

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



**MINUTES OF 52<sup>ND</sup> BOARD OF ACADEMICS MEETING**

VENUE	:	GUEST HOUSE (NC)CONFERENCE ROOM + ONLINE
DATE	:	02 <sup>nd</sup> NOVEMBER, 2023 (THURSDAY)
TIME	:	2:30 P.M.

**Following members attended the meeting**

Sl. No	Responsibilities	Name
1	Dean Academics	Prof. Aniruddha Chakraborty
2	Associate Dean (Research)	Dr. Amit Jaiswal
3	Associate Dean (Courses)	Dr. P. Anil Kishan
4	Chairman Senate Library Committee	Prof. Aniruddha Chakraborty
5	Nominee-1: School of Computing and Electrical Engineering	Dr. Padmanabhan Rajan
6	Nominee-2: School of Computing and Electrical Engineering	Dr. Gopi Shrikanth Reddy
7	Nominee-1: School of Physical Sciences	Dr. Arko Roy
8	Nominee-2: School of Physical Sciences	Dr. Gargee Sharma
9	Nominee-1: School of Chemical Sciences	Dr. Bhaskar Mondal
10	Nominee-1: School of Biosciences and Bioengineering	Dr. Sumit Murab
11	Nominee-2: School of Biosciences and Bioengineering	Dr. Kasturi Prasad
12	Nominee-1: School of Mathematical and Statistical Sciences	Dr. Rajendra K Ray
13	Nominee-2: School of Mathematical and Statistical Sciences	Dr. Syed Abbas
14	Nominee-1: School of Civil and Environmental Engineering	Dr. Maheshreddy Gade
15	Nominee-2: School of Civil and Environmental Engineering	Dr. Prasanna Rousseau
16	Nominee-1: School of Mechanical and Materials Engineering	Dr. Gaurav Bhutani
17	Nominee-1: School of Humanities & Social Sciences	Dr. Rajeshwari Dutt
18	Nominee-2: School of Humanities & Social Sciences	Dr. Ramna Thakur
19	Nominee-2: Centre of AI and Robotics	Dr. Jagadeesh
20	Nominee-1: IKSHMA	Dr. Aniruddha Chakraborty
21	Nominee-2: IKSHMA	Dr. Sumit Murab
22	Research Affairs Secretary	Mr. Saurabh Patel
23	Academic Affairs Secretary	Ms. Dishti Oberai
24	PG Academic Secretary	Mr. Sudama Babu Singhal
25	Deputy Registrar (Academics): Secretary	Mr. Suresh Rohilla

**Following members could not attend the meeting**

Sl. No.		Name	
1	Nominee-2: School of Chemical Sciences	Dr. Garima Agrawal	Member
2	Nominee-2: School of Mechanical and Materials Engineering	Dr. Sudhir Pandey	Member
3	Nominee-1: Centre of AI and Robotics	Dr. Narendra Kumar Dhar	Member
4	Industry Member – 1	Dr. Nadeem Akhtar	Member



**Special Invitee**

<b>Sl. No.</b>	<b>Name</b>	
1	Dr. Shubhajit Roy Chowdhury	Asso. Prof. SCEE
2	Dr. Ramajayam Govindaraji	Asst. Prof. IKSMHA
3	Dr. Varun Dutt	Asso. Prof. SCEE
4	Dr. Mayanka Ambade	Asst. Prof. SHSS
5	Dr. Sandip Kumar Saha	Asst. Prof. SCENE
6	Dr. Shreya Gaikwad	Asst. Prof. SHSS
7	Dr. Neethi Vadakkan Alexander	Asst. Prof. SHSS
8	Dr. Thirthankar Chakraborty	Asst. Prof. SHSS
9	Prof. Rahul Vaish	Prof., SMME
10	Dr. Jinesh Machchhar	Asst. Prof. SCEE
11	Dr. Pratim Kundu	Asst. Prof. SCEE
12	Dr. Tushar Jain	Asso. Prof. SCEE
13	Prof. Manoj Thakur	Prof., SMSS
14	Dr. Shyamasree Dasgupta	Asso. Prof. SHSS



## PART-A

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

**52.1 Confirmation of the minutes of 51<sup>st</sup> meeting of the Board of Academics:**

The minutes of the 51<sup>st</sup> meeting of the Board of Academics held on 5<sup>th</sup> October, 2023 were confirmed.

**52.2 To consider the proposal for Early Induction in M.Tech./Ph.D. programmes:**

Prof. Rahul Vaish, presented a proposal for Early Induction in M.Tech./Ph.D. programmes at IIT Mandi. After due deliberations, the BoA recommended the proposal for consideration of the Senate and its approval.

The proposal is placed as **Annexure – A**.

**52.3 To consider the proposal to establish a new Centre for Digital Health:**

The agenda Item is hereby withdrawn by the proposer.

**52.4 To consider the new courses from SHSS:**

SHSS respective faculty members presented the proposal of courses 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 course descriptions are placed as **Annexure- B**.

Sl.No.	Course No.	Course Name	Credits
1	HS-108	Basic English for Engineers	3-0-0-3
2	HS-109	Advanced English for Engineers	3-0-0-3
3	HS-306	Introduction to German Literature	3-0-0-3
4	HS-501	Global Health and Demography	3-0-2-4
5	HS-503	German Literature from World War II to Reunification	3-0-0-3
6	HS-504	Personal Finance and Portfolio Management	3-0-0-3

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

The agenda Item is not presented by the proposer.

**52.6 To consider the new courses from SBB:**

The agenda Item is not presented by the proposer.

**52.7 To consider the new courses from SOM:**

Prof. Manoj Thakur, Chair SOM, presented the proposal of courses 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 course descriptions are placed as **Annexure- C**.

Sl.No.	Course No.	Course Name	Credits	C/E	Semester
1	MB520	Fundamentals of Data and Analytics	2	Core	Two
2	MB521	Disruptive Technologies for Data Science	2	Core	Two
3	MB522	Machine Learning for Business	2	Core	Two
4	MB523	Introduction to AI and Automation	2	Core	Two
5	MB524	Organizational Behavior	2	Core	Two
6	MB525	Qualitative Research	2	Core	Two
7	MB526	Strategic Management	2	Core	Two
8	MB527	Financial Management	2	Core	Two
9	MB528	Human Resource Management	2	Core	Two
10	MB530	Neural Networks fundamentals for Business	2	Core	Three/Four
11	MB531	Ethical and Legal Aspects of Business	2	Core	Three/Four
12	MB532	Digital Business Strategy, Models and Transformations	2	Core	Three/Four
13	MB533	Entrepreneurship	2	Core	Three
14	MB570	Product Management	2	Elective	Three
15	MB592	Management Science in Practice	2	Elective	Three
16	MB579	Marketing Analytics	2	Elective	Three
17	MB562	Operations Management	2	Elective	Three
18	MB580	AI In Finance	2	Elective	Three

**52.8 To consider the revision of new CSE curriculum and change in course for minor in Intelligent Systems:**

Dr. Padmanabhan Rajan, Nominee SCEE, presented the revision of new CSE curriculum and change in course for minor in Intelligent Systems. After due deliberations, the BoA recommended proposal with minor modifications for consideration of the Senate and its approval.

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

**52.9 To consider the proposal of new Master of Arts in Sanskrit and Hindu Studies programme:**

Dr. Varun Dutt, presented the proposal of new branch in Master of Arts in Sanskrit and Hindu Studies. After due deliberations, the BoA suggested to constitute a committee for the presented proposal and submit its recommendations.

**52.10 To consider the proposal of crediting of independent study course for graduate students:**

Dr. Varun Dutt, Chair IKSMHA, presented the proposal of crediting of independent study course for graduate students. After due deliberations, the BoA recommended the proposal for consideration of the Senate and its approval, for courses taken upto December, 2023.

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

**52.11 To consider the new courses from SPS:**

Dr. Gargee Sharma, Nominee SPS, presented the proposal of courses 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 course descriptions are placed as **Annexure- F**.

Sl.No.	Course No.	Course Name	Credits
1	PH-625	Data Analysis in Particle Physics	2-0-4-4
2	PH-626	Elementary Theoretical Particle Physics	3-0-0-3
3	PH-627	Topological Quantum Matter	3-0-0-3

**52.12 To consider the new courses for BS Chemical Sciences in 2<sup>nd</sup> Year Curriculum:**

Dr. Bhaskar Mondal, Nominee SCS, presented the new courses for BS Chemical Sciences in 2<sup>nd</sup> Year Curriculum. After due deliberations, the BoA recommended the proposal for consideration of the Senate and its approval.

The modified proposal is placed as **Annexure-G**.

**52.13 To consider the new courses from SCENE:**

Dr. Maheshreddy Gade, Nominee SCENE, presented the proposal of courses 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 course descriptions are placed as **Annexure- H**.

Sl. No.	Course No.	Course Name	Credits	Remarks
1	CE202	Introduction to Civil Engineering	1	
2	CE203	Civil Engineering Materials	3	52 <sup>nd</sup> BOA on dated 2-11-2023
3	CE203P	Building Materials Lab	1	52 <sup>nd</sup> BOA on dated 2-11-2023
4	CE306P	Environmental Engineering Lab	1	Revised number & Name from 305P (Environment Earth Science Lab)
5	CE310	Strength of Materials and Structures	3	
6	CE310P	Strength of Materials and Structures Lab	1	
7	CE404	Analysis of Structures	3	
8	CE405	Water and Wastewater Engineering	3	
9	CE451	Irrigation Engineering & Hydraulic Structures	3	Course no revised from 405 due to clash
10	CE521	Ecology and Environment Microbiology	4	
11	CE522	Matrix Methods for Structural Analysis	3	Course no revised from 503
12	CE558	Air Pollution and its mitigation	3	
13	CE604	Theory of Plasticity	3	
14	CE303	Water Resources Engineering	3	Course Content revised, approved on 9 <sup>th</sup> senate

15	CE311	Geotechnical Engineering I	3	Course No revised from 302
16	CE311P	Geotechnical Engineering Laboratory	1	Course No revised from 302 & split
17	CE 352P	Transportation Engineering Laboratory	3	

**52.14 To consider the proposal for modification in the name and courses of Minor in German Language to be Minor in German Studies:**

Dr. Rajeshwari Dutt, Nominee SHSS, presented the proposal for modification in the name and courses of Minor in German Language to Minor in German Studies. After due deliberations, the BoA approved the modified proposal.

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

**52.15 To consider the proposal for discarding the HSS course basketing:**

Dr. Rajeshwari Dutt, Nominee SHSS, presented the proposal for discarding the HSS course basketing. After due deliberations, the BoA approved the modified proposal.

The proposal is placed at **Annexure-J**.

**52.16 To consider the proposal of modification in the courses towards Communication Competence in the Management Minor:**

Dr. Rajeshwari Dutt, Nominee SHSS, presented the proposal of modification in the courses towards Communication Competence in Minor Management. After due deliberations, the BoA approved the following modified proposal:

Addendum to the Management Minor document entitled "Modification in the structure for Minor in Management" dated February 2022.

Applicable to 2020-2024 and subsequent batches of B. Tech students, the Communicative Competence requirement may be fulfilled by taking one of the following courses:

Basic Communication Skills, HS105; 3-0-0-3

Public Speaking and Debating Skills; HS206, 3-0-0-3

Policy Analysis and Advocacy Skills; HS301, 3-0-0-3

Science Writing, HS305; 3-0-0-3

Creative Writing; HS357, 3-0-0-3

**52.17 To consider the proposal for inclusion of HSS paper in JAM for admission to MA program:**

Dr. Rajeshwari Dutt, Nominee SHSS, presented the proposal for inclusion of HSS paper in JAM for admission to MA program. After due deliberations, the BoA recommended the proposal for consideration of the Senate and its approval.

The proposal is placed as **Annexure – K**.

**52.18 To consider the new courses from IKSMHA:**

Dr. Ramajayam, presented the proposal of the new courses from IKSMHA. After due deliberations, the BoA recommended the proposal of new courses for consideration of the Senate and its approval.

The modified course(s) proposal is placed as **Annexure – L**.

Sl. No.	Course No.	Course Name	Credits
1	IK-506	Research Methods and Statistics for Contemplative Science	2-1-0-3
2	IK-507	Neuroscience and Mental Health	3-0-0-3

**52.19 To consider the proposal for M.Tech. (Research) in Music and Musopathy and Ph.D. program:**

Dr. Pratim Kundu presented the proposal for M.Tech. (Research) in Music and Musopathy and Ph.D. program. After due deliberations, the BoA suggested to constitute a committee for the presented proposal and submit its recommendations.

**52.20 Any other item with the permission of the Chair:**

Dr. Gopi Shrikanth Reddy, Nominee SCEE, presented the proposal of courses to the Board of Academics. After due deliberations, the BoA approved the courses and the same shall be reported to the Senate.

Sl. No.	Course No.	Course Name	Credits
1	EE-304	Communication Systems	3-0-2-4
2	EE-205	Electromagnetics and Wave Propagation	2.5-0.5-0-0, 03
3	EE-326	Computer Organization and Processor Architecture Design	3-0-2-4

The proposal is placed as **Annexure – M**.

**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.

*Amrit Kumar*  
20/12/23

**Chairman, Board of Academics**

*[Signature]*  
20/12/23  
**Secretary, Board of Academics**

## Proposal for Early admission in M.Tech (R) /M.Tech (R ) + PhD/PhD programs

Preamble: It has been noticed that higher technical education in Indian institutes is always less attractive among professional undergraduate students. It is due to more lucrative private companies offers, unawareness and many peers and social influences. In order to strengthen Indian education and research, it is important to motivate and admit young bright candidates into higher education. Indian government and many institutes in India have initiated many schemes to fulfill the objectives.

Early admission to M.Tech/M.Tech (R )/PhD can be one of the attractive provisions where students would like to join to save time.

Institute may consider below mentioned provisions to attract young bright candidates to admit in IIT Mandi PG/PhD programs.

### **Early admission in M.Tech (R)**

**It can be 4+1/1.5 years degree program for students opting provisional admission in M.Tech (R).**

Students can be offered to work in IIT Mandi in their VIIth and VIIIth semesters of UG program and can be offered provisional admission in M.Tech (R). During this duration, students need to fulfill academic requirements of their parents institutions and can start working on research projects and course requirements of M.Tech (R). Students may require additional courses to fulfill UG/PG requirements. After completion of their VIIIth semester and successful completion of B.Tech degree, student will continue for one more year at IIT Mandi to complete academic requirement of M.Tech program. Student can opt exit from the program before (any time) formally registered in the program.

In case students join IIT Mandi in 8<sup>th</sup> semester, student has to complete minimum 1.5 yrs after completion of UG degree.

### **Eligibility of the students**

B.Tech (students of VIIth /VIIIth Semester)/MSc students in top 100 NIRF institutions (overall category)/CFTIs/MoU partner institutions with 7.00 CGPA/10.00 scale or equivalent.

**Fellowship:** Fellowship can be awarded for additional 1/1.5 yrs as per existing Norms for the M.Tech (R).

These students can be awarded Degree certificates with mentioning their mode of admission as ***“Under the scheme of early induction in M.Tech degree program”***

### **Early admission in PhD /M.Tech (R )+ PhD dual degree programs**

Students can be provisionally admitted in PhD/M.Tech (R )+PhD and allow to work in IIT Mandi in their last semester/year of UG/PG programs . During this duration, students need to fulfill academic requirements of their parents institutions and can start working on research projects and course requirements of PhD/ (M.Tech+PhD). Students may require additional courses to fulfill UG/PhD requirements. After successful completion of B.Tech/MSc/M.Tech/MA/MBA or equivalent degree from their parent institutions, student will be registered in respective program and will continue full time at IIT Mandi to complete academic requirement of registered program. Student can opt exit from the program before (any time) formally registered in the program.

### **Eligibility of the students**

B.Tech (students of VIIth /VIIIth Semester)/MSc/M.Tech students in top 100 NIRF institutions (overall category)/ CFTIs/MoU partner institutions with 7.00 CGPA/10.00 scale or equivalent.

**Fellowship:** Fellowship can be awarded after completion of their UG/PG degree and as per existing Norms for the PhD/Dual degrees.

### **Selection Procedure:**

There can be three modes selection

1. Common advertisements followed by shortlisting and written test/interviews
2. Selection through campus placement
3. These offers can be made for intern students through interview/PI recommendations.

Fee structure/lodging-boarding charges etc (during final year of their UG/PG program) can be framed separately.

## IIT Mandi

### Proposal for a New Course

**Course Number:** HS 108  
**Course Name:** Basic English for Engineers  
**Credit:** 3  
**Distribution:** 3-0-0-3  
**Intended for:** B.Tech.  
**Prerequisite:** None  
**Mutual Exclusion:** None

#### 1. Preamble:

This course focuses on introducing students to fundamental skills in English communication pertaining to academic comprehension, reading, writing, and comprehension for students of engineering. The course will be largely practical in nature with greater emphasis on reading, speaking, and writing exercises to reinforce language proficiency.

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

##### Unit 1: Interactive speaking skills

**8 hours**

- Effective formal introductions
- Formal short speeches
- Extempore speaking and oratory
- Formal presentations (non-technical)

##### Unit 2: Written correspondence

**7 hours**

- Letters—enquiries, requests, invitation, complaints, orders
- Emails—formal and informal
- Memos and minutes of the meeting

##### Unit 3: Comprehension skills

**12 hours**

- Active listening and reading
- Note-making
- Summarizing
- Paraphrasing

##### Unit 4: Writing Skills

**15 hours**

- Descriptive writing (products and processes; with attention to time, place, objects, people)
- Instruction writing (technical)
- Describing graphs/pie-charts/tables
- Paragraph writing
- Essay writing-expository and narrative

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

#### 4. Text books:

- Lachance, Julie, *Basic English*, McGraw Hill, 2019.
- Raman, Meenakshi and Sangeeta Sharma, *Technical Communication: Principles and Practice*, Oxford University Press, 2004.

**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.	HS 208-English II (existing course)	Some elements from the unit on writing and speaking (~8)	~20%

**Justification of new course proposal if cumulative similarity content is >30%: --**

**Approvals:**

**Faculty interested in teaching this course: – SHSS English faculty**

**Proposed by: Thirthankar Chakraborty and Neethi Alexander**

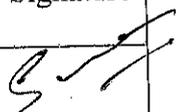
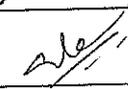
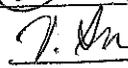
**School: School of Humanities and Social Sciences**

**Signature:**  

**Date: 15 NOVEMBER 2023**

The following faculty (at least 3 faculty) discussed on .5./6/23. and approved the proposal on. 8./6/23.

\*The course syllabus was circulated with all faculty members of SHSS and approved thereafter.

Sl. No	Faculty Name	Signature
1	DR SUMAN	
2.	DR ARUNA	
3.	DR THIRTHANKAR	
4.	DR NEETHI	

School Chair:

School: SHSS

Date: 

This proposal is reported in **52nd** Board of Academics on **2 November 2023**.

Dean Academics

Date:

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

29 Nov 12 45

# IIT Mandi

## Proposal for a New Course

**Course Number:** HS 109  
**Course Name:** Advanced English for Engineers  
**Credit:** 3  
**Distribution:** 3-0-0-3  
**Intended for:** B.Tech.  
**Prerequisite:** None  
**Mutual Exclusion:** None

### 1. Preamble:

This course builds on the previous course and aims to equip students with advanced English language communication skills relevant to their academic and professional advancement. Rigorous practice sessions on reading, writing, and speaking will cover a considerable proportion of in-class activities for the course and the primary focus will be on improving students' skills in technical communication.

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

#### Unit 1: Speaking skills

14 hours

- Technical presentations
- Group discussions (planned and unplanned)
- Interview Skills
- Principles of rhetoric and argumentation
- Debating

#### Unit 2: Written skills (professional)

6 hours

- CV/Resume
- Cover Letter
- Bio note and Statement of Purpose

#### Unit 3: Writing online (professional)

6 hours

- Posting on social media
- Writing an academic blog/magazine article
- Writing a technical blog—product reviews, analysis, etc.

#### Unit 4: Writing skills (academic)

16 hours

- Essay writing—critical and argumentative
- Abstracts—video and written
- Effective posters (technical)
- Project and research proposals
- Technical report writing
- Ethics of academic writing

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

### 4. Text books:

- Anderson, Paul. *Technical Writing: A Reader Centered Approach*, Harcourt, 1991.
- Markel, Mike and Stuart A. Selber. *Technical Communication*, Bedford St. Martin's, 2017.

**IIT Mandi**  
**Proposal for a New Course**

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.	HS 208-English II (existing course)	Some elements from the unit on writing and speaking (~8)	~20%

**Justification of new course proposal if cumulative similarity content is >30%: --**

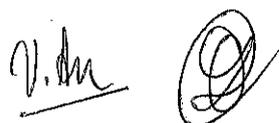
**Approvals:**

**Faculty interested in teaching this course: –** SHSS English faculty

**Proposed by:** Neethi Alexander and Thirthankar Chakraborty

**School:** School of Humanities and Social Sciences

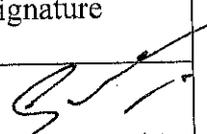
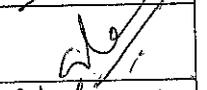
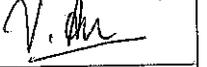
**Signature:**



**Date:** 15/11/23

The following faculty (at least 3 faculty) discussed on 5/6/23 and approved the proposal on 8/6/23

\*The course syllabus was circulated with all faculty members of SHSS and approved thereafter.

Sl. No	Faculty Name	Signature
1	Dr Suman Sigroha	
2	Dr Aruna Bommareddi	
3	Dr Neethi V Alexander	
4	Dr Thirthankar Chakraborty	

School Chair:

School: SHSS

Date:

This proposal was reported in the 52nd Board of Academics on 2 November 2023

Dean Academics

Date:

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

## IIT Mandi

### Proposal for a New Course

**Course Number:** HS 306  
**Course Name:** Introduction to German Literature  
**Credit:** 3  
**Distribution:** 3-0-0-3  
**Intended for:** B.Tech.  
**Prerequisite:** None  
**Mutual Exclusion:** None

#### 1. Preamble:

*This course is aimed at introducing students to German literature with the help of a variety of literary texts including fables, fairy tales, short stories, anecdotes, poems, and ballads. We shall be looking at different genres of literary texts and students shall be acquainted with the necessary literary vocabulary in German and English. This would enhance their understanding of German language and give them tools to work with literary texts and their interpretation.*

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

##### Unit 1: Fairy Tales/ Folktales (12 hours)

- Select fairy tales/ folktales (by Grimm Brothers)
- Introducing students to reading literary texts in German language
- Analysis of texts from various perspectives (literary, linguistic, feminist, close reading etc.)
- Developing an ability to read and interpret literary texts critically
- Literary tools, methods of interpretation and basic German grammar will also be an intrinsic part of this module

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##### Unit 2: Fables (8 hours)

- The genre of fables (Aesop's Fables)
- Engaging with different characteristics of this genre
- Enabling an insight into studying different types of literary texts

##### Unit 3: Short Stories, Anecdotes, and Parables (12 hours)

- Select prose like anecdotes, parables and prominent short stories, particularly from the Trümmer-literature (Post War Germany 1945-1947)
- Wolfgang Borchert, Heinrich Böll et al

##### Unit 4: Poetry (10 hours)

- Different forms of poetry, including ballads, poems
- Select popular German authors and their poetry (J.W. Goethe, Rainer Maria Rilke, Joseph von Eichendorff et al)
- Basic literary and linguistic tools to analyse deep layers of poetry

- Independent/ individual interpretations of poems will be encouraged

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

**4. Text books:**

Daniel Chandler: An Introduction to Genre Theory, 1997

Thomas Beebee: German Literature as World Literature, Bloomsbury 2014

**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.	None	-	-

**Justification of new course proposal if cumulative similarity content is >30%: --**

**Approvals:**

**Faculty interested in teaching this course: – Dr. Neha Kaushik**

**Proposed by: Dr. Shreya Gaikwad**

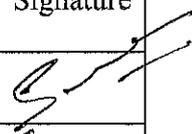
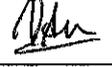
**School: School of Humanities and Social Sciences**

**Signature:** 

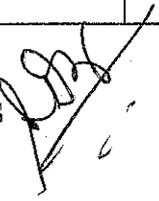
**Date:**

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

\*The course syllabus was circulated with all faculty members of SHSS and approved thereafter.

Sl. No	Faculty Name	Signature
1.	DeSuman	
2.	Dr. Neha Kaushik	Copy attached.
3.	Neeha A.	

School Chair:

School: SHSS 

Date:

- Independent/ individual interpretations of poems will be encouraged

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

**4. Text books:**

Daniel Chandler: An Introduction to Genre Theory, 1997

Thomas Beebee: German Literature as World Literature, Bloomsbury 2014

**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.	None	-	-

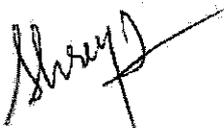
**Justification of new course proposal if cumulative similarity content is >30%: –**

**Approvals:**

**Faculty interested in teaching this course: – Dr. Neha Kaushik**

**Proposed by: Dr. Shreya Gaikwad**

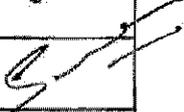
**School: School of Humanities and Social Sciences**

**Signature:** 

**Date:**

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

\*The course syllabus was circulated with all faculty members of SHSS and approved thereafter.

Sl. No	Faculty Name	Signature
1.	Dr Suman	
2	Dr Neha Kaushik	
3		

School Chair:

School: SHSS

Date:

# IIT Mandi

## Proposal for a New Course

**Course Number:** HS 306  
**Course Name:** Introduction to German Literature  
**Credit:** 3  
**Distribution:** 3-0-0-3  
**Intended for:** B.Tech.  
**Prerequisite:** None  
**Mutual Exclusion:** None

### 1. Preamble:

*This course is aimed at introducing students to German literature with the help of a variety of literary texts including fables, fairy tales, short stories, anecdotes, poems, and ballads. We shall be looking at different genres of literary texts and students shall be acquainted with the necessary literary vocabulary in German and English. This would enhance their understanding of German language and give them tools to work with literary texts and their interpretation.*

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

#### Unit 1: Fairy Tales/ Folktales (12 hours)

- Select fairy tales/ folktales (by Grimm Brothers)
- Introducing students to reading literary texts in German language
- Analysis of texts from various perspectives (literary, linguistic, feminist, close reading etc.)
- Developing an ability to read and interpret literary texts critically
- Literary tools, methods of interpretation and basic German grammar will also be an intrinsic part of this module

---

#### Unit 2: Fables (8 hours)

- The genre of fables (Aesop's Fables)
- Engaging with different characteristics of this genre
- Enabling an insight into studying different types of literary texts

#### Unit 3: Short Stories, Anecdotes, and Parables (12 hours)

- Select prose like anecdotes, parables and prominent short stories, particularly from the
- Trümmer-literature (Post War Germany 1945-1947)
- Wolfgang Borchert, Heinrich Böll et al

#### Unit 4: Poetry (10 hours)

- Different forms of poetry, including ballads, poems
- Select popular German authors and their poetry (J.W. Goethe, Rainer Maria Rilke, Joseph von Eichendorff et al)
- Basic literary and linguistic tools to analyse deep layers of poetry

This proposal is reported in **52nd** Board of Academics on **2 November 2023**.

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:** HS 501

**Course Name:** Global Health and Demography

**Credit:** 4

**Distribution:** 3-0-2-4

**Intended for:** Discipline Elective for MA Development Studies and Outside Discipline/Free Elective for Other Postgraduates and B.Tech. (3rd and 4th year)

**Prerequisite:** Elementary knowledge of probability and statistics; consent of the instructor

**Mutual Exclusion:** None

### 1. Preamble:

In this course, we will explore the levels and trends of health issues among different populations across the globe, with a special focus on South Asia, and particularly India; the evolution of health system structure and the innovations introduced to improve population health. Further, we will examine how demographic and epidemiological challenges have evolved together and impacted development in India. We will draw discussions from various theories of demography, public health, epidemiology, and social sciences to understand the drivers of such transformations. By the end of this course, students will be able to apply essential demographic, public health and economic tools to adopt and evaluate evidence-based approaches to address health challenges.

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

#### **Unit 1: Introduction to Global Health and Demography (5 lecture hours + 4 lab hours)**

- Why should we study global health and demography?
- Evolution of these subjects and their scope
- Current population and health trends across the globe, South Asia, and India
- Globalization, Population and health transformations
- Sources of data for measuring population process and health

#### **Unit 2: Demographic Measurement (5 lecture hours + 12 lab hours)**

- Age-Sex structure- measurement and trends
- Population aging and dependency ratios
- Basic measures of fertility, mortality, nuptiality and migration
- Estimating life expectancy using life tables
- Stable population model

#### **Unit 3: Morbidity and Public Health (10 lecture hours + 8 lab hours)**

- Measures of population health- prevalence and incidence
- Measuring burden of disease-DALYs, DFLE, HLE
- Basic concepts of epidemiology, study designs, risk of a disease,
- Exploring the issues of association, causation, interaction, inference, confounding and generalisability
- Survival analysis

#### **Unit 4: Demographic determinants of health (7 lecture hours)**

- Health issues during infancy and childhood- nutrition, infectious diseases and breastfeeding
- Adolescent health- sexual and reproductive health, anemia, BMI
- Maternal health
- Later adulthood and onset of non communicable diseases
- Health of older adults- NCDs, disability, Pain and Cognition
- Lifestyle and health behavior
- Mental health across age groups

#### **Unit 5: Social Determinants of Health (7 lecture hours + 4 lab hours)**

- Poverty, inequality and health
- Mortality selection and poverty
- Education and health- lifestyle choices, morbidity and health care utilization
- Social capital and health- variations by income, education and ethnicity
- Migration, urbanization and health;
- Multiple deprivations and health
- Social vulnerability and intergenerational impact of health

#### **Unit 6: Space, Place and Health (3 hours)**

- Space, culture and health-why is it essential to study health at disaggregated geographies
- Impact of natural and indoor environment on health
- Thinking about health at multiple level of geographies

#### **Unit 7: Health Policy and Innovations ( 5 hours)**

- Health systems across developed and developing nations- special focus on India and its states
- National and state policies on child health, sexual and reproductive health, major diseases and family welfare
- Universal health coverage- components and measurement
- Health system strengthening and health care financing reforms
- Policy and social innovations for modifying health behaviors, health care utilization and health care financing- with special focus on India

### **3. Laboratory/practical/tutorial Modules:**

- Introduction to handling large scale health dataset (understanding structure using STATA or R)- such as the Demographic and Health Surveys; Gateway to Global Ageing data (with focus on LASI); National Sample Survey Organisation – Health consumption rounds; IHME- Global Burden of Disease data; Census of India; Sample Registration System Data
- Creating population pyramids using excel
- Direct indirect adjustment of Crude death rates for different age sex structures using excel
- Adjusting health data for age-sex structure
- Construction of abridged life table using excel
- Estimating under-five mortality rates using DHS data on Stata/R
- Calculation of disability rates
- Calculation of disease free life expectancy
- Calculation of prevalence rates for childhood diseases and undernutrition using DHS
- Calculation of prevalence rates of major diseases using LASI, and the NSSO data
- Estimating the socio-economic gradient of any health issue (of choice) and quantifying their association

#### 4. References:

##### (a) Reading list

###### (i) Basic reading list

1. Bhende, A. A., Kanitkar, T. (1978). Principles of Population Studies. India: Himalaya Publishing House.
2. Slovník Richard (2016). Global Health 101: 4<sup>th</sup> ed. United States: Jones & Bartlett Learning.
3. Rothman, K. J., Greenland, S., Lash, T. L. (2008). Modern Epidemiology. United Kingdom: Wolters Kluwer Health/Lippincott Williams & Wilkins.

###### (ii) E-references-

1. <http://papp.iussp.org/>
2. <https://www.publichealth.columbia.edu/research/programs/population-health-methods>
3. <https://www.ined.fr/en/>
4. <https://www.youtube.com/@gregmartin>
5. <https://openwho.org/>

###### (iii) Reference books for laboratory sessions

1. Moultrie, T. A., Dorrington, R. E., Hill, A. G., Hill, K., Timæus, I. M., & Zaba, B. (2013). Tools for demographic estimation. International Union for the Scientific Study of Population.
2. Croft, T. N., Marshall, A. M., & Allen, C. K. (2018). Guide to DHS Statistics. Rockville, Maryland, USA: ICF; 2018.

###### (iv) Reading List:

1. J Swanson, D. A., & Stephan, G. E. (2004). A demography time line. The methods and materials of demography, 2, 779-786.
2. Lee, S., & Lim, H. (2019). Review of statistical methods for survival analysis using genomic data. Genomics & informatics, 17(4).
3. Ladusingh, L. (2018). Survey Sampling Methods. India: Prentice Hall India Pvt., Limited.
4. Hsiao, W. C. (2003). What is a health system? Why should we care. Harvard School of Public Health, working paper, 33.
5. Mosley, W. H., & Chen, L. C. (1984). An analytical framework for the study of child survival in developing countries. Population and development review, 10, 25-45.
6. Murray, C. J. (1994). Quantifying the burden of disease: the technical basis for disability-adjusted life years. Bulletin of the World health Organization, 72(3), 429.
7. Berkman, L. F., Kawachi, I., & Glymour, M. M. (Eds.). (2014). Social epidemiology. Oxford University Press.
8. Deaton, A. (2013). The great escape: health, wealth, and the origins of inequality. Princeton University Press.
9. Morland, P. (2019). The human tide: how population shaped the modern world. Hachette UK.

**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.	Applied Biostatistics	BE303	Introduction to survival analysis; Introduction of different study designs; Measures of important probabilities	~10%

**Justification of new course proposal if cumulative similarity content is >30%: --**

**Approvals:**

**Faculty interested in teaching this course: – Dr. Ramna Thakur**

**Proposed by: Dr. Mayanka Ambade**

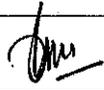
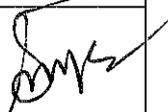
**School: School of Humanities and Social Sciences**

**Signature:** 

**Date: November 22, 2023**

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

\*The course syllabus was circulated with all faculty members of SHSS and approved thereafter.

Sl. No	Faculty Name	Signature
1	Dr Ramna Thakur	
2	Dr Shyamasree Dasgupta	
3	Dr Saumya Malaviya	
4	Dr Suryaprakash Upadhyay	

School Chair:

School: SHSS

Date:

This proposal is reported in **52nd** Board of Academics on **2 November 2023**.

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: HS 503**

**Course Name: German Literature from World War II to Reunification**

**Credit: 3**

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

**Intended for: Free Elective for UG/ PG/ Ph.D.**

**Prerequisite: None**

**Mutual Exclusion: None**

#### 1. Preamble:

This course examines post war German history through a literary perspective, with main focus on the period after the end of World War II (1945), the division of Germany leading up to the reunification of Germany (1990). Select short stories, poems and excerpts from relevant German novels will be discussed to get a better understanding of some key historical events of post war Germany. Core idea is to introduce German literature to students and the question of reading history through literary texts will be central.

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

##### **Unit 1: Trümmer-literature – The Zero Hour (8 lecture hours)**

- Immediate consequences of World War II and Holocaust
  - Stunde Null
  - Trauma and memories of the War and Holocaust
  - Wolfgang Borchert, Paul Celan, Günter Eich et al.
- 

##### **Unit 2: Literature from a divided Germany (9 lecture hours)**

- Division of Germany
- Vergangenheitsbewältigung – coming to terms with the past
- Inner Emigration
- Gruppe 47
- Heinrich Böll, Günter Grass, Paul Celan et al.

##### **Unit 3: Exile Literature (9 lecture hours)**

- Literary texts from authors of East Germany or GDR
- Division of Germany and socio-political consequences thereof
- Life in exile and under communist surveillance in GDR
- Question of Heimatlosigkeit (homelessness)
- Bertolt Brecht, Christa Wolf, Wolf Biermann et al

#### **Unit 4: Jewish authors and survivors of the Holocaust (8 lecture hours)**

- Select Jewish authors who have lived and survived the Holocaust
- Victim's perspective of the Third Reich
- Rose Ausländer, Nelly Sachs, Paul Celan et al

#### **Unit 5: Re-unification of Germany (Wendeliteratur) (8 lecture hours)**

- Fall of the Berlin Wall (die Wende)
- Immediate after-effects of the re-unification of Germany
- Identity crisis of the citizens

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

#### **4. Text books:**

1. Peter Demetz, Post War German Literature. A Critical Introduction, Pegasus, New York, 1970
2. Ingo R. Stoehr, German Literature of the Twentieth Century, Camden House, London 2001

#### **References:**

#### **Suggested Reading:**

- Wolfgang Borchert: The Kitchen Clock (Die Küchenuhr, 1947)
- Paul Celan: Death Fugue (Todesfuge, 1948)
- Heinrich Böll: The Train Was on Time (Der Zug war pünktlich, 1949)
- Günter Eich: Inventory (Inventur, 1947)
- Wolfdietrich Schnurr: On The Run (Auf der Flucht, 1950)
- Bertolt Brecht: On The Term Emigrants/ Über die Bezeichnung Emigranten, 1937/ To Those Who Follow in Our Wake (An die Nachgeborenen, 1939)
- Christa Wolf: Der geteilte Himmel, 1963 (Divided Heaven: Film 1964)
- Anna Seghers: The Seventh Cross (Das siebte Kreuz, 1942)
- Nelly Sachs: In the Houses of Death (In den Wohnungen des Todes, 1947)
- Thomas Brussig: Heroes Like Us (Helden wie wir, 1995)
- Christa Wolf: What Remains (Was bleibt, 1990)
- Sven Regener: Berlin Blues (Text or Film: 2003) (Herr Lehmann, 2001)
- Rose Ausländer: The Luck (Das Glück, 1939)
- Johannes Bobrowski: Shadowland/ The Latvian Autumn (1994)
- Marcel Reich-Ranicki: Videos from Literarische Quartett (Youtube)
- Hans Egon Holthusen: A Literature in Transition. Main Currents of Post War German Writing, The Atlantic
- Aaron Denis Horton: Catastrophe and Identity in Post War German Literature, 2005

#### **Films:**

- Schindler's List (1994)
- The Boy in Striped Pyjamas (2008)
- The Pianist (2002)
- The Lives of Others (2006)
- The Tin Drum (1979)
- The Reader (2008)

- Downfall (2004)
- Enemy at the Gates (2001)

**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.		HS-363: Post War Germany: A Literary Perspective	The title of this course and my proposed course seems to cover similar ground in terms of chronology. However, I have completely overhauled the modules and also updated the readings.	~10% The older course mentioned here was a 300-level course. It was felt that an updated and more rigorous 500-level course is required for students, esp. those pursuing a German Minor.

**Justification of new course proposal if cumulative similarity content is >30%: --**

**Approvals:**

**Faculty interested in teaching this course: – Dr. Neha Kaushik**

**Proposed by: Dr. Shreya Gaikwad**

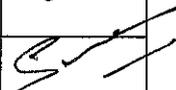
**School: School of Humanities and Social Sciences**

**Signature:** 

**Date:**

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

\*The course syllabus was circulated with all faculty members of SHSS and approved thereafter.

Sl. No	Faculty Name	Signature
1.	Dr. Siman	
2.	Dr. Neha Kaushik	Copy attached

3.	Neethi Alex	<i>[Signature]</i>

School Chair: *[Signature]*

School: SHSS

Date:

This proposal is reported in **52nd** Board of Academics on **2 November 2023**.

Dean Academics

Date:

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

- Downfall (2004)
- Enemy at the Gates (2001)

**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.		HS-363: Post War Germany: A Literary Perspective	The title of this course and my proposed course seems to cover similar ground in terms of chronology. However, I have completely overhauled the modules and also updated the readings.	~10% The older course mentioned here was a 300-level course. It was felt that an updated and more rigorous 500-level course is required for students, esp. those pursuing a German Minor.

**Justification of new course proposal if cumulative similarity content is >30%: --**

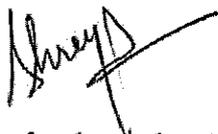
**Approvals:**

**Faculty interested in teaching this course: – Dr. Neha Kaushik**

**Proposed by: Dr. Shreya Gaikwad**

**School: School of Humanities and Social Sciences**

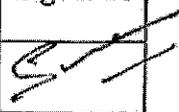
**Signature:**



**Date:**

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

\*The course syllabus was circulated with all faculty members of SHSS and approved thereafter.

Sl. No	Faculty Name	Signature
1.	Dr. Suman	
3	Dr Neha Kaushik	


School Chair:

School: SHSS

Date:

This proposal is reported in **52nd Board of Academics on 2 November 2023.**

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** : HS504  
**Course Name** : Personal Finance and portfolio Management  
**Credit** : 3  
**Distribution** : 3-0-0-3  
**Intended for** : UG and PG students  
**Prerequisite** : Nil  
**Mutual Exclusion**: None

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### 1. Preamble:

Personal finance management is an essential life skill that enables individuals to achieve financial independence and make sound financial decisions. This course introduces personal finance management, covering various topics such as budgeting, saving, investing, debt management, retirement planning, and tax planning. The course will cover fundamental concepts and techniques of personal finance, including financial planning, risk management, and retirement planning. The course will also introduce students to various financial tools and resources commonly used in personal finance management. Throughout the course, students will be encouraged to apply personal finance management techniques to their own finances. The course will include theoretical and practical components, emphasizing real-world applications and personal financial planning. By the end of the course, students will have gained a strong foundation in personal finance management, including the ability to create and manage a personal budget, understand different savings and investment vehicles, manage debts and improve credit scores, plan for retirement, and make sound financial decisions.

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

**Unit 1: Introduction to Personal Finance:** Introduction to personal finance and its importance, Overview of the financial planning process, time value of money, Overview of Indian Financial instruments, budgeting, Unique challenges and opportunities in the Indian context, Role of culture and social norms in personal finance management in India

**(6 Hours)**

**Unit 2: Banking:** The role of banks in the economy, The different types of banks (e.g., commercial, investment, central), Introduction to banking products and services (e.g. deposit accounts, loans, credit cards, mortgages), The importance of banking services to individuals.

