverage start-up/incubator ecosystem of IIT Mandi and initiate tech-based ventures that can shape the business landscape and create social/economic impact.

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

For smooth functioning of the program and for experiential learning, following labs will be set up over the next two years:

1. Business Analytics Laboratory (1500 Sq. feet)
2. Behavioral Laboratory (1500 Sq. feet)
3. Finance Research Laboratory (1500 Sq. feet)
4. Entrepreneurship Research Laboratory (1500 Sq. feet)

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

1. Business Analytics Laboratory (1.5 Cr)
2. Behavioral Laboratory (1.2 Cr)
3. Finance Research and Trading Laboratory (1.5 Cr)
4. Entrepreneurship Research Laboratory (1.0 Cr)

Additional requirements of faculty and non-teaching staff (Numbers and justification)

1. We would require about 20-24 faculty members in relevant research and teaching areas in the next 5 years.
2. We would require a staff member dedicated for managing internships, placements, industry liaisoning, and students exchange visits.

3. We will require two laboratory assistants to maintain the laboratories proposed earlier in this proposal.
4. We will require assistance of one office assistant to manage day to day operations related to the proposed program.

Note: The proposed infrastructure would also be helpful for executive education programs including FDP, MDP, Continuing Education, etc., which is a proven source of significant revenue to the institute.

III. Origin and development of the proposal:

- **Please mention name of faculty members involved in developing this proposal.**
  - **Phase 1**
    1. Dr. Ashish Bollimbala
    2. Dr. Saumya Dixit
    3. Dr. Puran Singh
    4. Prof. Manoj Thakur
  - **Phase 2: Curriculum Committee**
    1. Dr. Akhaya Kumar Nayak
    2. Prof. Anjan Swain
    3. Dr. Ashish Bollimbala
    4. Dr. Puran Singh

- **Details of external industry experts and their recommendations (please include their evaluation)**
  1. Mr. Saurabh Mittal, Qyon
  2. Mr. Vinay Kumar, Datawise
  3. Mr. Mahesh Venkataraman, Accenture

- **Details of external academia experts and their recommendations (please include their evaluation):**
  1. Prof. G Shridhar
  2. Prof. B K Mohanty
  3. Prof. M. Venkateswarlu

- **Proposers faculty name and their signatures:**

Name of Faculty members	Signatures
Dr. Ashish Bollimbala	
Dr. Puran Singh	
Prof. Anjan Swain	
Dr. Akhaya Kumar Nayak	

Recommendations of Chairperson of School/ Centre

Signature with Date:

Dean (Students) recommendations on availability of hostels and other requirements

Signature with Date:

Associate Dean (Courses) recommendation on class rooms availability and other academic infrastructure requirements

Signature with Date:

Dean Finance recommendation on financial aspects (if any)

Signature with Date:

Dean Academics recommendations:

Recommended/Not Recommended

Signature with Date:

Please enclose additional information if any.

Annexure 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 Master's program, distributed in 4 semesters. The credit requirement is 80. 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 (52 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 (12+6 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)** Program.

Project and internship (10 credits):

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	52
2	Discipline Electives	12
3	Free Electives	6
4	Project and Internship	10
Total		80

Proposed Curriculum of Two Years Master of Business Administration (Data Science and Artificial Intelligence)

Semester I MBA DS&AI		
	Communication Skills for Managers	2
	Financial Statement Analysis	2
	Mathematical Foundation of Data Science and AI	**2**
	Creative Thinking, Problem Solving and Decision Making	**2**
	Python Programming	**2**
	Operations Management	**2**
	Managerial Economics	**2**
	Marketing Management I	**2**
	Probability and Statistics for Data Science & AI	**2**
	Human Resource Management	**2**
	Financial Management	**2**
		22
Semester II DS and AI		
	Fundamentals of Data Analytics	2
	Disruptive Technology in Data Science	2
	Strategic Management	**2**
	Machine Learning for Business	**2**
	Introduction to AI and Automation	**2**
	Organizational Behaviour	**2**
	Decision Analysis	**2**
	Project Management	**2**
	Marketing Management II	**2**
	Ethical and Legal Aspects of Business	**2**
		20
Semester III DS and AI		
	Neural Network Fundamentals for Business	2
	Digital Business Strategy, Models and Transformations	2
	Entrepreneurship	**2**

	Business and Data Leadership	**2**
	Management Insights from Indian Knowledge System	**2**
	Discipline Elective 1	**2**
	Discipline Elective 2	**2**
	Free Elective 1	**2**
	Management Project I	**4**
		20
Semester IV		
	Discipline Elective 1	**2**
	Discipline Elective 2	**2**
	Discipline Elective 3	**2**
	Discipline Elective 4	**2**
	Free Elective 1	**2**
	Free Elective 2	**2**
	Management Project II	**6**
		18
Total credits in two years 80		

Annexure F

IIT Mandi
Proposal for a New Course

Course number : EE223P
Course Name : Reverse Engineering
Credit : 1
Distribution : *0-0-2-1*
Intended for : BTech EE/BTech VLSI
Prerequisite : Faculty approval
Mutual Exclusion : None

