

**Name of Institute: Indus Institute of Sciences, Humanities and Liberal Studies**  
**Name of Faculty: Department of Languages (English)**

**Course code: EN0211**

**Course name: Business Communication and Presentation Skills**

Pre-requisites: NA

Credit points: 03

Offered Semester: 02

### **Course Coordinator (weeks 12)**

Full Name: Dr Mamta Pillai, Assistant Professor & Head, Department of Languages

Department with sitting location: Computer Lab, Ground Floor, Main Building

Telephone: 9924241816

Email: [mamtapillai.gd@indusuni.ac.in](mailto:mamtapillai.gd@indusuni.ac.in)

### **Course Lecturer (weeks 12)**

Full name: Ms. Pranjal Bhatt/ Ms. Foram Patel/Ms. Nidhi Singh

Department with sitting location: Equinox Lab, Grd Floor (MB)

Telephone: 9429296329/9537384053/8160976525

Email:

[pranjalbhatt.gd@indusuni.ac.in](mailto:pranjalbhatt.gd@indusuni.ac.in)/[forampatel.ishls@indusuni.ac.in](mailto:forampatel.ishls@indusuni.ac.in)/[nidhisingh.ishls@indusuni.ac.in](mailto:nidhisingh.ishls@indusuni.ac.in)

Consultation times: 4 to 5PM from Monday to Friday

Students will be contacted throughout the Session via Mail with important information relating to this Course.

### **Course Objectives**

By participating in and understanding all facets of this Course a student will:

1. To gain the knowledge of the various subjects with the distinctive, integrative skills and abilities such that students attain various skills to formulate, solve and analyze engineering problems and become quality graduate engineers.
2. To develop abilities of life-long learning, effective communication skills, individual & team work for having competence in multidisciplinary approach to relate engineering issues to broader social and human context.
3. To develop the understanding of ethics, professionalism, safety and sustainability that makes them leaders & contributors to the society.
4. To develop basic writing skills.
5. To utilize the technical skills necessary for reading and writing.
6. To be able to communication skills in both technical and professional contexts

## Course Outcomes (CO):

**CO 1:** To enable student understanding of appropriate communication styles according to the social, business, professional and educational situations. [BT-2]

**CO 2:** To express, verbally and in written, analysis of topics related to engineering and other allied fields. [BT-2]

**CO 3:** To analyze a given situation and illustrate the situation through depiction in the written format using English Language Skills. [BT-3]

**CO 4:** To support ideas through logical development of arguments in the written form through the use of essays and letter writing. [BT-5]

**CO 5:** To prepare documents related to professional employability. [BT-6]

**CO 6:** To design visually appealing and theoretical sound presentations as a medium of corporate communication. [BT-6]

## Course Outline

(Key in topics to be dealt)

1. Business Communication skills
2. Presentation Skills
3. Basic paragraph Development and maintaining coherence
4. Reading Skills

## Method of delivery

1. Communicative Language Teaching (Learner Centric)
2. Face to face lectures
3. Task Based Language Learning
4. The Lexical Approach

## Study time

03 Hours

## CO-PO Mapping (PO: Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	1	1	1	2	1	-	1	2	3	-	2
CO2	-	2	1	1	1	1	-	1	3	3	1	2
CO3	-	3	1	1	2	1	-	2	3	3	1	2

1-Lightly Mapped

2- Moderately Mapped

3- Highly Mapped

## Blooms Taxonomy and Knowledge retention (For reference)

(Blooms taxonomy has been given for reference)

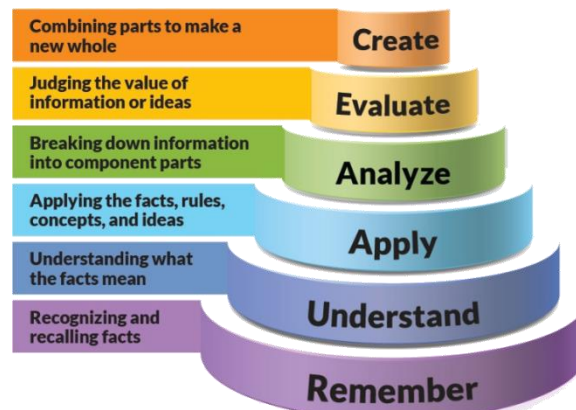


Figure 1: Blooms Taxonomy

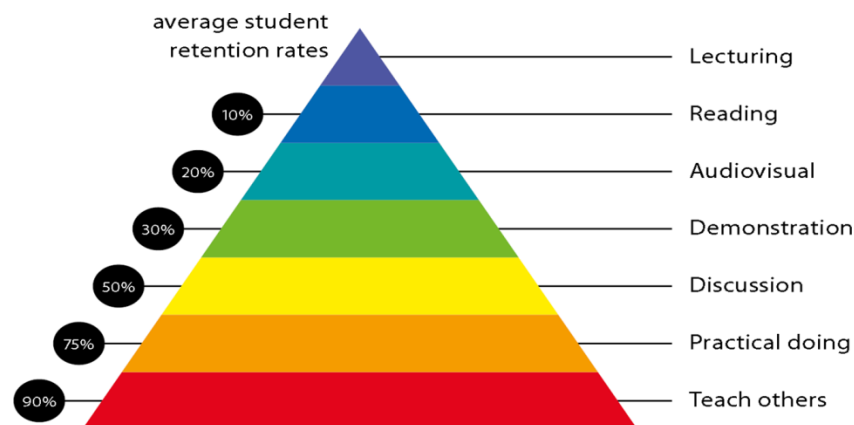


Figure 2: Knowledge retention

## Graduate Qualities and Capabilities covered

(Qualities graduates harness crediting this Course)

General Graduate Qualities	Specific Department of _____ Graduate Capabilities
<b>Informed</b> Have a sound knowledge of an area of study or profession and understand its current issues, locally and internationally. Know how to apply this knowledge. Understand how an area of study has developed and how it relates to other areas.	<b>1 Professional knowledge, grounding &amp; awareness</b>
<b>Independent learners</b> Engage with new ideas and ways of thinking and critically analyze issues. Seek to extend knowledge through ongoing research, enquiry and reflection. Find and evaluate information, using a variety of sources and technologies.	<b>2 Information literacy, gathering &amp; processing</b>

Acknowledge the work and ideas of others.	
<b>Problem solvers</b> Take on challenges and opportunities. Apply creative, logical and critical thinking skills to respond effectively. Make and implement decisions. Be flexible, thorough, innovative and aim for high standards.	<b>4 Problem solving skills</b>
<b>Effective communicators</b> Articulate ideas and convey them effectively using a range of media. Work collaboratively and engage with people in different settings. Recognize how culture can shape communication.	<b>5 Written communication</b> <b>6 Oral communication</b> <b>7 Teamwork</b>
<b>Responsible</b> Understand how decisions can affect others and make ethically informed choices. Appreciate and respect diversity. Act with integrity as part of local, national, global and professional communities.	<b>10 Sustainability, societal &amp; environmental impact</b>

### Practical work: NIL

(Mention what practical work this Course involves)

### Lecture/tutorial times

(Give lecture times in the format below)

**(1Hour theory and 2Hours practical per week) As per the Master Time-Table of FY B. Tech Year -2021**

### Attendance Requirements

The University norms states that it is the responsibility of students to attend all lectures, tutorials, seminars and practical work as stipulated in the Course outline. Minimum attendance requirement as per university norms is compulsory for being eligible for mid and end semester examinations.

## Details of referencing system to be used in written work

NIL

## Text books

NIL

## Additional Materials

- Fred Luthans, Organizational Behaviour, McGraw Hill
- Lesikar and petit, Report writing for Business
- M. Ashraf Rizvi, Effective Technical Communication, McGraw Hill
- Wallace and masters, Personal Development for Life and Work, Thomson Learning
- Hartman Lemay, Presentation Success, Thomson Learning
- Malcolm Goodale, Professional Presentations
- Farhathullah, T. M. Communication skills for Technical Students
- Michael Muckian, John Woods, The Business letters Handbook
- Herta A. Murphy, Effective Business Communication
- Lehman, Dufrene, Sinha BCOM, Cengage Learning

## ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

### Internal Evaluation Criteria:

Mid Semester Exam(MSE)	40 marks
Attendance	05 (80%)
Simulation Tasks	15 Marks

### External Evaluation Criteria:

End Semester Exam(ESE)	40 marks
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## SUPPLEMENTARY ASSESSMENT

Students who receive an overall mark less than 40% in mid semester or end semester will be considered for supplementary assessment in the respective components (i.e mid semester or end semester) of semester concerned. Students must make themselves available during the supplementary examination period to take up the respective components (mid semester or end semester) and need to obtain the required minimum 40% marks to clear the concerned components.

### Practical Work Report/Laboratory Report:

A report on the practical work is due the subsequent week after completion of the class by each group.

### Late Work

Late assignments will not be accepted without supporting documentation. Late submission of the reports will result in a deduction of -% of the maximum mark per calendar day

### Format

All assignments must be presented in a neat, legible format with all information sources correctly referenced. Assignment material handed in throughout the session that is not neat and legible will not be marked and will be returned to the student.

### Retention of Written Work

Written assessment work will be retained by the Course coordinator/lecturer for two weeks after marking to be collected by the students.

### University and Faculty Policies

Students should make themselves aware of the University and/or Faculty Policies regarding plagiarism, special consideration, supplementary examinations and other educational issues and student matters.

**Plagiarism** - Plagiarism is not acceptable and may result in the imposition of severe penalties. Plagiarism is the use of another person's work, or idea, as if it is his or her own - if you have any doubts at all on what constitutes plagiarism, please consult your Course coordinator or lecturer. Plagiarism will be penalized severely.

***Do not copy the work of other students.***

***Do not share your work with other students (except where required for a group activity or assessment)***

### Course schedule (subject to change)

(Mention quiz, assignment submission, breaks etc as well in the table under the Teaching Learning Activity Column)

	Week #	Topic & contents	CO Addressed	Teaching Learning Activity (TLA)
	Weeks 1	Introduction & Communicative Activity	1	Discussion
	Weeks 2	Presentation Skills	3	Lecture
	Week 3	<i>Business Communication</i>		<i>Lecture</i>
	Week 4	Organizational Behavior	2	Discussion
	Week 5	Developing Paragraph	2	Writing Task Pair
	Week 6	<i>Understanding Topic sentence, Unity and Coherence</i>	1	<i>Handouts</i>
	Week 7	Writing Letters	1	Writing Exercises
	Week 8	Writing Emails	1	Writing Exercises
	Week 9	Contrastive and Comparative Essays	1	Writing Exercises
	Week 10	Presentation Seminar	2	Group Activity
	Week 11	Presentation Seminar	2	Group Activity
	Week 12	Declamation	2	Public Speaking

## Syllabus Document

Subject: Business Communication & Presentation Skills								
Program: B.Tech. All Branches				Subject Code: EN0211			Semester: II	
Teaching Scheme				Examination Evaluation Scheme				
Lecture	Tutorial	Practical	Credits	University Theory Examination	University Practical Examination	Continuous Internal Evaluation (CIE)- Theory	Continuous Internal Evaluation (CIE)- Practical	Total
1	2	0	3	40	0	60	0	100

### Course Objectives:

- To orient students about the varied uses of business communication.
- Under the importance of personality and its reflection in communication.
- Train students to develop business correspondence in writing and presentation skills.