**(4 Hours)**

**Unit 3: Saving and Investing:** Creating and managing a personal budget, the Importance of saving and investing for personal finance, Financial Planning Tools, Types of savings and

investment instruments (e.g., mutual funds, stocks, bonds, real estate, commodity, fixed income, Real Estate, Unit Linked Investment), Risk and return, diversification, and asset allocation. **(10 Hours)**

**Unit 4: Debt Management:** Understand debts (e.g. credit cards, loans, mortgages), Types of debts and loans, Overview of credit scores and reports, and Strategies for managing debts and improving credit scores. **(4 Hours)**

**Unit 5: Retirement Planning:** Overview of retirement planning and its importance, Types of retirement accounts (NPS, Private pension, Provident funds), Retirement income sources (e.g., Pensions, rental incomes) **(6 Hours)**

**Unit 6: Tax Planning:** Overview of tax planning and its importance, Tax planning strategies for individuals (e.g. tax deductions, credits, and exemptions), Overview of tax laws and regulations **(6 Hours)**

**Unit 7: Financial Tools and Resources:** Overview of financial tools and resources for personal finance management, Examples of financial tools, such as budgeting apps, investment platforms, and retirement calculators, Evaluation of financial resources and tools **(6 Hours)**

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

**3. Text books:**

*(Latest, Only 2)*

1. Ramit Sethi, I will teach you to be rich, 2, Workman Publishing, USA, 2019
2. Basant Maheshwari, The thoughtful investor, The Equity Desk, India, 2021

**4. References:**

*(No limit on numbers, relevant)  
Standard format can be followed*

The Richest Man in Babylon by George S. Clason

The Intelligent Investor by Benjamin Graham

The Psychology of Money by Morgan Housel

- Rich Dad Poor Dad by Robert T. Kiyosaki
- The Simple Path to Wealth by JL Collins
- The Millionaire Next Door by Thomas J. Stanley and William D. Danko
- Your Money or Your Life by Vicki Robin and Joe Dominguez
- The Little Book of Common Sense Investing by John C. Bogle
- A Random Walk Down Wall Street by Burton Malkiel
- Money Master the Game by Tony Robbins

**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.	Special Topics in Personal Financial Planning (1 Credit)	HS591	Some content from unit 1,3 and 7	10 %

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

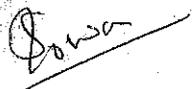
**Approvals:**

**Faculty interested in teaching this course: –**

**Proposed by:** Satvasheel Powar

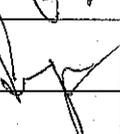
**School:** SMME

**Signature:**



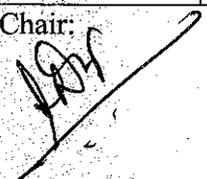
**Date:** 5<sup>th</sup> November 2022

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

Sl. No	Faculty Name	Signature
1.	Shyamendra Deshpande	
2.	Dr. Puran Singh	
3.	Dr. Saurabh Dixit	

**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.

<b>Proposal for New Course</b>		
<b>Course Number</b>	:	MB520
<b>Course Name</b>	:	Fundamentals of Data and Analytics
<b>Credits</b>	:	2-0-0-2 (L-T-P-C) <sup>1</sup>
<b>Prerequisites</b>	:	None
<b>Intended for</b>	:	MBA
<b>Distribution</b>	:	Compulsory
<b>Semester</b>	:	Odd

<b>Preamble</b>
<p>Increasingly the modern business is relying heavily on data so as to arrive at most appropriate rational decisions. Every successful decision maker needs to have the understanding of the basics of data analytics. The effectiveness of the decisions depends on data sources, data quality, intelligent data processing and analytics. This course will focus of model building from the given data, describing what happened, diagnosing what's wrong, predicting what's ahead, and prescribing what and how to do.</p> <p>The participants will learn to collect right data and information, understand data, data preparation, data visualization, understand metrics used. Further, they will learn concepts of data analytics, acquaint with software tools, and understand business through data.</p>

<b>Objective</b>
<p>With the help of various examples students will learn how to identify which data sources likely matches research questions, how to turn research questions into measurable pieces, and how to think about an analysis plan.</p> <p>On completion of this course, the student should be able to:</p> <ul style="list-style-type: none"> <li>- Understanding and driving analytics effectively.</li> <li>- Establishing processes or tools to measure success through analytics.</li> <li>- Identifying good analytics from bad-analytics.</li> <li>- Understanding where analytics can add value.</li> </ul>

<sup>1</sup> L= Lectures per week, T=Tutorials per week – P = Practical/Lab session per week – C = Credits for course

<b>Course Modules with Quantitative lecture hours</b>		
<b>Module 1</b>	<b>Data and Analytics Concepts</b>	<b>(4)</b>
Data concepts - DIKW and data analytics pyramid, small data to big data, Data analytic thinking, uncertainty and decision, data driven and goal driven decision making, Analytics processes and systems, data and analytics maturity, CRISP-DM Process.		
<b>Module 2</b>	<b>Models and Processes</b>	<b>(4)</b>
Business analytics models, Strategy creation and Key Performance Indicators (KPIs), Business questions and KPIs, Asking right business questions on data and analytics, Data and Analytics Models and their types.		
<b>Module 3</b>	<b>Data Preparation</b>	<b>(6)</b>
Data collection and preparation, perspectives on data, data types, sources and quality, data description using levels of measurement and types of measurement scales, Types of attributes/features, data cycle-the data preparation activities, data cleaning and data transformation, data encoding, data discretization, transformation for normality, feature selection- shrinking, dimensionality reduction.		
<b>Module 4</b>	<b>Exploratory Analytics</b>	<b>(4)</b>
Describing the past, data visualization, understanding your data sources, understanding variability in the data.		
<b>Module 5</b>	<b>Predictive Analytics</b>	<b>(6)</b>
Classes of predictive models-logic driven and data driven, predicting numerical and categorical values, asking predictive questions, simple and multiple linear regression as a predictive tool, correlation and multiple regression analysis, Forward and backward step-wise regression, Role of F-ratio and R-square adjusted statistics for predictive analytics (multiple regression based).		
<b>Module 6</b>	<b>Prescriptive Analytics</b>	<b>(4)</b>

Optimization and experimentation for prescriptive analytics, asking prescriptive questions, optimization (MS Excel solver/other optimization tools), Prescriptive steps in analytics – defining the problem, decision variables, objective functions, constraints, and arriving at business solution. Introducing Causality, importance of causal analytics for business problem solving.


<b>Lab Exercises</b> (If applicable):
Nil.

<b>Textbooks:</b>	
1.	
2.	
<b>Reference Book:</b>	
1	Daniel, Vaughan, Analytical Skills for AI & Data Science, Shroff Publishers and Distributors Pvt. Ltd, 2020.
2	Daniel T. Larose, Chantal D. Larose: Data Mining and Predictive Analytics, Wiley, 2016.
3	HBR Guide to Data Analytics Basics for Managers, Harvard Business Review Press, 2018
4	Provost, F and Fawcett, T., Data Science for Business, Shroff Publishers and Distributors Pvt. Ltd, 2014.
5	Jeffrey D. Camm, James J. Cochran, Michael J. Fry, Jeffrey W. Ohlmann, Business Analytics: Descriptive, Prescriptive and Predictive, (4ed), Cengage Learning Inc, 2021.
6	Laursen, G.H.N. and Thorlund, J., Business Analytics for Managers. Wiley India Pvt. Ltd., 2014.

7	Amar Sahay, Essentials of Data Science and Analytics Statistical Tools, Machine Learning, and R-Statistical Software Overview, Business Expert Press, 2021.
8	J. D. Kelleher and B. Tierney, Data Science, The MIT Press, 2018

<b>Proposal for New Course</b>		
<b>Course Number</b>	:	<b>MB521</b>
<b>Course Name</b>	:	<i>Disruptive Technologies for Data Science</i>
<b>Credits</b>	:	2-0-0-2 (L-T-P-C) <sup>1</sup>
<b>Prerequisites</b>	:	<b>NA</b>
<b>Intended for</b>	:	MBA
<b>Distribution</b>	:	Compulsory
<b>Semester</b>	:	

<b>Preamble</b>
<p>Disruptive Technologies for Data Science are innovations that enable businesses to create new market and disrupt the existing market by significantly altering the way consumers, industries, or businesses operate. Further, the exponential growth of these technologies have the potential to create new product infrastructure by impacting the growth and employment. This course deals with the technologies used to transform business and society, also known as fourth industrial revolution technologies. Students can learn how these technologies changing the way business decisions are made across the globe to transform business, industries and ultimately, our lives.</p>

<b>Objective</b>
<p>Upon successful completion of the course, students will be able to:</p> <ul style="list-style-type: none"> <li>● Grasp the characteristics of disruptive technologies and understand the building blocks of disruptive technologies</li> <li>● Understand how the technology is significantly improving our living standards by incorporating radical changes in the way the business is running.</li> </ul>

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<sup>1</sup> L= Lectures per week, T=Tutorials per week – P = Practical/Lab session per week – C = Credits for course

<b>Course Modules with Quantitative lecture hours</b>		
<b>Module 1</b>	<b>Overview of Disruptive Technologies</b>	<b>(5 sessions)</b>
Waves of Technology evolution; Digitization and digitalization; Digitalization and disruption; Disruptive innovation; The waves of internet and related technological advancements; Networks, 5G and sensors.		
<b>Module 2</b>	<b>Computing Technologies</b>	<b>(3 sessions)</b>
Moore's Law and its impact, miniaturization of computers, Quantum computing and its prospects in business.		
<b>Module 3</b>	<b>Artificial Intelligence</b>	<b>(4 sessions)</b>
Concepts of Artificial Intelligence (AI), Integrating AI into human world, AI and robotics, virtual and augmented reality, Impact of AI and robotics in business, AI Entrepreneurs, AI Disruption.		
<b>Module 4</b>	<b>Blockchain and Bitcoin</b>	<b>(3 sessions)</b>
Blockchain concepts, Blockchain and Coded currency, Blockchain and Enterprise, Blockchain as a technology of trust, Blockchain driving the business and beyond.		
<b>Module 5</b>	<b>Internet of Things and Cloud Computing</b>	<b>(4 sessions)</b>
Evolution of Internet of Things, Economic Impact of IoT, IoT as a revolutionary technology, IoT Challenges, risks and dangers; Internet of Things to Internet of Everything, Basics of cloud computing, Cloud computing and web 2.0, Ways to cloud compute and its business benefits, Personal cloud, Edge computing.		
<b>Module 6</b>	<b>Multidimensional Printing</b>	<b>(2 sessions)</b>
Additive and subtractive manufacturing, Decentralizing and disrupting manufacturing, Mass customization, Barriers to additive manufacturing.		
<b>Module 7</b>	<b>Nanotechnology</b>	<b>(2 sessions)</b>
New materials and their applications, nanotechnology initiatives.		

<b>Module 8</b>	<b>Biotechnology and Neurotechnology</b>	<b>(3 sessions)</b>
Importance of biotechnologies and neurotechnologies, Biotechnology applications in the fields of medicine to manufacturing, workings of neurotechnologies and their impact.		
<b>Module 9</b>	<b>Clean Energy Technology and Geo Engineering</b>	<b>(2 sessions)</b>
Clean energy, and its distribution and storage technologies, Geo engineering and global warming.		
<b>Textbooks:</b>		
<b>Reference Book:</b>		
1.	Klaus Schwab, Shaping the Future of the Fourth Industrial Revolution, Penguin Random House, 2018.	
2.	Daniel Franklin, Megatech: Technology in 2050, Profile Books Ltd, (The Economist), 2017.	
3.	Steve Case, The Third Wave, Simon & Schuster Paperbacks, 2016	
4.	Christopher Barnatt, A Brief Guide to Cloud Computing, Constable & Robinson Ltd., 2010.	
5.	Peter H. Diamandis and Steven Kotler. The Future is Faster Than You Think: How Converging Technologies are Transforming Business, Industries and Our Lives, Simon & Schuster Paperbacks, 2020	
6.	Peter Thiel, Zero to One: Notes on Startups or How to Build the Future, Penguin Random House (Virgin Books), 2014.	
7.	Jean-Marie Dru, The new Ways to New, Wiley India Pvt. Ltd, 2015	
8.	Clayton M. Christensen, The Innovator's Dillema, Collins Business Essentials, 2006	
9.	Peter H. Diamandis, Steven Kotler, Bold: How to Go Big, Create Wealth and Impact the World, Simon & Schuster, 2015.	
10.	Henry Chesbrough, Open Innovation: The New Imerative for Creating and Profiting from Technology, Harvard Business School Press, 2006.	
11.	Daniel Kellmereit, Daniel Obodovski, The Silent Intelligence: The Internet of Things, DnD Ventures, 2013	

12.	Alec Ross, The Industries of the Future, Simon & Schuster UK Ltd., 2016
13.	Jamie Bartlett, The People vs. Tech: How the Internet is Killing Democracy, Penguin Random House, 2018

## Proposal for New Course

<b>Proposal for New Course</b>		
<b>Course Number</b>	:	MB522
<b>Course Name</b>	:	Machine Learning for Business
<b>Credits</b>	:	2-0-0-2 (L-T-P-C) <sup>1</sup>
<b>Prerequisites</b>	:	None
<b>Intended for</b>	:	MBA
<b>Distribution</b>	:	Compulsory
<b>Semester</b>	:	Even

### Preamble

Machine learning is increasingly playing an important role in the mainstream business applications. It concentrates on how the natural ability of human beings to learn from environment can be embedded in machines. With rapid technological advancements of sensor technology necessitates to improve machine learnability to deal with huge amount of data available on real time basis. The real-time decision making becoming an integral part of majority of business decisions, and this necessitates to increase the capability of the learning methods to process efficiently and effectively the available data. This course is going to address the nuances of machine learnability and their applications in business. This course will focus on demystifying machine learning concepts, use cases and implementation issues to be faced by the business professionals. This course focuses on the managerial aspects the machine learning to arrive at most appropriate decision.

### Objective

On completion of this course, the student should be able to:

- Identify which industry and company will be affected and to what extent.
- Understand how machines help making business decisions through learning from the context, formulate solution and implement it.
- Capitalize on the ML tools and techniques to support company's digital journey.
- Acquire the knowledge to discover opportunities in business to drive it through innovation and efficiency.
- Realize the current capabilities and future possibilities of machine learning applicability in business.

<sup>1</sup> L= Lectures per week, T=Tutorials per week – P = Practical/Lab session per week – C = Credits for course

<b>Course Modules with Quantitative lecture hours</b>		
<b>Module 1</b>	<b>Introduction to Machine Learning</b>	<b>(3)</b>
Understanding what is ML, its purpose, how and when to use it in Business, ML and Statistics- similarities and contrasts, Data driven decision making, ML methods.		
<b>Module 2</b>	<b>Machine Learning and Data Analytics</b>	<b>(3)</b>
Data Models- Linear vs. Non-linear, complicated vs. Complex models for real world problem solving; ML system requirements, Iterative ML development Process, Framing ML Problems; feature understanding and selection.		
<b>Module 3</b>	<b>Supervised Learning: Fundamentals</b>	<b>(5)</b>
Learning from data, bias and variance, Model generalization- Overfitting and underfitting, Predictive modeling, data and target leakage, Data sets preparation for model building- Training, Testing and Validation datasets, cross validation, linear and logistic regression, K-nearest neighbor method, Business applications (appropriate case studies, use cases and situation analysis)		
<b>Module 4</b>	<b>Supervised Learning: Decision Trees</b>	<b>(8)</b>
Fundamentals of decision trees, evaluating splits- information gain, Gini Index, applications (eg. Business use cases like Churn analysis/credit scoring etc.), Diversity and prediction; Ensemble of Learners- Multiple Models: Condorcet Jury Theorem and Diversity Prediction Theorem, random forest, AdaBoost, Model evaluation, comparison, interpretation and communication, Business applications (appropriate case studies, use cases and situation analysis)		
<b>Module 5</b>	<b>Supervised Learning: Support Vector Machine (SVM)</b>	<b>(4)</b>
Fundamentals of support vector machines (SVMs); Linear SVM classification- hard margin classification, soft margin classification; Non-linear separation- a step towards neural network, Predicting continuous variables, Business applications (appropriate case studies, use cases and situation analysis)		
<b>Module 6</b>	<b>Unsupervised Learning</b>	<b>(5)</b>

Clustering Basics, Techniques used for clustering; k-means clustering- choosing k: elbow method, silhouette method; Density-based and hierarchical clustering methods; Principal Components analysis (PCA), Business applications (appropriate case studies, use cases and situation analysis)

**Lab Exercises** (If applicable):

Nil.

**Textbooks:**

**Reference Book:**

1	Provost, F and Fawcett, T., Data Science for Business, Shroff Publishers and Distributors Pvt. Ltd, 2014.
2	Daniel S. Becker and Kai R. Larsen, Automated Machine Learning for Business, Oxford University Press, 2021.
3	Ethem Alpaydin (2016), Machine Learning, MIT Press
4	H. Brink, J.W. Richards and M. Fetheerolf (2017), Real-world Machine Learning, Manning Pub.
5	J. Kelleher, B.M. Namee and A. D'Árcy (2015). Fundamentals of Machine Learning for Predictive Data Analytics, MIT Press. (JK)
6	Scot Page (2018). The Model Thinker, Basic Books
7	K. Hosanagar (2019). A human guide to Machine intelligence, Portfolio, Penguin Random House
8	Matthew Kirk (2019). Thoughtful Machine Learning with Python, Shroff Publishers and Distributors Pvt. Ltd.
9	Chip Huyen (2022), Designing Machine learning Systems, Shroff Publishers and Distributors Pvt. Ltd.

<b>Proposal for New Course</b>	
<b>Course Number</b>	: MB523
<b>Course Name</b>	: Introduction to AI and Automation
<b>Credits</b>	: 2-0-0-2 (L-T-P-C)
<b>Prerequisites</b>	: None
<b>Intended for</b>	: MBA
<b>Distribution</b>	: Compulsory
<b>Semester</b>	: Even

<b>Preamble</b>

<b>Objective</b>
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<b>Course Modules with Quantitative lecture hours</b>		
<b>Module 1</b>	<b>Introduction to AI and Automation</b>	<b>(4)</b>
Digitization and digitalization; Automation: traditional automation and intelligent automation; Identifying tasks and their characteristics suitable for automation, Automation payoffs; Defining AI, Types of AI: artificial narrow intelligence (ANI), artificial general intelligence (AGI) and artificial super intelligence (ASI), AI and machine learning, AI classification as per business capabilities- Process Automation, Cognitive Insights and Cognitive Engagement.		
<b>Module 2</b>	<b>Traditional Automation- No human Intervention</b>	<b>(4)</b>
Scopes and techniques of automation, Business processes, Process Standardization, Reengineering and deconstruction, Identification of repetition, replication and redundancy elements in business		

process, Robotic Process Automation (RPA)- Scope, Benefits, Types and components of RPA, RPA Platforms, RPA vs. BPM, understanding RPA through use cases.

<b>Module 3</b>	<b>AI for Automation</b>	<b>(6)</b>
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Automating decisions, human and machine capabilities for automation, Right Human-Automation Combination; Automating through Adaptive Business Processes, AI for automating repetitive tasks, AI for collaborative Automation (Human and Machine Collaboration).

<b>Module 4</b>	<b>AI and Humans- Optimal Collaboration</b>	<b>(4)</b>
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Collaborative Automation through activities by humans and machines to complement each other's roles, human-in-the-loop systems, Humans for machine capability extension and amplification - Human trainers, explainers and sustainers for AI system development.  
AI augmenting human capabilities, Types of augmentation- Amplification, Interaction and Embodiment.

<b>Module 5</b>	<b>Reimagining Business Processes</b>	<b>(6)</b>
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Proper mindset to reimagining processes, Experimentation, Leadership challenges for creating a blended culture of both humans and machines, and Building end-to-end data supply chains.

<b>Module 6</b>	<b>New Skill Requirements for AI Based Automation</b>	<b>(4)</b>
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Skills required in the collaborative human and machine environment: Intelligent Interrogation, Bot Based Empowerment, Reciprocating Apprenticeship, Holistic Melding, Rehumanising Time, Responsible Normalizing, Judgement Integration, Relentless Reimagination.

**Reference Book:**

1	Paul R. Daugherty and H. James Wilson, Human+ Machine: Reimagining Work in the Age of AI, Harvard Business Review Press, Boston, 2018.
2	Tom Taulli, Artificial Intelligence Basics: A Non-technical Introduction, Apress, 2019.
3	Thomas H. Davenport, The AI Advantage: How to Put the Artificial Intelligence Revolution to Work, The MIT Press, 2018

4	by Ravin Jesuthasan and John W. Boudreau, Reinventing jobs:a 4-step approach for applying automation to work, Harvard Business Review Press, Boston, 2018.
5	Melanie Mitchell, Artificial Intelligence: A Guide for Thinking Humans, Pelican Books, Penguin Random House, 2019.
6	Tomas Chamorro-Premuzic, I, Human: AI, Automation, and the Quest to Reclaim What Makes Us Unique, Harvard Business Review Press, Boston, 2023.
7	Ian Barkin, Jochen Wirtz, and Pascal Bornet, Intelligent Automation: Learn how to harness Artificial Intelligence to boost business & make our world more human, Independently Published, 2020.
8	Ian Barkin, Jochen Wirtz, and Pascal Bornet, Intelligent Automation: Learn how to harness Artificial Intelligence to boost business & make our world more human, Independently Published, 2020.
9	Byron Reese, The Fourth Age: Smart Robots, Conscious Computers, and the Future of Humanity, Atria International, 2018.
10	Deepak Karwal, The Automated Enterprise: Digital Reinvention through Intelligent Automation, Publisher: Deepak Karwal, 2020.
11	Matt Calkins, Neil Ward-Dutton, George Westerman et al., Hyperautomation, BookBaby, 2020.
12	Bhasker Ghosh, Gayathri Pallail and Rajendra Prasad, The Automation Advantage: Embrace the Future of Productivity and Improve Speed, Quality, and Customer Experience Through AI, McGraw-Hill Education, 2022.

## Proposal for New Course

<b>Proposal for New Course</b>		
<b>Course Number</b>	:	MB524
<b>Course Name</b>	:	Organizational Behaviour
<b>Credits</b>	:	2-0-0-2 (L-T-P-C) <sup>1</sup>
<b>Prerequisites</b>	:	None
<b>Intended for</b>	:	MBA
<b>Distribution</b>	:	Compulsory
<b>Semester</b>	:	Even

### Preamble

Organizational Behaviour is an introductory course, that provides inputs on behavioural dynamics of individuals, teams, and structures. The students will also get exposure to the influence of emerging technologies at various levels of the organization.

### Objective

On completion of this course, the student should be able to:

- Understand the individual, interpersonal, group and organizational dynamics
- Interventions at individual, group or organization levels to achieve organizational goals
- Motivate individuals and teams to enhance the effectiveness
- Understand organization structure and culture and make effective decisions within
- Understand and manage the influence of emerging technologies on employees, teams, and organizational structure

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<sup>1</sup> L= Lectures per week, T=Tutorials per week – P = Practical/Lab session per week – C = Credits for course

<b>Course Modules with Quantitative lecture hours</b>		
<b>Module 1</b>	<b>The Individual</b>	<b>(9 hours)</b>
Introduction to OB; Ability, Biographical Characteristics; Diversity – Indian Context – Diversity, Equity & Inclusion initiatives; Attitudes – Job Attitudes, Job Satisfaction, Antecedents & Consequences; Emotional Intelligence – Emotions, Moods, Emotional Labour; Personality – Big Five Model; Values; Decision Making; Motivation – Contemporary Theories, Applications, Job Characteristics Model, Ways of Motivating Employees; Leadership		
<b>Module 2</b>	<b>The Group</b>	<b>(6 hours)</b>
Group Dynamics – Properties, Group Development, Group Decision Making Techniques, GroupThink; Teams – Types, Team Effectiveness Model, Context, Composition, Process; Self Organising Teams, Virtual Teams; Technology – Team Effectiveness Interactions		
<b>Module 3</b>	<b>The Organization System</b>	<b>(7 hours)</b>
Types of organization structure, emerging organizational forms; functional structure, divisional structure, matrix structure, team structure, horizontal structure, network structure, virtual structure; Division of labour, specialisation, departmentalisation, chain of command, span of control, centralisation and decentralisation, formalisation, boundary spanning; Organizational culture, strong vs weak, dominant, socialisation model of culture, impact on employees and organization.		
<b>Module 4</b>	<b>Technology and Organizational Behaviour</b>	<b>(6 hours)</b>
Influence of social media & emerging technologies on employee behaviour Technology -structure interactions, Technology-culture interactions		
<b>Module 5</b>		
<b>Module 6</b>		

<b>Module 7</b>		
<b>Module 8</b>		

<b>List of articles and cases</b>
<p>Thomas Green: Power, Office Politics and a Career in Crisis  The Ordinary Heroes of the Taj, Rohit Deshpande; Anjali Raina  Ramesh and Gargi – IIMA case  Mahindra Financial Services- Restructuring for growth, IIMB case  Clash of Cultures – Business India case collection  Bank of Baroda</p>

<b>Textbooks:</b>	
1.	Robbins, S. P., Judge, T. A., & Vohra, N. (2019). <i>Organizational behaviour</i> . 18e. Pearson Education India.
2.	McShabe, S.L., Von Glinow, M. A., & Rai, H (2022) . <i>Organizational behaviour</i> . 9e. McGraw Hill India.
3.	Pareek, U. (2012). <i>Udai Pareek's Understanding organizational Behaviour</i> , 3e. Oxford University publications Catalogue.
4.	
<b>Reference Book:</b>	
1.	
2.	
3.	



## Proposal for New Course

<b>Proposal for New Course</b>		
<b>Course Number</b>	:	MB525
<b>Course Name</b>	:	Qualitative Research
<b>Credits</b>	:	2-0-0-2 (L-P-C) <sup>1</sup>
<b>Prerequisites</b>	:	None
<b>Intended for</b>	:	MBA
<b>Distribution</b>	:	Compulsory
<b>Semester</b>	:	Q2

### Preamble

This course introduces the process of qualitative research to the students. These methods are generally applied in conjunction with quantitative techniques. The course helps in designing, developing; planning and carrying out research work both as part of the inquiry process. The course helps the participant to systematically collect data, analyse, interpret and write the results. The course also sensitises students towards research ethics.

### Objective

The course has the following three objectives;

- develop appreciation towards qualitative methods
- equip with tools and techniques of qualitative data collection, analysis and writing.
- enable the students apply these skills for the research endeavours

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<sup>1</sup> L= Lectures per week, T=Tutorials per week – P = Practical/Lab session per week – C = Credits for course

<b>Course Modules with Quantitative lecture hours</b>		
<b>Module 1</b>	<b>Introduction to Qualitative Research</b>	<b>(8 hours)</b>
Types of research, qualitative, quantitative and mixed methods, Nature, foundations and scope of Qualitative Research, significance of qualitative research, qualitative research process, ethical consideration in qualitative research		
<b>Module 2</b>	<b>Case Study Method</b>	<b>(6 hours)</b>
Case study method – concepts, formation and measurement, Causation and models of causal inference, within case analysis method and practice, comparative case studies, data collection, interpretation and writing		
<b>Module 3</b>	<b>Grounded Theory</b>	<b>(6 hours)</b>
Emergence of Grounded Theory, design aspects, coding process, Memo writing and developing patterns and categories, theory integration, writing report		
<b>Module 4</b>	<b>Other Methods</b>	<b>(4 hours)</b>
Focus Group Discussions, Content Analysis, Ethnography studies		

<b>Textbooks:</b>	
1.	Uwe Flick – An Introduction to Qualitative Research
2.	Cheryl Poth and John Creswell – Qualitative Inquiry and Research Design
<b>Reference Book:</b>	
1.	Joseph Maxwell - Qualitative Research Design: An Interactive Approach
2.	Denzin, Norman K. and Lincoln, Yvonna S. Eds. (2011): The Sage Handbook of Qualitative Research, Sage Publications, Los Angeles,

### Proposal for New Course

<b>Course Number</b>	:	MB526
<b>Course Name</b>	:	Strategic Management
<b>Credits</b>	:	2-0-0-2 (L-T-P-C) <sup>1</sup>
<b>Prerequisites</b>	:	None
<b>Intended for</b>	:	MBA
<b>Distribution</b>	:	Compulsory
<b>Semester</b>	:	Even

#### Preamble

The course is designed to equip managers with the concepts, frameworks, and techniques towards making better strategic decisions. The participants through the completion of the course are expected to learn why and how some organizations exist and outperform the others in a specific business landscape and continue to derive competitive advantage? The participants of the course are expected to take leadership charge of the organization and to take responsibility for the performance of the organization. We have restricted the primary objective of the organization is to be profitability throughout the course though organizations with other than profit-objectives are out of the scope of the course. The course would primarily cover aspects of Business Strategy: dealing with how organizations derive competitive advantage and Corporate Strategy: dealing with what business(s) the organization should be in. The question of “how” and “what” of the business is not independent rather circular in nature. The course, nevertheless, follows a sequential approach for delivering Business Strategy (how) followed by Corporate Strategy (what). The course focuses on diagnosing the problem(s) of an organization in a complex management situation and searching and acting towards a solution. The course will demand drawing upon various functional theories and integrating towards a “holistic” management perspective towards problems and solutions.

#### Objective

On completion of this course, the student should be able to:

- To understand, analyse, and evaluate organization strategy in making operational decisions.
- To understand and sense-make organization strategy from operational activities.
- To learn how to formulate strategy within the dynamic and etymological contexts of operational, organizational, and external environments.
- To know few basic frameworks and the analytical process of their applications in formulating strategy and in their operationalization.

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<sup>1</sup> L= Lectures per week, T=Tutorials per week – P = Practical/Lab session per week – C = Credits for course

<b>Course Modules with Quantitative lecture hours</b>		
<b>Module 1</b>	<b>Introduction to Strategic Management and Development of Strategic Intent</b>	<b>(4 hours)</b>
<ul style="list-style-type: none"> <li>• Understanding Strategy</li> <li>• Comprehending the basic framework of strategy analysis</li> <li>• Evolution of Business Strategy thought over past years</li> <li>• How to describe Strategy of an organization</li> <li>• Understand how Strategy is made within organization.</li> <li>• Strategic Management in the Context of Functional Departments in an Organization</li> <li>• Strategic Intent &amp; Strategy Framework</li> <li>• Vision-Mission-Strategy / Purpose-Values- Strategy</li> <li>• Landscape of Strategic Management and Boundaries of Strategic Thinking</li> </ul>		
<b>Module 2</b>	<b>Frameworks and Tools for External Context Analysis</b>	<b>(5 hours)</b>
<u>Macro External Environmental Analysis of the Industry</u> <ul style="list-style-type: none"> <li>• Industry Life Cycle</li> <li>• Analysing Industry Attractiveness</li> <li>• Frameworks and Tools for External Context (Environment) Analysis [External Environmental Analysis, PESTLE Analysis, Organization Response to External Environment]</li> </ul> <u>Micro External Environmental Analysis of the Industry</u> <ul style="list-style-type: none"> <li>• Analysis &amp; Influence of Competitive Forces [Porter's 5 Force]</li> <li>• Strategic Group</li> </ul>		
<b>Module 3</b>	<b>Frameworks and Tools for Internal Context Analysis</b>	<b>(5 hours)</b>
<u>Internal Analysis of the Firm</u> <ul style="list-style-type: none"> <li>• Resource Based View</li> <li>• Value Chain Analysis</li> <li>• Core Competencies</li> <li>• VRIO Framework</li> </ul>		
<b>Module 4</b>	<b>Different approaches within Business Strategy to achieve Competitive Advantage</b>	<b>(5 hours)</b>
<ul style="list-style-type: none"> <li>• Generic business strategies (Cost Leadership, Differentiation, and Niche)</li> <li>• Blue Ocean Strategy</li> </ul>		
<b>Module 5</b>	<b>Organizational Design and its Influence on Strategy Formulation and Implementation</b>	<b>(4 hours)</b>
<ul style="list-style-type: none"> <li>• Principles that Determines Structural Characteristics of Complex Organization</li> <li>• Selection of Organization Structure best suited for Particular Business Context</li> <li>• Drivers of Changes of Organization Structure</li> <li>• Corporate Governance and Culture's influence on Strategy Formulation and Implementation</li> <li>• Role of Leadership Team/ Board in Strategy Execution</li> </ul>		
<b>Module 6</b>	<b>Managing Multiple Businesses</b>	<b>(5 hours)</b>
<ul style="list-style-type: none"> <li>• Basic Understanding of various Portfolio Planning Models (BCG Matrix, McKinsey Matrix, etc)</li> </ul>		

- Different approaches within Corporate Strategy for pursuing Growth - Vertical and Horizontal Integration, Mergers and Acquisition, Joint Ventures, Diversification (Ansoff's Framework, etc), Alliances and Internationalisation

**Lab Exercises** (If applicable):

Lab to be conducted on a 2-hour slot. It will be conducted in tandem with the theory course so the topics for problems given in the lab are already initiated in the theory class. The topics taught in the theory course should appropriately be sequenced for synchronization with the laboratory.

**Textbooks:**

1.	Robert M Grant (2015). <i>Contemporary Strategy Analysis: Text and Cases</i> , Edition, 9th Edition.
2.	Charles W. L. Hill; Melissa A. Schilling; and Gareth R. Jones (2017). <i>Strategic Management: Theory &amp; Cases: An Integrated Approach</i> . 12th Edition.
3.	
4.	

**Reference Book:**

1.	Porter, M. E. (1980). <i>Competitive Strategy: Techniques for Analyzing Industries and Competitors</i> . New York: Free Press, 1980.
2.	Rumelt, R. P. (2011). <i>Good strategy, bad strategy: The difference and why it matters</i> . New York: Crown Business.
3.	

## Proposal for New Course

<b>Proposal for New Course</b>		
<b>Course Number</b>	:	MB527
<b>Course Name</b>	:	<b>Financial Management</b>
<b>Credits</b>	:	2-0-0-2 (L-T-P-C) <sup>1</sup>
<b>Prerequisites</b>	:	None
<b>Intended for</b>	:	MBA
<b>Distribution</b>	:	Compulsory
<b>Semester</b>	:	Even

### Preamble

This course introduces concepts and techniques essential to understanding, analyzing, and implementing optimal financial decisions in a business entity. The course focuses on the importance of time and uncertainty in investment analysis and financing decisions. The topics covered in this course include the time value of money and discounting techniques, valuation of equity stock and bonds, capital budgeting, risk-return analysis, portfolio theory, and asset pricing. The course uses focused case studies to explain the context and application of the relevant finance theories and problem-solving.

The course focuses on understanding quantitative analysis in financial management and investment decision-making.

### Objective

The students should be able to;

- Understand the concepts and effect of the time value of money in decision making
- Analyze the capital investments under risk and uncertainty
- Demonstrate the estimation of risk and return
- Calculate the cost of capital
- Understand the modern portfolio theory and construct the efficient portfolios
- Illustrate optimal financing decisions
- learn how to use relevant spreadsheet modeling, RiskTools and Montecarlo Simulation, etc.

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<sup>1</sup> L= Lectures per week, T=Tutorials per week – P = Practical/Lab session per week – C = Credits for course

<b>Course Modules with Quantitative lecture hours</b>		
<b>Module 0</b>	<p><b>Introduction to Corporate Finance and Financial Goal of the Firm</b></p> <p>This module is intended to introduce two important questions; 1. What investments should the company make? 2. How should it pay for those investments?</p> <p>After understanding the goal of a firm, then students would be introduced to the challenges that managers may face and explain the agency problem and need for corporate governance.</p> <p><b>Readings:</b> Chapter – 1 of the Textbook</p>	<b>(1 hour)</b>
<b>Module 1</b>	<p><b>Time Value of Money</b></p> <p>In this module, we take the first steps to understand the relationship between the value of money (dollars/rupees) today and money in the future. The next step is understanding how much would be needed to invest today to produce a specified future sum of money. After the students learn how to value cash flows that occur at different points in time, then connect them to the next topic on how bonds and stocks are valued</p> <p>Readings: Chapter -2 of the Textbook Chapter end exercises</p>	<b>( 2 hours)</b>
<b>Module 2</b>	<p><b>Valuing Bonds and Common Stocks</b></p> <p><b>Bonds:</b> First would explain the sources of finances to the firm, then start with an analysis of the bond market by looking at government bonds' valuation and how to analyze the bond. The students should understand the bond prices and yields published in financial newspapers. Also, learn to differentiate between nominal and real (inflation-adjusted) interest rates.</p> <p><b>Common Stocks:</b> Begin with a look at how stocks are traded. Then explain the basic principles of share valuation and the use of Discounted Cash Flow (DCF) models to estimate the expected rates of return. Later, show how the DCF models can value the entire business rather than individual shares.</p> <p>Chapters: 3 and 4 of the Textbook Chapter end exercises and Case on 'Reeby Sports' from the textbook</p>	<b>(3 hours)</b>
<b>Lab -I</b>	<b>Applications of Time Value of Money</b>	<b>( 2 hours)</b>

<b>Module 4</b>	<b>Capital Investment Analysis</b> Begin with introducing the importance of capital investment decisions. Then explain the Net Present Value and other investment criteria. Conclude by showing how to cope with situations when the firm has only limited capital. Explain how to develop a set of cash flows from the business. Then demonstrate a realistic and comprehensive example of a capital investment analysis. Also, explain the role of corporate taxes in investment analysis Chapters – 5 and 6 of the Textbook Chapter end exercises Case: 1. Hola Kola Capital Budgeting Decisions (HBSP# TB0343) Case 2. Sneaker 2013 (HBSP# BAB166) (one of the above)	<b>( 3 hours)</b>
<b>Module 5</b>	<b>Risk and Return</b> First, explain how to read the stock prices and compute returns. Then take the first look at investment risks and show how they can be reduced by portfolio diversification. Introduce the risk measures, the standard deviation of returns, and the Beta coefficient for individual securities. <b>Reading:</b> Chapter 7 of the Textbook Case from the textbook, John and Marsha on Portfolio Selection Chapter end exercises	<b>( 2 hours)</b>
<b>Module 6</b>	<b>Portfolio Theory and the Capital Asset Pricing Model</b> This module would focus on presenting modern portfolio theories linking risk and return. Then demonstrate how these theories can be used to estimate the returns required by the investments. First, start with the Capital Asset Pricing Model (CAPM) and look at another class of models, arbitrage pricing or factor models. <b>Reading:</b> Chapter 8 of the textbook Case: 'Partners Healthcare' (HBSP#9-206-005)	<b>( 3 hours)</b>
<b>Module 7</b>	<b>Risk and Cost of Capital</b> First, understand why investment in a project is risky. Then evaluate the sensitivity of project cash flows to business cycles. Relate the CAPM and explain how to calculate the cost of capital (WACC). Conclude the topic after introducing the certainty-equivalent factors and illustrate how the risk can change over time. <b>Reading:</b> Chapter 9 of the Textbook Chapter end exercises	<b>( 3 hours)</b>

	Case: "Nike Inc; Cost of Capital" (HBSP#UV0010)	
<b>Module 8</b>	<p><b>Project Analysis</b> Focus on how firms develop budgets for capital investments. Illustrate sensitivity, break-even, and Monte Carlo simulation to identify investment proposals' crucial assumptions and explore what can go wrong. In the end, describe important real options, and show how to use decision trees to set out the possible future choices.</p> <p>Readings: Chapter 10 of the Textbook</p> <p><b>Investment, Strategy, and Economic Rents:</b> First, explain how the firm's competitive advantage links corporate strategy with finance. Then explain the common pitfalls in capital investment analysis and conclude how economic rents underlie all positive NPV investments.</p> <p>Reading: Chapter 11 of the Textbook</p>	<b>( 4 hours)</b>
<b>Lab</b>	<b>Simulation Exercise on Investment Analysis</b>	<b>( 2 hours)</b>
<b>Module 9</b>	<p><b>Corporate Financing</b> Illustrate the sources of financing and patterns with the help of financial data from CMIE or Bloomberg. Explain internal financing vs. external financing. Review some of the essential features of equity and debt financing.</p> <p><b>Dividend Policy</b> Explain how much cash should the firm's payout to its shareholders. Then how should the cash be distributed by paying cash dividends, stock dividends, or stock repurchases</p> <p>Case: 'Blaine Kitchenware Inc' (HBSP#4040)</p>	<b>( 3 hours)</b>

<b>Lab Exercises</b> (If applicable):
<ol style="list-style-type: none"> <li>1. The first lab session focuses on the time value of money to demonstrate the effect on the value of money with changes in assumptions such as time horizon, discounting factor, frequency of compounding, etc.</li> <li>2. The second lab session explains the sensitivity of project value to different business scenarios, how to forecast operating cash flows, and applications of Monte Carlo Simulation to know the expected value of cash flows.</li> </ol>

<b>Textbooks:</b>
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1.	Brealey A Richard, Myers C Stewart, and Allen Franklin, Principles of Corporate Finance. McGraw Hill Education, 13 <sup>th</sup> Edition (US) (Main Textbook)
2.	Ross A Stephen, Randolph W Westerfield, Jaffe Jeffrey and Bradford, Corporate Finance, 12 <sup>th</sup> Edition, McGraw Hill Education (Additional Textbook)
3.	Jonathan Berk and Peter DeMarzo, Corporate Finance (plus MyFinanceLab), 3rd ed., Pearson - Prentice Hall, 2014.
<b>Reference Book:</b>	
1.	Eugene F Fama, Theory of Finance, Thomson Learning, 1972.
2.	Elton J Edwin, Gruber J. Martin, Brown J. Stephen, and Goetzmann N. William, Modern Portfolio Theory and Investment Analysis, Wiley, 2014
3.	.

### Proposal for New Course

<b>Proposal for New Course</b>		
<b>Course Number</b>	:	MB528
<b>Course Name</b>	:	Human Resource Management
<b>Credits</b>	:	2-0-0-2 (L-T-P-C) <sup>1</sup>
<b>Prerequisites</b>	:	None
<b>Intended for</b>	:	MBA
<b>Distribution</b>	:	Compulsory
<b>Semester</b>	:	Even

#### Preamble

This course aims to impart knowledge on the fundamentals of Human Resource Management in the contemporary business world. It also embraces the skills required to appreciate the use of modern HR tools and techniques such as HR Information Systems, Artificial Intelligence, Analytical Frameworks, etc. Importance is given to the strategic views of managing various HR functions by embracing the opportunities available for the Future of Work.

#### Objective

Students would be guided in the learning process to ensure the following objectives.

1. To understand the changing nature of managing human resources in the context of changing workplace.
2. To recognize the application of modern tools and techniques like Artificial Intelligence and other analytical frameworks in HR decisions.

<sup>1</sup> L= Lectures per week, T=Tutorials per week – P = Practical/Lab session per week – C = Credits for course

3. To apply the strategic perspectives in analyzing the information collected in the HR functions.
4. To develop poise in framing HR policies and practices that are required to solve contemporary HR problems.

<b>Course Modules with lecture hours</b>		
<b>Module 1</b>	<b>HRM in 21<sup>st</sup> Century</b>	<b>(6 hours)</b>
Introduction to the domain of HR, Evolution of HR, The role of HR Business Partner, Evidence-based Human Resource Management, Driving forces of Evidence-based HRM, Linking Business Strategy with the HR Strategy, Manager's role in Strategic HRM, Building a high-performance work system in the era of Industry 4.0, Role of AI and ML in developing contemporary HR policies and practices.		
<b>Module 2</b>	<b>Job Analysis, HR Planning &amp; Talent Acquisition</b>	<b>(8 hours)</b>
Job Analysis in the changing nature of workplace, Steps involved in Job Analysis, Methods of collecting Job Analysis information, Quantitative Job Analysis Techniques, Using internet for writing Job Descriptions, Job Specifications based on statistical analysis, Job Rotation, Job Enlargement & Job Enrichment, Competency-based Job Analysis Human Resource Planning and Forecasting, Recruitment & Selection in the Talent Management era, Talent Acquisition Strategies, Use of AI in the Talent Acquisition process, Use of Applicant Tracking System (ATS) and application forms to predict Renege/job performance, Employee Testing and Selection.		
<b>Module 3</b>	<b>Talent Development</b>	<b>(8 hours)</b>
Training & Developing Employees, Training Need Analysis, Designing and implementing training programs, Management Development Programs, Managing Organizational Change Programs, The Kirkpatrick model of training evaluation, ROI and Behavioural Training, Use of Learning Analytics in creating L&D policies and practices, The AI-powered Coaching and Career Management. Managing Employee Performance, Mutual Goal setting, Techniques for appraising performance, Managing performance through HRIS, Mobile Apps for real-time performance management, Performance Metrics, 9-box grid measuring performance and potential of employees.		
<b>Module 4</b>	<b>Talent Engagement &amp; Compensation Management</b>	<b>(6 hours)</b>
Talent Engagement, Measuring employee Attrition and developing retention strategies, Understanding Turnover intention, Absenteeism, Satisfaction & Commitment Indices, Future of Employee Engagement with AI, AI-powered Employee Segmentation, Leveraging AI for Work-Life Balance.		

Compensation & Benefits, Factors determining Compensation & Benefits, Salary Survey, Job Evaluation, Executive Compensations, Competency-based Pay, Analytics in Compensation Management, Fundamental Laws related to Compensation & Benefits.