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1. Preamble:

The students focus on either software or hardware reverse engineering (RE). In the process of RE students understand existing technologies, functions, features, objects, components and systems. By carefully disassembling, observing, testing, analyzing and reporting, students can understand how something works and suggest ways it might be improved. This process requires careful observation, disassembly, documentation, analysis and reporting. Many times, the reverse engineering process is non-destructive. This means that the object or component can be reassembled and still function just as it did before it was taken apart. Throughout the reverse engineering project, the students are able to think of ways these objects could be improved. Is there some way it could function better? or manufactured less expensively? The students will use observations to make suggestions for improvement of the product.
Learning Topics: Forward Engineering Design, Design Thought and Process, Design Steps, System RE, RE Methodology, RE Steps, System level Design, and Examples, Product Development, Product Functions, Engineering Specifications, Product Architecture, Mechanical RE, Computer-Aided RE, Electronic RE, Identify electronic components, PCB RE, Schematic Drawings and Analysis, S/W RE, Reverse Engineering in Computer Applications, Re-engineering of PLC programs.

After the completion of the course, students should be able to:
• Understand basic engineering systems.
• Understand the terminologies related to re-engineering, forward engineering, and reverse engineering.
• Disassemble products and specify the interactions between its subsystems and their functionality
• Understand Reverse Engineering methodologies.
• Understand Reverse engineering of Systems, Mechanical RE, Electronic RE, and Computer RE.

2. Course Modules with quantitative lecture hours:

Topic 1 Introduction to Reverse Engineering, need of Reverse Engineering, understanding of Reverse Engineering through examples, methodologies for Reverse Engineering, Reverse Engineering vs Forward Engineering, steps for Reverse Engineering **(1 hour).**

Topic 2 Mechanical components used in joining (screw fasteners, bolts, nut and washers, compression fittings, pop rivets and rivets), and power transmission (belt drives, chain drives, gear drives and couplings), mechanical tools used in mechanical workshop: measuring tool, fastening-wrenches, fasting screwdrivers, fastening-pliers, cutting tools and striking/driving tools, standards of measurement: primary, secondary, tertiary and working standards, measurement devices: caliper and bevel protector **(1 hour)**.

Topic 3 Top down approach, product information through examples, important electrical/electronics devices: resistor, capacitor, inductor, diode, transistor, operational amplifiers and integrated circuit or microchip, various analysis and quantities, measuring instruments: multi-meter, function generator, oscilloscope, probe and connectors **(1 hour).**

Topic 4 Introduction to engineering drawing, importance of engineering drawing, engineering drawing projections, detailed drawing, assembly drawing and its classification, exploded assembly drawing, advantages of exploded views **(1 hour).**

Topic 5 Importance of engineering drawing in Reverse Engineering, engineering drawing of bench wise, engineering drawing standards in dimensioning, sectional view, tolerance, surface finish and welding, standard codes, engineering drawing format, production drawing of bench wise, Bill Of Material (BOM) **(1 hour).**

Topic 6 Introduction to engineering materials, evolution of engineering materials, classification of engineering materials into metals, non-metals, ceramics and composites, features, identification, examples and applications of different materials, understanding through case studies, introduction to manufacturing processes, classifications of machining and joining process, introduction to casting process, various allowances and types of casting process **(1 hour).**

Topic 7 Demonstration exercise: Reverse Engineering of Electric Kettle **(1 hour).**

Laboratory/practical/tutorial Modules:

4 lab activities will follow the 7 lectures indicated above. In the labs, the students will be disassembling and reassembling some day-to-day devices based on the lectured principles, and provide a report that will typically include

- Explanation of the working mechanism,
- Exploded drawing of the product,
- Assembly and disassembly procedure,
- Bill of Materials (BOM),
- Manufacturing processes and scope of materials,
- Discussion and Scope for Improvement.

The devices used will be (but not limited to) torch, calculator, mouse and DC motor.

3. Text books:

1. Product Design: Techniques in Reverse Engineering and New Product Development by K. Otto and K. Wood Prentice Hall, 2001.

2. Reverse Engineering: An Industrial Perspective by Raja and Fernandes. Springer-Verlag 2008

4. References:

1. Reversing: Secrets of Reverse Engineering by Eldad Eilam Publisher: Wiley (April 15, 2005)
2. The IDA Pro Book: The Unofficial Guide to the World's Most Popular Disassembler by Chris Eagle

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

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

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

Not applicable.

Approvals: Not applicable.

Faculty interested in teaching this course: – Dr. Kaushik Halder, Dr. Siddarth Panwar, Dr. Erwin Fuhrer.

Proposed by: Dr. Srikanth Sugavanam. **School: SCEE**

Signature: **Date:**

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

Sl. No	Faculty Name	Signature
1	Dr. Hitesh Shrimali	
2	Dr. Siddharth Panwar	
3	Dr. Kaushik Halder	

School Chair:

School:

Date:

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

Dean Academics

Date:

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