## COURSE CONTENT

### Unit 1: Business Communication

- Business Communication- Importance
- Information Age and Communication/Social Media
- Organizational Communication for Engineers
- Common Barriers in Professional Communication/Role Play
- Organizational Etiquettes

### Unit 2: Presentation Skills

- Planning, Preparing and Practice
- Audience Interaction
- Importance of AV Aids
- Best Presentation Videos
- Group Presentations/Pair Presentations/Teacher Review
- Group Presentations/Pair Presentations/ Peer Review

### Unit 3: Writing Skills

- Mind-mapping and Planning
- Paragraph Development with 7 c's
- Picture Elicitation



- Contrastive and Comparative Essays
- Completing a Story and Describing Situations

#### **Unit 4: Writing Skills II**

- Composing Drafts
- Letters / Good, Bad & Neutral Messages
- Emails/ Sample Analysis
- Creating a Blog

#### **Reference Books:**

- Fred Luthans, Organizational Behaviour, McGraw Hill
- Lesikar and petit, Report writing for Business
- M. Ashraf Rizvi, Effective Technical Communication, McGraw Hill
- Wallace and masters, Personal Development for Life and Work, Thomson Learning
- Hartman Lemay, Presentation Success, Thomson Learning
- Malcolm Goodale, Professional Presentations
- Farhathullah, T. M. Communication skills for Technical Students
- Michael Muckian, John Woods, The Business letters Handbook
- Herta A. Murphy, Effective Business Communication
- Lehman, Dufrene, Sinha BCOM, Cengage Learning

#### **Web resources/ MOOCs:**

- Business Conversation Rule 1 :<https://www.youtube.com/watch?v=wB8mr4iViy0>
- Business English Conversations Rule 2:  
<https://www.youtube.com/watch?v=wB8mr4iViy0>
- Business English Conversations 3:  
<https://www.youtube.com/watch?v=wB8mr4iViy0>
- Business English Conversations Rule 4:  
<https://www.youtube.com/watch?v=wB8mr4iViy0>
- Business English Conversations Rule 5:  
<https://www.youtube.com/watch?v=wB8mr4iViy0>
- English Presentation Video: <https://www.youtube.com/watch?v=wB8mr4iViy0>
- Powerful Presentation Skills: Body Language:  
<https://www.youtube.com/watch?v=wB8mr4iViy0>
- Make Body Language Your Superpower:  
<https://www.youtube.com/watch?v=wB8mr4iViy0>
- Make a Presentation Like Steve Jobs:  
<https://www.youtube.com/watch?v=wB8mr4iViy0>

**Name of Institute: Indus Institute of Sciences, Humanities & Liberal Studies (IISHLS)**

**Name of Faculty: Mr. Bharat Prajapati**

**Course code: CH0011**

**Course name: Engineering Chemistry**

Pre-requisites: 10+2

Credit points:

L	T	P	C
3	0	2	4

Offered Semester: I and II

**Course Coordinator (weeks XX - XX)**

Full name: **Prof. Bharat Prajapati**

Department with sitting location: Chemistry Department

EDC Cell , 4<sup>th</sup> Floor, Bhanvar Building

Telephone: EXT : 3404

Email: bharatprajapati.gd@indusuni.ac.in

Consultation times: Friday (02:25 – 04:15)

**Course Lecturer (weeks xx - XX)**

Full name: **Mr.. Bharat Prajapati**

Department with sitting location: Chemistry Department

B-404 , 4<sup>th</sup> Floor, Bhanvar Building

Telephone: EXT : 3404

Email: [bharatprajapati.gd@indusuni.ac.in](mailto:bharatprajapati.gd@indusuni.ac.in)

Consultation times: Friday (02:25 – 04:15)

Full name: **Dr. Chetana Deoghare**

Department with siting location: Chemistry Department

EDC Cell , 4<sup>th</sup> Floor, Bhanvar Building

Telephone: EXT : 3414

Email: [chetanadeoghare.gd@indusuni.ac.in](mailto:chetanadeoghare.gd@indusuni.ac.in)

Consultation times: 04:00PM to 05:00 PM

Full name: **Dr. Paras Patel**

Department with siting location: Chemistry Department

EDC Cell , 4<sup>th</sup> Floor, Bhanvar Building

Telephone: EXT : 3404

Email: [paraspatel.gd@indusuni.ac.in](mailto:paraspatel.gd@indusuni.ac.in)

Consultation times: 04:00PM to 05:00 PM

Full name: **Dr. Nikunj Valand**

Department with siting location: Chemistry Department

Faculty Room, 4<sup>th</sup> Floor

Telephone: EXT : 3425

Email: [nikunjvaland.gd@indusuni.ac.in](mailto:nikunjvaland.gd@indusuni.ac.in)

Consultation times: 04:00PM to 05:00 PM

Full name: **Dr. Ujwal Trivedi**

Department with sitting location: Chemistry Department

Faculty Room, 4<sup>th</sup> Floor

Telephone: EXT : 3425

Email: [ujwaltrivedi.ishls@indusuni.ac.in](mailto:ujwaltrivedi.ishls@indusuni.ac.in)

Consultation times: 04:00PM to 05:00 PM

Full name: **Dr. Rawesh Kumar**

Department with sitting location: Chemistry Department

Chemistry lab, 2<sup>nd</sup> Floor

Telephone: EXT : 3214

Email: [raweshkumar.ishls@indusuni.ac.in](mailto:raweshkumar.ishls@indusuni.ac.in)

Consultation times: 04:00PM to 05:00 PM

Students will be contacted throughout the Session via Mail with important information relating to this Course.

### Course Objectives

By participating in and understanding all facets of this Course a student will:

1. To recall the various basic concepts of chemistry and green chemistry with direct application to the built environment.
2. To understand the basics of energy system, electrochemistry, surface chemistry and their practical applications.

3. To aware about various smart materials, composites of cement and ceramics materials and their applications.
4. To apply consciousness about the quality of water for industrial process, problems and troubleshooting techniques
5. To apply knowledge about the corrosion for industrial process, problems and its prevention techniques.

### Course Outcomes (CO)

- CO1.** To understand the fundamental and advance concepts of chemistry applied in the various branches of engineering. [BT-2]
- CO2.** To analyze the various parameters of energy system and application of the catalyst in various fields of engineering. [BT-4]
- CO3.** To illustrate various kind of advance materials and composite materials and there application alloys in respective areas of expertise. [BT-4]
- CO4.** To identify problems caused by impurities of water as well as troubleshooting techniques for water purification for industry as well as potable water. [BT-1]
- CO5.** To evaluate various kind of corrosion process and their prevention process by various chemical techniques. [BT-5]
6. To design volumetric titration for the determination of acidic and basic species. [BT-6]

### Course Outline

(Key in topics to be dealt)

- ❖ **General Chemistry**
- ❖ **Green Chemistry**
- ❖ **Energy System**
- ❖ **Catalyst and Surface Chemistry**
- ❖ **Advance Engineering Materials and its Applications**
- ❖ **Cement & Ceramic Materials**
- ❖ **Water Chemistry**
- ❖ **Corrosion and its prevention**

### Method of delivery

(Face to face lectures, , Active Learning Techniques)

## Study time

(How many hours per week including class attendance)

07 Hours (03-Theory+04 Practical) Hours per week

## CO-PO Mapping (PO: Program Outcomes)

	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
<b>C01</b>	3	3	-	2	-	1	1	-	-	-	-	-
<b>C02</b>	2	2	1	-	-	-	2	-	-	-	-	-
<b>C03</b>	2	2	-	1	2	-	2	-	-	-	-	-
<b>C04</b>	3	3	1	-	-	2	2	-	2	-	-	-
<b>C05</b>	2	2	2	1	-	2	2	-	-	-	-	-
<b>C06</b>	3	3	2	1	-	2	2	-	1	-	-	-

## Blooms Taxonomy and Knowledge retention (For reference)

(Blooms taxonomy has been given for reference)

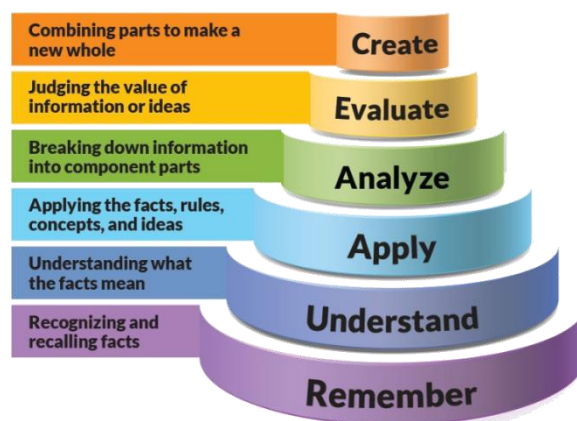


Figure 1: Blooms Taxonomy

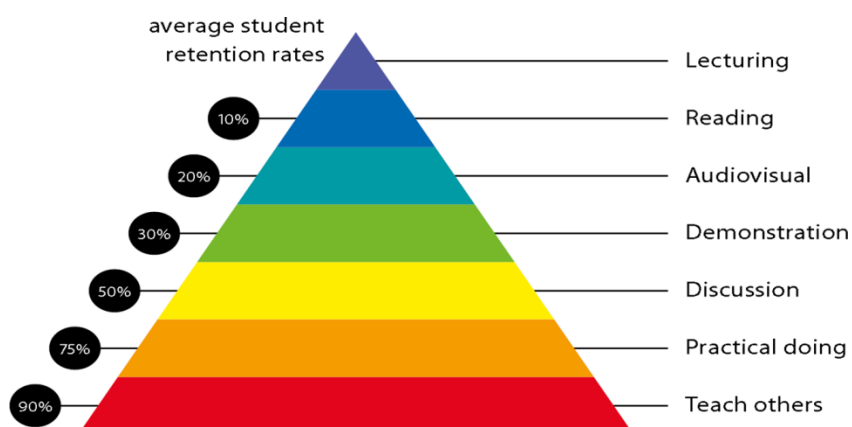


Figure 2: Knowledge retention

## Graduate Qualities and Capabilities covered

(Qualities graduates harness crediting this Course)

General Graduate Qualities	Specific Department of _____ Graduate Capabilities
Informed	<b>1 Professional knowledge, grounding &amp; awareness:-</b> Student's will gain knowledge about chemistry subject in the both areas

Have a sound knowledge of an area of study or profession and understand its current issues, locally and internationally. Know how to apply this knowledge. Understand how an area of study has developed and how it relates to other areas.	i.e. theory as well as practical's. Professionally students will know how chemistry is important in our daily life as well as to build up any industry. Students will be having knowledge/awareness about chemicals' such as how to use them and how hazardous they are for the environment.
<b>Independent learners</b>  Engage with new ideas and ways of thinking and critically analyze issues. Seek to extend knowledge through ongoing research, enquiry and reflection. Find and evaluate information, using a variety of sources and technologies. Acknowledge the work and ideas of others.	<b>2 Information literacy, gathering &amp; processing:-</b> Student's will be able identify the problems happening in the society as well as in the industry such as water quality, loss due to corrosion, pollutant coming from cement plant etc. with this basic information they will be having ability to gather the possible solutions.
<b>Problem solvers</b>  Take on challenges and opportunities. Apply creative, logical and critical thinking skills to respond effectively. Make and implement decisions. Be flexible, thorough, innovative and aim for high standards.	<b>4 Problem solving skills:</b>  Chemistry education provides students with the tools to solve problems. This means that students should be able to apply the scientific method: define a problem clearly, develop testable hypotheses, design and execute experiments, analyze data using appropriate statistical methods, and draw appropriate conclusions.  Students should be able to integrate knowledge across chemical sub disciplines and apply this knowledge to solve problems. In the laboratory, in addition to the characteristics described above, students should understand the fundamental uncertainties in experimental measurements.
<b>Effective communicators</b>  Articulate ideas and convey them effectively using a range of media. Work collaboratively and engage with people in different settings. Recognize how culture can shape communication.	<b>5 Written communication:-</b>  Students should be able to retrieve specific information from the chemical literature, critically evaluate technical articles, and manage many types of chemical information. Students should develop proficiency with electronic searching of