**Textbooks:**

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|----|---|
| 1. | Dessler, G & B. Varkkey, Human Resource Management, 16e. Pearson Education India, 2020. |
|----|---|

**Reference Book:**

- |    |   |
|----|---|
| 1. | A. Upadhyay, K. Khandelwal & J. Iyengar, Revolution in HRM: The New Scorecard, Sage Publications India Pvt. Ltd., 2021. |
| 2. | Yadav R S & S. Maheswari, HR Analytics: Connecting Data and Theory, Wiley India Pvt. Ltd., 2021.                        |
| 3. | Martin Edwards, Predictive HR Analytics: Mastering the HR Metric, Kogan Page, London, United Kingdom, 2016              |
| 4. | Kenneth M. York (2010). Applied Human Resource Management. Sage Publications India Pvt. Ltd.                            |

**Reference Articles**

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|----|--|
| 1. | Allan Baily, The Kirkpatrick/Philips Model for evaluating Human Resource Development and Training.   |
| 2. | Arellano, C., DiLeonardo, A., & Felix, I. (2017). Using people analytics to drive business performance: A case study. McKinsey Quarterly, 3, 114-119.  |
| 3. | Boudreau and Ramstad, Talentship, Talent Segmentation, and Sustainability: A New HR Decision Science Paradigm for a New Strategy Definition, Human Resource Management, Summer 2005, Vol. 44, No. 2, pp. 129-136 |

4.	De Cremer, D., & Stollberger, J. (2022). Are People Analytics Dehumanizing Your Employees?. Harvard Business Review, 2022(June 07). <a href="https://hbr.org/2022/06/are-people-analytics-dehumanizing-your-employees">https://hbr.org/2022/06/are-people-analytics-dehumanizing-your-employees</a> ; <a href="https://www.aihr.com/blog/hbr-people-analytics-misconceptions/">https://www.aihr.com/blog/hbr-people-analytics-misconceptions/</a>
5.	Malik, A., Srikanth, N. R., & Budhwar, P. (2020). Digitization, artificial intelligence (AI) and HRM. In Crawshaw, J., Davis, A., & Budhwar, P., Human resource management: Strategic and international perspectives. London:Sage. (pp. 88-111).
6.	McCartney, S., & Fu, N. (2022). Promise versus reality: a systematic review of the ongoing debates in people analytics. Journal of Organizational Effectiveness: People and Performance.
7.	Strohmeier, S. (2020). Digital human resource management: A conceptual clarification. German Journal of Human Resource Management, 34(3), 345-365.
8.	Tenakwah, E. (2021). Four by Four: Unintended Risks of People Analytics.
9.	Thite, M. (Ed.). (2018). e-HRM: Digital approaches, directions & applications. Routledge.
10.	Yano et al., Measuring Happiness using Wearable Technology, Hitachi Review, Vol. 64, No.: 8, 2015
11.	Accenture Reports: <a href="https://www.accenture.com/acnmedia/Thought-Leadership-Assets/PDF-3/Accenture-Care-To-Do-Better-Report.pdf">https://www.accenture.com/acnmedia/Thought-Leadership-Assets/PDF-3/Accenture-Care-To-Do-Better-Report.pdf</a> <a href="https://www.accenture.com/acnmedia/PDF-141/Accenture-Honing-your-Digital-Edge-POV.pdf">https://www.accenture.com/acnmedia/PDF-141/Accenture-Honing-your-Digital-Edge-POV.pdf</a>
<b>Case Studies recommended:</b>	
1.	Harvard Case: Sensing (and Monetizing) Happiness at Hitachi
2.	Harvard Case: Amazon as an Employer
3.	APSPOP's Recruitment Predicament (Ivey Case)
4.	Harvard Case: Performance Development at GE: Shaping a Fit-For-Purpose Performance Management System
5.	Harvard Case: Money Cash Flow Inc._ HR Analytics Applied to Employee Retention and Well-Being Issues
6.	Deloitte and KPMG: The War for Talent (Ivey Case)



## Proposal for New Course

<b>Proposal for New Course</b>		
<b>Course Number</b>	:	MB530
<b>Course Name</b>	:	Neural Networks Fundamentals for Business
<b>Credits</b>	:	2-0-0-2 (L-T-P-C) <sup>1</sup>
<b>Prerequisites</b>	:	None
<b>Intended for</b>	:	MBA
<b>Distribution</b>	:	Compulsory
<b>Semester</b>	:	Even

### Preamble

Neural networks gained prominence in the business slowly starting in 2010 with the advancements in processing and storage technologies. Neural networks is playing a crucial role in machine learning system development to implement AI based systems. Recent use of neural networks in enterprises is growing in a rapid rate. Business domains that have witnessed neural network use include banking and finance, sales and marketing, transportation, healthcare etc. This course provides a soft introduction to basics of neural network and its potential business applications.

### Objective

On completion of this course, the student should be able to:

- Understand the basics of neural networks and its architecture
- Identify the context for neural networks
- analyse performance of neural network
- learn how to use a neural network in a given situation
- Identify its impact on specific industry and company

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<sup>1</sup> L= Lectures per week, T=Tutorials per week – P = Practical/Lab session per week – C = Credits for course

<b>Course Modules with Quantitative lecture hours</b>		
<b>Module 1</b>	<b>Introduction to Neural Networks</b>	<b>(2)</b>
History of Neural Networks, Real and artificial Neurons, Maths behind neural network, Types of Neural Networks.		
<b>Module 2</b>	<b>Perceptron</b>	<b>(4)</b>
Neuron as a basic processing element, single and Multiple Perceptrons, Linear and nonlinear regression models of neural network, Activation function and its necessity, smooth and non-smooth activation functions- Sigmoid, Tanh, ReLU, argmax and softmax, feed-forward networks, deep networks and connectionism-distributed representation.		
<b>Module 3</b>	<b>Backpropagation and Gradient Descent</b>	<b>(8)</b>
Neural Networks training processes, Constants and variables in a network, weight initialization- Random, Glorot initialization, cost functions, Cross-entropy functions, Rosenblatt's perceptron training, gradient descent method, Gradient Descent for solving a simple Learning problem, Perceptrons for identifying patterns, Gradient Descent for Multilevel Neural Networks, Backpropagation Method – Forward and Backward Pass, Adjusting the Weights, Learning Rate- static and dynamic, Stochastic gradient descent-batch and mini-batch gradient descent, Neural network architecture – Selecting number of layers and number of neurons per layer.		
<b>Module 4</b>	<b>Supervised Learning</b>	<b>(6)</b>
Fully connected neural networks, Exploring the dataset, identifying biases in the dataset, Data drift and Splitting the dataset to training, testing and validation datasets, Bias-variance tradeoff through neural network architecture, bias and variance reduction techniques, diagnosing bias and variance, Neural network model building, parameter tuning, Dealing with data leakage, interpretation of learning curves, Learning customer churn through backpropagation. Neural networks for multiclass classification, Loss function for multiclass classification (eg. MNIST/iris dataset). Quantitative and qualitative evaluation of the solution. Vanishing gradient, Selecting right activation function, Neural Network Regression on practical datasets (eg. Boston dataset or churn dataset) and cases.		

<b>Module 5</b>	<b>Unsupervised Learning</b>	<b>(4)</b>
Competitive Learning, Kohonen Self-organising maps (SOM), SOM Dimensionality and size of the map, Data preprocessing for SOM, deciding on Number of clusters, Performance assessment, SOM clustering of appropriate datasets and cases.		
<b>Module 6</b>	<b>Time Series Forecasting</b>	<b>(4)</b>
Fundamentals of time series forecasting, types of time series forecasting, Time series smoothing and decomposition, ARIMA models, Neural network autoregressive models. [10]		

<b>Lab Exercises</b> (If applicable):
Using specific software package like RapidMiner/SPSS/Weka/Azure etc

<b>Textbooks:</b>	
1.	
2.	
<b>Reference Book:</b>	
1	Kotu V. and Deshpande, B., Data Science: Concepts and Practice, Morgan Kauffman Publications, 2019.
2	J. Kelleher, B.M. Namee and A. D'Arcy. Fundamentals of Machine Learning for Predictive Data Analytics, MIT Press, 2020.
3	J.D. Kelleher, Deep Learning, MIT Press, 2019.
4	James M. Keller, Derong Liu, and David B. Fogel, Fundamentals of Computational Intelligence Neural Networks, Fuzzy Systems, and Evolutionary Computation, Wiley-IEEE Press, 2016.
5	Phil Kim - MatLab Deep Learning with Machine Learning, Neural Networks and Artificial Intelligence, Apress, 2017.
6	Scot Page, The Model Thinker, Basic Books, 2018.

7	Wei Di, Anurag Bhardwaj and Jianing Wei, Deep Learning Essentials: Your hands-on guide to the fundamentals of deep learning and neural network modelling, Packt Publications, 2018
8	Bernhard Mehlig - Machine Learning with Neural Networks: An Introduction for Scientists and Engineers, Cambridge University Press, 2021.



## IIT Mandi

### Proposal for a New Course

**Course number** : MB531  
**Course Name** : Ethical and Legal aspects of Business  
**Credit** : 2-0-0-2  
**Distribution** : L-T-P-C  
**Intended for** : MBA  
**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:

Business managers face complicated legal issues as they move up in the corporate hierarchy. Hence a business manager is expected to understand the risk / reward ratio of a particular action from the legal perspective. In the context of commerce and business enterprises, legal principles and processes ought to provide a balanced framework within which business activities are facilitated, on the one hand to promote entrepreneurship and to understand the application of Business Laws on emerging Technologies, and on the other to enhance and enforce norms of accountability.

This course would incorporate and focus on the laws of business with specific focus on the Technology Laws such as 'Law of Data Protection', 'Information Technology Law', 'Law of E-Commerce & M-Commerce', 'Law of Internet & Internet Intermediaries', 'Law of Privacy', 'Law of Cyber Crimes', ... etc., and keeping in tune with the provisions of the 'Digital India Act, 2023 (DIA)'.

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

CO No.	Course Objectives (CO)
CO1	Students would be introduced to the basic legal and ethical framework of business not only in India, but also with a global perspective in mind including an overview of the law of emerging technologies and how best to leverage this law for optimum commercial gain. Students of business administration must understand what happens both: in civil as well as criminal litigation and how what happens in courts can impact

	business world. Students must understand the Contract law regarding the necessity to have / not to have written contracts; Students must understand the meaning, the scope and nuances of the application of business laws on contracts and how to take decisions that could have legal consequences in these contracts.
<b>CO2</b>	Students would develop an understanding of the business facilitation role of the legal system, particularly the Law of Contracts and e-contracts & e-commerce through the Digital India Act and the regulatory systems in place to supervise and regulate the business practices in India and also doing business beyond national borders and doing business and human transactions via online mode or through the use of electronic gadgets and wearable technologies.
<b>CO3</b>	Students will develop an introductory level understanding of the legal and ethical concepts relating to niche areas of business & technology laws such as intellectual property rights, Law of forms of Business Enterprises and Entrepreneurship, Law of Company Management and the Essentials of the Laws of Technology such as Intellectual Property Rights (IPRs) and how best to optimize trade and commerce in IP assets while also seeking legal protection for the same against infringement by violators/competitors.
<b>CO4</b>	Students would be introduced to niche areas of emerging and evolving laws and the legal and ethical regime of technology laws governing the application of the Digital India Act (DIA) on emerging technologies such as the use of electronic gadgets / Computers / laptops / wearables, ... etc. to interact and transact with other enterprises / entities either for commerce or for other social interactions or creating wealth, committing, investigating or preventing crime.... etc.

### **Pedagogy:**

The course intends to use multiple pedagogical tools to reinforce the learning among the participants. Predominantly, this course shall be delivered through (1) **Lectures** where legal concepts and doctrines are explained through meticulously prepared (2) **‘Illustrative Case Studies’** and flipped classroom initiative where students are also encouraged to actively participate in the learning process and to undergo self-learning through the guidance provided continuously by the law-faculty. A second method is the encouragement to learn through (3) **‘Outside Classroom Learning (OCL)’** initiatives – which will periodically be introduced by Law-Faculty who will provide a learning guide map to show the paths of self-learning the student-participant should take to gain optimal knowledge from the niche law course. Law-Faculty will also provide from time to time (4) **Supplementary Law Knowledge Resources** by way of dedicated course-instruction related emails, web-links, handouts, .... etc. The only Course Evaluation Component which will be introduced through two ‘Tutorial Sessions’ will be the (5) **‘Kababisthan Assignment’**, which in effect will cover the Teaching Content which in other b-school curricula, are spread over 4 Sessions in regular MBA Programs in b-schools including in the IIMs. The Kababisthan Assignment which will have a weight-age of 35% of

Course Marks, will ride on a student-centric learning effort and will cover vital Modules in the Course such as – ‘Law of Entrepreneurship’, ‘Law of Forms of Business Enterprises’, ‘Fundamentals of Company Law & Law of Company Management’ and promises to leave behind footprints of unforgettable knowledge enriching experience for the student-participants.

### Evaluation Components

Evaluation Component	Type (Individual / Group)	Weight-age	Remarks, if any	Linking to Course Objectives
Class Participation	Individual	15%	While consistent active class participation would be rewarded, inactive class participation or an absence of class participation will be penalized by way of deduction of marks under this ‘CP’ head	CO1, CO2, CO3, CO4
The ‘Kababisthan’ Handwritten Simulation Case Study Assignment	Individual	35%	To be submitted to the Class Representative on / or before the submission deadline, as per the requirements specified earlier.	CO1, CO2, CO3, CO4
End-Term Examination	Individual	50%	<ul style="list-style-type: none"> <li>● Open Book</li> <li>● No Cellphone or laptops</li> </ul>	CO1, CO2, CO3, CO4

### Laboratory/practical/tutorial Modules:

#### 3. Text books:

*(Relevant and Latest, Only 2)*

1. Author(s), Title, Vol., Publisher, Country, Year
2. Author(s), Title, Vol., Publisher, Country, Year

#### 4. References:

*(No limit on numbers, relevant)*

*Standard format can be followed, the formats should be similar)*

**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%:**

**Approvals:**

**Other Faculty interested in teaching this course: –**

**Proposed by:**

**School:**

**Signature:**

**Date:**

**Recommended/Not Recommended, with Comments:**

**Date:** \_\_\_\_\_

\_\_\_\_\_  
**Chairperson, CPC**

**Approved / Not Approved**

**Date:** \_\_\_\_\_

\_\_\_\_\_  
**Chairperson, BoA**

## Proposal for New Course

<b>Proposal for New Course</b>		
<b>Course Number</b>	:	MB532
<b>Course Name</b>	:	Digital Business Strategy, Models and Transformations
<b>Credits</b>	:	2-0-0-2 (L-T-P-C) <sup>1</sup>
<b>Prerequisites</b>	:	None
<b>Intended for</b>	:	MBA
<b>Distribution</b>	:	Compulsory
<b>Semester</b>	:	Even

### Preamble

This course aims to introduce students to the intricacies of digital transformation, which is set to revolutionize business processes to initiate new opportunities. Digital transformation is not only about technological advancements but also on business model changes that embed technology at the core of the business. This requires a well-designed business strategy and business model that can drive the transformation. The digital strategy started with a technology focus along with the people who delivered them with sole emphasis on technology to a stage of the seamless merger of people, technology, and business. The major focus is during and after this transformation how the organization can be sustainable, scalable, and successful. This course will enable the students to understand clearly the concepts of digital strategy, digital models, and their evolution that adapts to the constantly evolving organizations. This helps them learn how to continuously deploy, manage and evolve their digital capability to lead the business in the right direction. Further, the students will understand the intricacies of digital business through various challenges, bottlenecks, and transformative aspects of digital transformation.

### Objective

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<sup>1</sup> L= Lectures per week, T=Tutorials per week – P = Practical/Lab session per week – C = Credits for course

On completion of this course, the student should be able to:

- learn what is digital business and how it is being realized.
- Study how digital transformation affects any industry and enterprise
- Understand the business model
- Learning the concepts and applicability of the digital strategy
- Develop the required analytical skills to implement the digital strategy
- Learn to become a digital leader

<b>Course Modules with Quantitative lecture hours</b>		
<b>Module 1</b>	<b>Reimagining Business</b>	<b>(4)</b>
Digital business transformation, Digitization vs. Digitalization, Digital Optimization an digital business transformation, Automation to autonomous systems, , the Domains of Digital Transformation and Barriers; Dimensions of digital business-Scale, scope and speed of digitalization.		
<b>Module 2</b>	<b>Reimagining Business model and Business processes</b>	<b>(8)</b>
Business model concepts and their Importance, Understanding Platforms and their ecosystem, Types of Platforms- one sided to N-sided, Platform Business Models, Change Management for Digital Business, Technical architecture for digital strategy, Building Blocks of Business Model, Business Model Canvas.		
<b>Module 3</b>	<b>Reimagining Digital Strategy</b>	<b>(8)</b>
Strategy for Digital Transformation and their types, Digital KPI and Digital Revenue; Digital Platform strategy, business and IT Architecture, Digital Matrix, Phases of transformation.		
<b>Module 4</b>	<b>Strategy Development and Implementation</b>	<b>(6)</b>
Understanding Digital disruption, Response to digital disruption using Business models, Adaptive vs. disruptive models, digital adoption and adaptation, Building Digital Business Technology Platform, Implementation methods and future scope.		
<b>Module 5</b>	<b>Future Digital Business</b>	<b>(2)</b>
Elements of future digital business, Digital Transformation Risks, Digital Leadership		

<b>Lab Exercises</b> (If applicable):
Nil.

<b>Textbooks:</b>	
1.	
2.	
<b>Reference Book:</b>	
1	V. Venkatraman, The Digital Matrix. Penguin Random House India Pvt. Ltd., 2017
2	S. Gupta, Driving Digital Strategy, Harvard Business Review Press, 2018
3	Nitin Seth, Winning In The Digital Age - Seven Building Blocks of a Successful Digital Transformation, Penguin Random House India Private Limited, 2021.
4	Peter Weill, Stephanie Woerner, What's Your Digital Business Model?: Six Questions to Help You Build the Next-Generation Enterprise, HBR Press, 2018
5	G. O'Brien, G. Xiao, and M. Mason, Digital transformation Game Plan, Shroff Publishers & Distributors, Delhi, 2022.
6	A. Bock and G. George, The Business Model Book, Pearson, 2019
7	T. Saldanha, Why Digital Transformations Fail: The Surprise Disciplines of How to Take Off and Stay Ahead, Berrett-Koehler Publishers, Inc. 2019.
8	Anshuman Khare, Brian Stewart & Rod Schatz, Phantom Ex Machina – Digital Disruption’s Role in Business Model Transformation. Springer International Publishing Switzerland, 2017
9	George Westerman and Didier Bonnet, Leading Digital: Turning Technology into Business Transformation, Harvard Business Review Press, 2014
10	R. Wang, Disrupting Digital Business: Create an Authentic Experience in the Peer-to-Peer Economy, Harvard Business Review Press, 2015.
11	Thomas Siebel, Digital Transformation: Survive and Thrive in an Era of Mass Extinction, Rosetta Books, 2019.
12	HBR's 10 Must Reads on Leading Digital Transformation, Harvard Business Review, 2021.
13	V. Sambamurthy, Guiding the Digital transformation of Organization, Legerity Digital Press, 2012
14	D.L. Rogers, The Digital Transformation Playbook, Columbia University Press, 2016.
<b>Articles and Cases:</b>	
1	Gartner Publications/Reports
	Ross et al., Digitized ≠ Digital, MIT Sloan Management Review, 2017
	Ross et al. Digital Success requires Breaking Old Rules, , MIT Sloan Management Review, 2019

	Bharadwaj et al. Digital Business Strategy: Toward a Next Generation of Insights, MIS Quarterly Executive, June 2013
2	The essential components of Digital Transformation, Tomas Chamorro Premuzic, HBR, Nov 23, 2021
3	Digital Transformation Changes How Companies create Value, Marshall W. Van Alstyne and Geoffrey G Parker, HBR, Dec 17, 2021
4	4 lessons from Levi's Digital Transformation, Harmit Singh, HBR, Feb 2022.
5	Digital Transformation is not about Technology, Behnam Tabrizi; Ed Lam; Kirk Girard; Vernon Irvin; Kirk Gerard, HBR, Mar. 2019.
	Sia et al., How DBS Bank Pursued a Digital Strategy, MIS Quarterly Executive, June 2016
6	Ross et al. Designing Digital Organization, Research Report, MIT Sloan School of Management, 2016, CISR WP No. 406.
7	AccorHotel's digital transformation: A response to hospitality disruptor Airbnb
8	How Does Digital Transformation Happen? The Master card Case. (Case No. IN1463-PDF-ENG)
9	Digital India – Technology to transform a Connected nation, Mckinsey report, 2019
10	Digital Transformation 2.0 CEO Elie Girard at Atos (Case No. 421024-PDF-ENG)
11	Digital Transformation at La Presse (A): Crafting a New Digital Strategy
12	
13	



## IIT Mandi

### Proposal for a New Course

<b>Proposal for New Course: ENTREPRENEURSHIP</b>		
<b>Course Number</b>	:	MB533
<b>Course Name</b>	:	ENTREPRENEURSHIP
<b>Credits</b>	:	2-0-0-2 (L-T-P-C) <sup>1</sup> Tentative, to be finalized in consultation with Chair, SOM
<b>Prerequisites</b>	:	None
<b>Intended for</b>	:	MBA in Data Science & Artificial Intelligence
<b>Distribution</b>	:	Compulsory
<b>Semester</b>	:	Even (To be finalized in consultation with Chair, SOM)

<b>Preamble</b>	
<p>Entrepreneurship has emerged as a strategically significant economic endeavour across the world, from both supply as well as demand sides. Entrepreneurial efforts help create new ventures, to start with in the micro, small and medium sectors, which, in turn, play a critical role on the supply side by augmenting the size, quality and diversity of the gross domestic product (GDP) of a country by utilizing the resources available largely from within the country. On the demand side, entrepreneurial endeavour goes a long way in providing viable opportunities for employment of burgeoning human resources. Entrepreneurship also facilitates the process of</p>	

<sup>1</sup> L= Lectures per week, T=Tutorials per week – P = Practical/Lab session per week – C = Credits for course

transformation of creative ideas into meaningful business initiatives. As such, systematic study of entrepreneurship is recognized as a necessary academic pursuit.

**Objective**

The present programme on Entrepreneurship is sought to be conducted as a foundation course, aimed at familiarizing students with basic issues linked to the discourse on entrepreneurship, with particular reference to India. The issues thus intended to be covered in the present course include significance of entrepreneurship in the life of a nation, traits and characteristics required to be in place in a person aspiring to emerge as a successful entrepreneur, challenges involved in launching entrepreneurial ventures and significance of an entrepreneur-friendly eco system in advancement of entrepreneurship as a continuing economic endeavour etc.

On completion of this course, the student should be able to:  
utilize data analysis tools and software for formulating a viable entrepreneurial venture.

**Pedagogy**

Pedagogy is based largely on classroom discussions. Cases/examples from real-life experience drawn from across the country will be brought in, wherever necessary, in order to enrich the discussion and facilitate better comprehension of related issues. The experience and learnings of the Instructor as a senior management executive of a Public Sector Bank (and therefore a financier of entrepreneurs) for over two decades and subsequently as a mentor for a number of entrepreneurs, will be brought to bear on the pedagogy.

**Course Modules with Quantitative lecture hours**

<b>Module 1</b>	<b>Introducing Entrepreneurship</b>	<b>(5 hours)</b>
Significance of entrepreneurship, Taxonomy of entrepreneurship- types of entrepreneurs, distinction of entrepreneurs and intrapreneurs, Inherent traits and necessary skills required to be possessed by an entrepreneur with particular reference to technopreneurship		
<b>Module 2</b>	<b>Family Business and Social Entrepreneurship</b>	<b>(2 hours)</b>
Features of family businesses, understanding social entrepreneurship		
<b>Module 3</b>	<b>Starting-up strategy</b>	<b>(4 hours)</b>
Five-Question Framework and Porter’s Five Forces, preparation of Business Plans, understanding Business Models of entrepreneurs		
<b>Module 4</b>	<b>Challenges encountered</b>	<b>(3 hours)</b>

Opportunities and threats (pros and cons) of entrepreneurship, reasons of failure of entrepreneurs		
<b>Module 5</b>	<b>Financing of Entrepreneurial Ventures</b>	<b>(5 hours)</b>
Banking system and other openings available for accessing finance by entrepreneurs		
<b>Module 6</b>	<b>External Support required for Success of Entrepreneurship</b>	<b>(6 hours)</b>
Introduction to a conducive eco- system for promotion of entrepreneurship in India and the lacunae identified therein, Need for parental backing and social recognition as necessary external support for success of entrepreneurial ventures		
<b>Module 7</b>	<b>Assignments etc.</b>	<b>(3 hours)</b>

### Recommended Readings

Books recommended for the Course are listed below:

Sl No	Author	Title	Publishers
1.	Rajeev Roy	ENTREPRENEURSHIP (Latest Edition)	Oxford University Press
2	Harvard Business Review	Entrepreneur's Handbook (2018)	Harvard Business School Publishing Corporation
3.	Charles E. Bramford & Garry D. Bruton	ENTREPRENEURSHIP: A SMALL BUSINESS APPROACH <b>(Indian Edition: 2015)</b>	McGraw Hill Education
4.	Harvard Business Review	On AI, Analytics, and the New Machine Age (2019)	Harvard Business School Publishing Corporation

5.	Kanth Miriyala & Reethika Sunder	ENTREPRENEUR 5 P.M. to 9 A.M. <b>(11th Edition)</b> with endorsement from, among others, by the Instructor of the instant Course.	Rupa Publications India Pvt Ltd
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**Note:** (i) Please note that Serial Nos. 1, 2 and 3 above are the principal readings while Serial Nos. 4 & 5 are the supplementary readings recommended for obtaining a general overview of issues pertaining to Entrepreneurship as a business endeavour.

(ii) It may also be noted that some Study Materials prepared by the Instructor may be shared in the Classroom, as and when necessary.



## IIT Mandi

### Proposal for a New Course

**Course number** : MB570  
**Course Name** : Product Management  
**Credit Distribution** : 2-0-0-2 (L-T-P-C)  
**Intended for** : MBA  
**Prerequisite** : A basic course is Marketing  
**Mutual Exclusion** : None

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#### **1. Preamble:**

The primary job of a Product Manager manager is to take decisions related to development, improvement of a product. To prepare the budding managers for roles related to product management, this course intends to provide an in-depth understanding of product management strategies, frameworks, tools and techniques for delivering improved customer experience at every stage of customer journey in alignment with business goals.

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

##### **Unit 1: Introduction to Product Management**

**(1 hour)**

- i. The practice of Product Management
- ii. Core skills of Product Management: Communication, Organization, Research and Execution

##### **Unit 2: Product Strategy**

**(3 Hours)**

- i. What is a product
- ii. Types of products
- iii. Role of product strategy in product development
- iv. Factors influencing product strategy
- v. Product Life cycle
- vi. Product Line
- vii. Product elimination

##### **Unit 3: Competitor Analysis**

**(2 Hours)**

- i. SWOT Analysis
- ii. Porter's generic strategy
- iii. BGC Matrix

##### **Unit 4: New product development**

**(3 Hours)**

- i. New product development Process
- ii. Minimum viable product approach and Minimum delightful product approach

**Unit 5: Design Thinking****(4 Hours)**

- i. Introduction: Concept and role with NPD and Innovation; Framework of Design Thinking
- ii. Design Thinking tools: Inspirational Design Briefing; Personas; Customer experience mapping; Boosting creativity; Stories and prototypes
- iii. Design thinking within the firm: Design integration; Team training and implementation; Leading for a corporate culture of design thinking;
- iv. Consumer responses and values: Consumer response to product forms; Diversity in responses; Future friendly designs

**Unit 6: Product Analytics****(4 Hours)**

- i. Introduction: Basic concepts of analytics; Role of analytics; Product Analytics vs Marketing Analytics; Applications of Product Analytics
- ii. Process and Design: Stages of product analytics process; Product analytics design; Overview of Exploratory, Descriptive and Causal analytics; Direct exploratory methods - FGD, Depth interview; Indirect exploratory methods - Projective techniques Role of Observation Methods in Product Development and Management

**Unit 7: Product Roadmapping****(2 Hours)**

- i. Key elements
- ii. Building product roadmaps
- iii. Prioritizing features in roadmaps
- iv. Types of roadmaps

**Unit 8: Agile and Lean product development****(2 Hours)**

- i. Significance
- ii. SCRUM and KANBAN

**Unit 9: Marketing and Launch****(4 Hours)**

- i. Sales and Distribution Strategy
- ii. Product Positioning and Branding
- iii. Marketing Communication
- iv. Product Pricing
- v. Product Launch/feature launch

**Unit 10: Product leadership****(3 Hours)**

- i. Product Leader: Impact; Challenges; Being a great product leader; Hiring product leadership
- ii. The right leader: Startup leaders, Emerging product leader; enterprise product leader

References:

**Laboratory/practical/tutorial Modules:**

Not Applicable

**3. Text books:**

- i. C. Merle Crawford and C. Anthony Di Benedetto (2021) *New Products Management*, 12th Edition, Mc Graw Hill, 12e, ISBN: 9781259911828

**4. References:**

- i. Roman Pichler (2016) *Strategize Product Strategy and Product Roadmap Practices for the Digital Age*, Pichler Consulting, ISBN : 978-0993499203
- ii. Richard Banfield, Martin Eriksson, Nate Walkingshaw (2017) *Product Leadership* O'Reilly Media, Inc. ISBN: 9781491960554
- iii. Scott Swan, Michael G. Luchs, Abbie Griffin (2016) *Design Thinking: New Product Development Essentials from the PDMA*, Wiley-Blackwell, ISBN: 978-1118971802

**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.	Marketing Management	10%	

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

Not Applicable

**Approvals:**

**Other Faculty interested in teaching this course: –**

**Proposed by: Dr Saumya Dixit**

**School: School of Management**

**Signature:**

**Date:**

**Recommended/Not Recommended, with Comments:**

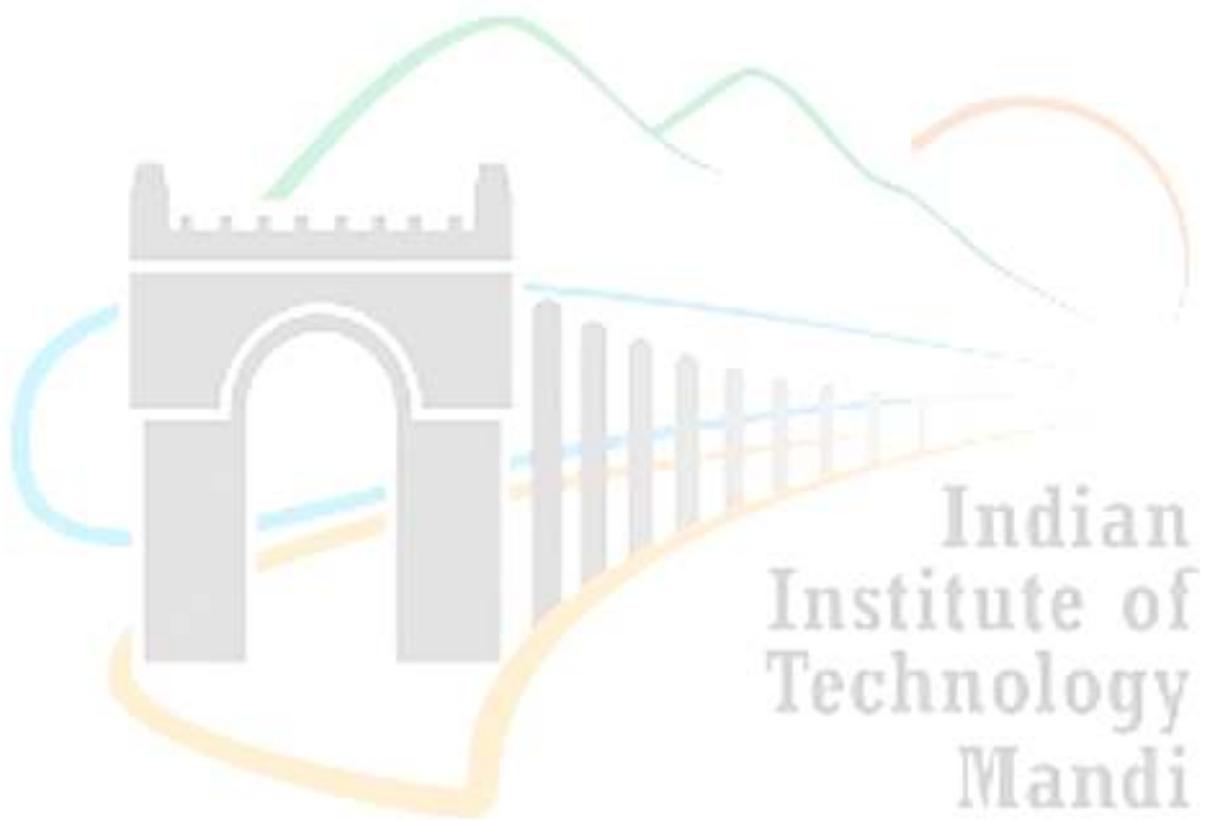
**Date:** \_\_\_\_\_

\_\_\_\_\_  
**Chairperson, CPC**

*Approved / Not Approved*

Date: \_\_\_\_\_

\_\_\_\_\_  
Chairperson, BoA





## **IIT Mandi** **Proposal for a New Course**

**Course number** : MB592  
**Course Name** : **MANAGEMENT SCIENCE IN PRACTICE – A MODELLING AND CASE STUDIES APPROACH WITH MS-EXCEL.**  
**Credit** : 1-0-2-2  
**Distribution** : L-T-P-C  
**Intended for** : MBA  
**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 is aimed to make the applications of Management Science tools in the problems of managerial decision-makings in Industry and Management Consultancies. The modern approach to of teaching management science is clearly to use spreadsheets (MS-Excel). Present day business students and managers live with spreadsheets. Therefore, the course is based on varieties of business cases through MS-Excel add-ins.*

#### ***COURSE OBJECTIVES***

*The objective of the course is to build a comfortable and enjoyable learning environment amongst the business students by solving varieties of business cases through MS-Excel add-ins. Modern spreadsheets add-in software like, SOLVER, Tree-Plan, Sensit, Data Analysis and SOLVER TABLE will be used in the course to model and solve the functional management problems.*

*Management Science concepts including Multiple Criteria Decision Analysis will be used as appropriate to solve various application oriented problems in the management. The course contains the problems in following applications as short cases along with the theoretical concepts. Ms-Excel will be used to model and solve all the case problems.*

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

Management Science concepts including Multiple Criteria Decision Analysis will be used as appropriate to solve various application oriented problems in the management. The course contains the problems in following applications as short but real cases along with the theoretical concepts therein.

Ms-Excel will be used to model and solve all the case problems in the following areas

The session details:

1. Work force Planning in call centres when the call centre requires dealing with multiple languages.
2. Banking Applications – Net Banking
3. Investment Planning
4. Cash Flow management
5. Personal Scheduling in Airlines
6. Corporate Financial Planning
7. Advertising - Media Planning in the web
8. Supply Chain Management
9. Production and Manufacturing
10. Inventory Management
11. Predictive Maintenance planning
12. Product planning and allocation in automobile industries.
13. Oil exploration planning in Oil and Gas Industries
14. Construction projects
15. Management Science in Indian Train Reservation
16. Indian General Election Planning
17. Airport Security Management-with a special reference to WTC
18. Hub Management in Airline Industries
19. Foreign Currency Trading ( currency arbitrage)
20. Multicriteria Decision Making in Marketing Management.

#### **EVALUATION**

- End term exam
- Quizzes/ Assignments

#### **GRADING SCHEME**

End Term Exam	60%
Quizzes/ Assignments	40%

### **3. Text books:**

1. Introduction to Management Science- A modelling and case studies approach F.S. Hillier and M.S. Hillier
2. Practical Management Science , Winston and Albright
3. Essentials of Business Analytic

**4. References:**

*(No limit on numbers, relevant)  
Standard format can be followed, the formats should be similar)*

**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%:**

**Approvals:**

**Other Faculty interested in teaching this course: –**

**Proposed by:**

**School:**

**Signature:**

**Date:**

**Recommended/Not Recommended, with Comments:**

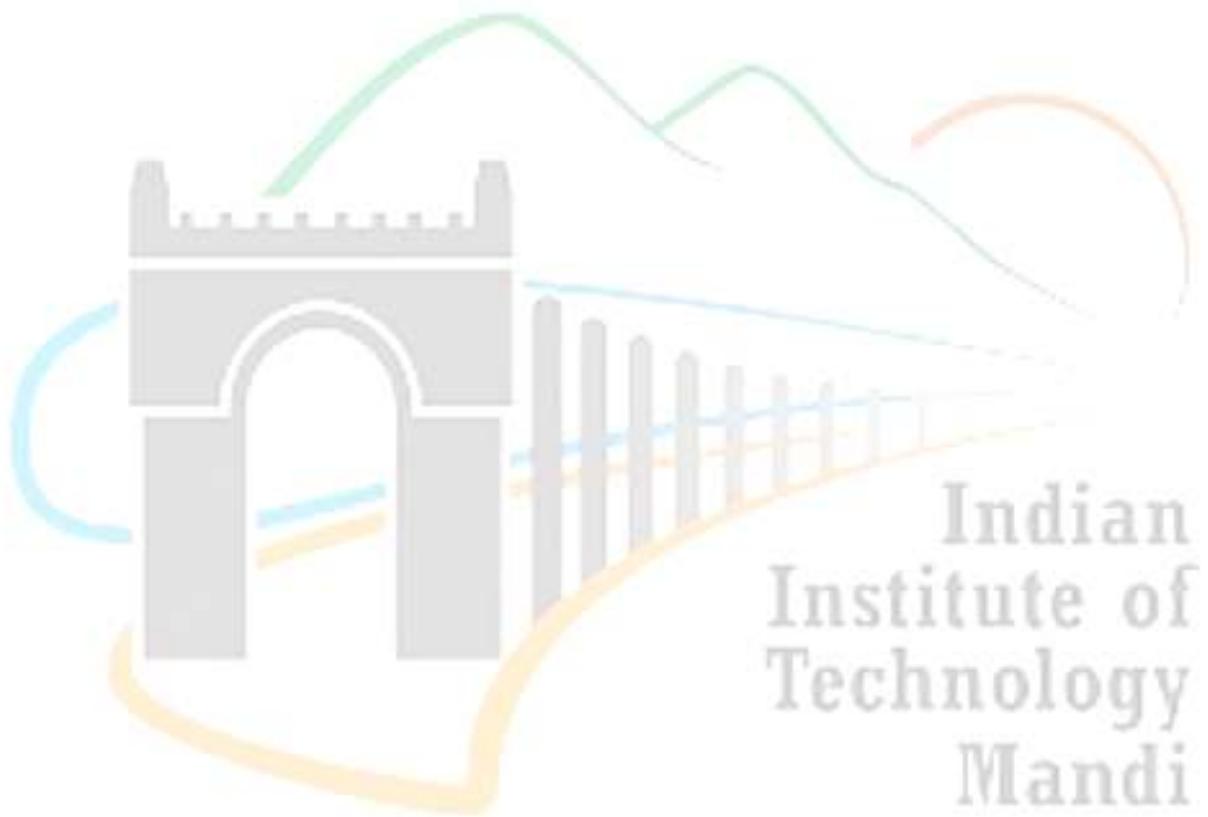
**Date:** \_\_\_\_\_

\_\_\_\_\_  
Chairperson, CPC

*Approved / Not Approved*

Date: \_\_\_\_\_

\_\_\_\_\_  
Chairperson, BoA





## **IIT Mandi**

### **Proposal for a New Course**

**Course number** : MB579  
**Course Name** : Marketing Analytics  
**Credit Distribution** : 2-0-0-2 (L-T-P-C)  
**Intended for** : MBA  
**Prerequisite** : A basic course is Marketing  
**Mutual Exclusion** : None

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#### **1. Preamble:**

This course intends to impart knowledge and skills, and confidence to understand marketing data for improved decision-making. Students will get an opportunity to think like a data scientist, build their problem-solving skills, and discover how to look at data in new ways to deliver business insights and make intelligent data-driven decisions. They will also learn how to clean, explore, and visualize data, implement machine learning algorithms and build models to make predictions. In this course, students will work with relevant datasets that simulate real-world market analysis projects.

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

##### **Unit 1: Marketing Analytics Introduction (5 hours)**

Data Science and Marketing: Technical requirements; Trends in marketing; Applications of data science in marketing; Setting up the Python environment; Setting up the R environment

Data Preparation and Cleaning: Introduction; Data Models and Structured Data; Data Manipulation

Data Exploration and Visualization: Introduction; Identifying and Focusing on the Right Attributes; Fine Tuning Generated Insights; Visualizing Data

##### **Unit 2: Descriptive and Explanatory Analysis (8 Hours)**

Key Performance Indicators and Visualizations: KPIs to measure performances of different marketing efforts Computing and visualizing KPIs using Python; Computing and visualizing KPIs using R

Drivers behind Marketing Engagement: Using regression analysis for explanatory analysis; Regression analysis

Engagement to Conversion: Decision Trees and their interpretation

Segmentation: Approaches to Segmentation; Choosing Relevant Attributes (Segmentation Criteria); K-Means Clustering; Evaluating and Choosing the Best Segmentation Approach

Predicting Customer Revenue Using Linear Regression: Introduction; Regression Problems; Feature Engineering for Regression; Performing and Interpreting Linear Regression

**Unit 3: Product Marketing and visibility (4 Hours)**

Product Analytics; The importance of product analytics; Product analytics using Python; Product analytics using R

Recommending the Right Products: Collaborative filtering and product recommendation; Building a product recommendation algorithm

**Unit 4: Personalized Marketing (8 Hours)**

Exploratory Analysis for Customer Behavior: Customer analytics – understanding customer behavior; Conducting customer analytics, market basket analysis

Predicting the Likelihood of Marketing Engagement: Predictive analytics in marketing; Evaluating classification models; Predicting the likelihood of marketing engagement

Customer Lifetime Value: CLV; Evaluating regression models; Predicting the 3 month CLV

Predicting Customer Churn and retention: Introduction; Classification Problems; Logistic Regression; Creating a Data Science Pipeline, cohort analysis

**Unit 5: Social Media and Text analysis (3 Hours)**

Value to marketing; background, methods; scraping from websites; visualizing text analysis

References:

**Laboratory/practical/tutorial Modules:**

Not Applicable

**3. Text books:**

Yoon Hyup Hwang (2019) Hands-On Data Science for Marketing: Improve your marketing strategies with machine learning using Python and R. Packt Publishing Limited, ISBN-13 : 978-1789346343

**4. References:**

Mirza Rahim Baig, Gururajan Govindan, Vishwesh Ravi Shrimali (2021) Data Science for Marketing Analytics: A practical guide to forming a killer marketing strategy through data analysis with Python, 2nd Edition, Packt Publishing Limited, ISBN-13 : 978-1800560475

Chapman, Chris and Elea McDonnell Feit (2019) R for Marketing Research and Analytics, Springer. ISBN: 978-3030143152

**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.	Marketing Management		10%	

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

Not Applicable

**Approvals:**

**Other Faculty interested in teaching this course: –**

**Proposed by: Dr Saumya Dixit**

**School: School of Management**

**Signature:**

**Date:**

***Recommended/Not Recommended, with Comments:***

\_\_\_\_\_  
**Chairperson, CPC**

**Date:** \_\_\_\_\_

***Approved / Not Approved***

\_\_\_\_\_  
**Chairperson, BoA**

**Date:** \_\_\_\_\_

## Proposal for New Course

<b>Proposal for New Course</b>		
<b>Course Number</b>	:	MB562
<b>Course Name</b>	:	Operations Management
<b>Credits</b>	:	2-0-0-2 (L-T-P-C) <sup>1</sup>
<b>Prerequisites</b>	:	None
<b>Intended for</b>	:	MBA
<b>Distribution</b>	:	Compulsory
<b>Semester</b>	:	Even

### Preamble

Operations is the functional area where the value for the consumer and hence, to the organisation is created. An efficient management of operations is a pre-requisite for competitive positioning. Over a period of time, operations management encompasses manufacturing and service operations. The formal methods and techniques that are used in manufacturing operations can also be used in service operations. This course introduces the fundamental ideas and concepts in operations management. This course also serves as a foundation course for the electives in the second year.

### Objective

- To understand the relevance of operations management in the overall functioning of an organisation.
- To understand the similarities and differences between manufacturing and service operations.
- To introduce tools, techniques and concepts relevant to operations management.
- To demonstrate the relevance of operations management to provide enhanced customer service.

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<sup>1</sup> L= Lectures per week, T=Tutorials per week – P = Practical/Lab session per week – C = Credits for course

<b>Course Modules with Quantitative Lecture Hours</b>		
<b>Module 1</b>	<b>Introduction to Operations Management</b>	<b>(4 hours)</b>
The scope of operations management and decision making, the historical evolution of operations management, process management, interlinkages of organisational strategy and operations management, Product Process matrix.		
<b>Module 2</b>	<b>Case Studies in Operations Management</b>	<b>(8 hours)</b>
Four case studies representing job shop, batch, assembly and process industry will be discussed to sensitize the participants on the uniqueness/challenges associated in managing various types of manufacturing/service facilities. The concepts to be discussed are process time, through-put time, response time, cycle time, capacity, bottleneck facilities, manpower productivity, capacity utilisation, set up time, batch size.		
<b>Module 3</b>	<b>Project Management</b>	<b>(4 hours)</b>
Project lifecycle, PERT and CPM, critical path, behavioural aspects of project management, resource allocation, crashing project cycle time.		
<b>Module 4</b>	<b>Inventory Management</b>	<b>(3 hours)</b>
Economic order quantity and its variations, single period inventory models, continuous review models, periodic review models, safety stock, expected lost sales.		
<b>Module 5</b>	<b>Quality Management</b>	<b>(4 hours)</b>
Foundation of modern quality management, process capability, six sigma, benchmarking, process improvements, control charts, total quality management, house of quality, eight dimensions of quality.		
<b>Module 6</b>	<b>Lean Operations</b>	<b>(3 hours)</b>
Paradigm shift in operations, lean operations, small group activities, kaizen, quality circle, variability reduction, process control, elimination of waste, Toyota production system.		

<b>Module 7</b>	<b>Operations Strategy</b>	<b>(2 hours)</b>
Competing through operations, response time, flexibility, agility, productivity, quality.(case studies)		

<b>Lab Exercises</b> (If applicable):
Not applicable.

<b>Textbooks:</b>	
1.	William J. Stevenson, (2015) <i>Operations Management</i> , McGraw Hill, Indian Edition 12.

## **MB580 AI in Finance**

### **Course Layout:**

Introduction to financial markets and trading instruments. Valuation of fixed income securities and common stocks, introduction to portfolio theory and asset pricing models, cost of capital.

Market efficiency and risk preferences Introduction to portfolio management. Modern portfolio theory. Capital Asset Pricing Model (CAPM) and Factor Models. Portfolio management strategies and performance measures.

Introduction to Algorithmic Trading, technical analysis and trend determination, Dow theory, moving averages, momentum indicators, classical price patterns. AI and machine learning in trading, and portfolio management, regression and classification algorithm applications in security analysis, forecasting, and prediction. Introduction to HFT. Algorithmic trading with Machine Learning and Technical analysis strategies. Advanced time-series regression algorithms, panel regression, quantile regression, ARMA/ARIMA models, mean reverting trading strategies with vector error correction models and cointegration, model risk management, back testing, model validation, and stress testing. Advanced time-series algorithms for financial risk-management, Value-at-risk, Expected Shortfall, coherent risk measures.

### **Books and references**

- 1. Machine Learning in Finance by M. Dixon, I Halperin, and P. Bilokon, Springer, 1st Edition**
- 2. Advances in Financial Machine Learning, Marcos Lopez, Wiley, 1st Edition**
- 3. Machine Learning for Asset Managers, Marcos Lopez, Cambridge University Press, 1st Edition**
- 4. Machine Learning for Algorithmic Trading, Stefan Jansen, 2nd Edition**
- 5. Elton & Gruber, "Modern Portfolio Theory", Wiley, 9th Edition**
- 6. Reilly, Frank,K., "Investment Analysis and Portfolio Management," 5th Edition, Dryden.**

Sl. No.	Semester	Type	Course Code	Course Name	L	T	P	C	L - T - P - C	Remarks	Semesterwise Credits	Credits Completed
<b>First Semester</b>												
1	I	IC	ICxxx	Calculus	1.5	0.5	0	2	1.5-0.5-0-2			
2	I	IC	ICxxx	Complex and Vector Calculus	1.5	0.5	0	2	1.5-0.5-0-2			
3	I	IC	IC140	Engineering Graphics for Design	2	0	3	4	2-0-3-4			
4	I	IC	IC152	Introduction to Python and Data Science	3	0	2	4	3-0-2-4			
5	I	IC	ICXXX	IC Core basket - 1	2.5/3	0.5/0	0	3	2.5-0.5-0-3	<a href="https://cloud.iitmandi.ac.in/f/f7a485930ece4b0fbaa0/">https://cloud.iitmandi.ac.in/f/f7a485930ece4b0fbaa0/</a>		
6	I	HSS	HSXXX	HSS Course	3	0	0	3	3-0-0-3	Preferably English Course for weak students; Other courses may also run		
7	I	IKS	IKS181	Ikshma Course	3	0	0	3	3-0-0-3			
8			ICXXX	Foundations of Design Practicum	1	0	6	4	1-0-6-4	Only one course (FDP/IKS) needs to be taken by students. They may take the other course in the 2nd semester		
										The total credits may be 18 if HSS course is not taken by the student. Accordingly the subsequent number would be changed. The compulsory 12 credits from HSS need to be completed by Sem VI. IKS and FDP may run in both semesters. Half of the batch does one course while the other half of the students do the other course. In the second semester, this will be swapped. Accordingly students may do 18-22 credits	21	21
<b>Second Semester</b>												
1	II	IC	ICxxx	Linear Algebra	1.5	0.5	0	2	1.5-0.5-0-2			
2	II	IC	ICxxx	ODE & Integral Transforms	2.5	0.5	0	3	2.5-0.5-0-2			
3	II	IC	IC161	Applied Electronics	3	0	0	3	3-0-0-3			
4	II	IC	IC 161P	Applied Electronics Lab	0	0	3	2	0-0-3-2			
5	II	IC	IC252	Probability and Statistics	3	0	2	4	3-0-2-4			
6	II	IC	ICXXX	Programming and Data Structures	2.5/3	0.5/0	0	3	2.5-0.5-0-3			
7	II	IC	ICXXX	Foundations of Design Practicum	1	0	6	4	1-0-6-4			
8	II	IC	IC221P	Physics Practicum	3	0	0	3	0-0-3-2			
9	II	IC	IKS	Ikshma courses						IKSHMA course and FDP may swap their batches from 1st year. Total credits may be 20-21 based on the courses	24	45
<b>Third Semester</b>												
1	III	IC	IC272	Machine Learning	3	0	0	3	3-0-0-3			
2	III	DC	CS213	Reverse Engineering	0	0	2	1	0-0-2-1			
3	III	DC	CS208	Mathematical Foundations of Computer Science	3	1	0	4	3-1-0-4			
4	III	DC	CS212	Design of Algorithms	3	0	2	4	3-0-2-4			
5	III	DC	CS214	Computer Organization	3	0	2	4	3-0-2-4			
6	III	HSS	HSXXX	HSS Course	x	x	x	3	x-x-x-3			
										Discipline Core and elective courses may be included as per requirement; please fill the details of the courses here. Machine learning may be offered in 3rd semester, and design practicum may be offered in 4th semester	19	64

Fourth Semester												
1	IV	IC	IC201P	Design Practicum	0	0	6	3	0-0-6-3			
2	IV	DC	CS304	Formal Languages and Automata Theory	3	0	0	3	3-0-0-3			
3	IV	DC	CS309	Information Systems and Databases	3	0	2	4	3-0-2-4			
4	IV	DC	CSXXX	Software Engineering	3	0	2	4	3-0-2-4			
5	IV	DE	DE-1	Discipline Elective-1	3	0	0	3	3-0-0-3			
										17	81	
Fifth Semester												
1	V	DC	CS312	Operating Systems	3	0	2	4	3-0-2-4			
2	V	DC	CS313	Computer Networks	3	0	2	4	3-0-2-4			
3	V	DC	CSXXX	Artificial Intelligence	3	0	0	3	3-0-0-3			
4	V	DE	DE-2	Discipline Elective-2	x	x	x	4	x-x-x-4			
5	V	FE	FE-1	Free Elective-1	x	x	x	4	x-x-x-3			
										19	100	
Sixth Semester												
1	VI	DC	CS302	Paradigms of Programming	3	0	2	4	3-0-2-4			
2	VI	DE	DE-3	Discipline Elective-3	x	x	x	4	x-x-x-4			
3	VI	DE	DE-4	Discipline Elective-4	x	x	x	4	x-x-x-4			
4	VI	FE	FE-2	Free Elective-2	x	x	x	3	x-x-x-4			
5	VI	FE	FE-3	Free Elective-3	x	x	x	3	x-x-x-4			
	VI	ISTP	ISTP	ISTP/Free elective	x	x	x	4	x-x-x-4	All core courses need to be completed by 6th semester. If the discipline core courses are completed by 5th semesters, the students may go for semester internship, without much issues of completing the core courses	22	122
Seventh Semester												
1	VI/VII	IC	IC010	Internship	x	x	x	2	x-x-x-2	Internship needs to be completed before start of 8th semester. The grades for the internship may be added to 8th semester grades.		
1	VII	DE	DE-5	Discipline Elective-5	x	x	x	4	x-x-x-4			
2	VII	DE	DE-6	Discipline Elective-6	x	x	x	4	x-x-x-4			
3	VII	FE	FE-4	Free Elective-4	x	x	x	4	x-x-x-4			
4	VII	FE	FE-5	Free Elective-5	x	x	x	4	x-x-x-4			
5	VII	MTP-1	MTP-1	MTP-1	x	x	x	3	x-x-x-3			
										21	143	
Eighth Semester												
1	VIII	DE	DE-7	Discipline Elective-7	x	x	x	4	x-x-x-4			
2	VIII	DE	DE-8	Discipline Elective-8	x	x	x	4	x-x-x-4			
3	VIII	FE	FE-6	Free Elective-6	x	x	x	4	x-x-x-4			
5	VIII	MTP 2	MTP-2	MTP-2	x	x	x	5	x-x-x-5			
										17	160	
										<p>If 3 credits HSS is done in Sem I then only one 3 credits needs to be done in either Se V or Sem VI. Hence the total HSS credits would be 12 and Overall Credits would be 160.</p>		

Program:

		List of Discipline Electives/Electives							
Sl. No	Course Code	Course Name	L	T	P	Cr	L-T-P-C	Remarks	
1	CS303	Software Engineering		2	0	2	3	2-0-2-3	
2	CS451	Computer Graphics and Game Design		2	0	2	3	2-0-2-3	
3	CS456	Distributed Databases		3	0	0	3	3-0-0-3	
4	CS507	Computer Architecture		3	0	2	4	3-0-2-4	
5	CS508	Introduction to Heterogeneous Computing		2	0	0	2	2-0-0-2	
6	CS514	Data Structures and Algorithms-II		3	0	2	4	3-0-2-4	
7	CS522	Distributed Algorithms		3	0	0	3	3-0-0-3	
8	CS523	Verification of Reactive Systems		3	0	0	3	3-0-0-3	
9	CS541P	IoT Systems and the Cloud		3	0	2	4	3-0-2-4	
10	CS542	Design patterns for scalable systems							
11	CS544	Formal Concept Analysis: Theory and Practice		2	0	2	3	2-0-2-3	
12	CS545	Software Design Pattern		3	0	0	3	3-0-0-3	
13	CS546	Design of Concurrent Software		3	0	0	3	3-0-0-3	
14	CS549	Performance analysis of computer networks		3	0	0	3	3-0-0-3	
15	CS550	Computer Graphics and Geometric Design		2	0	2	3	2-0-2-3	
16	CS561	Map Reduce and Big Data		3	0	0	3	3-0-0-3	
17	CS563	Scalable Data Science		3	1	0	4	3-1-0-4	
18	CS606	Computational Modeling of Social Systems		3	0	0	3	3-0-0-3	
19	CS609	Speech Processing		3	0	2	4	3-0-2-4	
20	CS611	Program Analysis		3	1	0	4	3-1-0-4	
21	CS660	Data Mining for Decision Making		3	0	0	3	3-0-0-3	
22	CS662	Mobile Virtual Reality and Artificial Intelligence		3	0	0	3	3-0-0-3	
23	CS669	Pattern Recognition		3	1	0	4	3-1-0-4	
24	CS670	Kernel Methods for Pattern Recognition		4	0	0	4	4-0-0-4	
25	CS671	Deep Learning and Applications		3	0	1	4	3-0-1-4	
26	DS201	Data handling and visualization		2	0	2	3	2-0-2-3	
27	DS301	Mathematical Foundation of Data Science		3	1	0	4	3-1-0-4	
28	DS303	Statistical Foundations of Data Science		3	0	0	3	3-0-0-3	
29	DS401	Optimization for Data Science		3	0	0	3	3-0-0-3	
30	DS403	Introduction to Statistical Learning		3	0	2	3	3-0-2-3	

This Discipline Electives list will be maintained by Academics Office. Elective courses are not allowed to delete. The addition of courses is permitted. This list may be modified during the time of next curriculum revision. UG students may preferably be allowed to take upto 5 level courses as Discipline Courses. 6 level courses may be offered as free electives.

Semester	DC	DE	DC + DE
III	13	0	13
IV	11	3	14
V	11	4	15
VI	4	8	12
VII	0	8	8
VIII	0	8	8
Total	39	31	70

Symbol	Course Type	Credits
DC	Discipline core	39
DE	Discipline elective	31
FE	Free elective	18
HSS	Humanities and Social Science Course	12
IC	Institute Core	45
IKS	Indian knowledge system	3
ISTP	Interactive Socio-Technical Practicum	4
MTP 1	Major Technical project 1	3
MTP 2	Major Technical project 2	5
		160

Including the baskets



Acad Office &lt;acadoa1@iitmandi.ac.in&gt;

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**Fwd: Minor in intelligent systems**

1 message

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**Padmanabhan Rajan** <padman@iitmandi.ac.in>  
To: Sonia Gupta <acadoa1@iitmandi.ac.in>

Fri, Dec 15, 2023 at 2:48 PM

----- Forwarded message -----

From: **Jinesh Machchhar** <jinesh@iitmandi.ac.in>  
Date: Thu, Sep 21, 2023 at 12:55 PM  
Subject: Fwd: Minor in intelligent systems  
To: Padmanabhan Rajan <padman@iitmandi.ac.in>

Hi Paddy,

The following change need to be made to the list of courses for minor in Intelligent Systems:

1. Remove "CS669" from the list.
2. Add "DS403 Introduction to Statistical Learning" to the list.

This needs to be approved in the **BOA meeting**. It has been discussed amongst our colleagues. (see the trailing email).Regs  
Jinesh

----- Forwarded message -----

From: **Dileep A. D** <addileep@iitmandi.ac.in>  
Date: Mon, Jul 31, 2023 at 3:54 PM  
Subject: Re: Minor in intelligent systems  
To: Jinesh Machchhar <jinesh@iitmandi.ac.in>  
Cc: SCEE\_fac <scee@iitmandi.ac.in>, chairscee <chairscee@iitmandi.ac.in>, Padmanabhan Rajan <padman@iitmandi.ac.in>

Please go ahead.

On Mon, 31 Jul 2023, 3:44 pm Jinesh Machchhar, &lt;jinesh@iitmandi.ac.in&gt; wrote:

Hello Folks,

CS669 is listed as one of the courses for minor in Intelligent Systems. However CS669 is only open to PG students. In view of this CS669 is to be replaced with "DS403 Introduction to statistical learning".

Let me know if you have any comments in this regards by tomorrow.

Regs  
Jinesh

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Padmanabhan Rajan  
School of Computing and Electrical Engineering  
Indian Institute of Technology Mandi  
Himachal Pradesh, India.  
Office: A17-03-12, North Campus  
<http://faculty.iitmandi.ac.in/~padman/>

# Proposal for making Independent Study Course for Credits for Graduate Students

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Committee: Prof. Anil Kishan (Chair), Prof. Arnav Bhavsar (Member), and Prof. Varun Dutt (Member)



# Independent Study Course at IIT Mandi

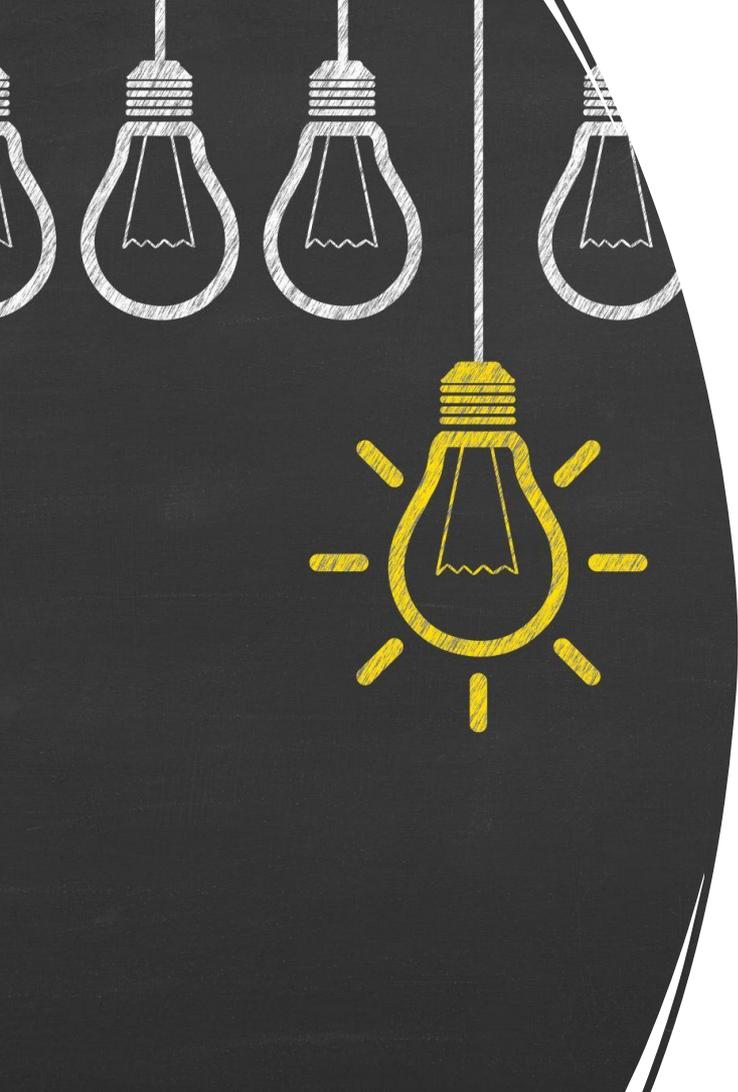
- Credit-based independent study course.
- Facilitates self-learning, supervised by faculty.
- Detailed proposal and approval process.
- Open to B.Tech./Dual Degree, M.A./M.Sc./M.Tech. students.
- M.S. or Ph.D. students can take it, but credits aren't counted towards minimum coursework.



# Proposed Change: Extending Credits to Graduate Students

- Proposal to allow Master by Research and Ph.D. students to take the independent study course for credits.
- This will be in addition to their existing curriculum and count towards minimum course work requirements.
- Proposal to introduce a graded evaluation, moving away from the current PASS/FAIL system for these graduate students.





# Rationale

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- The rise of new Centres such as IKSMHA, CAIR, and HCI without ample core faculty and courses.
- Graduate students find value in undertaking specialized topics under the guidance of faculty members.
- Enabling credits and grades provide an incentive and formal recognition of student's sincere efforts.

# Benefits

- Enhances the academic depth for graduate students.
- Facilitates interdisciplinary learning.
- Provides a solution to the challenge of fewer courses in new centers.





## IIT Mandi

**Course number** : PH6XX 625  
**Course Name** : Data Analysis in Particle Physics  
**Credit Distribution** : 2-0-4-4  
**Intended for** : UG/PG/I-PhD/PhD elective  
**Prerequisite** : PH621 (Computational Methods for Physicists), PH612 (Nuclear and Particle Physics)  
**Mutual Exclusion** : None

### 1. Preamble:

The objective of the proposed course is to introduce students to one of the most advanced computing methods for data analysis. This course will start with the basic ideas of numerical computing using C++ followed by various numerical techniques in the ROOT. ROOT is a framework for data processing and mining, born at CERN, at the heart of the research on high-energy physics which can be used in any field including Astro physics, Neuroscience etc.. In ROOT powerful mathematical and statistical tools are provided to operate on your data. The full power of a C++ application and of parallel processing is available for any kind of data manipulation. Data can also be generated following any statistical distribution and models, making it possible to simulate complex systems. From this course, students learn how to connect real world physics with experiments and interpretation of physical phenomena using data analysis. Students will have hands-on experience with the latest studies from the Large Hadron Collider at CERN and the discovery of Standard Model particles as well as beyond Standard model search.

**Course Outline:** The course will cover the basic ideas of data processing, handling and mining with various numerical techniques for physics analysis in ROOT framework developed by CERN. Starting from basic C and C++ computing this course aims to develop the skills of applying powerful mathematical and statistical tools provided in ROOT on data for advanced computing. Will also cover the idea of Monte Carlo simulation and complex systems simulation using statistical distributions.

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

#### (a). Data in Experiments, Particle Physics [4 hours]

- i. Brief overview of experiments in High Energy Physics. RHIC & CERN experiments.
- ii. Data from Experiments: Pulse processing, Timing and energy resolution, Tracking, Particle Identification (PID).
- iii. Analysis Methods: Acceptance, Efficiency, Error Calculations, Observable quantities.
- iv. Data Structure/Type/Format and algorithms from experiments and handling.

#### (b). Recalls [10 hours]

- i. Brief Overview of C++: Program Organization and Control Structures loops, arrays, and function, Error, Accuracy, and Stability. Transition from C to C++.
- ii. Brief Overview of numerical analysis in C++: Curve Fitting, ROOT finding, Integration and differentiation, Interpolation and Extrapolation

**(c). ROOT Framework and Familiarities [in root/pyroot/rootpy] [15 hours]**

- i. Introduction to ROOT: Is an object-oriented programming framework based on C++ developed by CERN. Originally designed for particle physics, but it is used in other applications such as astronomy and data mining. ROOT has capability to work in any field and potential to scale globally.
- ii. ROOT installation: ROOT is available on Linux, Mac, and (as a beta release) on Windows. The latest stable ROOT release is updated.
- iii. ROOT preliminaries:
- iv. Mathematical foundation, input, output, functions
- v. Histograms handling: Writing and reading: Basic, Binning, Statistical analysis: 1D, 2D, 3D
- vi. Tree handling: Writing and reading of the key feature of root
- vii. Libraries and useful tools
- viii. Fitting data: Formulas, Reading data, Writing data, TFI functions, Fittings.

**(d). Visualization in ROOT [in root/pyroot/rootpy] [10 hours]**

- i. Histograms: 1D, 2D, 3D and asymmetric binning
- ii. Trees, TProfiles, TBrowser
- iii. Graph Plotting: TCanvas, TGraph, TGraphError, Graphs with asymmetric error.
- iv. Markers and legends
- v. Histograms fittings with functions

**(e). Statistical analysis and Error methods [7 hours]**

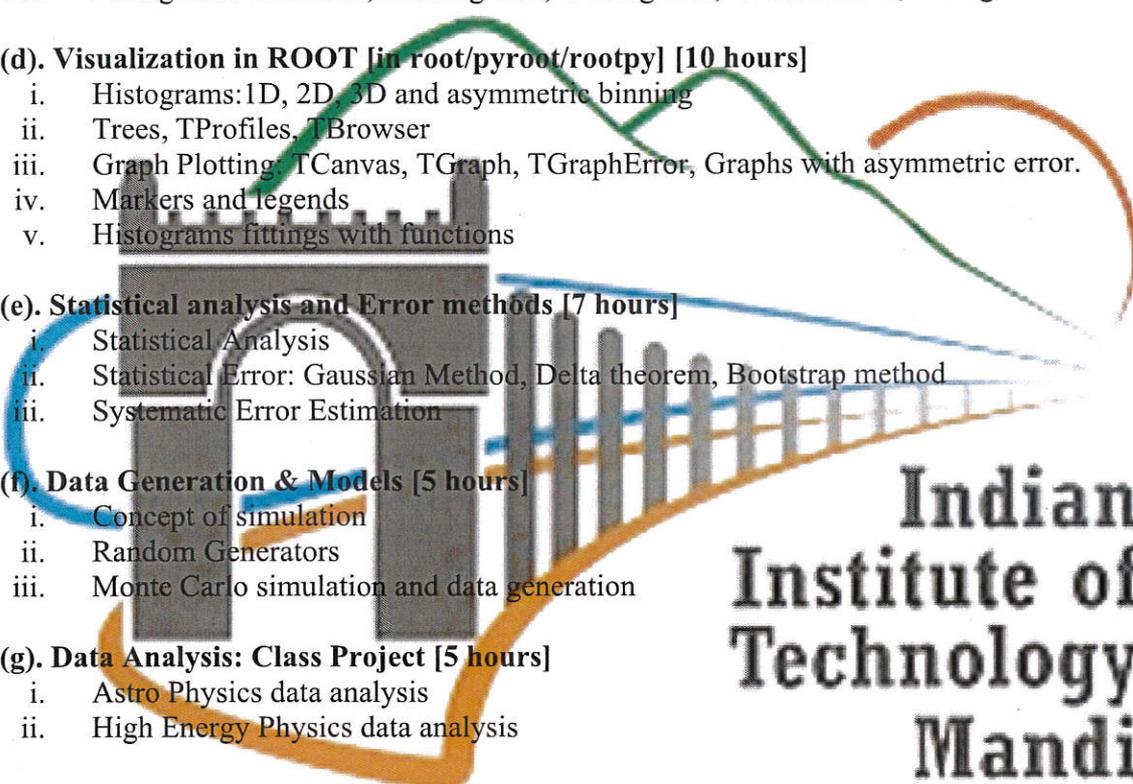
- i. Statistical Analysis
- ii. Statistical Error: Gaussian Method, Delta theorem, Bootstrap method
- iii. Systematic Error Estimation

**(f). Data Generation & Models [5 hours]**

- i. Concept of simulation
- ii. Random Generators
- iii. Monte Carlo simulation and data generation

**(g). Data Analysis: Class Project [5 hours]**

- i. Astro Physics data analysis
- ii. High Energy Physics data analysis



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**3. Text books:**

1. Let Us C: Authentic guide to C programming language Yashavant Kanetkar
2. Let Us C++ by Yashavant Kanetkar
3. <https://ROOT.cern/manual/>
4. Introduction to Elementary Particles by David J. Griffiths
5. Techniques for Nuclear and Particle Physics Experiments by William R. Leo
6. Statistical Methods in Experimental Physics by Fred James

**4. References:**

1. Let Us C++ Solutions by Yashavant Kanetkar
2. ROOT.cern.ch

- 3. cern.ch
- 4. rhic.bnl.gov

**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.	PH621	4 hrs	8%
2.	CS571	2 hrs	4%

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

NA

**Approvals:**

**Other Faculty interested in teaching this course: Dr. Prabhakar Palni**

**Proposed by: Dr. Amal Sarkar**

**School: School of Physical Sciences**

**Signature:**

**Date:**

*Recommended/Not Recommended, with Comments:*

**Date:**

**Chairperson, CPC**

*Approved / Not Approved*

**Chairperson, BoA**

**Date:**

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Technology  
Mandi**



Gargee Sharma &lt;gargee@iitmandi.ac.in&gt;

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## Request to review two proposed courses

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Mohamed Rameez &lt;mohamed.rameez@tifr.res.in&gt;

Mon, Jul 3, 2023 at  
2:44 PM

To: G S &lt;girish@iitmandi.ac.in&gt;

Dear Prof. Sharma

On the elementary particle physics course, my only suggestion would be to either change the name of the course to elementary theoretical particle physics, or add a module (~three lectures) about measurements in particle physics. Calorimetry for particle physics, as well as a historical and empirical treatment of how the SM came to be, would be nice. I can send you some references for this if you agree (also the pdf you sent me has strong watermarks obscuring my ability to read much of the material).

On the data analysis for particle physics course, I would request that the c) and d) be made not ROOT exclusive but also python/matplotlib dependent. There are packages such as pyroot and rootpy which bridge the gap, and I think students should be given a non platform dependent understanding of these. I would also suggest that e) be designed in such a way that all statistical problems are presented separately from both frequentist and Bayesian povs so students can see why that's important. I would recommend the textbook by Fred James ( <https://www.amazon.com/Statistical-Methods-Experimental-Physics-2Nd/dp/9812705279> ) for these purposes and can suggest more details if you like.

If you think these comments make sense, I'd be glad to help you find more resources to put that in the curriculum.

Thanks and Regards

Rameez

[Quoted text hidden]



Gargee Sharma <gargee@iitmandi.ac.in>

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## Request to review two proposed courses

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Amal Sarkar <amal@iitmandi.ac.in>

Mon, Aug 21, 2023 at 12:43 PM

To: Gargee Sharma <gargee@iitmandi.ac.in>

Cc: Prabhakar Palni <prabhakar@iitmandi.ac.in>, Chairperson SPS  
<chairsp@iitmandi.ac.in>

Dear Gargee,

Thank you for the expert's report. Also thanks to the expert for reviewing the proposed courses.

Although I have not mentioned it explicitly, I have plans for giving the option of following the course in pyroot and/or rootpy to the students as most of the students are learning Python these days. Including the Bayesian method would need at least 10hrs [4 theory, 2 labs] extra classes. This course is already a bit heavy and the class hours are already squeezed. A 5 credit elective course will be difficult to get approved. Due to the time and other constraints, I would not recommend including the Bayesian method right at this moment.

I also strongly believe the Bayesian method and its applications should be included in basic statistical courses [if already not there]. Please find the updated draft attached to this email [added suggestions from the referee and SPS]

Thanks & regards,

Amal

[Quoted text hidden]

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Thanks & Regards,

Dr. Amal Sarkar

Assistant Professor

School of Physical Science

Indian Institute of Technology Mandi

Kamand, Himachal Pradesh, India - 175005

Website: [https://sps.iitmandi.ac.in/faculty\\_personal.php?id=16](https://sps.iitmandi.ac.in/faculty_personal.php?id=16)



Data\_Analysis\_Particle\_Physics.pdf

407K

# IIT Mandi

## Proposal for a New Course

<b>Course number</b>	<b>: PH626</b>
<b>Course Name</b>	<b>: Elementary Theoretical Particle Physics</b>
<b>Credit</b>	<b>: 3</b>
<b>Distribution</b>	<b>: 3-0-0-3</b>
<b>Intended for</b>	<b>: UG/PG/I-PhD/PhD</b>
<b>Prerequisite</b>	<b>: PH612 (Nuclear and Particle Physics), PH301/PH513 (Quantum Mechanics)</b>

**Mutual Exclusion:** None

### **1. Preamble:**

Our visible universe is made up of elementary particles. In this course student will study the different types of elementary particles like quarks and leptons that exist in nature and how they interact with each other via three fundamental forces such as weak, electromagnetic and strong interactions via the exchange of boson. Student will learn Feynman diagrams and rules and how to calculate cross-section for QED, QCD and Weak processes. Moreover, student will gain understanding of Lagrangian formulation and local gauge invariance, spontaneous symmetry-breaking and Higgs mechanism. The course will also includes important results from research at the LHC including the discovery and study of the Higgs boson.

### **2. Course Modules with quantitative lecture**

#### **(a) Feynman Calculus: (6 hours)**

Decays, scattering and cross-sections, Mandelstem variables, Fermi Golden rule, Golden rule for two particle decays and scattering of particles, two-body scattering in the COM frame. Feynman rules and diagrams for a toy theory.

#### **(b) Quantum Electrodynamics: (10 hours)**

Dirac equation, solutions to the Dirac equation, and bilinear covariants, photon, Feynman rules for QED and examples, Casimir's Trick, cross-sections and lifetimes, and renormalization, hadron production in  $e^+e^-$  collisions, elastic electron-proton scattering.

#### **(c) Quantum Chromodynamics: (8 hours)**

Feynman rules for Chromodynamics, Color factors, quark and antiquark, Pair annihilation in QCD, asymptotic freedom.

#### **(d) Weak Interactions: (10 hours)**

Charged leptonic weak Interactions, decay of muon, neutron, and pion, charged weak interactions of quarks, neutral weak interactions, Electroweak unification and chiral fermion states, Weak isospin and hypercharge, Electroweak mixing.

**(e) Gauge Theories: (8 hours)**

Lagrangian formulation of classical particle mechanics and Lagrangians in relativistic field theory, Local gauge invariance and Yang-Mills Theory, Chromodynamics, Feynman rules and Mass term Spontaneous symmetry-breaking, Higgs Mechanism.

**Laboratory/practical/tutorial Modules:**

Not Applicable

**3. Text books:**

1. David Griffiths, Introduction to Elementary Particles, 2nd edition, Wiley (2008)
2. F. Halzen and A. D. Martin, Quarks and Leptons, 1st edition, John Wiley (2016)

**4. References:**

1. M. Thomson, Modern Particle Physics, 1st edition, Cambridge University Press India (2016)
2. M. E. Peskin, An Introduction to Quantum Field Theory, 1st edition, Westview Press (1995)
3. D. H. Perkins, Introduction to High Energy Physics, 4th edition, Cambridge (2000)

**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.		<b>PH612</b>	4 hrs	10%

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

Not Applicable

**Approvals:**

**Faculty interested in teaching this course: Dr. Prabhakar Palni**

**Proposed by: Dr. Prabhakar Palni**

**School: School of Physical Sciences**

**Signature:**

**Date: 24/11/2023**

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

Sl. No	Faculty Name	Signature
1.	Mohammed Rameez (TIFR)	
2.	Shilpi Jain (TIFR)	

School Chair: Suman Kalyan Pal

School: SPS

Date:

This proposal is reported in 52<sup>nd</sup> Board of Academics on 2 Nov 2023

Dean Academics

Date:

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

**Comments of the Reviewers:**

**Mohamed Rameez :** “On the elementary particle physics course, my only suggestion would be to either change the name of the course to elementary theoretical particle physics, or add a module (~three lectures) about measurements in particle physics”.

**IIT Mandi**  
**Proposal for a New Course**

<b>Course number</b>	<b>: PH627</b>
<b>Course Name</b>	<b>: Topological Quantum Matter</b>
<b>Credit</b>	<b>: 3</b>
<b>Distribution</b>	<b>: 3-0-0-3</b>
<b>Intended for</b>	<b>: UG/PG/I-PhD/PhD</b>
<b>Prerequisite</b>	<b>: PH513, PH523</b>

**Mutual Exclusion:** None

**1. Preamble:** This course dwells into the foundations of topological condensed matter physics, where topology, a branch of mathematics concerned with spatial properties, becomes a powerful tool to describe and predict the behavior of materials. The course will discuss some novel exotic materials, such as topological insulators and superconductors, where electrons cooperate in ways that defies classical intuition. The underlying theme will be the intricate connection between topology and quantum mechanics, revealing how the arrangement of electrons in solids can give rise to phenomena like protected edge states and quantized conductance.

**2. Course Modules with quantitative lecture**

**(a) The basics [4 hrs]**

Potentials in quantum mechanics, Aharonov-Bohm effect, Monopoles in physics, Berry phase.

**(b) Symmetries [6 hrs]**

Time-reversal symmetry (TRS) in classical and quantum mechanics, TRS operator, Kramer's degeneracy, Symmetries in momentum space, Inversion symmetry, particle-hole symmetry, ten-fold classification.

**(c) 1D Lattice models [6 hrs]**

Lattice models and band in momentum space, Peierl's instability, Su-Schrieffer-Heeger model, Berry phase effect on dynamics, topological index, charge fractionalization.

**(d) Quantum Hall Effect [6 hrs]**

Kubo formula and TKNN invariant, quantization of Hall conductance, QHE in 2DEG, Landau levels, QHE in graphene.

**(e) Topological insulators [6 hrs]**

Graphene, Dirac points, topological insulators, , Anomalous Hall Effect, BHZ model, edge states of BHZ model. Kane-Mele model, Z<sub>2</sub> invariant, 3D topological insulators, strong and weak TI.

**(f) Topological metals [5 hrs]**

Accidental degeneracies, Weyl and Dirac fermions, symmetry analysis, chiral anomaly, anomalous Hall effect, Fermi arcs, Weyl semimetals, Dirac semimetals.

**(g) Majorana fermions [5 hrs]**

Topological superconductivity, Majorana fermions, Majorana modes in chiral p-wave superconductors, Majorana modes in Rashba spin-orbit coupled semiconductors, detection of Majorana fermions.

**(h) Miscellaneous Topics [4 hrs]**

Quantum Spin Liquid, RVB, Kitaev model, spin fractionalization. Materials research, experimental realization of several topological phases in TIs and topological metals. Electronic structure theory aspect of topological phases.

**Laboratory/practical/tutorial Modules:**

Not Applicable

**3. Text books:**

1. Topological Insulators and Topological Superconductors B. Andrei Bernevig, Taylor L. Hughes Princeton Univ Press 2013

2. Topological Insulators: Dirac Equation in Condensed Matter Shun-Qing Shen Springer Berlin 2012

**4. References:**

1. Topological Insulators- A review by R. Shankar <https://arxiv.org/pdf/1804.06471.pdf>

2. Topological Insulators M. Z. Hasan, C. L. Kane <https://arxiv.org/pdf/1002.3895.pdf>

3. Topological insulators and superconductors Xiao-Liang Qi and Shou-Cheng Zhang <https://arxiv.org/pdf/1008.2026.pdf>

4. Weyl and Dirac Semimetals in Three-Dimensional Solids N.P. Armitage, E. J. Mele, Ashvin Vishwanath <https://arxiv.org/pdf/1705.01111.pdf>

5. Berry Phases in Electronic Structure Theory David Vanderbilt Cambridge Univ Press 2018

**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.	PH613	QM symmetries	3%
2.	PH601	QM Hall conductance	3%
3.	PH601	Aharonov Bohm effect	2%

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

Not Applicable.

**Approvals:**

**Faculty interested in teaching this course: Gargee Sharma**

**Proposed by: Gargee Sharma**

**School: School of Physical Sciences**

**Signature:**

**Date: 14/12/2023**

The following faculty (at least 3 faculty) discussed on Sep 4, 2023 and approved the proposal on Sep 4, 2023.

Sl. No	Faculty Name	Signature
1.	Pradeep Kumar (SPS)	
2.	CS Yadav	
3.	Ajay Soni	

School Chair: Suman Kalyan Pal

School: SPS

Date:

This proposal is reported in 52<sup>nd</sup> Board of Academics on Nov 2, 2023.

Dean Academics

Date:

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

# Semester-Wise Curriculum

1 <sup>st</sup> and 2 <sup>nd</sup> Year (Total Credit: 84)			
Semester-I		Semester-II	
• Math-I: Calculus (IC)	2	• Math-III: Linear Algebra (IC)	2
• Math-II: Complex Variable and Vector Calculus (IC)	2	• Math-IV: ODE & Integral Transform (IC)	2
• Engineering Graphics (IC)	4	• Applied Electronics (IC)	3
• Introduction to Python and Data Science (IC)	4	• Applied Electronics Lab (IC)	2
• IC-I Basket (IC131 Chemistry Compulsion)	3	• Probability and Statistics (IC)	4
• HSS Course (HSS, Basket)	3	• IC-II Basket (IC121 Physics Compulsion)	3
• IKSMHA (IKS)	3	• Foundations of Design Practicum (IC)	4
		• Physics Practicum (IC)	2
	<b>21</b>		<b>22</b>
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
	<b>20</b>		<b>21</b>

## Proposed Courses (2, 3, and 4 Levels)

Course Code	Course Title	L-T-P-C
CY-3XX	Principles and Theories of Physical Chemistry	3-0-0-3
CY-4XX	Introduction to Quantum Chemistry & Molecular Spectroscopy	3-0-0-3
CY-2XX	Physical Chemistry Laboratory	0-0-4-2
CY-3XX	Principles of Organic Chemistry	3-0-0-3
CY-2XX	Organic Chemistry Laboratory	0-0-4-2
CY-3XX	Fundamentals of Inorganic Chemistry	3-0-0-3
CY-2XX	Inorganic Chemistry Laboratory	0-0-4-2
CY-3XX	Basic Analytical Chemistry	3-0-0-3
CY-4XX	Applied Materials Chemistry	3-0-0-3
CY-4XX	Numerical Methods and Data Analysis in Chemistry	3-0-0-3



## **IIT Mandi** **Proposal for a New Course**

<b>Course number</b>	<b>: CYXXX</b>
<b>Course Name</b>	<b>: Principles and Theories of Physical Chemistry</b>
<b>Credit Distribution</b>	<b>: 3-0-0-3</b>
<b>Intended for</b>	<b>: BS Chemical Sciences</b>
<b>Prerequisite</b>	<b>: None</b>
<b>Mutual Exclusion</b>	<b>: None</b>

---

### **1. Preamble:**

This course deals with fundamental concepts of physical chemistry involving properties of gases, viscosity and surface tension, chemical kinetics, thermodynamics, and conductance. This is foundation course for all students interested in Chemistry and the concepts taught here would be required for most of the advanced and specialized courses in Chemistry.

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

#### **Unit 1: Gaseous State and Fluids (12 Lectures)**

Gas laws, distribution of molecular speeds, kinetic energy distribution, molar heat capacity of gases, virial expressions, collision of gas molecules and mean free path. Viscosity of fluids, viscosity coefficient, temperature dependence of viscosity, surface tension of liquids, capillary rise, measurement of surface tension, temperature dependence of surface tension.

#### **Unit 2: Concepts of Thermodynamics (12 Lectures)**

Equilibrium and concept of temperature, the zeroth-law of thermodynamics, first law of thermodynamics, state and path functions, extensive and intensive properties, equation of state, work, heat, internal energy, heat capacity and concept of enthalpy, second law of thermodynamics, reversible and irreversible process, heat engines, Carnot cycle, concept of entropy, free energy, criteria for equilibrium and stability, third law of thermodynamics, concept of the absolute zero temperature and Nernst heat theorem.

### Unit 3: Chemical Kinetics and Photochemistry (12 Lectures)

Rate laws and rate constants, order and molecularity of reactions, determination of order, kinetics of zero-, first- and second-order reactions, parallel, reversible and consecutive reactions, rate-determining and steady-state approximation, temperature dependence of rate constant, potential energy surface, Frank-Condon principle, decay of excited states, fluorescence and phosphorescence, Jablonsky diagram, laws of photochemistry, quantum yield.

### Unit 4: Conductance and Electrochemistry (6 Lectures)

Mechanism of electrolysis and Faraday's law, strong and weak electrolytes, conductance, electrolytic conductance, ionic conductance, conductometric titration, estimation of solubility product. Types of electrochemical cells, cell reactions, EMF and change thermodynamics properties, Nernst equation, standard cells, half-cells/electrodes.

#### Textbooks:

- *Physical Chemistry, Peter Atkins, Julio de Paula, James Keeler, Oxford University Press (2018).*
- *Physical Chemistry: A molecular approach, Donald A. McQuarrie & John D. Simons, Indian Reprint, Viva books (2019).*

#### 3. References:

- *Physical Chemistry, Ira N. Levine, McGraw Hill Book Co. (2008).*
- *Physical Chemistry, G. W. Castellan, Narosa Publications. (2004).*

#### 4. Similarity with the existing courses:

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

S. No.		Course Code	Similarity Content	Approx. % of Content
1.	NA	CY513, CY514	15%	

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

NA

**Approvals:**

**Other Faculty interested in teaching this course: –**

**Proposed by: B. Mondal and C. K. Nandi**

**School: Chemical Sciences**

**Signature:**

**Date: 22.12.2022**

***Recommended/Not Recommended, with Comments:***

**Date: \_\_\_\_\_**

**Chairperson, CPC**

***Approved / Not Approved***

**Date: \_\_\_\_\_**

**Chairperson, BoA**

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## **IIT Mandi** **Proposal for a New Course**

**Course number** : CYXXX  
**Course Name** : Introduction to Quantum Chemistry & Molecular Spectroscopy  
**Credit Distribution** : 3-0-0-3  
**Intended for** : BS Chemical Sciences  
**Prerequisite** : None  
**Mutual Exclusion** : None

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### **1. Preamble:**

This is an introductory course and must for all areas of chemistry. This course aims to provide molecular level understanding of fundamental chemistry. It includes topic from spectroscopy, reaction dynamics, thermodynamics, molecular structure, and dynamics.

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

#### **Unit 1: 20 Lectures**

Introduction to Schrödinger equation, Bohr's atom, De Broglie's Wave, wave-particle duality, Light-atom/molecule interaction, Introduction to optical spectroscopy, time-independent Schrodinger equation, Particle in a box, Quantum Mechanics of Hydrogen Atom.

#### **Unit 2: 14 Lectures**

Heisenberg's Uncertainty Relation, Operators, Commutators, Eigenvalues and Eigenvectors, absorption and emission spectra, Boltzmann Energy distribution, Principle of equipartition of energy Einstein's Semiclassical model, Born Oppenheimer Approximation, Beer-Lambert Law.

#### **Unit 3: 8 Lectures**

Diatomic Vibrational Spectra: Harmonic Model, Morse Oscillator Model, Molecular Vibrations in Polyatomic Molecules, Diatomic rotational spectra, rotation of polyatomic molecules, electronic absorption, and emission spectra.