	<p>appropriate technical databases, including structure-based searching.</p> <p><b>6 Oral communication:-</b> Students should orally able to use communication technology such as computerized presentations as well as software for word processing, chemical-structure drawing, and poster preparation and research paper presentation to any conferences.</p> <p><b>7 Teamwork:-</b> Students should be able to Solve scientific problems often involves working in disciplinary and multidisciplinary teams. This is especially true in industry and increasingly in academic settings. Students should learn to work productively with a diverse group of peers in classroom and laboratory activities. Students should be able to lead portions of an activity or be effective followers, as dictated by the situation. Peer- and self-assessment is often an effective way to evaluate student contributions to group activities.</p>
<p><b>Responsible</b></p> <p>Understand how decisions can affect others and make ethically informed choices. Appreciate and respect diversity. Act with integrity as part of local, national, global and professional communities.</p>	<p><b>10 Sustainability, societal &amp; environmental impact:</b> With this course students will know/ aware/ learn about the sustainable use of green products, proper management of renewable energy resources, and to find out new energy replacement sources. Students will be socially aware about the sources of pollutant that damages the water, soil, air etc. So they will be having capabilities/ knowledge how to tackled/ deal with different types of pollutions.</p>

### Practical work:

(Mention what practical work this Course involves)

- 1 Determination of the alkalinity of unknown water sample.
- 2 Estimation of hardness of water sample by EDTA method.
- 3 Estimation of dissolved oxygen in water sample.
- 4 Determination of metal ions ( $\text{Ca}^{2+}/\text{Zn}^{2+}$ ) from the mixture by EDTA titration.
- 5 Determination of metal ions ( $\text{Pb}^{2+}/\text{Mg}^{2+}$ ) from the mixture by EDTA titration.
- 6 Determination of strength of Acid or Base by pH meter.
- 7 Determination of strength of Acid or Base by Conductometer.
- 8 To calculate the Acid value of the given sample of oil.
- 9 Determination of the saponification value of a given oil sample.
- 10 Adsorption of acetic acid by charcoal.
- 11 To determines the specific gravity of cement.
- 12 Determination of available lime (as  $\text{CaO}$ ) in cement
- 13 Determination of sulphates in cement.

### Lecture/tutorial times

(Give lecture times in the format below)\_

***Example: For Automobile Engineering***

***Lecture :***

***Lab :***

## Attendance Requirements

The University norms states that it is the responsibility of students to attend all lectures, tutorials, seminars and practical work as stipulated in the Course outline. Minimum attendance requirement as per university norms is compulsory for being eligible for mid and end semester examinations.

## Details of referencing system to be used in written work

1. Dara, S.S., Umare S.S.; A Text Book of Engineering Chemistry (Twelfth edition); S. Chand. Co. 2014, ISBN: 8121903599.
2. P. Atkins, J.D. Paula, Physical Chemistry, Oxford University Press, 2017, ISBN :9780198769866.
3. A. J. Mee, Physical Chemistry, 6th Ed. English Language Book Society and Heinemann Educational Books Ltd. London, 1962.ISBN: 0435665766
4. Douglas A. Skoog, Donald M. West, Fundamentals of Analytical Chemistry, Cengage Learning, Ninth Edition, 2014.ISBN: 9780495558347
5. Puri B. R., Sharma L. R. , Pathania M.S; Principles of Physica Chemistry; Vishal Publishing Co. (46nd Edition), 2013.ISBN :9789382956013.
6. Arthur E. Morris, Gordon Geiger and H. Alan Fine, Handbook on Material & Energy Balance Calculations in Material Processing, Third Edition, 2011. ISBN:9781118065655

## Text books

1. P.C. Jain, M. Jain, Engineering Chemistry 15<sup>th</sup> edition, Dhanpat Rai Publishing Company, New Delhi, 2005.ISBN 8187433175
2. Shashi Chawla, Textbook of Engineering Chemistry, Dhanpat Rai Publishing Co.2004.ISBN 9788126519880

## Additional Materials

### ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

❖ **Theory**

❖ CIE\_(60 marks)

1. Mid Semester Examination = 40 marks

2. Internal Evaluation = 20 marks

(Attendance = 5 Marks

Presentation =5 Marks

Assignment or Case studies = 10 Marks)

ESE (40 marks)

1. Theory Exam = **40 marks**

❖ **Practical**

❖ CIE (60 Marks)

1. Viva exam = 30 marks

### SUPPLEMENTARY ASSESSMENT

Students who receive an overall mark less than 40% in mid semester or end semester will be considered for supplementary assessment in the respective components (i.e mid semester or end semester) of semester concerned. Students must make themselves available during the supplementary examination period to take up the respective components (mid semester or end semester) and need to obtain the required minimum 40% marks to clear the concerned components.

### Practical Work Report/Laboratory Report:

A report on the practical work is due the subsequent week after completion of the class by each group.

### Late Work

Late assignments will not be accepted without supporting documentation. Late submission of the reports will result in a deduction of -% of the maximum mark per calendar day

### Format

All assignments must be presented in a neat, legible format with all information sources correctly referenced. **Assignment material handed in throughout the session that is not neat and legible will not be marked and will be returned to the student.**

### Retention of Written Work

Written assessment work will be retained by the Course coordinator/lecturer for two weeks after marking to be collected by the students.

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Students should make themselves aware of the University and/or Faculty Policies regarding plagiarism, special consideration, supplementary examinations and other educational issues and student matters.

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***Do not copy the work of other students.***

***Do not share your work with other students (except where required for a group activity or assessment)***

## Course schedule (subject to change)

(Mention quiz, assignment submission, breaks etc as well in the table under the Teaching Learning Activity Column)

	Week #	Topic & contents	CO Addressed	Teaching Learning Activity (TLA)
	Weeks 1	<b>Unit-4 CH-1-Water Chemistry</b> Sources of water, Soft Water & Hard Water, Types of hardness, Units of hardness measurement, I.S.I. specification of drinking water, Impurities in water, Disadvantages of hard water,	4	Chalk and Talk
	Weeks 2	Determination of water hardness by EDTA method, Alkalinity of water and its significance, Significance and determination of COD and BOD. Boiler feed water, Scale and sludge formation in boilers and pipes etc ,	4	Chalk and Talk
	Week 3	Boiler Corrosion, Water softening through Soda lime process, Zeolite Process & Ion-exchange Process, Characteristics of Potable water, Sources and quality of drinking water, Treatment of water for domestic use: Filtration, Coagulation, Sedimentation and Disinfection, Desalination through Electro Dialysis & Reverse Osmosis, Numerical problems.	4	Chalk and Talk
	Week 4	<b>Unit-4 CH-2 Corrosion and its prevention.</b> Definition and types of corrosion water line, pitting, stress, erosion and soil corrosion, Caustic embrittlement, Factors affecting on corrosion (Metallic and Environmental), Pourbaix diagram,	5	Chalk and Talk

	Week 5	Protective measures to control Corrosion, Sacrificial anode and Cathode process for corrosion control., Dry (chemical corrosion), Wet (Electrochemical corrosion) and its mechanisms; Types of electrochemical corrosion, (differential aeration, galvanic, concentration cell.	5	Chalk and Talk  Surprised Test-1
	Week 6	<b>Unit-1 CH-1- General Chemistry</b> Introduction to Chemical Sciences, Basics includes: Periodicity, Types of reactions, various acid base concepts, Electrochemistry, Electrochemical Cell, Galvanic Cell, Electrolytic Cell, Types of electrodes,	1	Chalk and Talk
	Week 7	Single electrode potentials, Reference Electrodes, Standard Hydrogen Electrode (SHE), Standard Calomel Electrode (SCE),	1	Chalk and Talk
	Week 8	Glass Electrode, Quinhydrone Electrode, Nernst equation, Conductance, Cell constant and its determination, Conductometric titrations, Numerical. <b>Unit-1-CH-2-Green Chemistry</b> Introduction, Principles & Concepts of Green Chemistry,	1,6	Chalk and Talk
	Week 9	Importance of green synthesis, methods for green synthesis, application of green synthesis, Greenhouse concepts	1	Chalk and Talk
	Week 10	<b>Unit-2 CH-1- Energy System</b> Introduction, classification of fuel, characteristics of good fuel, determination of calorific value of solid/liquid fuel using bomb calorimeter, numerical problems.	2	Chalk and Talk

	Week 11	Power alcohol, unleaded petrol and biodiesel, Introduction, classification - primary, secondary and reserve batteries. Construction, working and applications of Li-ion batteries , Overview of Oil and lubricants	2,6	Chalk and Talk  Planned Test-2
	Week 12	<b>Unit-2 CH-2 Catalyst and Surface Chemistry</b>  Catalysis: Types of catalysis, Positive & Negative catalysis, Homogeneous and Heterogeneous catalysis, Characteristics of Catalytic action, Poisoning of catalysis, Promoters, Auto Catalysis, Acid-Base Catalysis, Theories of Catalysis process, Catalysis of metal salts Criteria for choosing the catalyst for industrial process , Industrial Applications of Catalysts.	2	Chalk and Talk
	Week 13	Adsorption: Introduction, Terminology, Factors affecting the adsorption of Gases by Solids, Types of adsorption, adsorption isotherm: Freundlich adsorption isotherm, Langmuir adsorption Isotherm, Determination of surface area by BET method, Application of adsorption.	2	Chalk and Talk
	Week 14	<b>Unit-3-CH-1 Advance Engineering Materials and its Applications</b>  Liquid Crystals: Introduction, classification and applications, Organic Electronic Materials: Introduction, types and applications, Chemical Sensors: Introduction, types and applications, Ionic Liquids: Introduction and applications, Chromic Materials: Introduction, types and applications, Synthesis and application of Nano materials.	3	Chalk and Talk



	Week 15	<b>Unit-3 CH-2 –Cement &amp; Ceramic materials</b> <b>Cement:</b> Cement: Introduction, Cement and its classification, Manufacture, chemical composition ,setting and hardening , I.S.I specification, physical properties of Portland cement, Lime and Plaster of Paris	3	Chalk and Talk
	Week 16	<b>Ceramics and Refractories</b> :Introduction, Refractories, Properties of Refractories, Some important high refractory materials, Glass, Porcelain.	3	Chalk and Talk

**Subject: Engineering Chemistry**

<b>Program: B.Tech. All</b>				<b>Subject Code: CH0011</b>			<b>Semester : I/II</b>	
Teaching Scheme				Examination Evaluation Scheme				
Lecture	Tutorial	Practical	Credits	University Theory Examination	University Practical Examination	Continuous Internal Evaluation (CIE)- Theory	Continuous Internal Evaluation (CIE)- Practical	Total
3	0	2	4	40	40	60	60	200

**Course Outcomes:**

- CO 1.To understand the fundamental and advance concepts of chemistry applied in the various branches of engineering. [BT-2]  
 CO 2.To analyze the various parameters of energy system and application of the catalyst in various fields of engineering. [BT-4]  
 CO 3.To illustrate various kind of advance materials and composite materials and there application alloys in respective areas of expertise. [BT-4]  
 CO 4.To identify problems caused by impurities of water as well as troubleshooting techniques for water purification for industry as well as potable water. [BT-1]  
 CO 5.To evaluate various kind of corrosion process and their prevention process by various chemical techniques. [BT-5]  
 CO 6.To design volumetric titration for the determination of acidic and basic species. [BT-6]

**CONTENTS**

**UNIT-I**

**[12 hours]**

**General Chemistry**

Introduction to Chemical Sciences, Basics includes: Periodicity, Types of reactions, various acid base concepts, Electrochemistry, Electrochemical Cell, Galvanic Cell, Electrolytic Cell, Types of electrodes, Single electrode potentials, Reference Electrodes, Standard Hydrogen Electrode (SHE), Standard Calomel Electrode (SCE), Glass Electrode, Quinhydrone Electrode, Nernst equation, Conductance, Cell constant and its determination, Conductometric titrations, Numerical

**Green Chemistry**

Introduction, Principles & Concepts of Green Chemistry, Importance of green synthesis, methods for green synthesis, application of green synthesis, Greenhouse concepts

**UNIT-II**

**[12 hours]**

### **Energy System**

Introduction, classification of fuel, characteristics of good fuel, determination of calorific value of solid/liquid fuel using bomb calorimeter, numerical problems. Power alcohol, unleaded petrol and biodiesel, Introduction, classification - primary, secondary and reserve batteries. Construction, working and applications of Li-ion batteries , Overview of Oil and lubricants

### **Catalyst and Surface Chemistry**

Catalysis: Types of catalysis, Positive & Negative catalysis, Homogeneous and Heterogeneous catalysis, Characteristics of Catalytic action, Poisoning of catalysis, Promoters, Auto Catalysis, Acid-Base Catalysis, Theories of Catalysis process, Catalysis of metal salts Criteria for choosing the catalyst for industrial process , Industrial Applications of Catalysts.