### 3. Textbooks:

*Physical Chemistry, Peter Atkins, Julio de Paula, James Keeler, Oxford University Press (2018).*

### 4. References:

*Quantum Chemistry & Spectroscopy, Thomas Engel, Pearson, 3rd edition (2015).*

*Physical Chemistry: A molecular approach, Donald A. McQuarrie & John D. Simons, Indian Reprint, Viva books (2019).*

### 5. Similarity with the existing courses:

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

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

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

NA

Approvals:

Other Faculty interested in teaching this course: –

Proposed by: **A. Chakraborty**

School: **Chemical Sciences**

Signature:

Date: **25.11.2022**

*Recommended/Not Recommended, with Comments:*

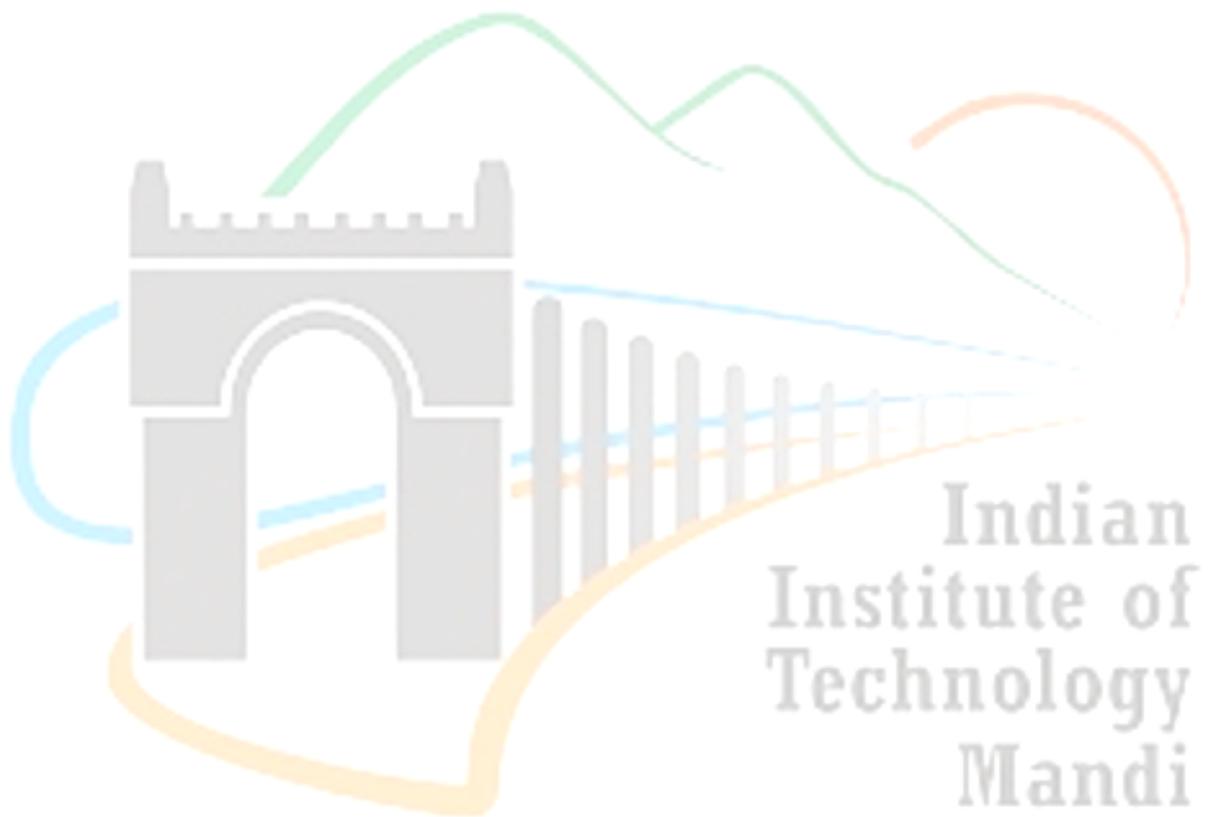
\_\_\_\_\_  
Chairperson, CPC

Date: \_\_\_\_\_

*Approved / Not Approved*

Date: \_\_\_\_\_

\_\_\_\_\_  
Chairperson, BoA





## **IIT Mandi** **Proposal for a New Course**

**Course number** : CYXXX  
**Course Name** : Physical Chemistry Laboratory  
**Credit Distribution** : 0-0-4-2  
**Intended for** : BS Chemical Sciences  
**Prerequisite** : None  
**Mutual Exclusion** : None

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### **1. Preamble:**

In this laboratory course, students will be introduced to basic data analysis and Physical Chemistry experiments involving spectroscopy, pH-metry, conductometry, chemical kinetics, etc. This laboratory course is designed to complement the theories and principles learned by the students in the general chemistry and basic physical chemistry courses.

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

#### **Module-I: Data Analysis and Programming**

1. Determination of distribution, mean, variance, standard deviation, confidence interval from sample data obtained for the space variables of diffusive particles at a finite-time.
2. Determination of correlations, auto-correlations and spectral density of sample data obtained for the space and momentum variables of diffusive particle at a given time.
3. Linear and non-linear curve fitting (regression analysis) of given spectroscopic data (Abs. coefficient. vs. T/Fl. Decay) and determination of physical properties from fitting.
4. Writing a Fortran/C++ program for matrix multiplication, diagonalization, and calculation of roots of a Secular determinant.

#### **Module-II: Physical Properties**

5. Determining a given solution's viscosity coefficient with Ostwald's viscometer

considering aqueous solutions of glycerol, ethanol, etc.

6. Determination of surface tension of a given solution by drop weight method using a stalagmometer, considering aqueous solutions of NaCl, acetic acid, ethanol, etc., as systems.

### Module-III: Chemical Kinetics

7. Study of kinetics of saponification of ester by using the conductometric method.
8. Study of the kinetics of the reaction  $I^- + S_2O_8^{2-}$  by colorimetric method.
9. Acid hydrolysis of methyl acetate at different temperatures at a given concentration of  $[H^+]$  ions.

### Module-IV: Spectroscopy

10. Verification of Beer-Lambert law using colorimetry.
11. Absorption spectrum of a conjugated dye, polymethine, interpretation of the spectra using the “free-electron” model.
12. Determination of quantum yield.

### Module-V: Electrochemistry

13. Determination of emf of an electrochemical cell and measurement of thermodynamic parameters from the temperature dependence of emf.
14. Determination of  $E_0$  of  $Fe^{3+}/Fe^{2+}$  couple in the hydrogen scale by potentiometric titration of ferrous ammonium sulfate solution using  $KMnO_4$ , or  $K_2Cr_2O_7$  as standard.

### 3. Textbooks:

- *Experimental Physical Chemistry*, D. P. Shoemaker, C. W. Garland, and J. W. Nibler, 8<sup>th</sup> Edition, McGraw Hill (2009).
- *Experimental Physical Chemistry*, G. Peter Matthews, Oxford University Press (1986).

### 4. References:

- *Experimental physical chemistry*, Frederick A. Bettelheim, Saunders; 1<sup>st</sup> edition (1971)
- *A. Ghosal, B. Mahapartra, A. K. Nad, An Advanced Course in Practical Chemistry*, New Central Book Agency Pvt Ltd, Calcutta (2000).

**5. Similarity with the existing courses:**

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

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

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

NA

**Approvals:**

**Other Faculty interested in teaching this course: –**

**Proposed by: B. Mondal and C. K. Nandi**

**School: Chemical Sciences**

**Signature:**

**Date: 25.11.2022**

***Recommended/Not Recommended, with Comments:***

**Date: \_\_\_\_\_**

**Chairperson, CPC**

***Approved / Not Approved***

**Date: \_\_\_\_\_**

**Chairperson, BoA**



**IIT Mandi**  
**Proposal for a New Course**

**Course number** : CY1XX  
**Course Name** : Principles of Organic Chemistry  
**Credit Distribution** : 3-0-0-3  
**Intended for** : BS Chemical Sciences  
**Prerequisite** : None  
**Mutual Exclusion** : None

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**1. Preamble:**

This course introduces basic concepts in organic chemistry with the aim to provide understanding with respect to structure, stereochemistry, reactivity, and mechanism. It would cover acid-base theory, aromaticity, oxidation and reduction protocols, reactive intermediates, reaction energetics and principles of stereochemistry.

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

**Unit 1: Bonding & Aromaticity (10 lectures)**

Atomic orbitals and their overlaps, bonding of different types –  $\sigma$ -bond,  $\pi$ -bond, Bond dissociation energy, Bond order and multiplicity, Hybridization, VSEPR theory, Bent's rule, Dipole moment, Molecular orbital (MO) theory, Electronic effects: inductive & field effects, Mesomeric effects, Hyperconjugation, Resonance. Aromaticity, antiaromaticity, and homoaromaticity; Hückel's rule, aromatic ring currents; examples of nonbenzenoid aromatic and antiaromatic compounds.

**Unit 2: Reaction Kinetics and Reactive Intermediates (8 lectures)**

Energetics of a chemical reaction, Transition state, Hammond's postulate, Hammett equation, Arrhenius equation, Effect of a catalyst, Kinetic Isotope Effect (primary and secondary), Isotope scrambling, Structure, stability and reactivity of carbocations, carbanions, free radicals, carbenes, and nitrenes

### Unit 3: Acid-Base Theory (4 lectures)

Acidity, basicity, and pKa, Brønsted & Lowry concept, Lewis concept, The definition of pKa, Basicity, Factors that influence the acidity and basicity, HSAB Principle, Keto-enol tautomerism

### Unit 4: Principles of Stereochemistry (10 lectures)

Baeyer's strain theory, Pitzer strain (torsional strain) and conformational analysis (up to cyclohexane), geometrical isomerism (E/Z), optical isomerism, projections, CIP rules (R/S nomenclature of acyclic and cyclic molecules); nomenclature – threo and erythro, syn and anti, endo and exo, and meso and d/l; Introduction to chirality and its origin;

### Unit 5: Organic Reactions (10 lectures)

Carbon-carbon bond forming reactions, Olefination reactions, Reduction & oxidation reactions, aromatic substitution reactions (electrophilic, nucleophilic, etc.), chemistry of carbonyl compounds, alkenes and alkynes.

### 3. Textbooks:

- Clayden, J., Greeves, N., Warren, S., Wothers, S. Organic Chemistry, Oxford University Press, 2001.
- Eliel, E. L., Wilen, S. H., Doyle, M. P. Basic Organic Stereochemistry, John Wiley and Sons, 2001.
- Smith, M. B. and March, J. Advanced Organic Chemistry, Wiley Interscience, 2007.
- D. Nasipuri, Stereochemistry of Organic Compounds-Principle and Applications, 4 Revised ed., New Academic Science, 2012.
- P. Sykes, A Guidebook to Mechanism in Organic Chemistry, 7ed., Addison-Wesley, 2003.

### 4. References:

- Modern Synthetic Reactions by H. O. House, W.A. Benjamin, Inc., 1972
- Understanding Organic Reaction Mechanism by A. Jacobs, Cambridge 1998.

### 5. Similarity with the existing courses:

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

S. No.		Course Code	Similarity Content	Approx. % of Content
1.	NA	CY501	5%	

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

NA

**Approvals:**

**Other Faculty interested in teaching this course:**

**Proposed by: Amit B. Pawar and Abhishek Dewanji**

**School: Chemical Sciences**

**Signature:**

**Date: 31.12.2022**

***Recommended/Not Recommended, with Comments:***

\_\_\_\_\_  
**Chairperson, CPC**

**Date:** \_\_\_\_\_

***Approved / Not Approved***

\_\_\_\_\_  
**Chairperson, BoA**

**Date:** \_\_\_\_\_

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## **IIT Mandi**

### **Proposal for a New Course**

**Course number** : CY2XX  
**Course Name** : Organic Chemistry Laboratory  
**Credit Distribution** : 0-0-4-2  
**Intended for** : BS  
**Prerequisite** : None  
**Mutual Exclusion** : None

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#### **1. Preamble:**

This course will provide an opportunity to the students to learn the fundamental aspects in organic synthesis with the help of hand-on experiments. It includes the principles and applications of separation, isolation, and analytical techniques in organic chemistry.

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

##### **Unit 1: Basic Lab Techniques**

- (a) To determine type and detection of extra elements (N, S, Cl, Br, I) in organic compounds
- (b) Thin layer chromatography (TLC) and calculation of R<sub>f</sub> values
- (c) Separation of 2 organic compounds by paper chromatography
- (d) Purification of organic compounds by crystallization.

##### **Unit 2: Organic Qualitative Analysis**

Separation of two components from the binary mixture of organic compounds (Solid-Solid, Solid-Liquid).

##### **Unit 3: Organic Preparations (any 6)**

- (a) Preparation of paracetamol
- (b) Preparation of aspirin
- (c) Preparation of phthalimide from phthalic anhydride
- (d) Preparation of 2:4-DNP derivative of aldehyde or ketone
- (e) Preparation 4-chloro benzyl alcohol from 4-chloro benzaldehyde
- (f) Base catalyzed Aldol condensation
- (g) Preparation 4-iodonitrobenzene from 4-nitroaniline by Sandmeyer Reaction
- (h) Preparation of Glucosazone derivative of Glucose
- (i) Preparation of quinone from hydroquinone
- (j) Preparation of Oxime derivative of Ketones.

### 3. Textbooks:

- Vogel's book of Practical Organic Chemistry (2006), 5th Edition, Longman Scientific & Technical.
- Organic Chemistry A Lab Manual, Pavia, Lampman, Kriz & Engel (2009), Cengage Learning.

### 4. References:

- Advanced Practical Organic Chemistry, Leonard, Lygo & Procter (1998), Stanley Thomas

### 5. Similarity with the existing courses:

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

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

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

NA

Approvals:

Other Faculty interested in teaching this course:

Proposed by: Amit B. Pawar

School: Chemical Sciences

Signature:

Date: 01.11.2023

*Recommended/Not Recommended, with Comments:*

\_\_\_\_\_  
Chairperson, CPC

Date: \_\_\_\_\_

*Approved / Not Approved*

\_\_\_\_\_  
Chairperson, BoA

Date: \_\_\_\_\_

## Response to Reviewer's Comments

**Prof. P. Anbarasan, IIT Madras**

We are extremely thankful to the reviewer for his valuable comments and suggestions. Following are the responses to the reviewer's comments.

### Theory syllabus

1. I feel it start from B.Sc level and ends in M.Sc level. Have a look at some of the IIT BS program syllabus or central university syllabus to have some good idea.

**Response:** As suggested, we have modified the syllabus accordingly.

2. Unit 1: Bonding and aromaticity is fine. I am not sure whether it is important to discuss Baker-Nathen effect after hyperconjugation. In the aromaticity, you may specify the Huckel's rule.

**Response:** As suggested, we have removed the Baker-Nathen effect and also included Huckel's rule under aromaticity.

3. Unit 2 looks fine. You may want to add primary and secondary in KIE.

**Response:** As suggested, we have now incorporated primary and secondary in KIE.

4. Unit 3 is OK.

5. Unit 4: some of the parts are M.Sc level. For the first course to BS students, please restrict the conformational analysis to butane and may be cyclohexane, decalin is of master level. Similarly, include center of chirality and remove planar chirality and helicity. Also, remove the rest after that.

**Response:** As suggested, we have now restricted the conformational analysis to butane cyclohexane. The conformation analysis of decalin is removed. We have also included the center of chirality and removed planar chirality, helicity, and rest after that.

6. Unit 5 is very broad. You may include aromatic substituted reactions (electrophilic, nucleophilic and etc), chemistry/reactions of carbonyl compounds and chemistry/reactions of alkene. Please make it more specific to help the students.

**Response:** As suggested, we have now included aromatic substituted reactions (electrophilic, nucleophilic, etc.), chemistry/reactions of carbonyl compounds, and chemistry/reactions of alkene under the Unit-5.

### Laboratory syllabus

Most of them is not appropriate to BS student who may be doing the lab for first time. Please include qualitative analysis of functional groups, may be even from mixture of compounds without separation.

Include the experiments that you are teaching them in the theory course as part of the lab experiment. This would give them good feel and will be able to appreciate the course also.

***Response:*** As suggested, we have now modified the syllabus accordingly.



## **IIT Mandi** **Proposal for a New Course**

**Course number** : CY XXX  
**Course Name** : Fundamentals of Inorganic Chemistry  
**Credit Distribution** : 3-0-0-3  
**Intended for** : BS Chemical Sciences  
**Prerequisite** : None  
**Mutual Exclusion** : None

---

### **1. Preamble:**

The main focus of this course is to provide the students with the fundamental understanding of the properties of inorganic compounds. Additionally, this course will strengthen the conceptual knowledge of students related to inorganic chemistry such as chemical periodicity, structure and bonding, acidity and basicity etc. This course will help the students appreciate the importance of the elements of the periodic table in practical world.

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

#### **Module 1: Periodic properties (8 Lectures)**

Atomic Structure, electronic configuration, Chemical periodicity and periodic anomalies, Size of atoms and ions, Effective nuclear charge, Screening effect, Ionization energy, Electronegativity, Electron affinity, Lanthanide contraction, Fajan's rules.

#### **Module 2: Concepts of acids and bases (8 Lectures)**

Theories of acids and bases, Bronsted and Lewis acids and bases, Gas phase versus solution acidity, leveling effects of solvents, Concepts of pH, pKa, pKb, Hardness and softness, surface acidity.

#### **Module 3: Principles of electrochemistry (6 Lectures)**

Oxidation and reduction, Redox potential and stability, Electrode potentials, Nernst equation, Frost, Latimer and Pourbaix diagrams.

#### **Module 4: s & p block elements (8 Lectures)**

Structure and properties of s and p block elements, and their compounds like hydrides, oxides, and halides, biological functions of inorganic elements in organisms

### **Module 5: Transition elements (8 Lectures)**

Coordination complexes, Isomerism, Theories of metal-ligand bonding and their limitations, Valence bond theory, Spectrochemical series of ligands, Crystal field theory, Splitting of d orbitals in octahedral, tetrahedral and square planar complexes, Low-spin and high-spin complexes, Brief introduction to color and magnetism.

### **Module 6: Introduction to nuclear chemistry (4 Lectures)**

Nuclear reactions, fission and fusion, radio analytical techniques

### **3. Textbooks:**

1. Ajai Kumar, Basic Inorganic Chemistry, Aaryush Education, 2<sup>nd</sup> Edition, 2019.
2. J. E. Huheey, E. A. Keiter and R. L. Keiter, Inorganic Chemistry: Principles of Structure and Reactivity, 4th edition, Pearson Education Inc., 2000.

### **4. References:**

1. F. A. Cotton, G. Wilkinson, C. A. Murillo and M. Bochmann, Advanced Inorganic Chemistry, Wiley, 6th edition, 2007.
2. B. Douglas, D. McDaniel and J. Alexander, Concepts and Models of Inorganic Chemistry, 3rd edition, Wiley, 2006.
3. J. D. Lee, Concise Inorganic Chemistry, 5th edition, Wiley, 2010.
4. P. Atkins et al, Shriver & Atkins' Inorganic Chemistry, 5th edition, W. H. Freeman and Company, New York, 2010.

### **5. Similarity with the existing courses:**

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

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

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

NA

**Approvals:**

**Other Faculty interested in teaching this course: –**

**Proposed by: Dr. Garima Agrawal**

**School: Chemical Sciences**

**Signature:**

**Date:**

***Recommended/Not Recommended, with Comments:***

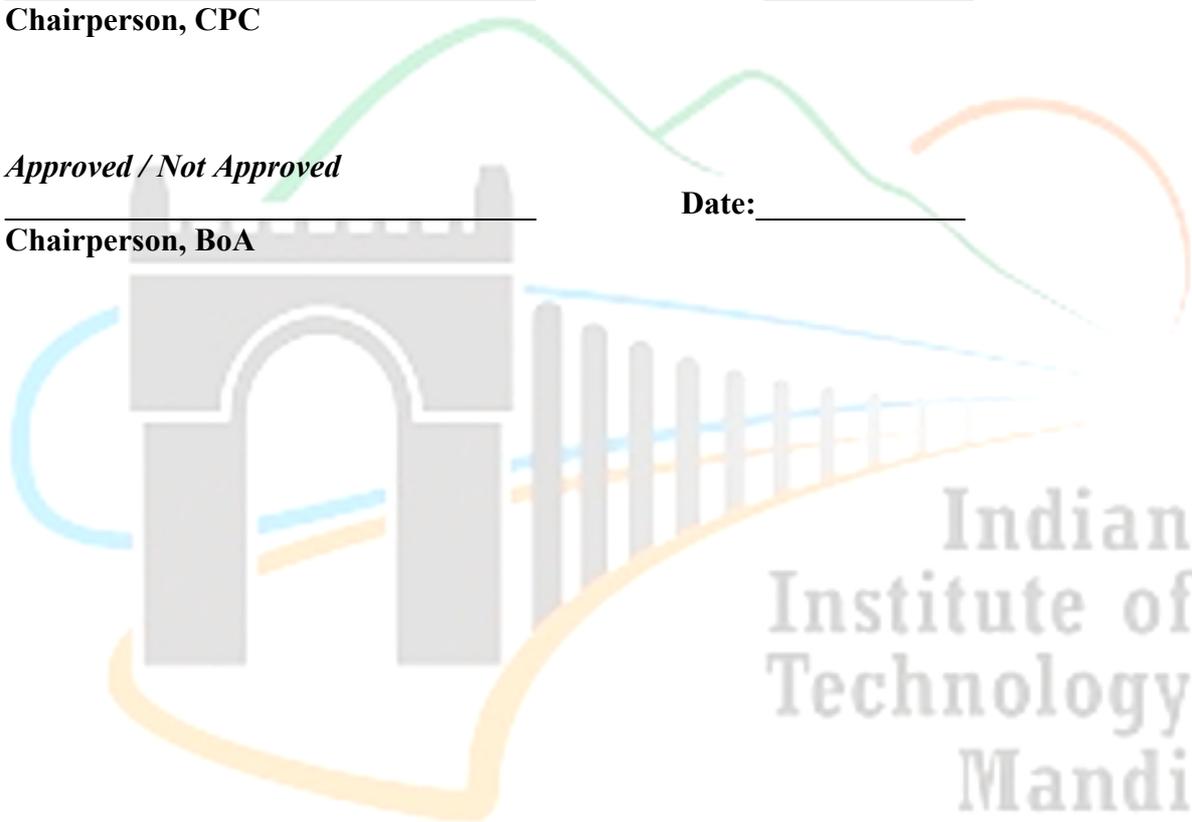
\_\_\_\_\_  
**Chairperson, CPC**

**Date:** \_\_\_\_\_

***Approved / Not Approved***

\_\_\_\_\_  
**Chairperson, BoA**

**Date:** \_\_\_\_\_





## **IIT Mandi**

### **Proposal for a New Course**

**Course number** : CY XXX  
**Course Name** : Inorganic Chemistry Laboratory  
**Credit Distribution** : 0-0-4-2  
**Intended for** : BS Chemical Sciences  
**Prerequisite** : None  
**Mutual Exclusion** : None

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#### **1. Preamble:**

This course is intended to provide the BS students with practical training on various aspects of inorganic chemistry.

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

1. General introduction to inorganic laboratory
2. Basic concepts of quantitative analysis
3. Errors in chemical analysis data
4. Qualitative analysis: Inorganic semi micro qualitative analysis with four radicals
5. Quantitative analysis:
  - a) Volumetric Analysis:
    - Acid-base titrations relevant to the neutralizing power of antacids
    - Complexometric and spectroscopic estimation of metal ions
  - b) Gravimetric Analysis:
    - Estimation of barium/sulphate as barium sulphate
    - Estimation of iron as ferric oxide etc.
6. Synthesis:
  - a) Preparation of potash alum from scrap aluminum
  - b) Preparation of hexamine Ni(II) chloride
  - c) Preparation of tetramine Cu(II) sulphate

#### **3. Textbooks:**

1. A Collection of Interesting General Chemistry Experiments: A.J. Elias (2007) Revised edition Universities Press (India) Pvt. Ltd.

#### 4. References:

1. Vogel's Textbook of Quantitative Chemical Analysis, 5th Edn, Orient Longman, 1989.
2. Vogel's Textbook of Macro and Semimicro Qualitative Inorganic Analysis, 5th Edn, Orient Longman, 1982.
3. Synthesis and Technique in Inorganic Chemistry, Robert J. Angelici, University Science Books, U.S.; 2nd edition, 1991.
4. Lab Manual and Instrument Manuals

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

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

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

NA

Approvals:

Other Faculty interested in teaching this course: –

Proposed by: Dr. Garima Agrawal

School: Chemical Sciences

Signature:

Date:

*Recommended/Not Recommended, with Comments:*

\_\_\_\_\_  
Chairperson, CPC

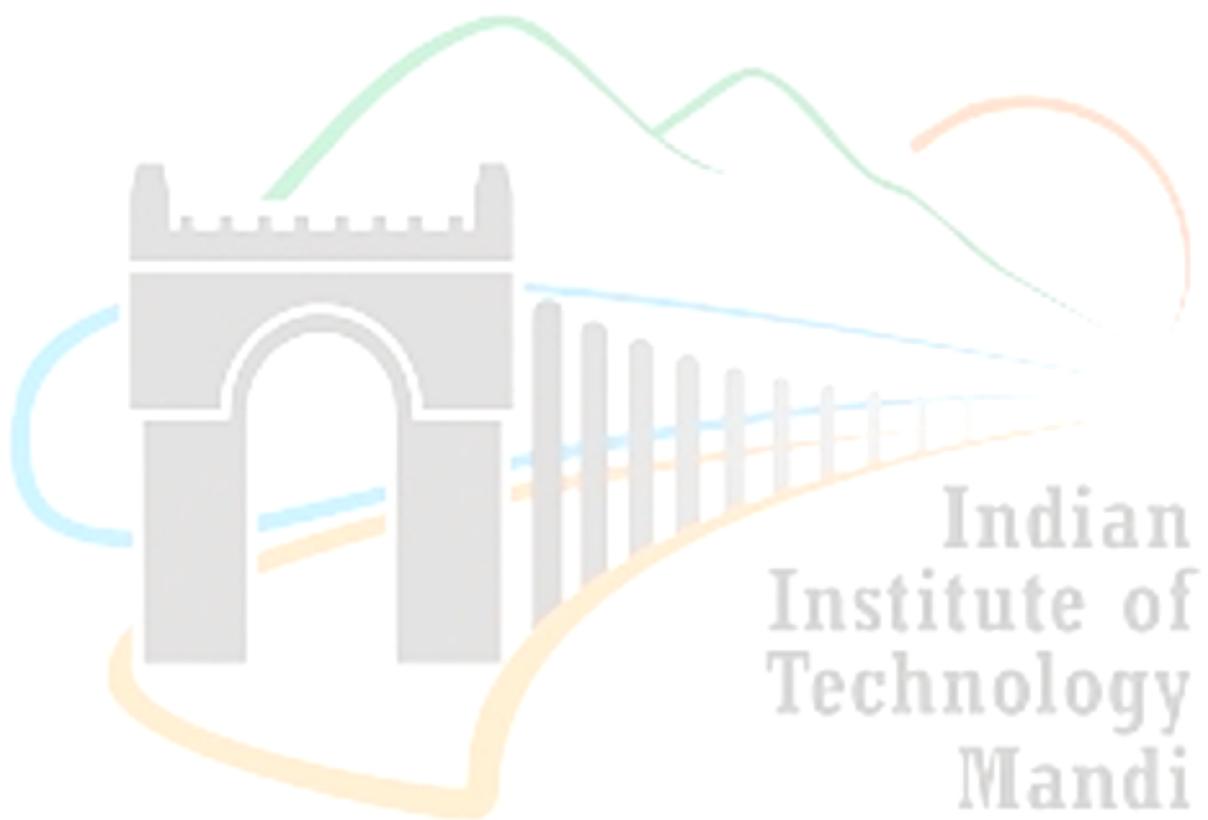
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*Approved / Not Approved*

\_\_\_\_\_

Date: \_\_\_\_\_

**Chairperson, BoA**



**Proposal for a New Course**

## **Response to Reviewer's Comments**

**Prof. G. K. Lahiri, IIT Bombay**

**Comment:** Thanks. It looks fine.

**Response:** No changes were required in the both the syllabus of theory and laboratory course of Inorganic Chemistry



**IIT Mandi**  
**Proposal for a New Course**

**Course number** : CYXXX  
**Course Name** : Fundamental Analytical Chemistry  
**Credit Distribution** : 3-0-0-3  
**Intended for** : BS Chemical Sciences  
**Prerequisite** : None  
**Mutual Exclusion** : None

---

**1. Preamble:**

This course aims to sensitize students towards appropriate scientific reporting of the data, and use of statistics for testing hypothesis. It also emphasizes the reproducibility of experiments and the sources of “errors” during repetitions of experiments. In the later part, it deals with the principles of separation techniques employed on synthetic chemicals and biomolecules.

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

**Unit 1: Basic Tools of Analytical Chemistry (10 Hours)**

Measurements in Analytical Chemistry, Units of Measurement, Uncertainty in Measurements, Concentration, Molarity and Formality, Normality, Molality, Weight, Volume, and Weight-to-Volume Percent, Parts Per Million and Parts Per Billion, Converting Between Concentration Units, Stoichiometric Calculations, Types of errors in Chemical Analyses, Accuracy, Precision, Sensitivity, Specificity and Selectivity, Sampling, Standardization and Calibration, Least square fit, Limit of detection and quantification, Statistical Data Treatment and Evaluation, Basic Equipment, Signal and noise in instrumental measurement, Equipment for Measuring Mass and Volume, Equipment for Drying Samples, Spreadsheets and Computational Software,

**Unit 2: Classical Methods of Analysis (10 Hours)**

Preparing Solutions, Preparing Stock Solutions, Preparing Solutions by Dilution, Gravimetric Methods of Analysis, Titrations in Analytical Chemistry, Principles of Neutralization Titrations, Complex Acid/Base Systems, Applications of Neutralization Titrations, Complexation and Precipitation Reactions and Titrations, Titration Curves,

Calculation of the pH of Solutions.

### **Unit 3: Chemical Equilibria (8 Hours)**

Reversible Reactions and Chemical Equilibria, Thermodynamics and Equilibrium Chemistry, Equilibrium Constants for Chemical Reactions, Precipitation Reactions, Acid–Base Reactions, Complexation Reactions, Oxidation–Reduction (Redox) Reactions, Le Châtelier’s Principle, Buffer Solutions.

### **Unit 4: Analytical Electrochemistry (8)**

Potentiometry-General principles, Calomel Electrodes, Ag-AgCl electrodes, Membrane electrodes-ion selective electrodes, glass electrodes, biosensors. Coulometry: Basic principles, constant current and constant potential coulometry. Voltammetry: different waveforms – linear scan, square scan and triangular scan, cyclic voltammetry.

### **Unit 5: Separation Techniques (6 Hours)**

Principles and applications of TLC, General Theory of Column Chromatography, Gas chromatography (GC), High Performance Liquid Chromatography (HPLC), FPLC, Ion chromatography (IC), Supercritical Fluid Chromatography, Capillary Electrophoresis.

### **3. Textbooks:**

- D. A. Skoog, D. M. West, F. J. Holler, S. R. Crouch, Fundamentals of Analytical Chemistry, 9th Edition, Thomson, 2013.
- D. Harvey, Analytical chemistry 2.1, McGraw-Hill, 2016. (better to include: Analytical Chemistry by G.D. Christian, P.K. Dasgupta and K.A. Schug, 7<sup>th</sup> edition, Wiley,)
- H. H. Willard, L. L. Merritt Jr., J. A. Dean, f. A. Settle Jr., Instrumental Methods of Analysis, CBS Publishers, New Delhi, 1986.
- J. C. Miller, J. N. Miller, Statistics for Analytical Chemistry, 2nd Edition, Wiley, 1998.
- D. C. Harris, W. H. Freeman Quantitative Chemical Analysis, 7th Edition, 2006.

### **4. Similarity with the existing courses:**

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

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

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

NA

**Approvals:**

**Other Faculty interested in teaching this course:**

**Proposed by: Dr. Sharvan Kumar**

**School: Chemical Sciences**

**Signature:**

**Date: 29-09-23**

*Recommended/Not Recommended, with Comments:*

\_\_\_\_\_  
**Chairperson, CPC**

**Date:** \_\_\_\_\_

*Approved / Not Approved*

\_\_\_\_\_  
**Chairperson, BoA**

**Date:** \_\_\_\_\_

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Technology  
Mandi

## **Response to Reviewer's Comments**

**Prof. Raj KumarDutta, IIT Roorkee**

**Comment:** I have edited a few points in the proposed syllabus. Overall, the syllabus looks fine, hopefully atomic spectroscopic methods will be covered as advanced course?

**Response:** All the corrections are included in the revised proposal.



## **IIT Mandi**

### **Proposal for a New Course**

**Course number** : CY xxx  
**Course Name** : Applied Materials Chemistry  
**Credit Distribution** : 3-0-0-3  
**Intended for** : BS  
**Prerequisite** : None  
**Mutual Exclusion** : None

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#### **1. Preamble:**

Applying the fundamentals of chemistry for developing functional materials has revolutionized the human life at various fronts. The exciting opportunity to tune material properties by manipulating various parameters opens up plethora of novel applications. Materials chemistry has emerged as a dynamic platform for billion-dollar industry in a very short span of time. This course will provide the students an appreciation of the versatility which is inherent in material chemistry and which is available to the material chemist in conjunction with other core and elective courses in the BS-MS program.

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

##### **Module 1: Introduction to Materials chemistry (6 Hours)**

Concepts of materials chemistry, Different types of materials, Sources and characteristics of traditional materials, Uses of materials, Approaches to producing new materials with new properties, Atomic level growth of solid material (crystalline and amorphous), Types of bonding in solids, Crystal structures

##### **Module 2: Polymers and Polymer based Materials (9 Hours)**

Introduction to polymers, History and recent developments, Classification and nomenclature of polymers, Thermoplastics, Thermosets, Elastomers, Molecular weight, Polymer synthesis, Techniques of polymerization Conducting polymers

##### **Module 3: Nanomaterials (9 Hours)**

Fundamentals of nanotechnology, Classification of nanomaterials, Synthesis of

nanomaterials, Top down and bottom-up approach, Discovery and synthesis of quantum dots, Particle surface functionalization: electrostatic, steric and electrosteric stabilization, Toxicity

#### **Module 4: Biomaterials (9 Hours)**

Introduction to biomaterials and its history, Classification, Properties of Biomaterials, biocompatibility and biodegradability, biopolymers, hydrogels, sealants and adhesives, Chemistry of dental materials

#### **Module 5: Functional materials, properties, and their applications (9 Hours)**

Smart materials, Carbon materials, Energy materials, Optoelectronic materials, Catalysis, Environment, Agriculture, Biomedicine, Emerging materials, **Thin films, Chemical vapour deposition (CVD), Atomic Layer deposition (ALD).**

### **3. Textbooks:**

1. Harry R. Allcock, Introduction to Materials Chemistry, Wiley, 2<sup>nd</sup> Edition, 2019.
2. V. R. Gowarikar, N. V. Viswanathan, J. Sreedhar, Polymer Science, New Age International. Wiley, 3<sup>rd</sup> Edition, 2019.
3. Bikramjit Basu; Biomaterials Science and Tissue Engineering: Principles and Methods; Cambridge University Press; [ISBN: 9781108415156]; 2017.
4. M.D. Ventra, S. Evoy, J.R. Heflin Jr. (Eds.), Introduction to Nanoscale Science and Technology, Kluwer Academic Publishers, Boston.
5. The Chemistry of Dental Materials (Classic Reprint) Hardcover – 21 October 2018 by Charles Stanley Gibson (Author)

### **4. References:**

1. R. J. Young and P. A. Lovell, Introduction to Polymers, CRC Press, Taylor & Francis group.
2. C. E. Carraher, Polymer Chemistry, CRC Press, Taylor & Francis group.
3. L. M. Liz-Marsan and P. V. Kamat, Nanoscale Materials, Kluwer Academic Publishers, Boston, USA.
4. Advanced Biomaterials: Fundamentals, Processing and Applications; John Wiley & Sons, Inc., USA (ISBN: 978-0-470-19340-2), September, 2009.
5. Related journal articles
6. *Semiconducting and Metallic Polymers: The Fourth Generation of Polymeric Materials*, Alan J. Heeger, *J. Phys. Chem. B*, Vol. 105, No. 36, 2001
7. *Handbook of Conducting Polymers*, ed. T. A. Skotheim, Dekker, New York, 1986, vol. 1–2.
8. *Nanotechnology in catalysis vol.3*, Eds. Bing Zhou, Scott Han, Robert Raja, and Gabor A. Somorjai, Springer 2007

9. *Introduction to Nanotechnology* by Charles P. Poole Jr and Frank J. Owens, Wiley India student Edition 2008

10. *Nanoscale Materials in chemistry* by K.J. Klabunde and Ryan M. Richard

11. *Nanostructured Materials* by Guozhong Cao, Imperial College Press 2004

**5. Similarity with the existing courses:**

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

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

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

NA

**Approvals:**

**Other Faculty interested in teaching this course: –**

**Proposed by: Dr. Garima Agrawal**

**School: Chemical Sciences**

**Signature:**

**Date:**

**Recommended/Not Recommended, with Comments:**

**Date:** \_\_\_\_\_

\_\_\_\_\_  
**Chairperson, CPC**

**Approved / Not Approved**

**Date:** \_\_\_\_\_

\_\_\_\_\_  
**Chairperson, BoA**

## **Response to Reviewer's Comments**

### **Prof. Jacob (IIT Delhi):**

Email with Prof. Jacob's comments enclosed.

*1. In my opinion, there is too much of content packed into this course. I think the characterization module can be removed and be part of another course solely on characterization (probably you are planning on it anyway). The currently allocated teaching hours can be easily distributed among the other modules.*

Thank you very much for the suggestion. We have now removed the characterization module and redistributed the teaching hours.

*2. For the polymer part (module 2), thermoplastics, thermosets and elastomers should also included. The proposed topics under this head still look heavy. Check if processing aspects are part of any other course, if so, these can be excluded.*

Thank you very much for the suggestion. We have now included thermoplastics, thermosets and elastomers in module 2. We have also removed polymer processing part from the module 2.

*3. The reference book by G. Odian is not easy for BS students to follow. Introduction to polymers by Yound and Lovell or Polymer chemistry by Charles Carraher is a lot easier to follow at this stage.*

Thank you very much for the suggestion. We have now removed G. Odian and added the suggested books.

### **Prof. Rao (IIT Madras):**

Email with Prof. Rao's comments enclosed.

*- Module 2: conducting polymers (PANI and others),  
Refer J. Phys. Chem. B, Vol. 105, No. 36, 2001 (FEATURE ARTICLE)*

It has been included. Thank you.

*- Module 3: Discovery and synthesis of quantum dots (quantum dots are used in photonics industry and research) Recently the Nobel prize 2023 in chemistry has been awarded "for the discovery and synthesis of quantum dots" to Mounqi Bawendi (MIT, USA), Louis Brus Columbia, USA and Alexei Ekimov (Nanocrystals Technology Inc, USA). .... <https://www.nobelprize.org/prizes/chemistry/>*

It has been included. Thank you.

*- Module 4: Chemistry of dental materials*

It has been included. Thank you.

- Module 5: X-ray photoelectron spectroscopy, EXAFS, Raman spectroscopy

As per the suggestion from the first reviewer, this module has been removed from the syllabus.

- Module 6: carbon materials,  
Thin films, Chemical vapour deposition (CVD), Atomic Layer deposition (ALD).

It has been included. Thank you.

- Textbooks: *The Chemistry of Dental Materials (Classic Reprint) Hardcover – 21 October 2018*  
by Charles Stanley Gibson (Author)

It has been included. Thank you.

- References:

5. *Semiconducting and Metallic Polymers: The Fourth Generation of Polymeric Materials*, Alan J. Heeger, **J. Phys. Chem. B**, Vol. 105, No. 36, 2001

6. *Handbook of Conducting Polymers*, ed. T. A. Skotheim, Dekker, New York, 1986, vol. 1–2.

7. *Nanotechnology in catalysis vol.3*, Eds. Bing Zhou, Scott Han, Robert Raja, and Gabor A. Somorjai, Springer 2007

8. *Introduction to Nanotechnology* by Charles P. Poole Jr and Frank J. Owens, Wiley India student Edition 2008

9. *Nanoscale Materials in chemistry* by K.J. Klabunde and Ryan M. Richard

10. *Nanostructured Materials* by Guozhong Cao, Imperial College Press 2004

Suggested references have been included in the revised course content file. Thank you.



## **IIT Mandi**

### **Proposal for a New Course**

**Course number** : CY xxx  
**Course Name** : Numerical methods and Data Analysis in Chemistry  
**Credit Distribution** : 3-0-0-3  
**Intended for** : BS  
**Prerequisite** : Computing and Data Science IC152  
**Mutual Exclusion** : None

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**1. Preamble:** Various mathematical methods are essential to deal with several fundamental branches of chemistry; such as kinetic theory, thermodynamics, chemical kinetics, transport phenomena, quantum mechanics and spectroscopy, and so on. In many cases, the problems related to these subjects are not exactly solvable and then there appears the need to apply numerical techniques for advancement. The objective of the present course is to offer the students learning the theories of numerical analysis and computer simulation techniques to solve the problems by employing the method of solution of the linear set of equations and nonlinear equations, numerical differentiation and integration, interpolation and extrapolation techniques, solution of ordinary and partial differential equations, Fast Fourier Transform, etc. The programming techniques will primarily be demonstrated in Python and Fortran programming languages with also some introduction to C and C++. The course would also focus on the important aspect of statistical analysis of data. The course will provide exposure to the students regarding the importance of learning stochastic simulations and Monte Carlo techniques in chemistry. The students would be introduced to the basic techniques of time-series analysis and machine learning to get an idea about their importance in crucial chemical applications; for example, detecting bond orders and normal modes, predicting reaction pathways, and designing new molecules and materials, to mention a few.

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

##### **Unit 1: Theories of Numerical Methods: (12 lectures)**

(a) *Methods of solution of sets of linear equations:* Gauss elimination, Gauss-Jordan

- elimination, Gauss-Seidel method, QR decomposition method
- (b) *Solution of nonlinear algebraic equations*: Bisection method, Newton-Raphson method, Secant method
- (c) *Interpolation and extrapolation*: Polynomial interpolation and extrapolation, Rational function interpolation and extrapolation, Cubic spline interpolation
- (d) *Numerical differentiation*: Finite-difference method, Higher-order methods
- (e) *Numerical integration*: Newton-Cotes quadrature – Rectangle rule, Trapezoidal rule, Simpson's  $1/3^{\text{rd}}$  and  $3/8^{\text{th}}$  rule, Romberg's method; Gaussian quadrature
- (f) *Solution of differential equations*: Euler method, Predictor-corrector method - Improved and Modified Euler method, Runge-Kutta method; Finite-difference method
- (g) *Fourier analysis*: Fourier transform of discretely sampled data, Fast Fourier transform

## **Unit 2: Significance and application of the numerical methods in Chemistry: (8 lectures)**

Application of the solution of the sets of linear equations in Quantum Mechanics, Application of the solution of the nonlinear algebraic equations to get the optimum of the energy landscapes and minimum of the error function, Application of interpolation and extrapolation techniques in Chemistry; to predict data related to chemical experiments at a given condition, Application of the numerical differentiation techniques to solve diffusion equation, Brief introduction to the Molecular Dynamics; Störmer-Verlet, Verlet, Velocity – Verlet methods, Importance of Fourier analysis in spectroscopy.

## **Unit 3: Data Analysis (4 lectures)**

Determining the distribution of a set of data, Moments of a distribution – its mean, variance, skewness etc., Correlation of data – linear correlation, auto-correlation, least square fit method, Importance of data analysis in Chemistry

## **Unit 4: Introduction to the Langevin Dynamics Simulations and Monte Carlo Techniques: (6 lectures)**

Idea of the random numbers, Langevin Dynamics Simulations, Monte Carlo algorithm, Metropolis algorithm, Gillespie algorithm; their significance in Chemistry

## **Unit 5: Introduction to time-series analysis and machine learning and their connection to chemistry (12 lectures)**

- (a) *Time-series analysis*: Trend, stationarity, seasonality and correlations; Moving average (MA), Autoregressive (AR), Autoregressive moving average (ARMA), Autoregressive integrated moving average (ARIMA) models; Forecasting with ARIMA model; Spectral density function and Spectral analysis
- (b) *Machine learning*: Supervised learning and linear regression, Logistic regression, Decision tree and Random forest, Unsupervised learning, Time-series modelling, Deep learning
- (c) *Significance in Chemistry*: Illustration of the applicability of time-series analysis and machine learning in important problems related to chemistry; such as calculating bond orders and determining normal modes, forecasting reaction pathways, proposing the designing techniques of new molecules and materials etc.

### **3. Textbooks:**

- (a) H. W. Press, S. A. Teukolsky, W. T. Vettering, and B. P. Flannery, Numerical Recipes - The Art of Scientific Computing (Cambridge Univ. Press, 1992).
- (b) F. Jensen, Introduction to Computational Chemistry, Second Edition (Wiley, New York, NY, 2006).
- (c) T. Hastie, R. Tibshirani and J. Friedman, The Elements of Statistical Learning (Springer, New York, NY, 2009).
- (d) R. H. Shumway and D. S. Stoffer, Time series analysis and its applications (Springer, New York, 2011)

### **4. References:**

- (a) H. W. Press, S. A. Teukolsky, W. T. Vettering, and B. P. Flannery, Numerical Recipes in Fortran (Cambridge Univ. Press, 1992)
- (b) W.H. Press, B.P. Flannery, S.A. Teukolsky, and W.T. Vetterling, Numerical Recipes in C (Cambridge Univ. Press, 1990)
- (c) J. M. Zelle. Python Programming: An Introduction to Computer Science (Beedle & Associates, Inc.: Portland, OR, USA, 2004)

(d) Carleo et al., Machine learning and the physical sciences, *Reviews of Modern Physics* **91**, 045002 (2019).

**5. Similarity with the existing courses:**

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

S. No.	Course Name	Course Code	Similarity Content	Approx. % of Content
1.	Numerical Analysis (3-1-0-4)	MA523	8 lectures	19%
2.	Numerical Analysis (3-0-0-3)	MA551	8 lectures	19%
3.	Numerical Analysis (2-0-2-3)	MA607	8 lectures	19%
4.	Numerical Methods for Engineering Computation (3-0-0-3)	ME 504	8 lectures	19%

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

NA

**Approvals:**

**Other Faculty interested in teaching this course: -**

**Proposed by: Dr. Moupriya Das**

**School: Chemical Sciences**

**Signature:**

**Date:**

***Recommended/Not Recommended, with Comments:***

\_\_\_\_\_

Chairperson, CPC

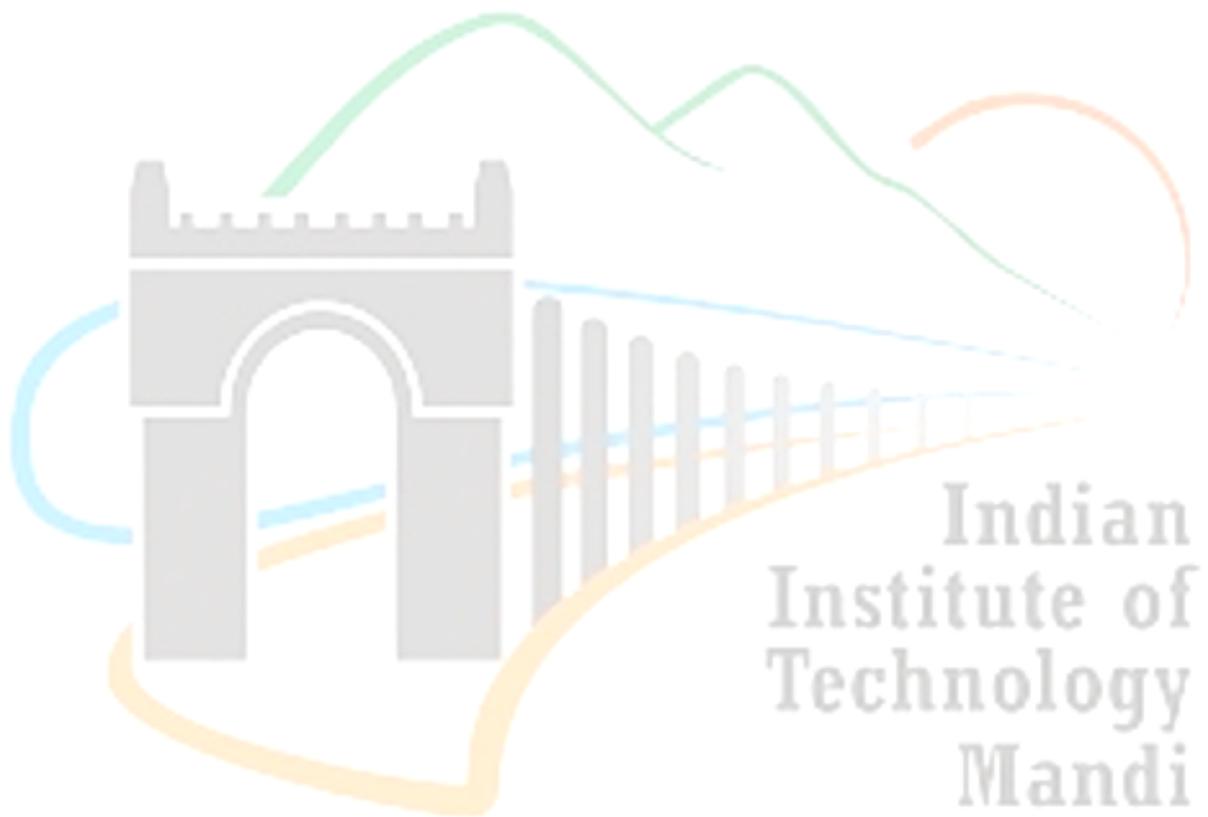
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*Approved / Not Approved*

\_\_\_\_\_

Chairperson, BoA

Date: \_\_\_\_\_



## **Response to Reviewer's Comments**

Following the suggestions of the Reviewer, the listed changes were made in the listed course proposal.

### **Prof. Ramakrishna Ramaswamy, IIT Delhi**

1. I completely agree with the Reviewer that including the basic programming part in the current proposal will make the course content of much higher volume compared to what is appropriate for one semester. Therefore, the Unit in the previous proposal has been completely removed. Consequently, a B. Tech 'Computing and Data Science' course (**IC152**) has been mentioned as the prerequisite that comes under the curriculum of the target students assuming this course will cover the basic programming part. I thank the Reviewer for pointing out this fact.

2. As suggested by the Reviewer, the application part of the numerical methods related to specific chemical problems has been included explicitly under all the methods discussed, in addition to what was proposed only for Unit 4 before. Considering the fact that the explanation of these applications in the classroom will benefit the students, they have been included in the lectures. As recommended, homework and assignments will be planned accordingly so that the students get a better idea of how to implement the methods in real applications.

3. I agree with the Reviewer that numerical packages are used extensively for Units 1(e) and 1(f). However, presuming the importance of providing the students with an idea about how these numerical packages run and the basic principles, the suggested methods have been included in the course proposal.

Some of the involved methods could be removed in case the lecture hours were not sufficient. However, as Unit 3 has been omitted from the proposal, it is presumed that proper scheduling of the lectures is done including the topics in 1(e) and (f).

4. It was a very important suggestion to add the discussions on the Monte Carlo method as it has significant applications in Chemistry including calculations of numerical integration. A new section (Unit 4 in the current proposal) has been added covering both Langevin dynamics simulations and Monte Carlo methods.

I extend my sincerest thanks to the Reviewer for his valuable time in evaluating the course proposal and for his constructive criticisms and valuable suggestions on it.



## IIT Mandi

### Proposal for a New Course

**Course number** : CE2XX 202  
**Course Name** : Introduction to Civil Engineering  
**Credit Distribution** : 1-0-0-1  
**Intended for** : UG Core  
**Prerequisite** : NA  
**Mutual Exclusion** : None

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#### 1. Preamble:

India is rapidly marching towards modern and sustainable infrastructure. In view of this before embarking on the journey of a prestigious Civil Engineering career, it is important for the students to have a bird-eye view of the entire Civil Engineering domain that includes structural engineering, geotechnical engineering, transportation engineering, geoinformatics, geosciences, hydrology and water engineering, and environmental engineering.

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

**Module 1:** A brief history of civil engineering, a brief introduction to different sub-branches of civil engineering, mega structure documentary show, a brief overview of the role and responsibilities of a civil engineer and the types of projects they work on. A brief discussion on civil engineering ethics. [2 hrs]

**Module 2:** In this module, one faculty (based on the internal discussion) from each of the following domain will come and talk on past, present, and future of research, industry and technological innovations in their domain (one hour each): (i) Structural Engineering, (ii) Geotechnical Engineering, (iii) Transportation Engineering, (iv) Geoinformatics and Survey, (v) Earth Sciences, (vi) Water and Hydrology Engineering, (vii) Environmental Engineering. [7 hrs]

**Module 3:** A visit to all the existing civil engineering laboratories of IIT Mandi including the construction activities going on in IIT Mandi. A discussion on recent advancement in Civil Engineering and role of AI/ ML and IOT etc. in Modern Civil Engineering. [3 hrs]

**Module 4:** A field visit or an external expert talk as per the availability. A panel discussion on various career opportunities for Civil Engineering graduates. [2 hrs]

3. Text book: NA

4. References: NA

5. Similarity with the existing courses: NA

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

Approvals:

Other Faculty interested in teaching this course: –

Proposed by: Dr. Shashank Pathak

School: SCENE

Signature:

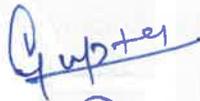


Date: 09.11.23

The following faculty approved the proposal:

~~1. Dr. Tanushree Parsai~~

2. Dr. Vivek Gupta



3. Dr. R. Prasanna



School Chair:

  
09/11/2023

School:

Date:

This proposal is reported in .....<sup>52<sup>nd</sup></sup>.....th Board of Academics on .....<sup>2/11/23</sup>.....

Dean Academics

Date:



## IIT Mandi Proposal for a New Course

Course number : CE203  
Course Name : Civil Engineering Materials  
Credit : 3  
Credit Distribution : 3-0-0-3  
Intended for : B.Tech. (CE)  
Prerequisite : None  
Mutual Exclusion : None

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### 1. Preamble:

The ability to design efficient civil engineering structures relies on a thorough understanding of construction materials. This course introduces the processing techniques, properties and behaviour of materials commonly used in civil engineering projects. The contents cover the necessary fundamentals of material science and also the engineering aspects related to the selection of a material for a given job. The science of deterioration under service conditions, testing and evaluation techniques are also duly emphasized. The course will provide the basics needed for higher courses in mechanics and design.

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

#### Module 1: Fundamentals

6 Hours

Atomic bonding and molecular structure of materials; Organic, inorganic and metallic construction materials; Alloys and Phase diagrams; Mechanical, physical and thermal properties of materials; Preliminaries of viscoelasticity and rheology; Environmental impact indices for construction materials.

#### Module 2: Ferrous and Non-ferrous metals

6 Hours

Classification of ferrous alloys; Production process, microstructure and properties of steel; Effects of alloy elements, work hardening and heat treatment on mechanical properties and weldability of steel; Corrosion of steel and its prevention; Structural steel products; Aluminum, Copper and their alloys, production process, properties and uses; Quality and test standards; Sustainability of metals.

#### Module 3: Cement Concrete and Asphalt

6 Hours

Ingredients of cement concrete and their properties; Concrete mix design and production; Major types of concrete and their characteristics in fresh and hardened states; Durability issues; Cement mortar and its applications; Asphalt binders and their properties; Asphalt mixture formulations; Effects of moisture, temperature and aging on asphalt; Quality and test standards; Sustainability of cement concrete and asphalt.

**Module 4: Stones, Bricks, Blocks and Tiles**

**6 Hours**

Composition of good brick earth; Brick manufacturing; Classification of bricks; Classification of rocks: Rock forming minerals; Stone quarrying, seasoning and dressing; Qualities of good building stone and brick; Deterioration and preservation of masonry; Fly ash and concrete masonry units; Sustainability of bricks and blocks; Commonly used tiles for floor, wall and roof; Choosing a floor tile; Quality and test standards

**Module 5: Glass**

**4 Hours**

Composition of glass; Production and treatment processes; Physical and mechanical properties; Types and uses; Quality and test standards.

**Module 6: Wood and Wood products**

**4 Hours**

Structure of wood, defects and non-uniformities; Physical and mechanical properties; Durability and preservation; Wood-based composites; Quality and test standards; Sustainability of wood.

**Module 7: Polymers and Plastics**

**4 Hours**

Classification and properties of polymers; Fabrication methods, additives and fillers used for plastics; Common plastics and their uses; Environmental effects of plastics.

**Module 8: Paints**

**3 Hours**

Composition and classification of paints; Production process; Choosing a paint; Defects in painting; Effect of paints on indoor air quality.

**Module 9: Special topics**

**3 hours**

Soil as a construction material; Geosynthetics; Materials for sound and thermal insulation, waterproofing and fire protection; Bamboo; Smart materials; Preliminaries of 3D printing

**3. Text books:**

1. Duggal, S.K., "Building Materials", 4<sup>th</sup> edition, New Age International, India, 2012.
2. Varghese, P.C., "Building Materials", 2<sup>nd</sup> edition, PHI Learning, India, 2015.

**4. References:**

1. Young, J.F., Mindess, S., Gray, R.J. and Bentur, A., "The science and technology of civil engineering materials", Prentice Hall, USA, 1998.
2. Goncalves, M. C. and Margarido, F., "Materials for Construction and Civil

- Engineering -- Science, Processing and Design". 1<sup>st</sup> edition, Springer Cham, Switzerland, 2015.
3. Subramanian, N., "Building Materials – Testing and Sustainability", 1<sup>st</sup> edition, Oxford University Press, India, 2019.

**5. Similarity with the existing courses:**

S. No.	Course Title	Course Code	Similarity Content	Approx. % of Content
1.	Materials Science for Engineers	IC 241	Overview of materials science, Structural application of materials	~29%

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

Approvals:

Faculty interested in teaching this course: –

Proposed by: Dr. Kaustav Sarkar

School: SCENE

Signature:

Date: 08/11/2023

The following faculty (at least 3 faculty) discussed on 21/03/23 and approved the proposal on 27/03/23.

Sl. No	Faculty Name	Signature
1	Dr. Shivang Shekhar	
2	Dr. Thainswemong Choudhury	
3	Dr. Kaustav Sarkar	

School Chair:

School:

Date:

This proposal is reported in <sup>5<sup>th</sup> nd</sup> Board of Academics on 02/11/23.

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** : CE203P  
**Course Name** : Building Materials Lab  
**Credit** : 1  
**Distribution** : 0-0-2-1  
**Intended for** : B.Tech. (CE)  
**Prerequisite** : None  
**Mutual Exclusion** : None

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#### 1. Preamble:

The quality control of raw and finished materials based on the measurement of their physical, mechanical or thermal properties constitutes an important facet of all construction projects. This course aims to provide a hands-on training on the standard equipment, protocols, and reporting methods which are most relevant to the materials used in building construction practice.

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

- i. Static tension test of mild steel, cast iron and aluminum.
- ii. Static compression test of fired clay brick, concrete blocks, cubes, cores and cylinders.
- iii. Measurement of the flexural strength of tiles and concrete.
- iv. Measurement of the wear/abrasion resistance of tiles and concrete.
- v. Water absorption tests for fired clay brick and concrete.
- vi. Measurement of thermal properties of concrete using hot wire method.
- vii. Measurement of thermal conductivity of common insulation materials and glass using Lees' Disc apparatus.
- viii. Particle shape and size analyses of aggregates.
- ix. Specific gravity and water absorption tests for aggregates.
- x. Crushing and Impact value tests for coarse aggregates.
- xi. Fineness and specific gravity tests for cement.
- xii. Standard consistency and setting time tests for cement.
- xiii. Le Chatelier's and autoclave soundness tests for cement.
- xiv. Use of moisture meter, ultrasonic pulse velocity and rebound hammer tests for the non-destructive assessment of concrete quality.

#### 3. Text books:

1. Relevant BIS and ASTM standards

#### 4. References:

- Bahurudeen A., and Moorthi, P.V.P., "Testing of Construction Materials", 1<sup>st</sup> edition, CRC Press, USA, 2021.

**5. Similarity with the existing courses:**

S. No.	Course Title	Course Code	Similarity Content	Approx. % of Content
1.	Design Lab-1	ME311P	Static tensile test	14%

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

**Approvals:**

**Faculty interested in teaching this course: –**

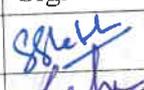
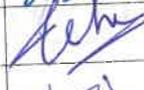
**Proposed by: Dr. Kaustav Sarkar**

**School: SCENE**

**Signature:**

**Date: 08/11/2023**

The following faculty (at least 3 faculty) discussed on <sup>21/03/23</sup> and approved the proposal on <sup>27/03/23</sup>.

Sl. No	Faculty Name	Signature
1	Dr. Shivang Shekhar	
2	Dr. Thainswemong Choudhury	
3	Dr. Kaustav Sarkar	

School Chair:

  
09/11/2023.

School:

Date:

This proposal is reported in <sup>52nd</sup> .....th Board of Academics on <sup>2/11/23</sup>.

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** : CE306P  
**Course Name** : Environmental Engineering Lab  
**Credit** : 1  
**Distribution** : 0-0-2-1  
**Intended for** : UG  
**Prerequisite** : None  
**Mutual Exclusion**: None

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#### 1. Preamble:

The present course aims at introducing the standard test procedures required for the students to understand environmental pollution by characterizing air, water and soil media. The course presented has experiments related to water and waste water characterization, titration methods to determine the anion and cation compositions. It also has experiments to determine air and soil pollution and ways to quantify and check the fate of contaminants.

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

##### Experiments:

1. Determination of solids
2. Jar Test for determining optimum coagulant dosage
3. Determination of acidity
4. Determination of alkalinity
5. Determination of hardness
6. Determination of Dissolved Oxygen
7. Determination of B.O.D. of wastewater sample
8. Determination of C.O.D. of wastewater sample
9. Tests for Coliforms, Fecal, Total Coliforms
10. Soil contamination (adsorption) studies
11. Introduction to advanced analytical instruments
12. Determination of bulk and size-segregated PM<sub>2.5</sub>
13. Determination of ionic species in PM<sub>2.5</sub>
14. Determination of heavy metals in PM<sub>2.5</sub>

#### 3. Laboratory/practical/tutorial Modules: The course is entirely laboratory-based.

#### 4. Text books:

- a. Sawyer, N.C. and McCarty, P.L., 'Chemistry for Environmental Engineering 5th Edn', McGraw- Hill Book Co., New York, 2003.



- b. APHA, 'Standard Methods Examination of Water and Wastewater', American Public Health Association, Washington DC, 1998.

5. References: None.

6. 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
None			

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

Approvals:

Faculty interested in teaching this course: –

Proposed by: Dr. Deepak Swami

School: SCENE

Signature:

Date:

The following faculty (at least 3 faculty) discussed on <sup>21/03/23</sup>.....and approved the proposal on <sup>22/03/23</sup>.....

Sl. No	Faculty Name	Signature
1.	Dr. Deepak Swami	
2.	Dr. Sayantan Sarkar	
3.	Dr. Harshad Kulkarni	

School Chair:

School:

Date:



This proposal is reported in .....52nd.....th Board of Academics on ..21/11/23..

Dean Academics

Date:

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

**IIT Mandi**  
**Proposal for modifying existing course**

Course number	: CE310
Name	: Strength of Materials and Structures
Credit	: 3
Distribution	: L-T-P-C 3-0-0-3
Intended for	: UG Program
Prerequisite	: IC240: Mechanics of Rigid Bodies
Mutual Exclusion	: -

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**1. Preamble:**

*The design of structural systems is based on the applied external loads and strength of the materials. Hence, it is critical for an engineer to have a holistic knowledge of the behaviour of structural materials. This course will provide an understanding of different loads that could act upon a structure, the different materials that are used in building a structure, and an understanding of the corresponding strength condition and the supports typically provided for a structure. Students will be exposed to the application of conventional theories and methods that can be facilitated to estimate forces, reactions, and deflection of structural systems. The course focuses on the basic techniques of structural analysis for determinate trusses, cables, arches, beams, and frames. The contents have been developed to include the fundamentals of material performance and topics of force and deflection analysis with a special emphasis on statically determinate structures.*

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

**Module 1:** Introduction to loads, structural materials, and support conditions, (3 Hours)  
Overview of internal and external stability, Definition of determinate structures.

**Module 2:** Mechanics of small deformation: Free Body Diagram, Concepts of stress (8 Hours)  
and strain - types and definition, stress-strain characteristics of ductile and brittle materials, elastic constants and their relationships, Axially loaded members, Concept of Torsion and Torsional behaviour of circular shafts

**Module 3:** Transformation of stresses and strains, principal stresses and strains, (5 Hours)  
Mohr's circle, and Failure theories

**Module 4:** Determination of external and internal forces in Trusses, Cables, Arches, (10 Hours)  
and Beams, Concept of shear force, and bending moment diagrams of determinate beams and frames.

**Module 5:** Flexural and shear stresses in beams, deflections of beams using double (8 Hours)  
integration, introduction to moment area, unit load, and conjugate beam methods.

**Module 6:** Influence lines for statically determinate structures; Moving loads on (4 Hours)  
beams and trusses; Maximum shear force and bending moment due to moving loads.

**Module 7:** Columns: Euler's theory, Critical load for different end conditions, (4 Hours)  
eccentric loading, columns with small initial curvatures.

**Laboratory/practical/tutorial Modules: -**

**3. Text books:**

1. Hibbeler, RC, Structural Analysis, Pearson Education, 9th edition, New Delhi, 2017.
2. Hibbeler, RC, Mechanics of Materials, Pearson Education, 10th edition, New Delhi, 2016.

**4. References:**

1. Timoshenko, S.P., and Young, D.H., Elements of Strength of Materials, 5th Edition, 2003.
2. Beer, F.P., Johnston, E.R., DeWolf, J, and Mazurek, D.F., Engineering Mechanics of Solids by Egor P. Popov, 2nd Edition Pearson Education Inc, 2009
3. Gere and Timoshenko, Mechanics of Materials, 2nd Edition, CBS Publishers, 2004.
4. Reddy, CS, Basic Structural Analysis, Tata McGraw Hill, New Delhi, 2001.
5. Menon, D, Structural Analysis, Narosa Publishing House, 2008.
6. Ross, C.T.F, Case, J, and Chivler, L, Strength of Materials and Structures, 4th edition, Butterworth Heinemann, UK, 1999.
7. Megson, THG, Structural and Stress Analysis, Butterworth-Heinemann, UK and USA, 2014.

**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%:**

**Approvals:**

**Faculty interested in teaching this course: –**

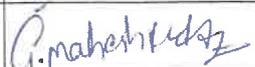
**Proposed by:** Dr. Dhanya J and  
Dr. Shivang Shekhar

**School:** School of Civil & Environmental  
Engineering (SCENE)

**Signature:** 

**Date:** 08/09/2022

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

Sl. No	Faculty Name	Signature
1	Dr. Kaustav Sarkar	
2	Dr. Sandip Kumar Saha	
3	Dr. Maheshreddy Gade	

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 Laboratory Course**

<b>Course number</b>	: CE310 P
<b>Name</b>	: Strength of Materials and Structures Lab
<b>Credit</b>	: 1
<b>Distribution</b>	: L-T-P-C 0-0-2-1
<b>Intended for</b>	: UG Program
<b>Prerequisite</b>	: CE310: Strength of Materials and Structures/Equivalent
<b>Mutual Exclusion</b>	: -

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**1. Preamble:**

*This course is intended for students to understand in practice how the different structural systems behave depending on the type of loadings and the system configuration. In this lab course, the students will get practical aspects of the concepts they learned from the Strength of Materials and Structures course (CE 310). The course is essential in understanding the differences between theory and practice, further recognizing the limitations of analysis approaches..*

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

**Laboratory/practical/tutorial Modules: -**

The curriculum is split into eleven experiments encompassing different structural engineering analysis and strength testing problems typically encountered in the field practices. Validation of the concept through computer programming will also be made as part of this course. The duration of each lab session shall be 3 hours

1. Study of stress-strain characteristics of civil engineering materials.
2. Study of reactions in beams with different support conditions.
3. Study of variation of bending moment and shearing force in a beam subjected to various loading conditions.
4. Study of load-deflection characteristics of trusses.
5. Study of load-deflection characteristics of rectangular portal frames with uniform and nonuniform sections.
6. Study of stress and strains in the members of pin jointed frames.
7. Study of plastic bending of portal frames.
8. Load-deflection study of pinned arches.
9. Study of buckling characteristics of struts.
10. Study of horizontal and vertical deflections of asymmetric sections at various angles and loads.
11. Study of behaviour of circular section under torsion.

**3. Text books:**

For conceptual understanding

1. Hibbeler, RC, Structural Analysis, Pearson Education, 9th edition, New Delhi, 2017.
2. Hibbeler, RC, Mechanics of Materials, Pearson Education, 10th edition, New Delhi, 2016.

**4. References:**

For conceptual understanding

1. Timoshenko, S.P., and Young, D.H., Elements of Strength of Materials, 5th Edition, 2003.
2. Beer, F.P., Johnston, E.R., DeWolf, J, and Mazurek, D.F., Engineering Mechanics of Solids by Egor P. Popov, 2nd Edition Pearson Education Inc, 2009
3. Gere and Timoshenko, Mechanics of Materials, 2nd Edition, CBS Publishers, 2004.
4. Reddy, CS, Basic Structural Analysis, Tata McGraw Hill, New Delhi, 2001.
5. Menon, D, Structural Analysis, Narosa Publishing House, 2008.
6. Ross, C.T.F, Case, J, and Chivler, L, Strength of Materials and Structures, 4th edition, Butterworth Heinemann, UK, 1999.
7. Megson, THG, Structural and Stress Analysis, Butterworth-Heinemann, UK and USA, 2014.

**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%:**

**Approvals:**

**Faculty interested in teaching this course: –**

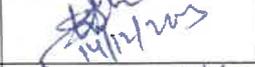
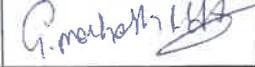
**Proposed by:** Dr. Dhanya J and  
Dr. Shivang Shekhar

**School:** School of Civil & Environmental  
Engineering (SCENE)

**Signature:** 

**Date:** 08/09/2022

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

Sl. No	Faculty Name	Signature
1	Dr. Kaustav Sarkar	
2	Dr. Sandip Kumar Saha	
3	Dr. Maheshreddy Gade	

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**

<b>Course number</b>	<b>: CE404</b>
<b>Name</b>	<b>: Analysis of Structures</b>
<b>Credit</b>	<b>: 3</b>
<b>Distribution</b>	<b>: L-T-P-C 3-0-0-3</b>
<b>Intended for</b>	<b>: UG Program</b>
<b>Prerequisite</b>	<b>: CE301: Strength of Materials and Structures/Equivalent</b>
<b>Mutual Exclusion</b>	<b>: -</b>

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**1. Preamble:**

*Structural analysis is an essential part of the Civil Engineering curriculum. This course assesses the response of a structure subjected to the external loads. The course explains in detail how a structure can be idealized, the corresponding formulation, and its limitations. Further, this course deal with a specific focus on applying conventional theories in estimating the internal forces, reactions, and displacement of the structural system. A detailed analysis of both determinate and indeterminate structures shall be explained as part of this course. An introduction to matrix methods for structural analysis is also included. Furthermore, the students will also be encouraged to write codes in any standard programming language based on the concepts learned in this course.*

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

**Module 1:** Introduction: Statically determinate vs statically indeterminate structures, (3 Hours)  
Degrees of static and kinematic indeterminacy, Review on the methods of analysis of determinate structures

**Module 2:** Energy methods of structural analysis: Basic concept, Energy relations with (5 Hours)  
structural theory, Virtual work and its application, Energy principles based on displacement and force fields.

**Module 3:** Analysis using force method: Analysis of indeterminate beams and frames, (6 Hours)  
Law of reciprocal deflections, Theorem of least work, Reactions due to yielding of supports, Analysis of indeterminate trusses using force method

**Module 4:** Analysis using the displacement method: Slope-deflection method: (8 Hours)  
Analysis of continuous beams, analysis of rigid frames with and without side sway;  
Moment distribution method: Analysis of indeterminate beams subjected to loads and uneven settlement of supports, analysis of rigid frames with and without side sway.

**Module 5:** Three-moment theorem: Derivation and application for analysis of (4 Hours)  
continuous beams subjected to loads and supports settlement.

**Module 6:** Arches: Introduction, Basic mechanics, Three hinged arch, Two hinged (5 Hours)  
arch, Tied arch and bowstring girder, Analysis of cables and suspension bridges.

**Module 7:** Approximate analysis of statically indeterminate structures: Analysis of (4 Hours)  
trusses, Gravity loaded building frames, Portal and cantilever methods for laterally loaded building frames.

**Module 8:** Moving load and Influence lines: Introduction to the methodology and (2 Hours)  
application to indeterminate structures.

**Module 9:** Advanced concepts: Brief introduction to matrix stiffness method of (5 Hours) structural analysis and exposure to relevant software's, Basic introduction to plastic analysis: plastic hinge, shape factor, collapse mechanism, Methods of analysis: static and kinematic.

**Laboratory/practical/tutorial Modules: -**

**3. Text books:**

1. Hibbeler, RC, Structural Analysis, Pearson Education, 9th edition, New Delhi, 2017.
2. Reddy, C.S., Basic Structural Analysis, Tata McGraw Hill, New Delhi, 2001.

**4. References:**

1. Wang, C.K., Intermediate Structural Analysis, Tata McGraw Hill, New Delhi, 2010.
2. Ghali, A., and Neville, A.M., Structural Analysis: A Unified Classical and Matrix Approach', 7th Edition, CRC Press, 2017.
3. Negi, LS, and Jangid, R.S., Structural Analysis, Tata Mc. Graw, New Delhi, 1997.
4. Gupta, S. P., Gupta, R, and Pandit, GS, Theory of Structures, Tata McGraw-Hill, 1999.
5. Menon, D, Advanced Structural Analysis, Narosa Publishing House, 2015.
6. Kassimali, A., Structural Analysis, 6th Edition, Cengage Learning, 2018.

**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%:**

**Approvals:**

**Faculty interested in teaching this course: –**

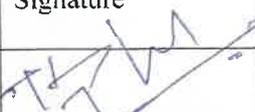
**Proposed by:** Dr. Shivang Shekhar and Dr. Dhanya J

**School:** School of Civil & Environmental Engineering (SCENE)

**Signature:**

**Date:** 08/09/2022

The following faculty (at least 3 faculty) discussed on .....and approved the proposal on .....  
*21/05/22*

Sl. No	Faculty Name	Signature
1	Dr. Kaustav Sarkar	
2	Dr. Sandip Kumar Saha	
3	Dr. Maheshreddy Gade	

School Chair:

School:

Date:

This proposal is reported in .....<sup>52<sup>nd</sup></sup>.....th Board of Academics on ...2/11/23.

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** : CE405  
**Course Name** : Water and Wastewater Engineering  
**Credit** : 3  
**Distribution** : 3-0-0-3  
**Intended for** : UG/ M. Tech. /MS  
**Prerequisite** : Environmental Science (IC 230) or equivalent  
**Mutual Exclusion:** None

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### 1. Preamble:

The objective of this course is to help students understand various aspects of water and waste water treatment plants. The course will be helpful for students to develop the ability to apply the understanding of physical, chemical and biological phenomena for the efficient design of water/wastewater treatment plants. The course will also help them understand regular maintenance of treatment plants for sustainable recycling. The expected outcome of the course is that the students will be able to develop the ability to estimate, design and maintain wastewater treatment plants and to manage sludge.

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

1. **Planning and hydraulic design of water and sewerage system:** Population forecasting, equivalent sewage flow estimation, sewer pipelines and materials, sewer hydraulics, stormwater drainage, storm runoff estimation, sewer appurtenances, sewage pumping. (12 hours)
2. **Water treatment processes:** Theory and application of water treatment process - aeration, coagulation, flocculation, sedimentation, filtration, and disinfection. (6 hours)
3. **Wastewater treatment processes:** Unit operations and processes, selection of treatment processes, onsite sanitation, septic tank, grey water harvesting, primary treatment, screens, grit chamber, primary sedimentation tanks, construction, operation and maintenance aspects. (8 hours)
4. **Secondary treatment processes:** Selection of treatment methods, hydraulic principles, activated sludge process and extended aeration systems, trickling filters and their design, sequencing batch reactor (SBR), membrane bioreactor (MBR), waste stabilization ponds, construction, operation and maintenance aspects.



(10 hours)

5. **Sewage Disposal and sludge management:** Standards for disposal methods, dilution, mass balance principle, self-purification of river, oxygen sag curve, deoxygenation and reaeration, dissolved oxygen modelling, reclamation and reuse of sewage, land disposal, agricultural uses of treated sewage, sludge characterization and sludge disposal methods. (6 hrs)

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

4. **Text books:**

1. Mackenzie L. Davis, Water and Wastewater Engineering: Design Principles and Practice. McGraw-Hill Education. India. 2010.
2. Peavy, H.S., Rowe, D.R., Tchobanoglous, G., Environmental Engineering, McGraw-Hill Education, India, 2013.

5. **References:**

1. Metcalf, L., Eddy, H. P., & Tchobanoglous, G. (1979). Wastewater engineering: treatment, disposal, and reuse (Vol. 4). New York: McGraw-Hill.
2. Karia, G. L., Christian, R. A., Wastewater treatment: Concepts and design approach. PHI Learning Pvt. Ltd., India, 2013.

6. **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.	CE559 (this course is no longer being offered)	Less than 5%	Less than 10%

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

**Approvals:**

**Faculty interested in teaching this course: –**

**Proposed by:** Dr. Deepak Swami

**School:** SCENE

**Signature:**

**Date:**



The following faculty (at least 3 faculty) discussed on 21/07/23 and approved the proposal on 27/07/23.

Sl. No	Faculty Name	Signature
1.	Dr. Deepak Swami	
2.	Dr. Sayantan Sarkar	
3.	Dr. Harshad Kulkarni	

School Chair:

School:

Date:

This proposal is reported in ..... 52nd th Board of Academics on 21/11/23...

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** : CE451  
**Course Name** : Irrigation Engineering and Hydraulic Structures  
**Credit** : 3-0-0-3  
**Distribution** : L-T-P-C  
**Intended for** : B.Tech. (Civil Engineering)  
**Prerequisite** : CE303  
**Mutual Exclusion**: None

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**1. Preamble:**

*This course aims to teach students about the importance of the irrigation system in India. During this course, students will learn about the water requirements of the crops, the hydraulic design of canals, and irrigation structures such as diversion headwork, cross drainage structures, weirs, barrage, dams, etc. In this course, students will also learn about some of the important dams of India and the design criteria for gravity and earthen dams.*

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

<b>Module I: Crop water requirement</b>	6 Hours
Scope of irrigation engineering, Irrigation requirements in India, Soil moisture and plant growth, Crop water requirement, Evapotranspiration, Duty, Delta, irrigation scheduling, methods and efficiency, irrigation water quality.	
<b>Module II: Design of Irrigation Channel</b>	8 Hours
Alignment; canal capacity; losses; FSL of the canal; design of canal in alluvial soil and nonalluvial soils; Kennedy's silt theory; Lacey's regime theory; balancing depth; use of Garrets diagrams and Lacey's Regime diagrams; the lining of irrigation channels; design of lined canal drainage behind lining; Water logging: Causes, Measures: surface and sub-surface drains, land reclamation	
<b>Module III: Diversion head works</b>	8 Hours
Introduction; the layout of diversion headwork and its component; Selection of site, Khosla's theory and concept of flow net; safe exit gradient; hydraulic design of weir on Bligh's theory; and design of modern barrage on Khosla's theory; Necessity & functioning of silt excluder & silt extractor.	
<b>Module IV: Cross drainage structures</b>	6 Hours
Types; selection of the suitable type of Cross drainage works; aqueduct and Siphon aqueduct; determination of maximum flood discharge and waterway	

for drain, fluming of the canal; uplift pressure on the underside of barrel roof and at the floor of the culvert; design of bank connections

**Module V: Reservoir and planning of dam reservoirs** 8 Hours  
 Types of dams; selection of the type of dam; capacity elevation and area elevation curves; design of reservoir capacity; Rule curves and operating tables; sedimentation of the reservoir; Gravity dams: modes of failure, stability analysis, construction, joints; Earthen dams: types, modes of failure, design criteria, seepage analysis, and control

**Module VI: Spillway energy dissipators and Spillway gates** 6 Hours  
 Location of a Spillway; design criteria; controlled and uncontrolled Spillways; Ogee, Chute, Side Channel, Shaft, Syphon Spillways; Energy dissipation; Stilling + basins; Crest gates

**Laboratory/practical/tutorial Modules:**

**3. Text books:**

*(Latest, Only 2)*

1. Irrigation Engineering and Hydraulic Structures, S.K. Garg, Khanna Publications.
2. Irrigation and Water Power Engineering, B.C. Punmia, Laxmi Publication.

**4. References:**

1. Viessmen, Jr. & Lewis, Introduction to Hydrology, PHI Learning Private Ltd.
2. Larry W. Mays, Water Resources Engineering. Wiley Publications.

**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%:**

**Approvals:**

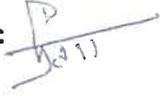
**Faculty interested in teaching this course: –**

1. Dr. Deepak Swami, Associate Professor, School of Civil and Environmental Engineering

**Proposed by: Dr. Vivek Gupta**

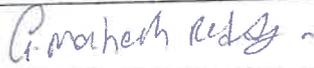
**School: SCEnE**

**Signature:**



**Date:**

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

Sl. No	Faculty Name	Signature
1	Mahesh Reddy Gade	
2	Deepak Swami	
3	Harshad Kulkarni	

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 : CE521  
Course Name : Ecology and Environment Microbiology  
Credit Distribution : 3-0-2-4  
Intended for : PG, PhD  
Prerequisite : IC230 (completed a similar course)  
Mutual Exclusion : (courses with high similarity not allowed to credit by the students after or along with this course, if not relevant courses write 'None')

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#### 1. Preamble:

*This course emphasizes the significance of basic concepts of ecology and microorganism in the environment and their beneficial uses. The present course will provide understanding about the interactions between microbes and their ecosystem. This curriculum will prepare aspiring professionals in the field of microbiology with fundamental knowledge in the fields of plant pathology, environmental microbiology, soil microbiology, public health microbiology, and microbial ecology. The laboratory exercises of present course are provide to the students to documentation of the various microorganism and their characteristics.*

#### Course Modules with quantitative lecture hours:

##### Module 1: Fundamental of Ecology (6 hours)

Basic concept of ecology and ecosystem, level of organization, ecosystem structure, process, stability, biogeography and life zone, population, population characteristic and regulations, species interactions, community and keystone species, succession and concept of climax, fundamental of primary and secondary productivity, energy transfer and nutrient cycling, biodiversity and ecological restoration

##### Module 2: Introduction of Microbiology (8 Hours)

Science of microbiology, microbial cell and properties, impact of microorganism on humans, historical route of discovery of microbiology, Hooke, van Leeuwenhoek, and Cohn concepts of discovery, cell structure and history; prokaryotic, eukaryotic and viruses, DNA arrangement in microbial cell, metabolic diversity of microbes, Types of bacteria; proteobacteria gram positive and gram negative, archaea, cell morphology and size, cytoplasmic membrane;

structure and function, cell wall of prokaryotes; gram positive and gram negative, cell walls of archaea, flagella and motility

### **Module 3: Environment Microbiology (12 Hours)**

Microorganism in the environment, bacterial nutrition and growth, specific growth rate and doubling time, type of culture media; batch and continuous culture, enzyme and catalyst, energy-rich compounds and storage, microbial metabolism- glycolysis, TCA, and ETC, fermentation, nitrogen fixation, nitrogenase, methanogenesis, acetogenesis, biodegradation, bioremediation, bioleaching or biomining, biodegradative organism, environmental factors affecting biodegradation, biodegradation of organic pollutants, biofuel, waste water treatment, water borne microbial diseases, major industrial products, flavouring agents and food supplement, vitamins and beverages, organic acids, aeromicrobiology

### **Module 4: Himalayan Environmental Microbiology (8 Hours)**

Geography and uniqueness of Himalayan region, life in extreme environment, biogeochemical cycle of elements, high altitude lake microbiology, cryospheric microbiology, extremophile (halophile, thermophile, psychrophile), adaptations and metabolic processes under extreme condition, applications of cryospheric microbes,

### **Module 5: Advanced Microbiology tools and Techniques (8 hours)**

Light Microscopy and its principles, compound light microscope, increasing contrast in light microscopy, phase-contrast and dark-field microscopy, fluorescence microscopy, differential interference contrast microscopy (DIC), atomic force microscopy (AFM), Confocal Scanning Laser microscopy (CSLM), electron microscopy, OMICs techniques in microbial remediation processes, genomics, proteomics and metabolomics in microbial remediation, recent advances in in silico approaches for removal of environmental pollutants

### **Laboratory/practical/tutorial Modules: (2 hours)**

1. Method of vegetation sampling, quadrat method; shape, size and number, density, relative density, frequency, relative frequency of vegetation (6 hours)
1. Basic instrumentation, safety and disinfection and in microbiology laboratory (2 hours)
2. Preparation and sterilization of various growth media for microbial isolation (2 hours)
3. Microbial isolation and maintenance through serial dilution, plating, streaking, slant and storage of microbial culture (4 hours)
4. Morphological and biochemical characterization: Gram staining, catalase, urease, oxidase, indole, methyl red etc. (6 hours)
5. Growth curve, effect of physical parameter such as temperature, pH, carbon and nitrogen

sources on microbial growth (4 hours)

6 Isolation of environmental and industrially important microbes (2 hours)

7. Isolation of halophile, thermophile, psychrophile from Himalayan sources. (2 hours)

**Text Books:**

1) Madigan, M. T., Clark, D. P., Stahl, D., & Martinko, J. M. Brock biology of microorganisms 13th edition. Benjamin Cummings. United States, 2010).

2) Singh, J. S., Singh, S. P., & Gupta, S. R. Ecology, environmental science & conservation. S. Chand Publishing. India, (2014).

**References:**

1. Dhakar, K., & Pandey, A. (2020). Microbial ecology from the Himalayan-cryosphere perspective. Microorganisms, 8(2), 257.

2. Liu, Y., Yao, T., Jiao, N., Tian, L., Hu, A., Yu, W., & Li, S. (2011). Microbial diversity in the snow, a moraine lake and a stream in Himalayan glacier. Extremophiles, 15, 411-421.

3. Sati, S. C., & Belwal, M. Microbes: Diversity And Biotechnology, Daya Publishing House, ISBN:9788170357940

4. Maier, R.M., Pepper, I. L. and Gerba, C. P. (2000). Environmental Microbiology A Laboratory Manual. Academic Press

5. Odum, E. P., & Barrett, G. W. (1971). Fundamentals of ecology, 5th edition. Cengage Learning India

6. Pepper, I. L., Gerba, C. P., Gentry, T. J., & Maier, R. M. (Eds.) (2011). Environmental microbiology. Academic press.

7. Giri, A., & Pant, D. (2019). CO2 management using carbonic anhydrase producing microbes from western Indian Himalaya. Bioresource Technology Reports, 8, 100320.

**1. 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.	Environmental Sciences	IC230	< 5%	< 5%

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

**Approvals:**

Other Faculty interested in teaching this course: – Dr. Harshad V. Kulkarni

Proposed by: Dr. Anand Giri School: School of Civil and Environmental Engineering

Signature:

Date: 4/3/2023

*Anand Giri*

The following faculty (at least 3 faculty) discussed on 4<sup>th</sup> March 2023 and approved the proposal on 4<sup>th</sup> March 2023

Sl. No	Faculty Name	Signature
1	Dr. Sayantan Sarkar	
2	Dr. Harshad V. Kulkarni	<i>[Signature]</i>
3	Dr. Dericks P. Shukla	

School Chair:

School:

Date:

This proposal is reported in <sup>52<sup>nd</sup></sup>.....the Board of Academics on <sup>2/11/23</sup>.....

Dean Academics

Date:

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

Comments of the Reviewers:

Reviewer 1.