Adsorption: Introduction, Terminology, Factors affecting the adsorption of Gases by Solids, Types of adsorption, adsorption isotherm: Freundlich adsorption isotherm, Langmuir adsorption Isotherm, Determination of surface area by BET method, Application of adsorption.

## **UNIT-III**

**[11 hours]**

### **Advance Engineering Materials and its Applications**

Liquid Crystals: Introduction, classification and applications, Organic Electronic Materials: Introduction, types and applications, Chemical Sensors: Introduction, types and applications, Ionic Liquids: Introduction and applications, Chromic Materials: Introduction, types and applications, Synthesis and application of Nano materials.

### **Cement & Ceramic Materials**

**Cement:** Cement: Introduction, Cement and its classification, Manufacture, chemical composition , setting and hardening , I.S.I specification , physical properties of Portland cement, Lime and Plaster of Paris .**Ceramics and Refractories :** Introduction, Refractories, Properties of Refractories, Some important high refractory materials, Glass, Porcelain.

## **UNIT-IV**

**[13 hours]**

### **Water Chemistry**

Sources of water, Soft Water & Hard Water, Types of hardness, Units of hardness measurement, I.S.I. specification of drinking water, Impurities in water, Disadvantages of hard water, Determination of water hardness by EDTA method, Alkalinity of water and its significance, Significance and determination of COD and BOD. Boiler feed water, Scale and sludge formation in boilers and pipes etc , Boiler Corrosion, Water softening through Soda lime process, Zeolite Process & Ion-exchange Process, Characteristics of Potable water, Sources and quality of drinking water, Treatment of water for domestic use: Filtration, Coagulation, Sedimentation and Disinfection, Desalination through Electro Dialysis & Reverse Osmosis, Numerical problems.

### **Corrosion and its prevention**

Definition and types of corrosion water line, pitting, stress, erosion and soil corrosion, Caustic embrittlement, Factors affecting on corrosion (Metallic and Environmental), Pourbaix diagram, Protective measures to control Corrosion, Sacrificial anode and Cathode process for corrosion

control., Dry (chemical corrosion), Wet (Electrochemical corrosion) and its mechanisms; Types of electrochemical corrosion, (differential aeration, galvanic, concentration cell.

### **Text Books**

3. P.C. Jain, M. Jain, Engineering Chemistry 15<sup>th</sup> edition, Dhanpat Rai Publishing Company, New Delhi, 2005.ISBN 8187433175
4. Shashi Chawla, Textbook of Engineering Chemistry, Dhanpat Rai Publishing Co.2004.ISBN 9788126519880

### **Reference Books**

7. Dara, S.S., Umare S.S.; A Text Book of Engineering Chemistry (Twelfth edition); S. Chand. Co. 2014, ISBN: 8121903599.
8. P. Atkins, J.D. Paula, Physical Chemistry, Oxford University Press, 2017, ISBN :9780198769866.
9. A. J. Mee, Physical Chemistry, 6th Ed. English Language Book Society and Heinemann Educational Books Ltd. London, 1962.ISBN: 0435665766
10. Douglas A. Skoog, Donald M. West, Fundamentals of Analytical Chemistry, Cengage Learning, Ninth Edition, 2014.ISBN: [9780495558347](https://www.cengage.com/books/9780495558347)
11. Puri B. R., Sharma L. R. , Pathania M.S; Principles of Physica Chemistry; Vishal Publishing Co. (46nd Edition), 2013.ISBN :9789382956013.
12. Arthur E. Morris, Gordon Geiger and H. Alan Fine, Handbook on Material & Energy Balance Calculations in Material Processing, Third Edition, 2011. ISBN:9781118065655

### **Web Resources**

#### **1. General chemistry**

- Electrochemistry([http://www.cdeep.iitb.ac.in/webpage\\_data/nptel/Core%20Science/Engineering% 20Chemistry%201/Course\\_home\\_Lec22.html](http://www.cdeep.iitb.ac.in/webpage_data/nptel/Core%20Science/Engineering%20Chemistry%201/Course_home_Lec22.html),
- [http://www.cdeep.iitb.ac.in/webpage\\_data/nptel/Core%20Science/Engineering%20Chemistry%201/Course\\_home\\_Lec24.html](http://www.cdeep.iitb.ac.in/webpage_data/nptel/Core%20Science/Engineering%20Chemistry%201/Course_home_Lec24.html) )

#### **2. Green Chemistry**

- (<https://www.epa.gov/greenchemistry>)

#### **3. Energy System**

- ([https://www.toppr.com/guides/chemistry/combustion-anm fuel/introductionto-fuel-and-fuel efficiency/](https://www.toppr.com/guides/chemistry/combustion-anm-fuel/introduction-to-fuel-and-fuel-efficiency/),<https://nptel.ac.in/courses/121106014/31>)

#### **4. Catalyst and Surface Chemistry**

- ([http://www.cdeep.iitb.ac.in/webpage\\_data/nptel/Core%20Science/Engineering%20Chemistry%201/Course\\_home\\_Lec36.html](http://www.cdeep.iitb.ac.in/webpage_data/nptel/Core%20Science/Engineering%20Chemistry%201/Course_home_Lec36.html) )

#### **5. Advance Engineering Materials and its Applications**

- (<https://www.youtube.com/watch?v=dm0bUBy-Utk>,
- <https://www.youtube.com/watch?v=qUEbxTkPIWI>)

#### **6. Cement & Ceramic Materials**

- (<https://www.youtube.com/watch?v=qk9P3e0l2IE>)

#### **7. Water Treatment**

- (<https://www.youtube.com/watch?v=O-MRC0dskHg>,
- <https://www.youtube.com/watch?v=SvClfcovf9k> )

## 8. Corrosion

- ([http://www.cdeep.iitb.ac.in/webpage\\_data/nptel/Core%20Science/Engineering%20Chemistry%201/Course\\_home\\_Lec25.html](http://www.cdeep.iitb.ac.in/webpage_data/nptel/Core%20Science/Engineering%20Chemistry%201/Course_home_Lec25.html))

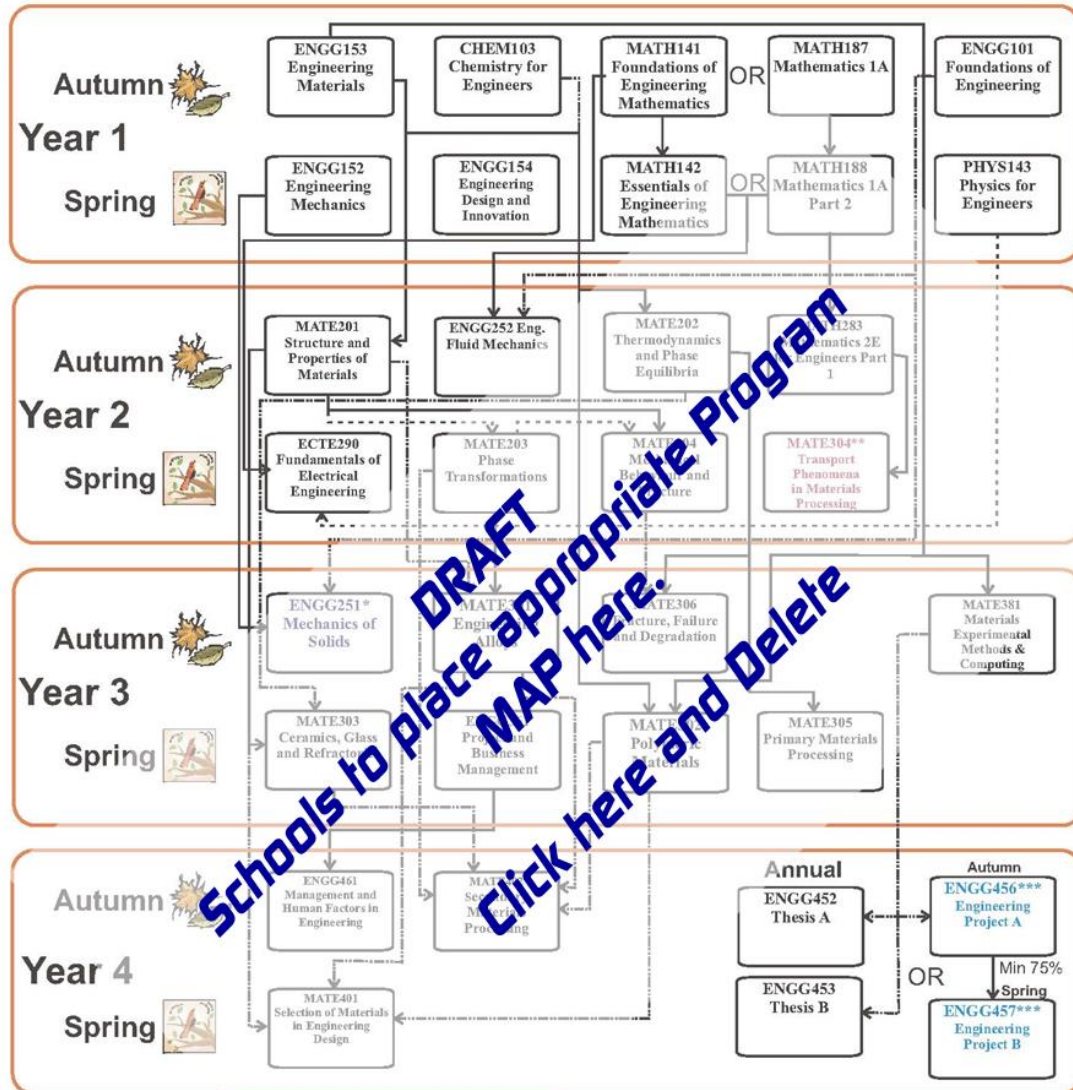
### LIST OF EXPERIMENTS

Experiment No.	Title
1	Determination of the alkalinity of unknown water sample.
2	Estimation of hardness of water sample by EDTA method.
3	Estimation of dissolved oxygen in water sample.
4	Determination of metal ions ( $\text{Ca}^{2+}/\text{Zn}^{2+}$ ) from the mixture by EDTA titration.
5	Determination of metal ions ( $\text{Pb}^{2+}/\text{Mg}^{2+}$ ) from the mixture by EDTA titration.
6	Determination of strength of Acid or Base by pH meter.
7	Determination of strength of Acid or Base by Conductometer.
8	To calculate the Acid value of the given sample of oil.
9	Determination of the saponification value of a given oil sample.
10	Adsorption of acetic acid by charcoal.
11	To determines the specific gravity of cement.
12	Determination of available lime (as $\text{CaO}$ ) in cement.
13	Determination of sulphates in cement.



## PROGRAM MAP for Bachelor of Engineering (Materials Engineering)

DEGREE - 2012



### Electives \*

MATE 411  
Advanced  
Materials  
and Processing

MATE412  
Electronic  
Materials

MATE413  
Structural  
Characterisation  
Techniques

MATE422  
Iron and  
Steelmaking

MATE433  
Surface  
Engineering

\* Note: Students will take three electives

Some electives are only offered every 2nd year

ENGG251\* Note: Full time students entering Year 3 in 2012 will need to take one elective in Autumn as they have already completed ENGG251

MATE304\*\* Note: Full time students entering Year 3 in 2012 will need to take MATE304 in Spring of their 4th year or take it in 2012 and defer another subject to Spring 2012

ENGG456\*\*\*Note: If ENGG456 Engineering Project A (6cp) is done instead of a thesis, a student needs to complete 4 electives and is not eligible for honours

Pre-requisite  
Co-requisite  
Assumed  
Knowledge

**Name of Institute: Indus Institute of Technology and Engineering**

**Name of Faculty: Dr.Bansi Raja**

**Course code: ME0211**

**Course name: Engineering Graphics**

Pre-requisites: None

Teaching Scheme					Examination Scheme				
					Theory		Practical		
L*	T*	P*	Cr	Hrs	CIE	ESE	CIE	ESE	TOTAL
1	0	4	3	5	60	40	60	40	200

Credit points: 3

Offered Semester: II

### **Course Coordinator**

Full name: Dr.Bansi Raja

Department with siting location: HMT Lab,FF,Bhanwar Building

Telephone: 3113,

Email: bansiraja.me@indusuni.ac.in Consultation

times: Friday (9.30am to 11.00 am)

Students will be contacted throughout the session via mail with important information relating to this course.

### **Course Objectives**

- 1) To make students understand the conventions and the methods of engineering drawing.
- 2) To make students interpret engineering drawings using fundamental technical mathematics.
- 3) To improve visualization skills of students so that they can apply these skills in developing new products.
- 4) To improve student's technical communication skill in the form of communicative drawings.
- 5) To make students comprehend the theory of projection.



## Course Outcomes (CO)

After learning the course, the students should be able to,

1. Understand the conventions and the methods of engineering drawing.
2. Interpret engineering drawings using fundamental techniques of mathematics.
3. Construct basic and intermediate geometry.
4. Improve their visualization skills so that they can apply these skills in developing new products.
5. Improve their technical communication skill in the form of communicative drawings.
6. Comprehend the theory of projection.

## Course Outline

Key in topics to be dealt:

1. Engineering curves
2. Projection of various geometries.
3. Orthographic Projection
4. Isometric view.

## Method of delivery

(Face to Face Lecture), PPT & Video, Self-study material, Problem Based Learning)

## Study time

(How many hours per week including class attendance)

	Lecture	Tutorial	Practical
No of hours	1	0	4

## CO-PO Mapping (PO: Program Outcomes)

PO/PSO CO	PO											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3					2	1	-				
CO2	3	-	-	1	3	-	-	-	-	-	-	-
CO3	3	2	2	2	3	-	-	-	-	-	-	-
CO4	2	2	1	-	-	-	-	-	-	-	-	-
CO5	3	-	3	1	3	-	-	-	-	-	-	-
CO6	2	3	-	1	-	-	-	-	-	-	-	-



## Blooms Taxonomy and Knowledge retention (For reference)

(Blooms taxonomy has been given for reference)

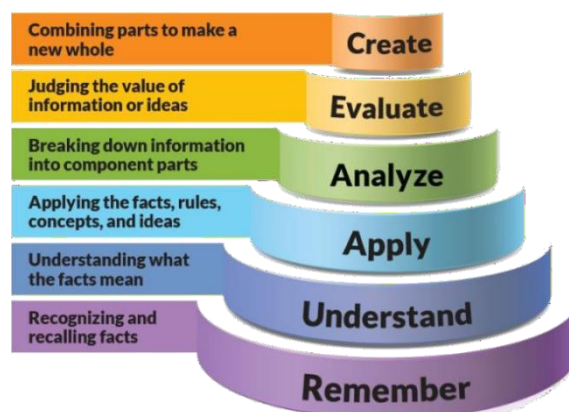


Figure 1: Blooms Taxonomy

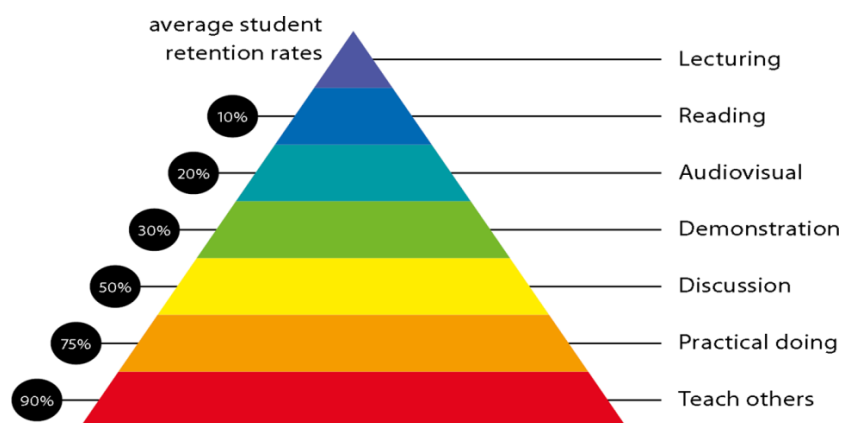


Figure 2: Knowledge retention

## Graduate Qualities and Capabilities covered

(Qualities graduates harness crediting this Course)

General Graduate Qualities	Specific Department of _____ Graduate Capabilities
<b>Informed</b> Have a sound knowledge of an area of study or profession and understand its current issues, locally and internationally. Know how to apply this knowledge. Understand how an area of study has developed and how it relates to other areas.	<b>1 Professional knowledge, grounding &amp; awareness</b>

<b>Independent learners</b> Engage with new ideas and ways of thinking and critically analyze issues. Seek to extend knowledge through ongoing research, enquiry and reflection. Find and evaluate information, using a variety of sources and technologies. Acknowledge the work and ideas of others.	<b>2 Information literacy, gathering &amp; processing</b>
<b>Problem solvers</b> Take on challenges and opportunities. Apply creative, logical and critical thinking skills to respond effectively. Make and implement decisions. Be flexible, thorough, innovative and aim for high standards.	<b>4 Problem solving skills</b>
<b>Effective communicators</b> Articulate ideas and convey them effectively using a range of media. Work collaboratively and engage with people in different settings. Recognize how culture can shape communication.	<b>5 Written communication</b>
	<b>6 Oral communication</b>
	<b>7 Teamwork</b>
<b>Responsible</b> Understand how decisions can affect others and make ethically informed choices. Appreciate and respect diversity. Act with integrity as part of local, national, global and professional communities.	<b>10 Sustainability, societal &amp; environmental impact</b>

### Practical work: LIST OF PRACTICALS (SHEETS)

1. Engineering curves – I (Ellipse, parabola and Hyperbola)
2. Engineering curves – II (Cycloid, Hypocycloid, Epicycloids, Involute, Spirals)
3. Projections of Points and Line
4. Projections of Planes
5. Projections of solids
6. Orthographic projection
7. Section Orthographic projection
8. Isometric Projection/view

## Lecture/tutorial times

(Give lecture times in the format below)

As per Time Table
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## Attendance Requirements

The University norms states that it is the responsibility of students to attend all lectures, tutorials, seminars and practical work as stipulated in the course outline. Minimum attendance requirement as per university norms is compulsory for being eligible for semester examinations.

## Details of referencing system to be used in written work

### Text books

1. P. J. Shah, "A Text Book of Engineering Graphics" Publication: S. Chand.
2. P. D. Patel, "Engineering Graphics" Publication: Mahajan

### Reference Books

1. N. D. Bhatt, "Elementary Engineering Drawing", Charotar Publishing House, Anand
2. A text book of Engineering Drawing by R. K. Dhawan, S. Chand & Company Ltd., New Delhi
3. A text book of Engineering Drawing by P. S. Gill, S. K. Kataria & sons, Delhi
4. A Text Book of Machine Drawing By P. J. Shah S. Chand & Company Ltd., New Delhi

### Additional Materials

<http://nptel.ac.in/courses/112103019/>

## ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

Tentative CIE Theory 60 Marks Bifurcation		Tentative Duration
10 Marks	3 Drawing Sheets(2 drg sheet of Engg.Curves and 1 drg sheet of Projection of Plane)	After completion of each Topic
10 Marks	Assignments (Engg.Curves and Projection of Plane)	After completion of each Topic
40 Marks	Mid Sem exam	As per academic Calendar
Tentative CIE Practical 60Marks Bifurcation		Tentative Duration
10 Marks	Lab Participation	Academic Session
20 Marks	Maximum 4 Assignments	After completion of each Topic
30 Marks	4 Drawing Sheets [Proj. Of Point and Line(1 Sheet),Orthographic and Sectional Orthographic(1 Sheet),Isometric Projection (1 Sheet)& Projection of Solids (1 sheet)]	After completion of each Topic

## SUPPLEMENTARY ASSESSMENT

Students who receive an overall mark less than 40% in internal component or less than 40% in the end semester will be considered for supplementary assessment in the respective components (i.e internal component or end semester) of semester concerned. Students must make themselves available during the supplementary examination period to take up the respective components (internal component or end semester) and need to obtain the required minimum 40% marks to clear the concerned components.

### Practical Work Report/Laboratory Report:

A report on the practical work is due the subsequent week after completion of the class by each group.

### Late Work

Late assignments will not be accepted without supporting documentation. Late submission of the reports will result in a deduction of -% of the maximum mark per calendar day

### Format

All assignments must be presented in a neat, legible format with all information sources correctly referenced. **Assignment material handed in throughout the session that is not neat and legible will not be marked and will be returned to the student.**

### Retention of Written Work

Written assessment work will be retained by the Course coordinator/lecturer for two weeks after marking to be collected by the students.

### University and Faculty Policies

Students should make themselves aware of the University and/or Faculty Policies regarding plagiarism, special consideration, supplementary examinations and other educational issues and student matters.

**Plagiarism** - Plagiarism is not acceptable and may result in the imposition of severe penalties. Plagiarism is the use of another person's work, or idea, as if it is his or her own - if you have any doubts at all on what constitutes plagiarism, please consult your Course coordinator or lecturer. Plagiarism will be penalized severely.