- 1) A significant portion of the course (22 out of 42 theory hours) is devoted to fundamental and introductory concepts (Modules 1 and 2). Since this is a 500 level course, the introductory portion can be made significantly more compact and much more time can be spent on relatively advanced topics.
- 2) If possible, subsections dealing with technology-driven tools such as measurement methods (confocal, AFM, LC-MS) and bioinformatics can be covered.
- 3) The proposed course has a substantial lab component. Assuming that the course is intended to be floated in the next semester, do/would we have the infrastructural setup ready in time to cater to the lab component?

Reviewer 2 and 3: No comments (Approved)

Proposal for a New Course

**IIT Mandi**  
**Proposal for a New Course**

<b>Course number</b>	: CE522
<b>Name</b>	: Matrix Methods for Structural Analysis
<b>Credit</b>	: 3
<b>Distribution</b>	: L-T-P-C 3-0-0-3
<b>Intended for</b>	: UG Program (B. Tech 3 <sup>rd</sup> /4 <sup>th</sup> Year Students) and PG Program
<b>Prerequisite</b>	: CE404: Analysis of Structures/Equivalent
<b>Mutual Exclusion</b>	: -

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**1. Preamble:**

*The basic structural analysis deals with understanding the response of a structural system subjected to external loads. With the advancements in digital computations, it becomes convenient if one can formulate the forces and displacements in structures in terms of matrix and/or vectors. Hence, it becomes essential to know how a structural system could be idealized systematically so that such computational advantages can be fully utilized. This course thus gives advanced exposure to the students on how matrix methods could be efficiently used in any type of structural systems to perform systematic analysis using computers. The course also encompasses assessments/projects and case studies which can equip the students to apply the formulation to any real structures.*

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

**Module 1:** Introduction to matrix analysis of structures, elements and structures, (3 Hours) degrees of freedom, the principle of superposition, concepts of matrix algebra.

**Module 2:** Matrix analysis of structures with axial elements: plane trusses and space trusses Flexibility method: Introduction to the approach, Deriving the flexibility matrix of truss. Analysis of determinate and indeterminate structures employing the flexibility matrix approach.

**Module 3:** Matrix analysis of beams and grids: Flexibility method-Deriving the flexibility matrix beams and grids: Analysis of determinate and indeterminate structures employing the flexibility matrix approach.

**Module 4:** Matrix analysis of plane and space frames: Flexibility method: Deriving the flexibility matrix of plane and space frames: Analysis of determinate and indeterminate structures employing the flexibility matrix approach. Analysis of prismatic and non-prismatic frames.

**Module 5:** Matrix analysis of structures with axial elements: plane trusses and space trusses. Stiffness Method: Introduction to the approach, Deriving the stiffness matrix truss. Analysis of determinate and indeterminate structures employing the stiffness matrix approach.

**Module 6:** Matrix analysis of beams and grids: Stiffness method: Derivation of stiffness matrix beams and grids: Analysis of determinate and indeterminate structures employing the stiffness matrix approach.

**Module 7:** Matrix analysis of plane and space frames: Stiffness method: Derivation of (5 Hours) the stiffness matrix plane and space frames: Analysis of determinate and indeterminate structures employing the stiffness matrix approach. Analysis of prismatic and non-prismatic frames.

**Module 8:** Comparison between stiffness and flexibility methods, Analysis of truss, (5 Hours) beams, and frame structures using direct stiffness approach; Computer application of direct stiffness method.

**Module 9:** Beyond matrix methods: Introduction to finite element method, element (4 Hours) types, basic formulation, and application to 1D problems.

**Laboratory/practical/tutorial Modules: -**

**3. Text books:**

1. Weaver, W., and Gere, J. M., Matrix analysis framed structures. Springer science & business media, 2012.
2. Hibbeler, RC, Structural Analysis, Pearson Education, 9th edition, New Delhi, 2017.

**4. References:**

1. G. S. Pandit and S. P. Gupta, Structural Analysis: A Matrix Approach, Tata McGraw-Hill, 2008.
2. Martin, H. C., Introduction to Matrix Methods of Structural Analysis, McGraw-Hill, New York, 1996
3. Menon, D, Advanced Structural Analysis, Narosa Publishing House, 2015.

**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.	Analysis of Indeterminate Structures	CE506	Introduction to matrix methods for structural analysis.	21%

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

**Approvals:**

**Faculty interested in teaching this course: –**

**Proposed by:** Dr. Shivang Shekhar and Dr. Dhanya J

**School:** School of Civil & Environmental Engineering (SCENE)

**Signature:**

**Date:** 08/09/2022

The following faculty discussed on.....and approved the proposal on.....

Sl. No	Faculty Name	Signature
1	Dr. Kaustav Sarkar	

2	Dr. Sandip Kumar Saha	
3	Dr. Maheshreddy Gade	

School Chair:

School:

Date:

This proposal is reported in .....52nd.th Board of Academics on ...2.11.23

Dean Academics

Date:

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

IIT Mandi

Course Number	: CE 558
Course Name	: Air pollution and its mitigation
Credits	: 3-0-0-3
Prerequisites	: IC 230 (Environmental Science) for B.Tech.
Intended for	: 3 <sup>rd</sup> and 4 <sup>th</sup> year B.Tech., Post-graduate
Distribution	: Elective

1. Preamble:

The atmospheric system mediates phenomena ranging from local- and regional-scale air pollution to global-scale climate change, thereby affecting the environment, human health and the sustainability of the planet as a whole. A robust understanding of these processes and the complexities of the earth-atmosphere-climate system is critical to the ability to design effective mitigation technologies and policies. This course aims to foster this understanding by focusing on the fundamental physical and chemical processes that govern atmospheric behaviour, especially related to the residence, transformation, transport, and deposition of gaseous and aerosol species. This is followed by analyses of the natural and anthropogenic controls on various aspects of air pollution, and perspectives on their measurement, monitoring, risk assessment and mitigation.

**Learning outcomes:** The students would i) develop a thorough understanding of the interactive processes that lead to atmospheric pollution on varying spatial scales; ii) appreciate the links between air quality and health; iii) develop insights into the theoretical and practical aspects of air pollution control engineering; and v) draw lessons from the success stories and failures of local, regional and global policies to tackle air pollution.

2. Course Modules:

**Module 1: The atmospheric system**

**[5 Hours]**

Vertical profiles of pressure and temperature; atmospheric structure; hydrostatic equilibrium and scale height; stability and lapse rates; temperature inversions; atmospheric dispersion; general circulation and surface winds; timescales of atmospheric transport

**Module 2: Basics of atmospheric chemistry**

**[2 Hours]**

Photochemical and radical-assisted reactions; daytime vs nighttime and tropical vs polar chemistry; species lifetimes; atmospheric measurement units

**Module 3: Stratospheric processes**

**[5 Hours]**

Dynamics of stratospheric transport; formation and distribution (latitudinal, seasonal and vertical) of stratospheric O<sub>3</sub>; UV shielding and effect on climate; role of HO<sub>x</sub>, NO<sub>x</sub> and chlorofluorocarbons in catalyzing O<sub>3</sub> depletion – observational evidence, mitigation measures, recovery and challenges

**Module 4: Tropospheric gas-phase species**

**[8 Hours]**

*Debar*

Local, regional and global pollutants; the oxidizing capacity of the troposphere; constraints on CO and CH<sub>4</sub>; the CO-HO<sub>x</sub>-NO<sub>x</sub>-VOC-O<sub>3</sub> cycle; photochemical smog – case study of Los Angeles, USA; dry and wet removal of pollutants; acidic deposition – case study of the Northeastern USA; current scenario in Asia and the Indian perspective; mitigation, challenges and opportunities

**Module 5: Aerosols**

**[6 Hours]**

Historical perspectives on air pollution; physical properties of aerosols – formation, growth, aging and size distribution; primary vs secondary and externally- vs internally-mixed aerosol; core-shell theory; major aerosol chemical components and their sources; tracers

**Module 6: Air pollution control technologies**

**[11 Hours]**

Basics of air pollution control system design – velocities, flow rate, pressure drop, nature of combustion, acid dew point, particle settling and drag forces, diffusion; mitigation technologies in stationary systems – fluidized bed combustion, integrated gasification combined cycle, flue gas desulfurization, baghouses, scrubbers, cyclone collectors, and electrostatic precipitators; mitigation technologies in mobile systems – crankcase, evaporative and tailpipe emissions from automobiles, catalytic converters, diesel particulate filters, fuel modification and blending

**Module 7: Risk assessment and policy intervention on air pollution**

**[5 Hours]**

Link between air pollution and mortality/morbidity; risk assessment for carcinogenic and non-carcinogenic pollutants; air quality indices – case study of India; air pollution as an externality; ambient, emission and technology standards; policies for air pollution control

**3. Textbooks:**

- i) Atmospheric Chemistry and Physics: From Air Pollution to Climate Change; 3<sup>rd</sup> Edition, 2016; John H. Seinfeld and Spyros N. Pandis; Wiley.
- ii) Introduction to Atmospheric Chemistry; 1<sup>st</sup> Edition, 2000; Daniel J. Jacob; Princeton University Press.
- iii) Air Pollution Control Engineering, 2<sup>nd</sup> Edition, 2000; Noel De Nevers; McGraw-Hill.

**4. References:**

- i) Chemistry of the Upper and Lower Atmosphere; 2<sup>nd</sup> Edition, 2000; Barbara J. Finlayson-Pitts and James N. Pitts Jr; Academic Press.
- ii) Environmental Chemistry, 5<sup>th</sup> Edition, 2012; C. Bard and M. Cann; W.H. Freeman and Company.
- iii) Research articles will be advised as required.

**5. Similarity Content Declaration with Existing Courses**

S.N.	Course Code	Similarity Content	Approx. % of Content
1	IC 230 (Environmental Science)	Introduction to air pollution (minor)	5%

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

Approvals:

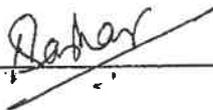


Other Faculty interested in teaching this course:

Proposed by: Dr. Sayantan Sarkar

School: School of Engineering

Signature: \_\_\_\_\_



Date: \_\_\_\_\_

Recommended/Not Recommended, with Comments:

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Date: \_\_\_\_\_

Chairman, CPC

*Approved/Not Approved*

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Date: \_\_\_\_\_

Chairman, Senate

**IIT Mandi**  
**Proposal for a New course**

**Course Number** : CE 604  
**Course Name** : Theory of Plasticity  
**Credits** : 3  
**Distribution** : 2-1-0-3  
**Intended for** : P.G. (M.Tech Structure, Design, etc., M.Tech by Research, and Ph.D.)  
**Prerequisites** : Strength of Materials and Structures, Structural Analysis, Theory of elasticity, advanced solid mechanics

1. **Preamble:** This course highlights the limitations of the results given by the Strength of material and theory of elasticity approach and equally important for the postgraduate students in Civil, Mechanical and Aerospace engineering as well as for engineers to understand the complete behavior of solids under applied loads. The course starts with the introduction to plasticity, assumptions and its applications to the different fields of engineering. Later on, the concept of the analysis of stresses and strains will be developed and applied to practical problems.

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

1. **Introduction:** Fundamental principles of plasticity, Basic laws of plasticity, Index notations. (4)
2. **Criteria of yielding;** Maximum stress theory, Maximum strain theory, maximum shear theory, maximum strain energy theory, Distortion energy theory, Mohr's theory of yielding, Yielding surfaces. (6)
3. **Plastic stress strain relations:** Strain relations, Distinction between Elastic and Plastic Stress-Strain Relations, Plastic work, Derivation of Plastic Stress- strain relations. (6)
4. **Elastoplastic Problems of Spheres and Cylinders:** General relations, thick hollow sphere with internal pressure and thermal loading, Hollow sphere- Spread of Plastic Zone, Residual Stresses and Strain hardening material. (8)
5. **Plane problems in plasticity:** Beltrami- Michell equation, Plastic Bending of Plates, Deflection of Circular Plates, Plane Strain Analogy for Plate Bending, Yield Line theory for Plates, Axis symmetric case, General theorems of plasticity, Drucker's postulates, Integration of Plasticity Equation. (8)
6. **The Torsion problem:** Torsion of Prismatic Bar, General relations, elasticity solutions, perfect plasticity, elastoplastic torsion with strain hardening, bar with rectangular cross-section, bar with circular cross-section. (6)
7. Slip-Line Field and limit analysis. (4)

3. **Text books:**

- a. J. Chakrabarty, "Applied Plasticity, Second Edition", Springer New York Dordrecht Heidelberg London.
- b. Alexander Mendelson, "PLASTICITY: Theory and Application", The Macmillan Company, New York.
- c. Jacob Lubliner, "Plasticity Theory", Courier Corporation, 2008.

**4. Reference books:**

- 1) R. M. Jones, "Deformation theory of plasticity". Bull Ridge Publishing, USA.
- 2) Akhatar S khan Sujain Huang, "Continuum Theory of Plasticity", John Wiley and sons. INC.
- 3) L.M. Kachanov, "Fundamentals Theory of Plasticity", Dover Publication. INC.
- 4) Jacob Lubliner, "Plasticity theory", Dover Publication. INC.

**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.	None	None	None

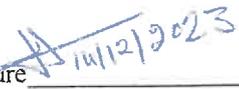
**6. Justification of new course proposal if cumulative similarity content is >30%: N/A**

**Approvals:**

**Faculty interested in teaching this course: – Dr. Himanshu Pathak**

Proposed by: **Dr. Rajneesh Sharma**

School: SCEnE

Signature 

Date: 14/12/2023

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

Sl. No	Faculty Name	Signature
1.	Prof. Puneet Mahajan	
2.	Prof. Arshad Hussain khan	

School Chair:

School:

Date:

This proposal is reported in ...<sup>52<sup>nd</sup></sup>.....th Board of Academics on ...<sup>02/11/23</sup> -

Dean Academics

Date:

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

**Comments of the Reviewers:**

**Dr. Arshad Hussain Khan**

Thanks for your offer to review the course Theory of Plasticity which is designed for PG students. This course is of immense benefits for PG students who are working in structural mechanics. In my opinion the course has been well defined and covers in detail the various issues in Plasticity. The prescribed Text books and reference books also seems to be appropriate.

**Prof. Puneet Mahajan**

I have reviewed the course and it seems fine to me in the present form.

Approved in  
9<sup>th</sup> senate  
meeting



## IIT Mandi

### Proposal for a Course Content Change

**Course number** : CE303  
**Course Name** : Water Resources Engineering  
**Credit Distribution** : 3-0-0-3  
**Intended for** : B.Tech. (Civil Engineering)  
**Prerequisite** : CE251-Hydraulic Engineering  
**Mutual Exclusion** : None

#### 1. Preamble:

This course is an advance course of civil engineering which will cover the aspects of hydrology and surface water, watershed management and other hydraulic engineering concepts. This course will unveil the concepts to more advanced level. The effect of hydrological cycle to runoff generation, calculation of runoff and estimation in a catchment. The subject will also provide the learning opportunity to the students to understand the floods and water shed management in hilly terrain. Students will also understand the concept of groundwater flow and transport problems. Learning outcomes of this course are anticipated as follows:

- Students will understand the basics of hydrology, meteorology, rainfall-runoff calculations and factors affecting the rainfall and runoff relation.
- Students will learn the concepts of storm hydrology, s-curve and depth area duration curves for estimation of rainfall over a catchment area
- Students will develop the skills to analyze floods, flood routing systems flood forecasting, return period of any flood, and probability analysis.

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

<b>Module I: Introduction</b> Hydrological Cycle, Water budget equation, Reynold Transport Theory, Principle of mass, momentum, and energy balance in Hydrology	6 Hours
<b>Module II: Precipitation</b> Atmospheric Circulation, Water vapor, Precipitation measurement, rain gauge network, Mean Precipitation, Maximum Intensity/Depth Duration Curve, Rainfall patterns in India and Himachal Pradesh	8 Hours
<b>Module III: Abstractions from Precipitation</b>	6 Hours

Evaporation and its estimation, Evapotranspiration, Estimation of Evapotranspiration, Potential Evapotranspiration, Interception, Infiltration	
<b>Module IV: Hydrometry</b> Measurement of Stage, Velocity, Area Velocity Method, Dilution Technique, Electromagnetic method, Ultrasonic Method, Indirect method, Rating Curve	6 Hours
<b>Module V: Storm Hydrology</b> Hydrographs, unit hydrograph theory, S-curve, Mass and flow duration curve, depth area duration curve, runoff estimation.	8 Hours
<b>Module VI: Floods and Droughts</b> Flood estimation, Frequency analysis, Risk and Reliability, Hydrologic and Hydraulic routing, Clark's and Nash's model	6 Hours
<b>Module VI: Groundwater Hydrology</b> Types of Aquifer and characteristics, Application of Darcy Law, Groundwater flow equations, well hydraulics.	2 Hours

**3. Text books:**

1. K. Subramaniya, 'Engineering Hydrology', Tata MacGraw Hill, New Delhi, 2013.
2. V.T. Chow, D.R. Maidment, and L.W. Mays, 'Applied Hydrology', McGraw Hill, 1988.

**4. References:**

1. H.M. Raghunath, 'Hydrology – Principles, Analysis and Design', Wiley Eastern Ltd., 2006.
2. V.P. Singh, 'Elementary Hydrology', Prentice Hall, 1993.
3. R.K. Linsley, J. B. Franzini, D. L. Freyberg and G. Tchobanoglous, 'Water Resource Engineering 4th Edn.', McGraw Hill Book Co., 1992.

**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

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

**Approvals:**

**Other Faculty interested in teaching this course: –**

1. Dr. Deepak Swami, Associate Professor, School of Civil and Environmental Engineering

**Proposed by:** Dr. Vivek Gupta

**School:**

**Proposal for a New Course**

Signature:

*P*  
*J d 11*

Date:

*Recommended/Not Recommended, with Comments:*

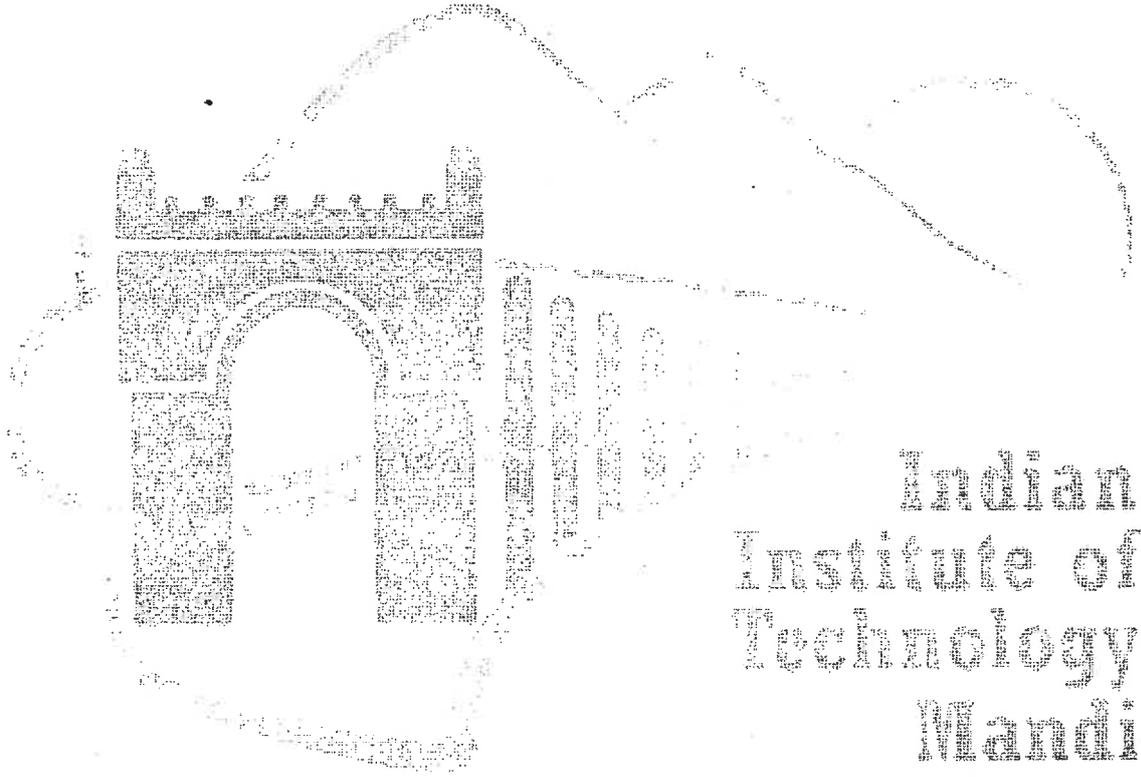
Date: \_\_\_\_\_

Chairperson, CPC

*Approved / Not Approved*

Date: \_\_\_\_\_

Chairperson, BoA



Approved in 97  
Senate meeting

**Indian Institute of Technology Mandi**

<b>Course Number:</b>	CE 311
<b>Course Name:</b>	Geotechnical Engineering I
<b>Credits:</b>	3-0-0-3
<b>Prerequisites:</b>	NIL
<b>Intended for:</b>	UG students (B.Tech. 3 <sup>rd</sup> Year)
<b>Distribution:</b>	Discipline Core
<b>Semester:</b>	odd/even

**Permeable:** The basic course on Geotechnical Engineering introduces students to the fundamentals of the engineering behaviour of soil. The present course aims at familiarizing the basic about the soil formation, basic properties, testing procedures and thereby provides the required elementary knowledge for in-depth understanding about the soil for later studies.

**Module for theory component:**

1. **Introduction:** Origin, Formation, Importance of geotechnical engineering, Idealization of soil matrix, three phase diagram, Mass-weight-volume relationships, applications **(8 hours)**
2. **Properties of soil:** Particle size distribution, Index properties, Atterberg Limits, plasticity chart, Soil Classification **(4 hours)**
3. **Soil Compaction:** Soil density-water relationship, Proctor tests, field tests and applicability **(3 hours)**
4. **Permeability in soils:** One-dimensional flow, Darcy's Law, Laboratory and field method of determination of permeability, concept of seepage **(6 hours)**
5. **Stresses in soils:** Stresses in soil mass, capillarity phenomena, concept of effective stress, Stresses from elastic theory, Boussinesq and Westergaard's theory, pressure distribution diagram, pressure bulb, shapes of loading area **(7 hours)**
6. **Consolidation:** 1D laboratory test, preconsolidation pressure, concept of normally consolidated and over consolidated soil, One-dimensional equation and solution, determination of consolidation settlement **(5 hours)**

7. **Shear Strength of Soil:** Mohr circle, Mohr-coulomb failure criteria, shear strength of sand and clays, pore pressure, factors affecting shear strength, laboratory measurement of shear strength. (8 hours)

**Text Books:**

- (a) Robert D Holtz, William D. Kovacs and Thomas C. Sheahan, Introduction to Geotechnical Engineering, 2<sup>nd</sup> Edition, Pearson, 2021.  
(b) V. N. S. Murty, 'Geotechnical Engineering', Book World Enterprises, 2005.

**Reference Books:**

- a) R.F. Craig, 'Soil Mechanics', ELBS and Van Nostrand Reinhold Co. Ltd., Berkshire, 2004.  
b) Braja M. Das, 'Principles of Geotechnical Engineering', Cengage Learning, 7th edition and above.  
c) G. Ranjan and A.S.R. Rao, 'Basic and Applied Soil Mechanics', New Age International Publishers, 2007.

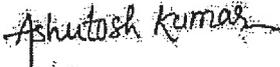
**Justification for new course proposal if cumulative similarity content is more than 30%:**  
Not applicable.

**Approvals:**

Other faculty interested in teaching this course: Dr. Prassana R, Dr. Uday and Dr. Mousumi.

Proposed by: Dr. Ashutosh Kumar

School: School of Civil and Environmental Engineering (SCENE)

Signature:  Date: 07.09.2022

**Recommended / Not Recommended, with comments:**

Chairman, CPC

Date:

Approved / Not Approved:

Chairman, Senate

Date:

**Indian Institute of Technology Mandi**

<b>Course Number:</b>	CE311P
<b>Course Name:</b>	Geotechnical Engineering Laboratory
<b>Credits:</b>	0-0-2-1
<b>Prerequisites:</b>	NIL
<b>Intended for:</b>	UG students (B.Tech. 3 <sup>rd</sup> Year)
<b>Distribution:</b>	Discipline Core
<b>Semester:</b>	odd/even

**Permeable:** The laboratory exercises aim at providing the required standard test procedures discussed in geotechnical engineering course. The students would be exposed to the hands on experience on the various tests on soil and provides a scope of extending them to various materials as possible.

**Laboratory Modules:**

1. Determination of Specific Gravity
2. Grain Size Analysis (a) Sieve analysis (b) Hydrometer Analysis
3. Determination of Consistency Limits
4. Permeability Test (a) Constant Head Testing (b) Falling Head testing
5. Proctor Test
6. Direct Shear Test
7. Unconfined Compression Test
8. Vane Shear Test
9. Field Density Test
10. Free swell and consolidation test
11. Triaxial Testing

**Text Books:**

- a) V. N. S. Murty, 'Geotechnical Engineering', Book World Enterprises, 2005.
- b) Braja M. Das, 'Principles of Geotechnical Engineering', Cengage Learning, 7th edition and above

**Reference books:**

- (a) Indian standards using Geotechnical Testing

**Justification for new course proposal if cumulative similarity content is more than 30%:**

Not applicable.

**Approvals:**

Other faculty interested in teaching this course: Dr. Prassana R, Dr. Uday and Dr. Mousumi.

Proposed by: Dr. Ashutosh Kumar

School: School of Civil and Environmental Engineering (SCENE)

Signature: *Ashutosh Kumar* Date: 07.09.2022

**Recommended / Not Recommended, with comments:**

Chairman, CPC

Date:

Approved / Not Approved:

Chairman, Senate

Date:

# IIT Mandi

## Proposal for a New Course

**Course number** : CE 352P  
**Course Name** : Transportation Engineering Laboratory  
**Credit Distribution** : 0-0-2-1  
**Intended for** : UG Civil Engineering  
**Prerequisite** : None  
**Mutual Exclusion** : None

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### **1. Preamble:**

Transportation Engineering Laboratory, where a dynamic and essential component of our comprehensive engineering curriculum is presented. This course serves as a bridge between theoretical knowledge and real-world applications in transportation engineering. Through hands-on experiments, data analysis, and innovative problem-solving, invaluable insights will be gained into the design, analysis, and optimization of transportation systems. Our state-of-the-art facilities will guide the students in exploring traffic flow dynamics, pavement materials quality assurance and control, and traffic surveys. The laboratory session offers students a unique opportunity to acquire the skills and expertise needed to shape the future of transportation infrastructure.

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

#### **Laboratory/practical/tutorial Modules:**

<b>S. No</b>	<b>Experiments</b>
1	Los Angles Abrasion Test of Bitumen
2	Devel's abrasion Test of Bitumen
3	CBR Test
4	Marshall Stability of Bitumen
5	Penetration Test of Bitumen
6	Softening Point of Bitumen
7	Flash and Fire point of Bitumen
8	Ductility of Bitumen
9	Viscosity of Bitumen
10	Banklmen's Beam Test
11	Road Survey- Cross section, Super-Elevation Camber, Gradient
12	Measuring Spot Speed/Flow/Density/Vehicle Count

### 3. Text books:

- 1) S.K. Khanna, C.E.G. Justo and A. Veeraraghavan, 'Highway Engineering', Nem Chand Bros., 10th Edition, 2018.
- 2) Kadiyali L.R., 'Principles and Practice of highway Engineering', Khanna Publishers, Delhi, 1992.

### 4. References:

- IS Standards for each test
- "Transportation Engineering: Planning and Design" by Paul H. Wright and Norman J. Ashford -
- "Traffic and Highway Engineering" by Nicholas J. Garber and Lester A. Hoel

### 1. 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.	nil			

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

**Approvals:**

**Faculty interested in teaching this course: –**

**Proposed by: Dr K V Uday**

**School: SCEnE**

**Signature:**

**Date: 21.09.2023**

The following faculty (at least 3 faculty) discussed on 25 August 2023, and approved the proposal on 21<sup>st</sup> September 2023.

Sl. No	Faculty Name	Signature
1	Dr K V Uday	
2	Dr Maheshreddy	
3	Dr Ashutosh Kumar	

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.

**Proposal for modification in Minor in German Language (currently proposed to be Minor in German Studies) and the courses therein**

1. The current Minor basket in German language comprises courses in German History and Literature apart from those in the German language. Accordingly, the name 'Minor in German Language' is not comprehensive enough and should be changed to 'Minor in German Studies'.
2. Some of the prescribed textbooks are more than ten years old and need to be updated in the course of time. These include textbooks for the courses HS342 - German I, HS352 - German II, HS362 - German III, and HS372 - German IV.
3. As many new and relevant courses have been proposed and floated since the inception of the Minor program, these need to be included in the Minor Basket. The details of these courses are provided below.
4. The Common European Frame of Reference (CEFR) levels corresponding to the various language courses need to be updated as well, since it is not possible to cover the mentioned levels within the duration of the semester.

The revised proposal is appended below:

## **Minor in German Studies**

The minor stream in German Studies is intended to encourage B.Tech. students to acquire adequate skills in reading comprehension, writing and oral expression conforming up to the B1 level of the Common European Frame of Reference (CEFR)\*. The program seeks to equip students for intercultural understanding by offering them courses in Literature and History.

It offers sufficient value-addition to professional prospects in terms of international language competence; besides, it facilitates student exchange with the TU-9 partner universities of the IIT Mandi.

\*B1: B1 level proficiency signifies an intermediate stage of language proficiency, where individuals can understand and communicate in everyday situations, express opinions, and participate in basic conversations.

Students are expected to take two core courses and two elective courses from the list given below in order to qualify for a minor.

### **Courses for Minor in German Studies:**

#### **A. Core Courses (6-credits):**

- HS 342: German I (3-0-0-3)
- HS 352: German II (3-0-0-3)

#### **B. Elective Courses\* (Students have to opt for any two courses from this basket to complete 6-credits):**

- HS 362: German III (3-0-0-3)
- HS 372: German IV (3-0-0-3)
- HS 373: Readings from German History (3-0-0-3)
- HS 363: Post-War Germany: A Literary Perspective (3-0-0-3)
- HS 539: Post-War Germany: Politics, Society, and Culture (3-0-0-3)
- HS 306: Introduction to German Literature (3-0-0-3)
- HS 503: German Literature from World War II to Reunification (3-0-0-3)

\* The list of elective courses is based on current offerings and may be modified and reported to the BoA

***The modifications shall be applicable to all the UG students of BTech 2020 batch and thereafter.***

## **A. Core Courses (6-credits):**

### **1. HS 342 German I**

Credit: 3-0-0-3

Prerequisite: Consent of the faculty member

Students intended for: B.Tech

Semester: Even/Odd

Common European Frame of Reference Norms (Level A1.1)

#### **Preamble:**

The course introduces students to the German language: Elementary grammatical features and basic German vocabulary; simple conversation skills required in routine situations forms the core of the course. The focus on communicative language includes listening, speaking, reading and writing. Pronunciation practice and learning strategies rounds off the introductory course. German culture of today also plays a crucial role in communicating effectively and this will feature in all learning modules.

**Course content:** Basic grammatical features: position of verbs in affirmative sentences and questions, conjugation, the use of articles, imperative, the accusative case and the personal pronouns in the dative case. Listening and speaking practice: understanding simple information at railway stations, in telephone calls and being able to hold simple conversations where the partner in conversation assists in the communication process. Writing and reading: short messages and notes, filling up simple forms. Vocabulary: personal information, food and drinks, shopping, numbers, orientation.

#### **Prescribed Textbook**

Stefanie Dengler, Tanja Mayr-Sieber, Paul Rusch, Helen Schmitz: Netzwerk A1 Deutsch als Fremdsprache. New Delhi (Goyal Publishers, rpt.) 2012.

#### **Select References**

- Christine Eckhard-Black / Dr. Ruth Whittle: Cassell's Contemporary German. A Handbook of Grammar, Current Usage, and Word Power. New York et.al. (MacMilan) 1993.
- Heinz Oehler: Grundwortschatz Deutsch. Stuttgart (Klett Verlag) 1994.
- Krishna Murari Sharma: German-Hindi Dictionary. Delhi (Rachna publication) 1978.
- Idiomatiche Redewendungen von A – Z. Berlin/München (Langenscheidt Verlag) 1993.
- Langenscheidt's German-English, English-German Dictionary. New Delhi (Goyal Saab) 2009.
- Deutsch Übungsbuch Grammatik A2-B2. (Hueber Publication). 2017.

## **2. HS 352      German II**

Course Name:            German II  
 Course No:             HS 352  
 Credits:                 3-0-0-3  
 Offered to:             B.Tech

Common European Frame of Reference Norms (Level A1.2)

### **Preamble:**

The course is essentially a continuation of German I and seeks to reinforce communication skills through greater emphasis on speaking, listening, reading and writing. German grammar, principal syntactic features and vocabulary referring to everyday life is part of the syllabus. German culture of today also plays a crucial role in communicating effectively and will feature in all topics.

### **Course Content:**

Basic Grammatical Features: Modal Verbs, Prepositions (Revision as well as Prepositions with Dative), Perfect Tense, Separable Verbs, The Subjunctive Mood, Advanced Conversation skills (pertaining chiefly to simple dialogues in everyday situations), Writing skills geared to communicative tasks such as writing e-mails, short messages and notes, Listening and Reading Comprehension. Basic information on German speaking countries.

### **Prescribed Textbook**

Stefanie Dengler, Tanja Mayr-Sieber, Paul Rusch, Helen Schmitz: Netzwerk A1 Deutsch als Fremdsprache. New Delhi (Goyal Publishers, rpt.) 2012.

### **Select References**

- Christine Eckhard-Black / Dr. Ruth Whittle: Cassell's Contemporary German. A Handbook of Grammar, Current Usage, and Word Power. New York et.al. (MacMilan) 1993.
- Heinz Oehler: Grundwortschatz Deutsch. Stuttgart (Klett Verlag) 1994.
- Krishna Murari Sharma: German-Hindi Dictionary. Delhi (Rachna publication) 1978.
- Idiomatiche Redewendungen von A-Z. Berlin/München (Langenscheidt Verlag) 1993.
- Langenscheidt's German-English, English-German Dictionary. New Delhi (Goyal Saab) 2009
- Deutsch Übungsbuch Grammatik A2-B2. (Hueber Publication). 2017.

**B. Elective Courses\* (Students have to opt for any two courses from this basket to complete 6-credits):**

1. HS 362: German III (3-0-0-3)
2. HS 372: German IV (3-0-0-3)
3. HS 373: Readings from German History (3-0-0-3)
4. HS 363: Post-War Germany: A Literary Perspective (3-0-0-3)
5. HS 539: Post-War Germany: Politics, Society, and Culture (3-0-0-3)
6. HS 306: Introduction to German Literature (3-0-0-3)
7. HS 503: German Literature from World War II to Reunification (3-0-0-3)

**1. HS 362      German III**

Course Name:            German III  
Course No:              HS362  
Credits:                  3-0-0-3  
Offered to:              B.Tech

Conforms to Common European Frame of Reference Norms (Level A2.1)

**Preamble:**

The course is a continuation of German I and II that enables students to hold basic conversations in German, read longer texts and write informal e-mails and postcards. The focus is on communicative language use, thus comprising speaking, listening, reading and writing practice. Basic vocabulary and grammar from German I and II will be revised and extended to ensure deeper understanding of grammatical features in addition to word formation rules of the German language. Cultural knowledge is extended to include information on Germany, Switzerland and Austria.

**Course Content**

Basic grammatical features: Preterite form of auxiliary and modal verbs, perfect tense, subjunctive form of important verbs, subordinate clauses, comparative and superlative. Listening and speaking practice: Talking about past events, describing people, writing about single items/objects. Reading and writing practice: Reading about a survey, reading and writing postcards and e-mails. Vocabulary: where people live, vacations, health, colours, clothes, the human body.

### **Prescribed Textbook**

Stefanie Dengler, Tanja Mayr-Sieber, Paul Rusch, Helen Schmitz: Netzwerk A2 Deutsch als Fremdsprache. New Delhi (Goyal Publishers, rpt.) 2013.

### **Select References**

- Christine Eckhard-Black / Dr, Ruth Whittle: Cassell's Contemporary German. A Handbook of Grammar, Current Usage, and Word Power. New York et.al. (MacMilan) 1993.
- Heinz Oehler: Grundwortschatz Deutsch. Stuttgart (Klett Verlag) 1994.
- Krishna Murari Sharma: German-Hindi Dictionary. Delhi (Rachna publication) 1978.
- Idiomatic Redewendungen von A-Z Berlin/München (Langenscheidt Verlag) 1993.
- Langenscheidt's German-English, English-German Dictionary. New Delhi (Goyal Saab) 2009.
- Deutsch Übungsbuch Grammatik A2-B2. (Hueber Publication). 2017.

## **2. HS 372      German IV**

Course Name:            German IV

Course No:             HS372

Credits:                3-0-0-3

Offered to:            B.Tech

Common European Frame of Reference Norms (Level A2.2-B1.1)

## **Preamble:**

The course offers a comprehensive survey of German grammar. In addition, it provides the platform for acquiring requisite vocabulary for everyday communication situations. The course enables the student to understand the central ideas of complex texts on a variety of themes and concerns informing everyday life in Germany. It exploits multi-media resources to enable students to express themselves clearly in speech and in writing.

## **Course Content**

Grammatical features: Genitive prepositions; subordinating conjunctions, relative clauses; passive voice; present subjunctive; indirect speech; phrasal verbs and common idioms. Listening and speaking skills: listening to radio news: responding to questions thereon; preparing news summary, interviewing people to elicit complex information. Writing skills: Express concrete as well as abstract ideas, write short biographies, prepare resumes, write brief essays on topics of general import. Reading skills: Read simple stories and recount, read newspaper reports and prepare outlines.

## **Prescribed Text**

- Stefanie Dengler, Tanja Mayr-Sieber, Paul Rusch, Helen Schmitz: Netzwerk A2 Deutsch als Fremdsprache. New Delhi (Goyal Publishers, rpt.) 2013.
- Stefanie Dengler, Tanja Mayr-Sieber, Paul Rusch, Helen Schmitz: Netzwerk A2 Deutsch als Fremdsprache. New Delhi (Goyal Publishers, rpt.) 2015.

## **Select References**

- Christine Eckhard-Black/ Dr. Ruth Whittle: Cassell's Contemporary German. A Handbook of Grammar, Current Usage, and Word Power. New York et al. (MacMillan) 1993.
- Heinz Oehler: Grundwortschatz Deutsch. Stuttgart (Klett Verlag) 1994.
- Idiomatiche Redewendungen von AZ. Berlin/München (Langenscheidt Verlag) 1993.
- Langenscheidt's German-English, English-German Dictionary. New Delhi (Goyal Saab) 2009.

- Podcasts of the Deutsche Welle.
- Excerpts from standard German newspapers, national and regional.
- Deutsch Übungsbuch Grammatik A2-B2. (Hueber Publication). 2017.

### **3. HS 373      Readings from German History**

Course Name:            Readings from German History

Course No:             HS373

Credits:                3-0-0-3

Offered to:            B.Tech

Common European Frame of Reference Norms (Level B2)

#### **Preamble:**

The course offers a broad survey of German history. It seeks to promote the main advanced reading comprehension in German through a systematic study of carefully graded texts and (slightly abridged) original materials that deal with major landmarks in German history from 1806 to the present.

#### **Course Content:**

##### **Select Reading Material on:**

The Birth of the German Nation (1806 - 1848); Prussia and Austria 1848- 1871; the Nation State: Empire and Colonial Ambitions (1890- 1910); from World War I to the Weimar Republic (1914- 1933); Nazi Germany (1933 - 1942); Finis Germaniae to the Basic Law (1942 -1949), Divided Legacy (1949 -1990); United Germany

#### **Prescribed Texts: Excerpts from:**

- Heinz Ludwig Arnold: Deutschland! Deutschland? Texte aus 500 Jahren von Martin Luther bis Günter Grass. Frankfurt a.M.: Fischer, 2002.

- Hagen Schulze: Kleine deutsche Geschichte. Mit Bildern aus dem Deutschen Historischen Museum, Munich: Beck, 1996.

### **Select References**

- Karin Hermann: Reading German History. A German Reading Course for Beginners. Munich: Max Hueber, 1992.
- Eberhard Jäckel: Das deutsche Jahrhundert. Eine historische Bilanz. Stuttgart: Deutsche Verlags-Anstalt, 1996.
- Martin Kitchen: The Cambridge Illustrated History of Germany. Cambridge: CUP, 2000.
- Klaus Schulz: Aus deutscher Vergangenheit. Ein geschichtlicher Überblick. Munich: Max Hueber, 1971.
- Peter Watson: The German Genius. Europe's Third Renaissance, the Second Scientific Revolution and the Twentieth Century. New York: Harper Collins, 2010.

## **4. HS 363 Post-War Germany: A Literary Perspective**

Course Name: Post-War Germany: A Literary Perspective  
 Course No: HS363  
 Credits: 3-0-0-3  
 Offered to: B.Tech

Common European Frame of Reference Norms (Level B2)

### **Preamble:**

The course examines the trajectory of German history from the Stunde Null or Zero Hour in 1945 to the Fall of the Wall in 1989 through its literary reflexes. It focuses on advanced reading comprehension by a thorough study of select short stories and poems besides short excerpts from novels that dwell on major defining moments in post-war Germany.

### **Course Content:**

### **Select Reading Material on:**

‘Vergangenheitsbewältigung’ or Coming to terms with the Nazi past; Cold War; the two Germanys; the German Economic Miracle, the Workers' Uprising of 1953; the Berlin Wall; the Student Revolt of 1968, the RAF; Citizens' Initiatives; Glasnost und Perestroika- the route map to German re-unification; European Union and German Identity.

### **Prescribed Texts**

#### **Excerpts from:**

Heinz Ludwig Arnold: Deutschlandl Deutschland? Texte aus 500 Jahren von Martin Luther bis Günter Grass. Frankfurt a.M.: Fischer, 2002. Pages 345-447.

### **Select Short Stories:**

- Wolfgang Borchert: An diesem Dienstag
- Wolfdietrich Schnurre: Auf der Flucht
- Heiner Müller: Das Eiserne Kreuz
- Heinrich Böll: Der Wegwerfer
- Max von der Grün: Wir sind eine demokratische Familie

### **Select Passages from:**

- Bernhard Schlink: Der Vorleser;
- Ulrich Plenzdorf: Die neuen Leiden des jungen Werther.

### **Select References**

- Martin Kitchen: The Cambridge Illustrated History of Germany. Cambridge: CUP, 2000.
- Moderne Erzähler Series. Paderborn: Ferdinand Schöningh. 1957ff.
- Erlebnis Geschichte. Produced by the Foundation Haus der Geschichte der Bundesrepublik Deutschland. Bonn 2003.
- Spiegel Special, The Germans. Sixty Years after the War, Intl' Edition 4/2005.

## **5. HS-539 : Post-War Germany: Politics, Society, and Culture**

Course Name : Post-War Germany: Politics, Society, and Culture

Course No. : HS 539

Credits : 3-0-0-3

Prerequisites : None

Intended for : Ph.D./Masters/B.Tech. (3rd and 4th year)

Semester : Odd/Even

### **Preamble:**

The course will introduce the students to a brief social and cultural history of Germany during the second half of the twentieth century. The students will gain an insight into the political and economic situation prevalent at the time, beginning with the post-war period, which saw Germany being divided into the FRG and GDR, and ending with the reunification of the two in 1990. A brief overview of the history of the European Union is also given to facilitate an understanding of present-day Europe so that the students have a broad understanding of culture and diversity as a whole. In addition, students will examine contemporary issues that impact Europe like the current migrant crisis in Germany, the debate around Brexit, rise of Eurosceptic parties in addition to the far-right ones.

### **Course Modules:**

#### **Module I:**

This module provides the students with a background on the events leading up to the Second World War, briefly outlining topics like the First World War, Weimar Republic, and National Socialism among others.

## **Module II: Allied Occupation of Germany**

Zero hour/Stunde Null

Denazification

Four occupation zones

## **Module III: Germany-US relations**

Bizone/Trizone

Berlin Blockade

European Recovery Program/Marshall Plan

## **Module IV: GDR and FRG**

Formation of GDR and FRG

Comparison of political and economic systems. Basic Law

Democratisation of education

NATO and Warsaw

Adenauer era

Brandt's Ostpolitik

## **Module V: Anti Government Protests**

East German uprising

Students' movement

Green movement (anti-nuclear movement, environmentalism)

## **Module VI: Migrants in Germany**

Gastarbeiter/'Guest Worker'

Debate over Multiculturalism

Current migrant crisis

Emergence of far-right parties like AfD

## **Module VII: The reunification of Germany**

Fall of the Berlin Wall

Reunification

Problems in the process of internal integration

### **Module VIII: Post-War German Cinema/Literature**

The students will engage with selected works of German literature/cinema, which will offer them a historical as well as a cultural perspective of the German society as it existed during the postwar period. It will include dealing with themes like Heimat ('homeland'), Vergangenheitsbewältigung ('coming to terms with the past'), and Wende ('turn').