*Do not copy the work of other students.*

*Do not share your work with other students (except where required for a group activity or assessment).*

### Course schedule (subject to change)

Week #	Topic & contents	CO Addressed	Teaching Learning Activity (TLA)
Week 1	Principles of Engineering Graphics and their Significance – Drawing Instruments and their Use – Conventions in Drawing – Lettering –	1 , 2	Assignment Submission
Week 2	BIS Conventions- Dimensioning systems – polygons-types of lines.  Classification and application of Engineering Curves, Construction of different methods of Ellipse, parabola and Hyperbola.	1 , 2	Worksheet Submission
Week 3	construction of Conics, Cycloid Curves – Cycloid, Hypocycloid, Epicycloids, Involute and Spirals.	2 , 3	Worksheet submission, Quiz
Week 4	Introduction to principal planes of projections, Projections of the points located in same quadrant and different quadrants, Projections of line with its inclination to one reference plane and with two reference planes.	3 , 4	Assignment and Worksheet Submission
Week 5	True length and inclination with the reference planes.	3 , 4	Assignment and Worksheet Submission
Week 6	Projections of planes (polygons, circle, and ellipse) with its inclination to one reference plane and with two reference planes, Concept of auxiliary plane method for projections of the plane.	4	Assignment and Worksheet Submission
Week 7	Classification of solids. Projections of solids (Cylinder, Cone, Pyramid, Prism) along with frustum of cone and pyramid with their inclinations to one reference plane and with two reference planes.	4 , 6	Assignment and Worksheet Submission

Week 8	Fundamental of projection along with classification, Projections from the pictorial view of the object on the principal planes for view from front, top and sides using first angle projection method and third angle projection method.	4 , 6	Assignment and Worksheet Submission, Quiz
Week 9	Fundamental of projection along with classification, Projections from the pictorial view of the object on the principal planes for view from front, top and sides using first angle projection method and third angle projection method.	5 , 6	Assignment and Worksheet Submission, Quiz
Week 10	Introduction of section of objects, full sectional view.	4 , 5 , 6	Assignment and Worksheet Submission, Quiz
Week 11	Isometric orthographic projection. Scale, views Conversion of into isometric	5 , 6	Assignment and Worksheet Submission, Quiz
Week 12	Isometric view or drawing	4 , 6	Assignment and Worksheet Submission, Quiz

**Name of Institute: IITE**  
**Name of Faculty: Mr. Monil Salot**

**Course code: MME0202**  
**Course name: Metallurgy for Non Metallurgists**  
Pre-requisites: None  
Credit points: 03  
Offered Semester: 02

**Course Coordinator**

Full Name: Mr. Monil Salot  
Department with sitting location: Metallurgical Engineering, Bhanwar Building, Lab-004 (GF)  
Telephone: 9428600336  
Email: monilsalot.mt@indusuni.ac.in  
Consultation times: 3:45-4:20 PM

**Course Lecturer**

Full Name: Mr. Monil Salot  
Department with sitting location: Metallurgical Engineering, Bhanwar Building, Lab-004 (GF)  
Telephone: 9428600336  
Email: monilsalot.mt@indusuni.ac.in  
Consultation times: 3:45-4:20 PM

Students will be contacted throughout the Session via Mail with important information relating to this Course.

**Course Objectives**

By participating in and understanding all facets of this Course a student will:

1. Every human being particularly who are not familiar with metallurgy would be curious to know about the behavior of these metals and alloys, their applications in industries and in every walk of human life.
2. This course aims at providing knowledge and understanding to the students not only about the extraction of metals but also their manufacturing processes into different shapes and sizes, their properties, testing and applications.

## Course Outcomes (CO)

1. The students will be made familiar with different types of ferrous and non-ferrous metals and their brief introduction to extraction processes from respective ores and minerals.
2. Refining and alloying of metals and alloys and their properties, microstructural characteristics.
3. Manufacturing processes such as Rolling, Forging, and Casting and welding.
4. Testing of metallic components destructively and non-destructively.
5. Heat treatment processes for their change in the microstructure and mechanical properties.
6. Corrosion behavior of metals and materials.

## Course Outline

Proposed course mainly deal with fundamentals of metal and ores, introduction to the various fundamentals of metallurgy and what the impact of metallurgists are

## Method of delivery

- Face to face lectures,
- Numerical and Simulations in Tutorials,
- Model Making
- Video Lectures When and as necessary

## Study time

3 Lectures

## CO-PO Mapping (PO: Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	2	1	3	-	2	1	1	-	-	1	2	3
<b>CO2</b>	3	3	3	3	2	-	-	-	-	-	2	1
<b>CO3</b>	3	3	2	2	1	-	-	-	-	-	2	-
<b>CO4</b>	1	3	3	3	2	1	1	1	1	-	2	1
<b>CO5</b>	3	3	2	2	1	-	-	-	-	-	1	-
<b>CO6</b>	2	2	3	3	1	-	-	-	-	-	1	1

1-Lightly Mapped      2- Moderately Mapped      3- Highly Mapped



## Blooms Taxonomy and Knowledge retention (For reference)

(Blooms taxonomy has been given for reference)

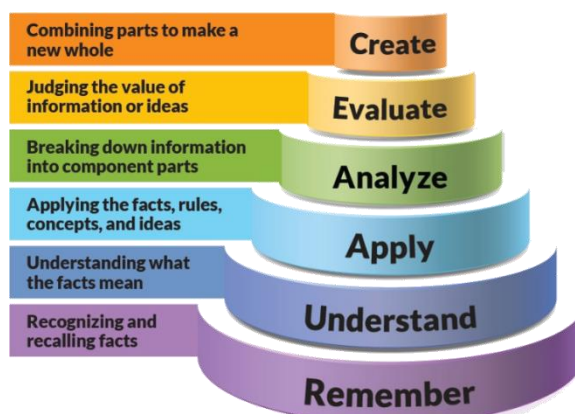


Figure 1: Blooms Taxonomy

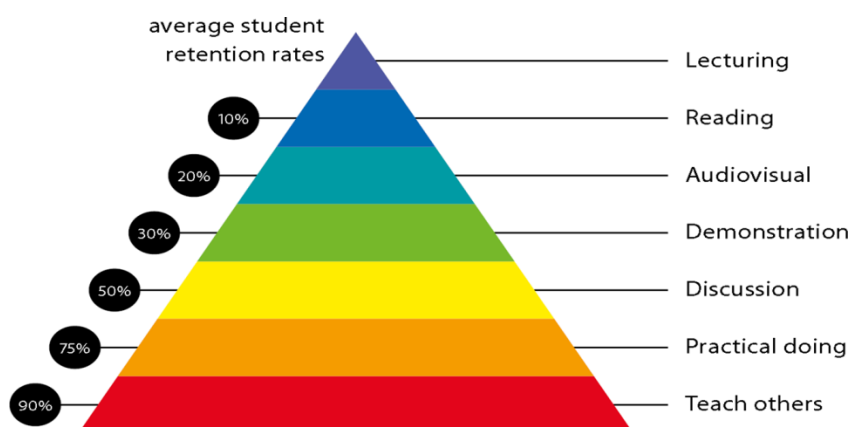


Figure 2: Knowledge retention

## Graduate Qualities and Capabilities covered

(Qualities graduates harness crediting this Course)

General Graduate Qualities	Specific Department of _____ Graduate Capabilities
<b>Informed</b> Have a sound knowledge of an area of study or profession and understand its current issues, locally and internationally. Know how to apply this knowledge. Understand how an area of study has developed and how it relates to other areas.	<b>1 Professional knowledge, grounding &amp; awareness</b>
<b>Independent learners</b> Engage with new ideas and ways of thinking and critically analyze issues. Seek to extend knowledge through ongoing research, enquiry and reflection.	<b>2 Information literacy, gathering &amp; processing</b>

Find and evaluate information, using a variety of sources and technologies. Acknowledge the work and ideas of others.	
<b>Problem solvers</b> Take on challenges and opportunities. Apply creative, logical and critical thinking skills to respond effectively. Make and implement decisions. Be flexible, thorough, innovative and aim for high standards.	<b>4 Problem solving skills</b>
<b>Effective communicators</b> Articulate ideas and convey them effectively using a range of media. Work collaboratively and engage with people in different settings. Recognize how culture can shape communication.	<b>5 Written communication</b> <b>6 Oral communication</b> <b>7 Teamwork</b>
<b>Responsible</b> Understand how decisions can affect others and make ethically informed choices. Appreciate and respect diversity. Act with integrity as part of local, national, global and professional communities.	<b>10 Sustainability, societal &amp; environmental impact</b>

### Practical work:

NA

### Lecture/tutorial times

**\*Please Refer to Time Table for Lecture Timings, Circulated Separately**

Lecture	Room LH 3
Lecture	Room LH 3
Lecture	Room LH 3

### Attendance Requirements

The University norms states that it is the responsibility of students to attend all lectures, tutorials, seminars and practical work as stipulated in the Course outline. Minimum attendance requirement as per university norms is compulsory for being eligible for mid and end semester examinations.

## Details of referencing system to be used in written work

### Reference Books

1. Elements of Metallurgy – D. Swarup.
2. O. P. Khanna, “Material Science and Metallurgy”, Dalpat Rai Publications, 2<sup>nd</sup> Edition, 2014, ISBN: 9789383182459.

### Text books

#### Text Books

1. Short Term Course Material on Metallurgy for Non-Metallurgists by I. I. M., Baroda Chapter.

### Additional Materials

NA

## ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

<b>Example:</b>		
MSE	40% (week 4)	Objective (1-3)
Assignments and Problems	05% (week 8)	Objective (1-4)
Mini Project	10% (due week 10)	Objectives (2-5)
Class Temperament and Innovative Thinking	05% (due week 10)	Objectives (1-5)
Final exam ( <i>closed book</i> )	40%	Objectives (1-5)

## SUPPLEMENTARY ASSESSMENT

Students who receive an overall mark less than 40% in mid semester or end semester will be considered for supplementary assessment in the respective components (i.e mid semester or end semester) of semester concerned. Students must make themselves available during the supplementary examination period to take up the respective components (mid semester or end semester) and need to obtain the required minimum 40% marks to clear the concerned components. ***Examination and Assessment to be carried out as per university policy***

### Practical Work Report/Laboratory Report:

NA

### Late Work

Late assignments will not be accepted without supporting documentation. Late submission of the reports will result in a deduction of -% of the maximum mark per calendar day

### Format

All assignments must be presented in a neat, legible format with all information sources correctly referenced. **Assignment material handed in throughout the session that is not neat and legible will not be marked and will be returned to the student.**

### Retention of Written Work

Written assessment work will be retained by the Course coordinator/lecturer for two weeks after marking to be collected by the students.

### University and Faculty Policies

Students should make themselves aware of the University and/or Faculty Policies regarding plagiarism, special consideration, supplementary examinations and other educational issues and student matters.

**Plagiarism** - Plagiarism is not acceptable and may result in the imposition of severe penalties. Plagiarism is the use of another person's work, or idea, as if it is his or her own - if you have any doubts at all on what constitutes plagiarism, please consult your Course coordinator or lecturer. Plagiarism will be penalized severely.

***Do not copy the work of other students.***

***Do not share your work with other students (except where required for a group activity or assessment)***

## Course schedule(subject to change)

	Week #	Topic & contents	CO Addressed	Teaching Learning Activity (TLA)
	Weeks 1	Introduction to Metallurgy Metal Extraction from Ores	C01, C02	BB PPT
	Weeks 2	Introduction to Metallurgy Metal Extraction from Ores	C01, C02	BB PPT
	Week 3	Introduction to Metallurgy Metal Extraction from Ores	C01, C02	BB PPT
	Week 4	Metallography and its applications Mechanical properties of metals and alloys, Strengthening Mechanism	C01, C02,C03	BB PPT
	Week 5	Metallography and its applications Mechanical properties of metals and alloys, Strengthening Mechanism	C01, C02,C03	BB PPT
	Week 6	Metallography and its applications Mechanical properties of metals and alloys, Strengthening Mechanism	C01, C02,C03	BB PPT
	Week 7	Heat treatment processes Manufacturing processes such as Rolling, Forging, Casting and Welding	C01, C02, C03	BB PPT
	Week 8	Heat treatment processes Manufacturing processes such as Rolling, Forging, Casting and Welding	C01, C02, C03	BB PPT
	Week 9	Heat treatment processes Manufacturing processes such as Rolling, Forging, Casting and Welding	C01, C03	BB PPT
	Week 10	Introduction to Corrosion science and engineering Treatment of steels such as Plating, Galvanizing, Aluminizing Destructive and Non-Destructive Testing	C01, C03	BB PPT

	Week 11	Introduction to Corrosion science and engineering Treatment of steels such as Plating, Galvanizing, Aluminizing Destructive and Non-Destructive Testing	C03, C02	BB PPT
	Week 12	Introduction to Corrosion science and engineering Treatment of steels such as Plating, Galvanizing, Aluminizing Destructive and Non-Destructive Testing	C03, C02	BB PPT

## Program Map for Metallurgical Engineering Department

Sem	Subjects
1 <sup>st</sup>	<div>Calculus</div> <div>Engineering Physics</div> <div>Workshop</div> <div>Material Science</div> <div>Environmental Science</div> <div>Material Science (OE)</div> <div>Technical Communication</div>
2 <sup>nd</sup>	<div>Differential Equations and Linear Algebra</div> <div>Engineering Chemistry</div> <div>Metallurgy for Non Metallurgists (OE)</div> <div>Structural Properties and Physics of Materials</div> <div>Engineering Graphics</div> <div>Advanced Material and Application (OE)</div> <div>Business Communication and Presentation Skills</div>
3 <sup>rd</sup>	<div>Probability, Statistics and Numerical Methods</div> <div>Management for Engineers</div> <div>Human Values and Professional Ethics</div> <div>Mineral Processing</div> <div>Metallurgical Thermodynamics</div> <div>Internship-I</div> <div>Physical Metallurgy</div>
4 <sup>th</sup>	<div>Iron Making</div> <div>Transport Phenomena</div> <div>Metal Casting and Solidification (OE)</div> <div>Recycled Materials (OE)</div> <div>Heat Treatment Principles and Practices</div> <div>Soft Skill and International Comm.</div> <div>Personality Credit-1</div>
5 <sup>th</sup>	<div>Foundry Technology</div> <div>Steel Making</div> <div>Fuel Furnace and Refractories (EL)</div> <div>Environmental Pollution and its Control in Met. Ind. (EL)</div> <div>Non Ferrous Extractive Metallurgy</div> <div>Plastic Deformation of Metals</div> <div>Energy Economy and Waste Management- (OE)</div> <div>Internship-2</div>
6 <sup>th</sup>	<div>Metal Forming</div> <div>Phase Transformation</div> <div>Powder Metallurgy (Elective-1)</div> <div>Modelling of Metallurgical Processes (Elective-1)</div> <div>Electrometallurgy and Corrosion</div> <div>Ind. Ceramics and Polymers (EL-2)</div> <div>Composite Materials (EL-2)</div> <div>Nano Technology (OE)</div> <div>Metal Joining Processes</div> <div>Personality Credit-2</div>
7 <sup>th</sup>	<div>Metal Testing and Characterisation</div> <div>Alloy Design (EL)</div> <div>Advanced Ferrous Metallurgy (EL)</div> <div>Surface (EL)</div> <div>Internship-3</div> <div>Non Destructive Testing (EL) and (OE)</div> <div>Material Testing and Standards</div> <div>Selection of Material &amp; Failure analysis (EL) &amp; (OE)</div> <div>Advanced Foundry Technology (EL)</div>
8 <sup>th</sup>	<div>Project</div>



**Subject: Metallurgy for Non-Metallurgists (OE – 2)**

<b>Program: B. Tech in Metallurgical Engineering</b>				<b>Subject Code: MME0202</b>			<b>Semester: II</b>	
<b>Teaching Scheme (Hours per week)</b>				<b>Examination Evaluation Scheme (Marks)</b>				
<b>Lecture</b>	<b>Tutorial</b>	<b>Practical</b>	<b>Credits</b>	<b>University Theory Examination</b>	<b>University Practical Examination</b>	<b>Continuous Internal Evaluation (CIE)- Theory</b>	<b>Continuous Internal Evaluation (CIE)- Practical</b>	<b>Total</b>
3	0	0	3	16/40	0	24/60	0	100

### Course Objectives

1. Every human being particularly who are not familiar with metallurgy would be curious to know about the behavior of these metals and alloys, their applications in industries and in every walk of human life.
2. This course aims at providing knowledge and understanding to the students not only about the extraction of metals but also their manufacturing processes into different shapes and sizes, their properties, testing and applications.

### CONTENTS

#### UNIT-I

**[10 hours]**

Introduction to Metallurgy  
Metal Extraction from Ores

#### UNIT-II

**[10 hours]**

Metallography and its applications  
Mechanical properties of metals and alloys, Strengthening Mechanism

#### UNIT-III

**[10 hours]**

Heat treatment processes  
Manufacturing processes such as Rolling, Forging, Casting and Welding

#### UNIT-IV

**[10 hours]**

Introduction to Corrosion science and engineering  
Treatment of steels such as Plating, Galvanizing, Aluminizing  
Destructive and Non-Destructive Testing

### Course Outcomes

1. The students will be made familiar with different types of ferrous and non-ferrous metals and their brief introduction to extraction processes from respective ores and minerals.
2. Refining and alloying of metals and alloys and their properties, microstructural characteristics.
3. Manufacturing processes such as Rolling, Forging, and Casting and welding.
4. Testing of metallic components destructively and non-destructively.



5. Heat treatment processes for their change in the microstructure and mechanical properties.
6. Corrosion behavior of metals and materials.

### **Text Books**

3. Elements of Metallurgy – D. Swarup.
4. O. P. Khanna, “Material Science and Metallurgy”, Dalpat Rai Publications, 2<sup>nd</sup> Edition, 2014, ISBN: 9789383182459.

### **Reference Books**

1. Short Term Course Material on Metallurgy for Non-Metallurgists by I. I. M., Baroda Chapter.

**Name of Institute:** Indus Institute of Technology and Engineering

**Name of Faculty:** Dr.K. Santhy

**Course code:** MME0201

**Course name:** Structural Metallurgy and Physics of Materials

Pre-requisites: Materials Science, Engineering Physics

Credit points: 3

Offered Semester: 2<sup>nd</sup> semester

### **Course Coordinator (weeks XX - XX)**

Full Name: Dr.K. Santhy

Department with sitting location: Materials and Metallurgical Engg., Third floor (Staff room)

Telephone: 3326

Email: santhyk.mt@indusuni.ac.in

Consultation times: 4.15 to 5 pm

### **Course Lecturer (weeks xx - XX)**

Full Name: Dr.K. Santhy

Department with sitting location: Materials and Metallurgical Engg., Third floor (Staff room)

Telephone: 3326

Email: santhyk.mt@indusuni.ac.in

Consultation times: 4.15 to 5 pm

Students will be contacted throughout the Session via Mail with important information relating to this Course.

### **Course Objectives**

By participating in and understanding all facets of this Course a student will:

1. To give them knowledge about diffusion in solids.
2. To teach them basics on nucleation and growth and its applications.
3. To teach them about crystal defects in metallic materials their origin, causes and remedial measure.
4. To provide basic knowledge about properties of materials such as electrical and thermal Conductivity, magnetism, dielectric properties.

### **Course Outcomes (CO)**

CO 1: List the types of bonds and its properties. [BT-1]

CO 2: Differentiate isotropy and anisotropy, homogeneous and heterogeneous, amorphous and crystalline solids, polycrystalline and single crystal. [BT-2]

CO 3: Sketch the slip direction and plane on simple structure. [BT-3]

CO 4: Analyze the properties of metal, polymer and ceramics based on bonding. [BT-4]

CO 5: Compare ferromagnetism, diamagnetism and paramagnetism. [BT-5]

CO6: Design a new material based on the knowledge of bonding, crystal structure and properties. [BT-6]

## Course Outline

(Key in topics to be dealt)

- Bonding related to materials
- Slip plan and slip direction
- Plastic deformation
- Magnetism.

## Method of delivery

( teaching, self study material, Active Learning Techniques)

## Study time

(How many hours per week including class attendance)

3 hrs per week

## CO-PO Mapping (PO: Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	3	2	2	-	-	-	-	-	-	-	-	3
<b>CO2</b>	3	2	2	-	-	-	-	-	-	-	-	1
<b>CO3</b>	3	2	3	-	-	-	-	-	-	-	-	1
<b>CO4</b>	3	3	3	1	-	-	-	-	-	-	-	1
<b>CO5</b>	3	3	1	-	-	-	-	-	-	-	-	1
<b>CO6</b>	3	2	3	2	-	-	-	-	-	-	-	2

## Blooms Taxonomy and Knowledge retention (For reference)

(Blooms taxonomy has been given for reference)

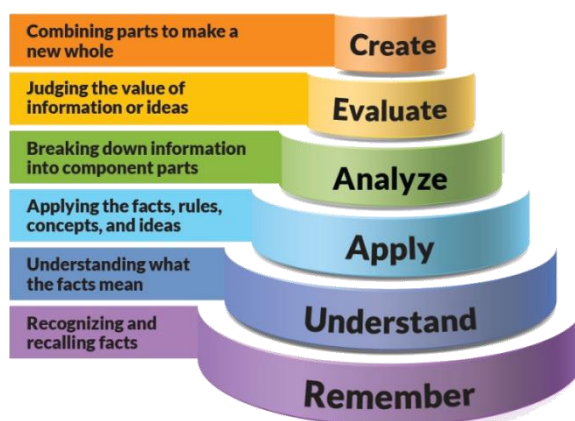


Figure 1: Blooms Taxonomy

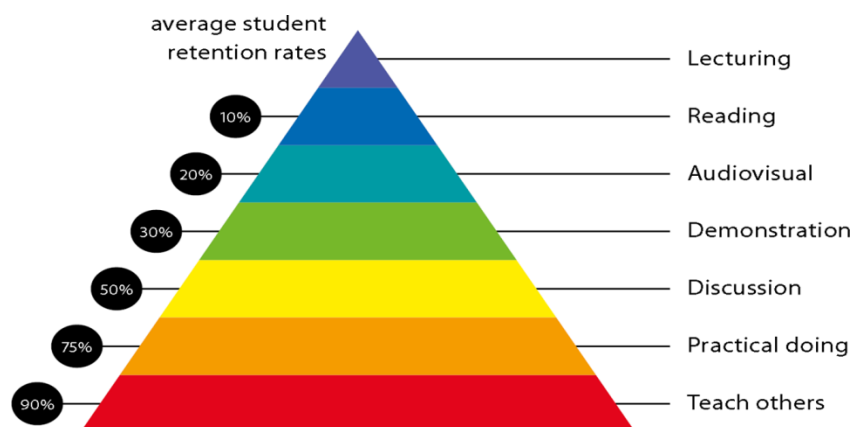


Figure 2: Knowledge retention

### Graduate Qualities and Capabilities covered

(Qualities graduates harness crediting this Course)

General Graduate Qualities	Specific Department of _____ Graduate Capabilities
<b>Informed</b> Have a sound knowledge of an area of study or profession and understand its current issues, locally and internationally. Know how to apply this knowledge. Understand how an area of study has developed and how it relates to other areas.	<b>1 Professional knowledge, grounding &amp; awareness</b>
<b>Independent learners</b> Engage with new ideas and ways of thinking and critically analyze issues. Seek to extend knowledge through ongoing research, enquiry and reflection. Find and evaluate information, using a variety of sources and technologies. Acknowledge the work and ideas of others.	<b>2 Information literacy, gathering &amp; processing</b>
<b>Problem solvers</b> Take on challenges and opportunities. Apply creative, logical and critical thinking skills to respond effectively. Make and implement decisions. Be flexible, thorough, innovative and aim for high standards.	<b>4 Problem solving skills</b>
<b>Effective communicators</b> Articulate ideas and convey them effectively using a range of media. Work collaboratively and engage with people in	<b>5 Written communication</b>
	<b>6 Oral communication</b>
	<b>7 Teamwork</b>

different settings. Recognize how culture can shape communication.	
<b>Responsible</b> Understand how decisions can affect others and make ethically informed choices. Appreciate and respect diversity. Act with integrity as part of local, national, global and professional communities.	<b>10 Sustainability, societal &amp; environmental impact</b>

### Practical work:

(Mention what practical work this Course involves)

### Lecture/tutorial times

(Give lecture times in the format below)

<b>Example:</b>		
Lecture	Monday	10.00 – 11.00 am
Lecture	Thursday	9.00 – 10.00 am
Lecture	Friday	9.00 – 10.00 am

### Attendance Requirements

The University norms states that it is the responsibility of students to attend all lectures, tutorials, seminars and practical work as stipulated in the Course outline. Minimum attendance requirement as per university norms is compulsory for being eligible for mid and end semester examinations.