### **Module IX: European Union as it exists today**

European Integration (ECSC, EEC)

Expansion of the EU (1993 – today)

Germany's role within the EU

Euroscepticism

Brexit

#### **Textbooks:**

- Judt, Tony: Postwar. A History of Europe since 1945, New York, Penguin Press, 2005
- Staab, Andreas: The European Union Explained: Institutions, Actors, Global Impact, Bloomington, Indiana University Press, 2008

#### **References:**

- Braunthal, G, Right-Wing Extremism in Contemporary Germany, Palgrave Macmillan UK, 2009
- Childs, David, The Fall of the GDR: Germany's Road To Unity, Longman, 2001
- Dennis, Mike, The Rise and Fall of the German Democratic Republic 1945-1990, London: Routledge, 2000
- Dinan, Desmond: Europe Recast: A History of European Union, Boulder, Lynne Rienner Publishers, 2014

- Fulbrook, Mary, A History of Germany 1918-2014: The Divided Nation, Wiley-Blackwell 2014
- Gilbert, Mark: European Integration: A concise History, Rowman & Littlefield, 2012
- Göktürk, Deniz, David Gramling and Anton Kaes (eds.), Germany in Transit: Nation and Migration, 1955-2005, California: University of California Press, 2007
- Hofmann, Arne, The Emergence of Détente in Europe: Brandt, Kennedy and the Formation of Ostpolitik, London, New York: Routledge: 2007.
- Jones, Erik, Anand Menon and Stephen Weatherill (eds.): The Oxford Handbook of the European Union, Oxford, Oxford University Press, 2012
- Kitchen, Martin: A History of Modern Germany 1800-2000, Malden, Blackwell, 2006
- Maier, C.S. and G. Bischof (eds.) The Marshall Plan and Germany: West German Development within the Framework of the European Recovery Programme, Oxford: Berg, 1991.
- McCormick, John: Understanding the European Union, New York, Palgrave, 2008
- Müller, Jan-Werner (ed.): German ideologies since 1945; studies in the political thought and culture of the Bonn republic, New York 2003
- Pulzer, Peter: German Politics 1945-1995, New York, Oxford University Press, 1996
- Smith, Helmut Walser (ed.): The Oxford Handbook of Modern German History, Oxford, 2011
- Vorländer, Hans, Maik Herold, Steven Schäller, PEGIDA and New Right-Wing Populism in Germany, Palgrave Macmillan, 2018.
- Warleigh-Lack, Alex: European Union: The Basics, London, Routledge, 2008
- Wilhelm, Cornelia (ed), Migration, Memory and Diversity: From 1945 to the Present, New York: Berghahn Books, 2016.

## **6. HS-306                    Introduction to German Literature**

Course number            : HS-306  
 Course Name             : Introduction to German Literature  
 Credit Distribution      : 3-0-0-3  
 Intended for             : B.Tech.  
 Prerequisite              : None  
 Mutual Exclusion         : None

## **1. Preamble:**

*This course is aimed at introducing students to German literature with the help of a variety of literary texts including fables, fairy tales, short stories, anecdotes, poems, and ballads. We shall be looking at different genres of literary texts and students shall be acquainted with the necessary literary vocabulary in German and English. This would enhance their understanding of German language and give them tools to work with literary texts and their interpretation.*

## **2. Course Modules with quantitative lecture hours: (42 hours)**

### **Module 1: Fairy Tales/ Folktales (12 hours)**

- Select fairy tales/ folktales (by Grimm Brothers)
- Introducing students to reading literary texts in German language
- Analysis of texts from various perspectives (literary, linguistic, feminist, close reading etc.)
- Developing an ability to read and interpret literary texts critically
- Literary tools, methods of interpretation and basic German grammar will also be an intrinsic part of this module

### **Module 2: Fables (8 hours)**

- The genre of fables (*Aesop's Fables*)
- Engaging with different characteristics of this genre
- Enabling an insight into studying different types of literary texts

### **Module 3: Short Stories, Anecdotes, and Parables (12 hours)**

- Select prose like anecdotes, parables and prominent short stories, particularly from the *Trümmer*-literature (Post War Germany 1945-1947)
- Wolfgang Borchert, Heinrich Böll et al

### **Module 4: Poetry (10 hours)**

- Different forms of poetry, including ballads, poems
- Select popular German authors and their poetry (J.W. Goethe, Rainer Maria Rilke, Joseph von Eichendorff et al)
- Basic literary and linguistic tools to analyse deep layers of poetry
- Independent/ individual interpretations of poems will be encouraged

## **3. Text books:**

Daniel Chandler: An Introduction to Genre Theory, 1997

Thomas Beebee: German Literature as World Literature, Bloomsbury 2014

#### 4. References:

- Aesops Fables: *The Wolf and the Lamb (Der Wolf und der Lamm)*
- Aesops Fables: *The Fox and the Crow (Vom Fuchs und Raben)*
- Charles Perrault: *Bluebeard (Blaubart)*
- Christa Reinig: *Scorpion (Skorpion)*
- Grimm Brothers: *Cinderella (Aschenputtel)*
- Grimm Brothers: *Hansel und Gretel (Hänsel und Gretel)*
- Grimm Brothers: *Little Red Riding Hood (Rotkäppchen)*
- Grimm Brothers: *The Fisherman and his Wife (Vom Fischer und seiner Frau)*
- Grimm Brothers: *The Bremen Town Musicians (Die Bremer Stadtmusikanten)*
- Heinrich Böll: *Anecdote concerning the Lowering of Productivity (Anekdote zur Senkung der Arbeitsmoral)*
- Johann Wolfgang von Goethe: *Elf King (Erlkönig)*
- Joseph von Eichendorff: *Moon Night (Mondnacht), Longing (Sehnsucht)*
- Rainer Maria-Rilke: *The Panther (Der Panther)*
- Wolfgang Borchert: *The Kitchen Clock (Die Küchenuhr)*
- Wolfdietrich Schnurre: *On The Run (Auf der Flucht)*

#### 7. HS503 German Literature from World War II to Reunification

Course number	: HS503
Course Name	: German Literature from World War II to Reunification
Credit Distribution	: 3-0-0-3
Intended for	: Outside Discipline/ Free Elective for MA, UG (3rd and 4th year)
Prerequisite	: None
Mutual Exclusion	: None

##### 1. Preamble:

This course examines post war German history through a *literary* perspective, with main focus on the period after the end of World War II (1945), the division of Germany leading up to the reunification of Germany (1990). Select short stories, poems and excerpts from relevant German novels will be discussed to get a better understanding of some key historical events of post war Germany. Core idea is to introduce German literature to students and the question of reading history through literary texts will be central.

## **2. Course Modules with quantitative lecture hours: (42 hours)**

### **Unit 1: *Trümmer*-literature – The Zero Hour (8 lecture hours)**

- Immediate consequences of World War II and Holocaust
- *Stunde Null*
- Trauma and memories of the War and Holocaust
- Wolfgang Borchert, Paul Celan, Günter Eich et al.

### **Unit 2: Literature from a divided Germany (9 lecture hours)**

- Division of Germany
- *Vergangenheitsbewältigung* – coming to terms with the past
- Inner Emigration
- *Gruppe 47*
- Heinrich Böll, Günter Grass, Paul Celan et al.

### **Unit 3: Exile Literature (9 lecture hours)**

- Literary texts from authors of East Germany or GDR
- Division of Germany and socio-political consequences thereof
- Life in exile and under communist surveillance in GDR
- Question of *Heimatlosigkeit* (homelessness)
- Bertolt Brecht, Christa Wolf, Wolf Biermann et al

### **Unit 4: Jewish authors and survivors of the Holocaust (8 lecture hours)**

- Select Jewish authors who have lived and survived the Holocaust
- Victim's perspective of the Third Reich
- Rose Ausländer, Nelly Sachs, Paul Celan et al

### **Unit 5: Re-unification of Germany (*Wendeliteratur*) (8 lecture hours)**

- Fall of the Berlin Wall (*die Wende*)
- Immediate after-effects of the re-unification of Germany
- Identity crisis of the citizens

## **3. Text books:**

1. Peter Demetz, Post War German Literature. A Critical Introduction, Pegasus, New York, 1970
2. Ingo R. Stoehr, German Literature of the Twentieth Century, Camden House, London 2001

#### 4. References:

##### Suggested Reading:

- Wolfgang Borchert: *The Kitchen Clock (Die Küchenuhr, 1947)*
- Paul Celan: *Death Fugue (Todesfuge, 1948)*
- Heinrich Böll: *The Train Was on Time (Der Zug war pünktlich, 1949)*
- Günter Eich: *Inventory (Inventur, 1947)*
- Wolfdietrich Schnurr: *On The Run (Auf der Flucht, 1950)*
- Bertolt Brecht: *On The Term Emigrants/ Über die Bezeichnung Emigranten, 1937/ To Those Who Follow in Our Wake (An die Nachgeborenen, 1939)*
- Christa Wolf: *Der geteilte Himmel, 1963 (Divided Heaven: Film 1964)*
- Anna Seghers: *The Seventh Cross (Das siebte Kreuz, 1942)*
- Nelly Sachs: *In the Houses of Death (In den Wohnungen des Todes, 1947)*
- Thomas Brussig: *Heroes Like Us (Helden wie wir, 1995)*
- Christa Wolf: *What Remains (Was bleibt, 1990)*
- Sven Regener: *Berlin Blues (Text or Film: 2003) (Herr Lehmann, 2001)*
- Rose Ausländer: *The Luck (Das Glück, 1939)*
- Johannes Bobrowski: *Shadowland/ The Latvian Autumn (1994)*
- Marcel Reich-Ranicki: *Videos from Literarische Quartett (Youtube)*
- Hans Egon Holthusen: *A Literature in Transition. Main Currents of Post War German Writing, The Atlantic*
- Aaron Denis Horton: *Catastrophe and Identity in Post War German Literature, 2005*

##### **Films:**

- Schindler's List (1994)
- The Boy in Striped Pyjamas (2008)
- The Pianist (2002)
- The Lives of Others (2006)
- The Tin Drum (1979)
- The Reader (2008)
- Downfall (2004)
- Enemy at the Gates (2001)

The following HSS course basketing document is hereby discarded since the concept of basketing is no longer relevant. Annexure  
J

## **Basket Distribution for SHSS courses** **(Modified & w.e.f. February, 2020)**

### **I. Creative Understanding**

Art and Architecture, HS102; 0-0-2-1

Dance and Drama, HS103; 1-0-0-1

Music, HS104; 1-0-0-1

### **II. International Language Competence:**

English I, HS106; 3-0-0-3

English II, HS208; 3-0-0-3

German I, HS342; 3-0-0-3

German II, HS352; 3-0-0-3

### **III. Communicative Competence:**

Basic Communication Skills, HS105; 3-0-0-3

Public Speaking and Debating Skills; HS206, 3-0-0-3

Policy Analysis and Advocacy Skills; HS301, 3-0-0-3

Science Writing, HS305; 3-0-0-3

### **IV. Social Competence:**

Introduction to English Literature, HS151, 3-0-0-3

Introduction to Psychology, HS252; 3-0-0-3

Introduction to Sociology, HS344; 3-0-0-3

Introduction to Political Science, HS204; 3-0-0-3

Introduction to World History; HS391, 3-0-0-3

Science Technology and Society, HS 353, 3-0-0-3

### **V. Managerial Competence**

Organizational Management, HS304, 3-0-0-3

Principles of Economics, HS202; 3-0-0-3

Financial Accounting, HS205, 3-0-0-3

Organizational Behaviour, HS403, 3-0-0-3

Managerial Thinking and Decision Making, HS616 3-0-0-3

Essentials of Entrepreneurship, HS510, 3-0-0-3

Financial Management, HS551, 3-0-0-3

### **VI. Free Elective**

Any course not covered under the above.

### **Note:**

- (i) Any course taken in any basket over and above the one HSS course basket requirement course would be considered a free elective course.
- (ii) 1-credit towards the Creative Competence basket would be awarded as a result of successful completion of Creative Understanding module of the 5WIP.

## **PROPOSAL**

Proposal for inclusion of HSS paper in JAM for admission to MA programs in IITs and IISERs

## **CONTENTS**

- I. PREAMBLE**
- II. JUSTIFICATION**
- III. JAM SYLLABUS**
- IV. ELIGIBILITY**

### **I. PREAMBLE**

It is proposed that a new Humanities and Social Sciences (HSS) paper be added to the list of subjects that are currently included in the JAM for testing. This new paper will allow candidates to take the exam with a view towards applying for admissions to the MA programmes currently being offered at IIT Guwahati, IIT Mandi, as well as other postgraduate programmes available at other institutions. The aforementioned programmes are examples of the wide variety of programmes on offer at IITs and IISERs that can use JAM scores for admissions.

The Joint Admission Test for Masters (JAM) for admission into postgraduate programmes at IITs and the Indian Institute of Science, Bangalore is a computer based online examination. Admissions to most postgraduate programmes across various institutions is made on the basis of the JAM scores/ ranks.

Eight institutes conduct JAM: IISc, IITB, IITK, IITD, IITM, IITKGP, IITR, and IITG. The others are admitting institutes. There are 21 IITs that participate in admissions only through JAM that includes admissions also with respect to the Science programmes. The inclusion of the HSS paper and syllabi in the JAM test structure will widen the ambit of admissions into several PG courses of study available at IITs, IISERs etc.

### **II. JUSTIFICATION**

1. The inclusion of an HSS paper for admission to MA programmes as mentioned above will allow students from across India and abroad to take the exam in a more convenient manner.
2. The HSS paper, if included in JAM, will allow greater number of aspirants to sit for the exam from different regions who otherwise may not be able to take it as the exam is currently held only at IIT Guwahati, IIT Mandi or at other specific institutions who conduct their own entrance exams.

3. The inclusion of this new paper in JAM will allow institutes to have a more seamless mode of selection of students for any additional programmes of study that may be introduced in the future.
4. The paper (a sample of which is provided with this proposal) will test students on standardized components as outlined. This will be beneficial to assess their suitability for the programmes offered.
5. Since several IITs already use the JAM for admissions into their postgraduate programmes, the inclusion of this new paper puts our programmes on par with the latest testing processes in the country currently used for admissions.
6. The online examination such as JAM obviates the need for a paper-based, single city testing process for MA admissions. This all-India online examination will enable students to take the exam in the event of travel, weather or other related disruptions that can prevent students to sit for a paper-based exam scheduled in a few cities.

### **III. JAM SYLLABUS (Indicative)**

#### **HUMANITIES AND SOCIAL SCIENCES**

##### **1. Logic and Reasoning:**

Deductive Reasoning, Statement Analysis, Figure Matrix, Syllogism, Statement and Assertion, Premises and Conclusion, Extension and Intension, Pattern Series and Sequences, Order and Ranking, Alphanumeric series, Analogical Reasoning, Inductive Reasoning, Abductive Reasoning, Data Sufficiency, Cause and Effect, Picture Series and Sequences.

##### **2. Quantitative Ability:**

Number systems, Polynomials, Linear and Quadratic Equations, Areas, Surfaces, Volumes, basic arithmetic, interpretation of tables, graphs, charts, etc.

##### **3. Verbal Ability:**

Antonyms, Synonyms, Reading Comprehension, Error detection, One word substitutions, Concise and precise writing, Conversion from passive to active voice, Omission of vague words, Jumbled words, Jumbled sentences and paragraph, paragraphs, Idioms and Phrases.

##### **4. Disciplinary Competence:**

- a. **Indian Society and Culture:** Structure of Indian Society (Marriage, Family and Kinship), Political Institutions, Stratification and Inequality (Caste, Class, Religion, Tribe, Region), Social Change in India, Affirmative Action and Policies of Positive Discrimination, Commissions and Policy Interventions, Social Movements in India,

Gender and Development, Violence and Social Unrest, Population and Development in India.

- b. **Economy, Polity and Development:** Indian Economy, Planning and liberalization; Relevant policies in sectors such as agriculture, industry, health, education, etc.; Monetary and Fiscal policies; Poverty, inequality, unemployment, inflation; Demand and supply; Consumers' and producers' behaviour; Market structure; Welfare economics; Trade; Public Economics;
- c. **Global Politics and Economy:** Sustainable Development Goals, International Relations and Politics, Treaties and Declarations, World Affairs and Global Economy, Global North and South Divide, Cold War, Trade and International Organizations, UN, WTO, NAM, NATO, SAARC, ASEAN, BRICS.
- d. **Ecology and Development:** Environment, Ecology and Development, Environmental Pollution and Health Hazards, Climate Change, Environmental Movements in India, Natural Resources Management, Displacement and Development.
- e. **India's History and Politics:** India's Struggle for Independence, Nationalism, Emergence of the Indian Nation State, Contemporary history, Indian political thinkers and theories..

#### **IV. ELIGIBILITY**

Eligibility requirement is any bachelor's degree (3 yr or 4 yr), 55% marks (or equivalent CGPA) obtained in bachelor's degree.

\*\*\*

## IIT Mandi

### Proposal for a New Course

**Course number** : IK\_506  
**Course Name** : Research methods and statistics for contemplative science  
**Credit Distribution** : (2-1-0-3) (*Lectures-Tutorial-Practical-Total credits*)  
**Intended for** : 3<sup>rd</sup> & 4<sup>th</sup> Year B. Tech, Masters and PhD  
**Prerequisite** : None  
**Mutual Exclusion**: None

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#### 1. Preamble:

Research methods and statistics are the foundation for scientific research. Two existing courses of the institute (HS550 & HS 522) covers research methods and statistics from social science perspective. Considering the inherent challenges associated with contemplative science research (e.g., Yoga/Meditation), this course is designed to equip the students to develop skills in research methods and statistics from a contemplative science perspective. 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 contemplative science and mental health perspective.

#### 2. Course Modules with quantitative lecture hours (42 hours):

##### Module 1 (21 hours + 7 tutorial hours)

##### Research methods theory:

Basic assumptions underlying scientific research

Ethics in scientific research

Literature review and hypothesis formulation

Data collection methods

Measurement techniques & Sampling methods

Research designs

Apart from controlled trial designs (including randomized controlled trial designs-RCT), emphasis will also be given on case-control study design and prospective cohort design from contemplative science perspective. For example, studying the effect of advanced meditation (with monks is more feasible from case-control design

than RCT). Similarly naturalistic cohort long term follow-up studies are optimal from sampling perspective to study the effect of yogic/meditative lifestyle.

Procedure for conducting research experiment

Control techniques in experimental research

Mixed methods research

Emphasis on first person (for subjective experience) and third person perspective-based assessments will be discussed. Special emphasis on experience sampling method and its relevance for contemplative science will be discussed

Scientific writing

### **Tutorial sessions**

Randomization procedure

Scientific illustrations-Inkscape and blender

Reference management-Zotero

Qualitative data coding-Qualcoder

**Note:** All the tutorial sessions will be taught with Yog/Meditation based dataset for better understanding of the concepts

### **Module 2 (7 hours + 7 tutorial hours)**

#### **Statistics theory**

Data representation-tables & figures

Descriptive statistics

Key ingredients for inferential statistics

Hypothesis testing, statistical significance and decision errors

T tests

ANOVA

Correlation

Regression

Chi square test

Linear mixed model analysis (LMM)

Distribution free statistics

#### **Tutorial sessions (Using Jamovi & R-open-source free software)**

Data wrangling

T tests

ANOVA

Correlation & Regression

Chi square test

LMM

Sample size calculation-G power

**Note:** All the tutorial sessions will be taught with Yog/Meditation based dataset for better understanding of the concepts

### 3. Text books:

Christensen LB, Johnson B, Turner LA. Research Methods, Design, and Analysis. Pearson Education; 2019.

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

### 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

### 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, T test, ANOVA, correlation & regression	25%
2		HS 522	Literature review & Hypothesis formulation	5 %

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

**Approvals:**

**Faculty interested in teaching this course: –**



**Proposed by: Dr Ramajayam G**

**School: IKSMHA**

**Signature:**

**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.

**Responses for the reviewer's comments:**

**Reviewer 1:**

Dr Arun Sasidharan MBBS, PhD (Neurophysiology)  
Scientist-C  
Centre for Consciousness Studies  
Dept of Neurophysiology  
National Institute of Mental Health & Neurosciences (NIMHANS)  
Bengaluru

**Comment 1:**

*As there are overlapping courses from social science perspective, it would be good to have a subtopic (in Module 1 & 2) that describes the differences between social science and contemplative science perspectives in terms of application/challenges in research method and statistics approaches.*

**Response 1:**

*Suggestions are incorporated on page no-1 & 2, under research designs and mixed methods section in module 1*

**Comment 2:**

*Explicitly mention that the Lab sessions would use examples/datasets from contemplative science research*

**Response 2:**

*Suggestions are incorporated on page no- 2, under tutorial sessions in module 1 & 2*

**Reviewer 2:**

Dr Bhupendra Singh MBBS, MD (Psychiatry)  
Additional Professor  
Dept of Psychiatry (Geriatric Mental Health)  
King George Medical College  
Lucknow

**Comments:**

*The course content looks good.*

# IIT Mandi

## Proposal for a New Course

**Course number** : IK\_507  
**Course Name** : Neuroscience and mental health  
**Credit Distribution** : (3-0-0-3) (*Lectures-Tutorial-Practical-Total credits*)  
**Intended for** : 3<sup>rd</sup> & 4<sup>th</sup> Year B.Tech, Masters and PhD  
**Prerequisite** : None  
**Mutual Exclusion**: None

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### **1. Preamble:**

As per the National Mental Health Survey 2016, 120 million people in India are suffering from common mental health disorders like depression and anxiety and 12 million Indians are suffering from severe mental health disorders like psychosis. Many of these mental health disorders are preventable if the youth are sensitized appropriately, as many of these mental health disorders begin in young adulthood. This course would enable the students to have a scientific understanding of common mental health problems and adopt a healthy lifestyle to prevent mental health disorders. It would also facilitate the students to develop new research questions related to preventive/therapeutic technologies for promotion of positive mental health.

### **2. Course Modules with quantitative lecture hours (42 hours):**

#### **Theory (38 hours)**

##### **Module 1(10 hours)**

##### **Basics of neuroscience**

Structure and function of the nervous system-1

Structure and function of the nervous system-2

##### **Module 2 (14 hours)**

##### **Neuropsychology underlying illness & wellness**

Illness & Wellness-perspectives from neuroscience

Neuroscience of positive psychology

Human development through life cycle and the neuroscience of ageing  
Theories of personality & psychopathology: eastern & western perspectives

**Module 3 (14 hours)**

**Mental health disorders**

Classification of mental health disorders  
Substance related mental health disorders  
Common mental health disorders  
Severe mental health disorders

**Practical (4 hours)**

**Module 4 (4 hours)**

Stigma of mental illness-discussion  
The beautiful mind-movie analysis  
Active listening as a crisis intervention-activity in pairs  
Complementary & integrative mental health practices-discussion

**3. Text books:**

Kandel ER, Koester JD, Mack SH, Siegelbaum SA. Principles of Neural Science, Sixth Edition. McGraw Hill LLC; 2021.  
Sadock BJ, Sadock VA. Kaplan & Sadock's Concise Textbook of Clinical Psychiatry. Wolters Kluwer/Lippincott Williams & Wilkins; 2008.

**4. References:**

Sadock BJ, Sadock VA, Ruiz P. Kaplan & Sadock's Comprehensive Textbook of Psychiatry. Wolters Kluwer; 2017.

**5. Similarity with the existing courses:**

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

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

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

**Approvals:**

**Faculty interested in teaching this course: –**



**Proposed by: Dr Ramajayam G**

**School: IKSMHA**

**Signature:**

**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.

**Responses for the reviewer's comments:**

**Reviewer 1:**

Dr Arun Sasidharan MBBS, PhD (Neurophysiology)  
Scientist-C  
Centre for Consciousness Studies  
Dept of Neurophysiology  
National Institute of Mental Health & Neurosciences (NIMHANS)  
Bengaluru

***Comments:***

***1. As the Module-2 has subtopics on Neuroscience besides Psychology, it may be renamed from "Psychology underlying illness & wellness" to "Neuropsychology underlying illness & wellness".***

***Response:***

***1. As suggested by the reviewer, "Psychology underlying illness & wellness" is renamed as "Neuropsychology underlying illness & wellness" in module 2 on page no. 1***

**Reviewer 2:**

Dr Bhupendra Singh MBBS, MD (Psychiatry)  
Additional Professor  
Dept of Psychiatry (Geriatric Mental Health)  
King George Medical College  
Lucknow

***Comments:***

***The course content looks good.***

## IIT Mandi

### Proposal for a New Course

<b>Course number</b>	<b>: EE304</b>
<b>Course Name</b>	<b>: Communication Systems</b>
<b>Credit Distribution</b>	<b>: 3-0-2-4</b>
<b>Intended for</b>	<b>: BTech EE (core), BTech CSE (elective)</b>
<b>Prerequisite</b>	<b>: IC260, IC252</b>

#### 1. Preamble:

To obtain a comprehensive view of communication theory and its applications, undergraduate students should not only learn the principles of modern digital communications, they should also be aware of the historical developments in the analog communications that led us to this digital communication era and are still relevant. Considering the breadth of the topics that need to be covered to provide such a comprehensive view, it is understandable that all these topics cannot be accommodated in a single course. Therefore, two courses namely Communication Theory and Advanced Communication Theory are proposed, by grouping the topics based on their prerequisites, difficulty level and coherency over the topics.

Communication theory, the first course in this two-course sequence, introduces the students to the different signals and systems pertaining to communication engineering by tracing the route of development of analog broadcasting technologies, e.g., AM and FM. Upon familiarising students with different performance metrics, this course also highlights the benefits of digital communication over its analog counterpart. Finally, this course briefly introduces some of the digital modulation schemes, e.g., ASK, FSK, QAM, BPSK. The theory sessions are accompanied by the corresponding lab sessions.

#### 2. Changes made in the revised proposal:

- Removed the module that introduces the information and coding theory.
- Removed a portion of the digital communication module. The removed portion is now part of the Advanced Communication Theory course.
- Reorganised the existing content to link this course with one of its prerequisites-signals and systems.
- Introduced a module (case studies) to highlight the importance of this course in the modern context.
- Combined the theory and the lab course.

#### 3. Learning outcomes:

After taking this course, students will be

- familiar with different types of communication systems. They will also gain familiarisation with various types of signals and systems that are commonly used in modelling various communication systems.
- able to identify different design criteria (power budget, bandwidth, SNR, BER etc.) associated with communication systems.
- able to compare the performance of different communication schemes/systems in terms of widely used metrics, e.g., SNR and BER.
- able to understand different tradeoffs associated with different communications systems, e.g., noise immunity and bandwidth etc.
- able to comprehend limitations of different models and the associated analyses.
- familiar with several prototyping systems, e.g., USRP, LabVIEW and GNURadio. Additionally, they will also gain hands-on experience in developing simple communication systems.

#### 4. Course Modules with quantitative lecture hours:

##### i. Signals in communication systems and their representation: (15)

Time and frequency domain representations of signals, vector representation of signals, Constellation diagram, Baseband and bandpass signals, Amplitude and angle modulated signals (AM, FM, PM, ASK, FSK, PSK, PAM etc.), random processes and their analysis, Energy and Power spectral densities.

##### ii. Systems in communication system and their analysis: (15)

Modulators and demodulators (coherent and noncoherent; envelope detectors, PLLs, balanced discriminators etc.), Pre-emphasis and de-emphasis, Sampler, Quantizer, Equalizers, Encoders (PCM), Line coders (On-off, Polar, Bipolar, NRZ, RZ etc.), Pulse shapers, Bandlimited and distortion-less channels, LTI systems and random processes, Matched filter, Correlation receiver.

##### iii. Performance analysis of analog and digital communication systems: (8)

Signal-to-Noise Ratio (SNR) calculation for different analog communication systems, SNR analysis for PCM, Bit Error Rate (BER) calculations for different digital communication systems.

##### iv. Case studies: (4)

A brief overview of modern communication/broadcast technologies, e.g. Digital Radio Mondiale (DRM), WiFi, Cellular communication etc.

#### 5. Text books (any one) :

- i. B. P. Lathi and Z. Ding, Modern Digital and Analog Communication Systems, Oxford Univ. Press, January 2009, 4/e.
- ii. J. G. Proakis and M. Salehi, Fundamentals of Communication Systems, Prentice Hall, December 2004

#### 6. References:

- i. S. Haykin and M. Moher, An Introduction to Analog and Digital Communications, Wiley, January 2006, 2/e.
- ii. R. G. Gallager, Principles of Digital Communication, Cambridge Univ. Press, March 2008.
- iii. A. Lapidoth, A Foundation in Digital Communication, Cambridge Univ. Press, August 2009.

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

NA

#### (b) Justification of new course proposal if cumulative similarity content is >30%:

NA

#### Approvals:

**Faculty interested in teaching this course:** – Drs. Adarsh Patel, Samar Agnihotri, Satyajit Thakor

**Proposed by:** Dr. Siddhartha Sarma

**School:** SCEE

Signature: 

Date: 31/10/2023

The following faculty (at least 3 faculty) discussed on 10th April 2023 and approved the proposal on 31st Oct 2023.

Sl. No	Faculty Name	Signature
1.	Dr. Adarsh Patel	 31/10/23
2.	Dr. Samar Agnihotri	Samar
3.	Dr. Satyajit Thakor	S. A. Thakor (01/11/2023)

School Chair:

School: SCEE

Date: 31<sup>th</sup> Oct 2023

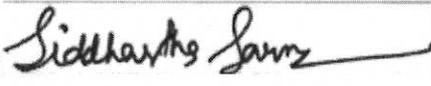
This proposal is reported in 52<sup>nd</sup> Board of Academics on 2<sup>nd</sup> Nov 2023

Dean

Academics

Date:

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

Signature: 

Date: 31/10/2023

The following faculty (at least 3 faculty) discussed on 10th April 2023 and approved the proposal on 31st Oct 2023.

Sl. No	Faculty Name	Signature
1.	Dr. Adarsh Patel	
2.	Dr. Samar Agnihotri	Samar
3.	Dr. Satyajit Thakor	S. A. Thakor (01/10/2023)

School Chair:

School: SCEE

Date: 31<sup>th</sup> Oct 2023



This proposal is reported in 52<sup>nd</sup> Board of Academics on 2<sup>nd</sup> Nov 2023

Dean

Academics

Date:

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

# IIT Mandi

## Proposal for a New Course

<b>Course number</b>	: <u>EE-202</u> 205
<b>Course Name</b>	: <b>Electromagnetics and Wave propagation</b>
<b>Credit Distribution</b>	: (format: 2.5-0.5-0-0,) 3-credits
<b>Intended for</b>	: <b>Discipline core for 2<sup>nd</sup> year (Even-sem) B.Tech Electrical Engineering, VLSI students</b>
<b>Prerequisite</b>	: None
<b>Mutual Exclusion</b>	: None

### 1. Preamble:

Electromagnetic theory is a core subject for any Electrical Engineering curriculum. This course enables the students to understand the engineering applications of fundamental laws of Physics related to electromagnetic theory. The proposed course covers: required basics of Vector Algebra and Coordinate systems, static and dynamic electric and magnetic fields and their interaction. Major topics include Electromagnetic theory, Wave propagation, and Principle of Electromagnetic radiation. Some part of the course credit is devoted to tutorials where students will be demonstrated certain physical phenomena related to laws of Electromagnetic physics and its representation shall be discussed. Successful completion of the course will allow students to understand the working principle of applications ranging from diodes to motors and generation of signals to communication theory. The concepts learned in the proposed course shall aid students in understanding courses like Electrical system around us, Analog electronics, Communication theory, and networks, later they can take up advance courses such as Transmission line theory and Basic Microwave Eng., Radiating systems etc.,.

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

#### i. Unit/Topic 1: Vector Analysis (9 Hours)

Subtopics: Basic Mathematical operations using vectors, coordinate systems, integrals (line, surface, volume) using vector functions, vector theorems, basics of partial derivatives, Laplacian, Greens functions.

#### ii. Unit/Topic 2: Electrostatics (9 Hours)

Subtopics: Electrostatic in free space, Coulomb's law, Gauss Law and its applications, Potential and work done, Conductors, Dielectric, capacitance, static fields in matter, static boundary conditions, method of images

#### iii. Unit/Topic 3: Magnetostatics (9 Hours)

Subtopics: Magnetostatics in free-space, Magnetostatics force, Vector Magnetic potential, Biot-Savart law, Ampere's law, Inductance and Magnetic materials, Boundary conditions for Magnetostatics

#### iv. Unit/Topic 4: Time Varying fields (9 Hours)

Subtopics: Introduction to time varying fields, limitation of Ampere's law, Continuity relations, Maxwell's Equations and its applications, Boundary conditions for dynamic fields, use of vector potential for dynamic fields, wave equations and propagation (in isotropic and anisotropic medium),

#### v. Unit/Topic 5: Radiation and propagation principle (9 Hours)

Subtopics: Relation between guided wave and free space wave, Concept of dipoles and monopoles, radiated fields from dipoles, Far-fields and near fields, Concept of group and phase velocity. Introduction to high frequency transmission line.

**Laboratory/practical/tutorial Modules:** There shall be practical demonstration for certain fundamental laws of physics and its interpretations shall be derived in mathematical form. This shall be conducted in the form of tutorial sessions to aid theoretical concepts.

**3. Text books (any one) :**

- a) Matthew N.O. Sadiku, Principle of Electromagnetics., Publisher: Oxford Press USA; 4th edition (8 February 2007),
- b) David. K Cheng, Fields and Wave Electromagnetics, Publisher: Person Education, Country: USA, Year-1989, 5<sup>th</sup> Impression 2007.

**4. References:**

- a) R. K. Shevgaonkar, Electromagnetic waves, Publisher: McGraw-Hill Education (India) Pvt Limited, 2005
- b) David. J Griffith, Introduction to Electrodynamics, Publisher: Cambridge University Press, Republished year-2017.
- c) G. S. N Raju, Electromagnetic Field Theory and Transmission Lines, Publisher: Pearson Education India, 2006
- d) Walter Lewin, Lectures on Physics, MIT,
- e) J. D. Jackson, Classical Electrodynamics, Publisher, Wiley, USA, 1999

**a. 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.	Electromagnetic theory	PH521	12 lectures	40-50%

**b) Justification of new course proposal if cumulative similarity content is >30%:**

The B.Tech (EE) students earlier used to study 'Foundation of electrodynamic course' (IC) in their 2<sup>nd</sup> year which use to cover their basic fundamental on electromagnetics and time varying fields. Now as the concern IC course is dissolved, to cater the requirement of EE students the proposed course is placed a discipline core course. This course can be considered as fundamental courses for all the courses in EE curriculum, as it deals with basic nature of forces between charges, basic nature of inductance, capacitance and resistance and understanding of wave-propagation in general. There is a similar course PH521 in Physics, whose course content (main topic) is similar with the proposed course. However, the subtopics and its contents for EE 202 are entirely different from PH521. EE 202 course starts with a basics on vector algebra which include all the fundamental mathematical content required for this course. As we go further EE 202 serially engages with fundamental of electric and magnetic fields and then places an introduction to time varying fields with emphases on wave-propagation in medium and transmission line. The contents (subtopics) are curated especially for Electrical engineering and VLSI students. Hence, the mode of teaching for the proposed course i.e. EE 202 will be entirely different from any related course.

**Approvals:**

**Faculty interested in teaching this course:** – Dr. G. Shrikanth Reddy, Dr. Anirban, Dr. Samar

Proposed by: Dr. G. Shrikanth Reddy

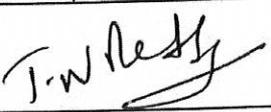
School: SCEE

Signature:



Date: 30/10/2023

The following faculty (at least 3 faculty) discussed on Oct-15<sup>th</sup>, 20<sup>th</sup>, 30<sup>th</sup> and approved the proposal on 30<sup>th</sup> of Oct 2023.

Sl. No	Faculty Name	Signature
1.	Dr. Shubhajit Roy Chowdhury	
2.	Dr. Narsa Reddy	
3.	Dr. Srikant Sugvanam	
4.	Dr. Anirban Sarkar	

School Chair:



School: SCEE

Date: 30<sup>th</sup> Oct 2023

This proposal is reported in 52<sup>nd</sup> Board of Academics on 2<sup>nd</sup> Nov 2023

Dean Academics

Date:

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

1 Nov - 4 30

## IIT Mandi Proposal for a New Course

**Course number** : ~~EE3XX~~ 326  
**Course Name** : Computer Organization and Processor Architecture Design  
**Credit** : 3-0-2-4  
**Distribution** : Odd/Even  
**Intended for** : B. Tech in Electrical Engineering  
**Prerequisite** : Digital System Design (EE210) or equivalent

**Mutual Exclusion**: Computer Organization (CS201)

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### 1. Preamble:

This course provides an introduction to the design and implementation of basic building blocks of a computer at a logic circuit level with special emphasis on microprocessor design. The course assumes a previous course on digital logic design. The course aims at providing a *designers' perspective to a computer system*. Students are expected to model the computer hardware using a hardware description language with the target of modelling and simulating a typical processor.

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

- i. **Introduction to Computer Organization:** Notion of organization and architecture. Von Neumann and Harvard architectures. Evolution of computers. Role of VLSI Technology in miniaturization of computers. **1 hour**
- ii. **Computer System Design:** Introduction, design of a computer system, register transfer level (RTL) structure realizing behaviour expressed in an algorithm, logic circuit level structure of RTL components, HDL description of RTL structures at architectural and logic levels. **2 hours**
- iii. **Datapath Design:** Block diagram description of a processor, overview of basic digital building blocks in the data-path, adder, subtractor, shifter, multiplier and divider, comparator circuits, optimization of adders and multipliers, integration of arithmetic logic unit, design of general purpose register files in RISC and CISC processors, integration of data-path using ALU and general purpose register file, integer versus floating point ALU, IEEE 754 single precision, double precision and extended double precision floating point formats, algorithms and RTL realization of floating point adders, subtractors, multipliers, dividers, design of floating point ALU. **8 hours**
- iv. **Controller Design:** Motivation behind use of controller circuits, instruction interpretation and execution, design of hardwired controller based on finite state machine model, design of microprogrammed control circuits, horizontal and vertical microprogramming, integration of controller and data-path into a processor, design of RISC and CISC processors, examples of some well-known processors. **5 hours**
- v. **Instruction set architecture and addressing modes:** Concept of instruction formats, types of instructions, different types of addressing modes, programming considerations in

register transfers and assembly languages. Example case study of ARM processor including its instruction formats and addressing modes. Assembly language programming of ARM processor. **5 hours**

- vi. **Memory organization and design:** Introduction, processor-memory interaction, storage technology, memory array organization and technology, semiconductor memories, ROM, static and dynamic RAM, 1D, versus 2D RAM, FPMDRAM, EDODRAM, SDRAM, RDRAM, DDRAM, DDR2RAM, DDR4RAM, content addressable memory (CAM), memory hierarchy, cache organization, cache coherence protocols, cache mapping techniques – direct, associative, set-associative and sector mapping techniques, cache optimization techniques, virtual memory, multiple module memory, gap filler memories – magnetic bubble memories and charge coupled devices, secondary storage device, disk recording methods, disk drives and controllers, cyclic redundancy check logic. **8 hours**
- vii. **Input Output organization:** Introduction, data transfer techniques, bus interface, programmed I/O, interrupt driven I/O, conflict resolution of interrupts, programmable interrupt controller, direct memory access (DMA), DMA controller, types of DMA. **5 hours**
- viii. **Pipelining:** Linear pipelined architectures, synchronous versus asynchronous pipelining, non-linear pipelining, reservation and latency analysis, collision free scheduling, pipeline schedule optimization. **4 hours**
- ix. **Multiprocessor architectures:** Flynn's classification of computers, SISD, SIMD, MISD and MIMD architectures, shared memory multiprocessors, distributed memory multicomputers, distributed coherent caches. **4 hours**

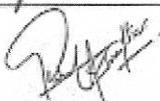
### 3. Laboratory/practical/tutorial Modules:

- i. **Hardware description language:** Introduction to some HDL (Verilog, VHDL, BSV). Digital Design using HDLs. Modeling and simulation of ALU, controller and processors using HDL. Timing analysis of processors with inertial and transport delays.
- ii. **Assembly language programming:** The assignments should cover the following concepts: Registers; different type of instructions (load, store, arithmetic, logic, branch); operand addressing modes; memory addressing modes; conditions (codes/flags and conditional branches) stack manipulation; procedure calls; procedure call conventions (load/store of; arguments on stack, activation records)
- iii. **Realization of Computer Circuits:** Realization of arithmetic and logic circuits on bread board, realization of memory and I/O interface circuits on bread board, study of universal synchronous-asynchronous receiver transmitter on bread board.

### 4. Text books:

- i. V. Carl Hamacher, Zvonko G. Vranesic, Safwat Zaky, "Computer Organization", 5<sup>th</sup> Edition, Mc Graw Hill Education, July 2017.

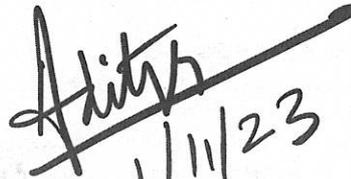
The following faculty (at least 3 faculty) discussed on 20<sup>th</sup> of July 2023 and approved the proposal on 26<sup>th</sup> of July 2023.

Sl. No	Faculty Name	Signature
1.	Dr. Shubhajit Roy Chowdhury	
2.	Dr. Srinivasu Bodapati	
3.	Dr. Rahul Shrestha	

School Chair:

School:

Date:

  
1/11/23

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. References:**

- i. John P. Hayes, "Computer Organization and Architecture", 3<sup>rd</sup> Edition, Mc Graw Hill Education, July 2017.
- ii. William Stallings, "Computer Organization and Architecture", 11<sup>th</sup> Edition, Pearson Education, 2022.
- iii. Zainalabedin Navabi, "VHDL: Modular Design and Synthesis of Cores and Systems", 3<sup>rd</sup> Edition, Mc Graw Hill Education, 2022.

iv. **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.	Computer Organization	CS201	Modules i, ii, vii, viii, ix in full and iii, iv, v, vi in part	67%

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

The B.Tech (CSE) students study a core course on Computer Organization (CS201) in which they study the content at a considerable higher level of abstraction where they do not enter into the details of computer design, computer circuits, etc. However, B.Tech (EE) students need to study Computer Organization from a designer's perspective with special emphasis to computer circuits. Hence, we propose a separate course on Computer Organization and Processor Architecture Design as a core course specifically for B.Tech (EE) students.

**Approvals:**

**Faculty interested in teaching this course:** – Dr. Rahul Shrestha, Dr. Srinivasu Bodapati

**Proposed by:** Dr. Shubhajit Roy Chowdhury

**School:** SCEE

**Signature:**

**Date:**



Academic Office &lt;acadoffice@iitmandi.ac.in&gt;

## Regarding Course No.s

**G Shrikanth Reddy** <gopishrikanth@iitmandi.ac.in>

Mon, Dec 18, 2023 at 2:56 PM

To: Academic Office <acadoffice@iitmandi.ac.in>

Cc: Nalini <sceeoffice@iitmandi.ac.in>, Rahul Shrestha <rahul\_shrestha@iitmandi.ac.in>

The course code is recommended/approved from myside.

Regards

Dr. G. Shrikanth Reddy (Ph.D.) SMIEEE  
Asst. Professor,  
School of Computing and Electrical engineering  
IIT Mandi,

On Mon, 18 Dec, 2023, 13:03 Academic Office, <acadoffice@iitmandi.ac.in> wrote:

Dear Madam

Please confirm the course No.s to the following courses approved in 52<sup>nd</sup> BoA

Sl. No.	Course No.	Course Name	Credits
1	EE-304	Communication Systems	3-0-2-4
2	EE-205	Electromagnetics and Wave Propagation	2.5-0.5-0-0, 03 credits
3	EE-326	Computer Organization and Processor Architecture Design	3-0-2-4