### Details of referencing system to be used in written work

#### Text books

1. C. S. Barret & T. B. Massalski, “Structure of Metals – Crystallographic Methods, Principles & Data”, McGraw-Hill Book Company, 3<sup>rd</sup> Edition, 1966, ISBN: 9780070038158.
2. A. H. Cottrell, “Theoretical Structural Metallurgy”, The English Language Book Society & Edward Arnold (Publishers) Ltd., 2<sup>nd</sup> Edition, 1964, OCLC: 959782723.
3. B. D. Cullity, “Elements of X-ray Diffraction”, Pearson New International, 3<sup>rd</sup> Edition, 2014, ISBN: 9781292040547.
4. R. Abbaschian, L. Abbaschian and R. E. Reed-Hill, “Physical Metallurgy Principles”, Stamford CT: Cengage Learning, 4<sup>th</sup> Edition, 2010, ISBN: 9780495438519.

## Additional Materials

### Reference Books

1. V. Raghavan, “Materials Science & Engineering”, Prentice-Hall of India Pvt. Ltd, 6<sup>th</sup> Edition, 2015, ISBN: 9788120350922.

### Web Resources

1. MIT Open Courseware on “Materials Science and Engineering”  
(<http://ocw.mit.edu/OcwWeb/Materials-Science-and-Engineering/>)
2. EdX Course on “Materials Science and Engineering”  
(<https://www.edx.org/course/materials-science-engineering-misisx-mse1x>)
3. NPTEL MOOC Course on “Physics of Materials”  
([https://courses.nptel.ac.in/noc16\\_mm08/preview](https://courses.nptel.ac.in/noc16_mm08/preview))
4. NPTEL MOOC Course on “Physics of Materials”  
([https://courses.nptel.ac.in/noc15\\_mm03/preview](https://courses.nptel.ac.in/noc15_mm03/preview))
5. NPTEL MOOC Course on “Nature and Properties of Materials”  
([https://courses.nptel.ac.in/noc17\\_me27/preview](https://courses.nptel.ac.in/noc17_me27/preview))  
([https://courses.nptel.ac.in/noc16\\_me16/preview](https://courses.nptel.ac.in/noc16_me16/preview))

## ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

### Example:

Mid semester exam	40% (week 4)
Assignment/MCQ	10%
Assignment/MCQ	<b>10%</b>
Final exam ( <i>closed book</i> )	40%

## SUPPLEMENTARY ASSESSMENT

Students who receive an overall mark less than 40% in mid semester or end semester will be considered for supplementary assessment in the respective components (i.e mid semester or end semester) of semester concerned. Students must make themselves available during the supplementary examination period to take up the respective components (mid semester or end semester) and need to obtain the required minimum 40% marks to clear the concerned components.

### Practical Work Report/Laboratory Report:

A report on the practical work is due the subsequent week after completion of the class by each group.

### Late Work

Late assignments will not be accepted without supporting documentation. Late submission of the reports will result in a deduction of -% of the maximum mark per calendar day

### Format

All assignments must be presented in a neat, legible format with all information sources correctly referenced. **Assignment material handed in throughout the session that is not neat and legible will not be marked and will be returned to the student.**

### Retention of Written Work

Written assessment work will be retained by the Course coordinator/lecturer for two weeks after marking to be collected by the students.

### University and Faculty Policies

Students should make themselves aware of the University and/or Faculty Policies regarding plagiarism, special consideration, supplementary examinations and other educational issues and student matters.

**Plagiarism** - Plagiarism is not acceptable and may result in the imposition of severe penalties. Plagiarism is the use of another person's work, or idea, as if it is his or her own - if you have any doubts at all on what constitutes plagiarism, please consult your Course coordinator or lecturer. Plagiarism will be penalized severely.

***Do not copy the work of other students.***

***Do not share your work with other students (except where required for a group activity or assessment)***

### Course schedule (subject to change)

(Mention quiz, assignment submission, breaks etc as well in the table under the Teaching Learning Activity Column)

	Week #	Topic & contents	CO Addressed	Teaching Learning Activity (TLA)
	Weeks 1	Atomic Structure, types of bonds; ionic bonds, covalent bonds, Van der Waals bonds, metallic bonds, metallic properties;	CO1 and CO6	lecture
	Weeks 2	crystalline vs. non-crystalline solids. Inter-atomic Bonding, Inter-atomic distances. Macro and micro structure in metallic materials, levels of structure, structure property relationships in materials,	CO2 and CO6	lecture
	Week 3	Equilibrium & kinetics: stability & met stability, Basic thermodynamic functions, The statistical nature of entropy.	CO2	lecture
	Week 4	Revision and MCQ/Assignment with discussion. The Structure of Crystalline Solids: Crystalline & non-crystalline states, covalent solids, Metals & alloys. Ionic solid,	CO1 and CO2	lecture & Google form
	Week 5	Unit cell, space lattice, Crystal geometry, crystal systems & Miller-Bravais lattices, Polymorphism or allotropy, direction & planes, slip planes, atom sizes, co-ordination number, atomic packing factor.	CO3	lecture
	Week 6	Single crystal, Polycrystalline & Non crystals. Assignment/MCQ followed by discussion.	CO2	lecture & Google form
	Week 7	Isotropy & anisotropy, Homogenous & heterogeneous, Types of deformation elastic & anelastic deformation,	CO2	lecture
	Week 8	viscoelastic behavior, work hardening & strain hardening, dislocation & strain aging,	CO4	lecture
	Week 9	The Bragg's law Diffraction methods, Crystal structure	CO3	lecture



		determination, Crystallite size determination.		
	Week 10	Assignment/MCQ followed by discussion. Glass transition, Conductors and Resistors:	CO6	lecture & Google form
	Week 11	The resistivity range, Free electron theory, conduction by free electrons, conductor, Semi- conductor, insulators and resistor materials.	CO4 & CO6	lecture
	Week 12	Ferromagnetism, diamagnetism, paramagnetism, superconductivity, dielectric behavior,	CO5	lecture
	Week 13	Thermal conductivity principles. Revision of 4 <sup>th</sup> Unit	CO5 & CO6	lecture

## Mapping for B.Tech Metallurgy

Sem	Subjects
1 <sup>st</sup>	<div>Calculus</div> <div>Engineering Physics</div> <div>Workshop</div> <div>Technical Communication</div> <div>Material Science</div> <div>Environmental Science</div> <div>Material Science (OE)</div> <div>Matrix Algebra</div> <div>Engineering Graphics</div>
2 <sup>nd</sup>	<div>Differential Equations and Linear Algebra</div> <div>Engineering Chemistry</div> <div>Metallurgy for Non-Metallurgists (OE)</div> <div>Structural Metallurgy and Physics of Materials</div> <div>Engineering Graphics</div> <div>Advanced Material and Applications (OE)</div> <div>Business Communication and Presentation Skills</div> <div>Matrix Algebra</div> <div>Engineering Graphics</div>
3 <sup>rd</sup>	<div>Probability, Statistics and Numerical Methods</div> <div>Management for Engineers</div> <div>Human Values and Professional Ethics</div> <div>Engineering Graphics</div> <div>Mineral Processing</div> <div>Metallurgical Thermodynamics</div> <div>Internship-I</div> <div>Physical Metallurgy</div> <div>Differential Calculus and Matrix Algebra</div>
4 <sup>th</sup>	<div>Introduction to Process Metallurgy</div> <div>Transport Phenomena</div> <div>Metal Casting and Solidification (OE)</div> <div>Recycling of Materials (OE)</div> <div>Heat Treatment Principles and Practices</div> <div>Soft Skill and Interpersonal Comm.</div> <div>Iron Making</div> <div>Personality Credit-1</div> <div>Matrix Algebra</div>
5 <sup>th</sup>	<div>Foundry Technology</div> <div>Steel Making</div> <div>Fuel Furnace &amp; Refractories (EL)</div> <div>Environmental Pollution &amp; its Control in Met. Ind. (EL)</div> <div>Non Ferrous Extractive Metallurgy</div> <div>Plastic Deformation of Metals</div> <div>Energy Economy &amp; Waste Management- (OE)</div> <div>Graphics</div> <div>Internship-2</div> <div>Differential Calculus and Matrix Algebra</div>
6 <sup>th</sup>	<div>Metal Forming</div> <div>Phase Transformations</div> <div>Powder Metallurgy (Elective-1)</div> <div>Modelling of Metallurgical Processes (Elective-1)</div> <div>Electrometallurgy &amp; Corrosion</div> <div>Ind. Ceramics and Polymers (EL-2)</div> <div>Composite Materials (EL-2)</div> <div>Nano Technology (OE)</div> <div>Metal Joining Processes</div> <div>Personality Credit-2</div> <div>Graphics</div>
7 <sup>th</sup>	<div>Metal Testing &amp; Characterization</div> <div>Alloy Design (EL)</div> <div>Advanced Ferrous Metallurgy (EL)</div> <div>Surface Engg. (EL)</div> <div>Internship-3</div> <div>Non Destructive Testing</div> <div>Material Testing and Standards</div> <div>Selection of Material &amp; Failure analysis (EL) &amp; (OE)</div> <div>Advanced Foundry Technology (EL)</div> <div>Matrix Algebra</div>
8 <sup>th</sup>	<div>Project</div> <div>Pre-requisite Co-requisite</div> <div>Engineering Graphics</div>

**Subject: Structural Metallurgy and Physics of Materials**

<b>Program: B. Tech in Metallurgical Engineering</b>				<b>Subject Code: MME0201</b>			<b>Semester: II</b>	
<b>Teaching Scheme (Hours per week)</b>				<b>Examination Evaluation Scheme (Marks)</b>				
<b>Lecture</b>	<b>Tutorial</b>	<b>Practical</b>	<b>Credits</b>	<b>University Theory Examination</b>	<b>University Practical Examination</b>	<b>Continuous Internal Evaluation (CIE)- Theory</b>	<b>Continuous Internal Evaluation (CIE)- Practical</b>	<b>Total</b>
3	0	0	3	16/40	0	24/60	0	100

**Course Objectives**

1. To give them knowledge about diffusion in solids.
2. To teach them basics on nucleation and growth and its applications.
3. To teach them about crystal defects in metallic materials their origin, causes and remedial measure.
4. To provide basic knowledge about properties of materials such as electrical and thermal Conductivity, magnetism, dielectric properties.

**CONTENTS**

**UNIT-I**

**[10 hours]**

Atomic Structure, types of bonds; ionic bonds, covalent bonds, Van der Waals bonds, metallic bonds, metallic properties; crystalline vs. non-crystalline solids. Inter-atomic Bonding, Inter- atomic distances.

Macro and micro structure in metallic materials, levels of structure, structure property relationships in materials, Equilibrium & kinetics: stability & met stability, Basic thermodynamic functions, The statistical nature of entropy.

**UNIT-II**

**[10 hours]**

The Structure of Crystalline Solids: Crystalline & non crystalline states, covalent solids, Metals & alloys. Ionic solid, unit cell, space lattice, Crystal geometry, crystal systems & Miller- Bravais lattices, Polymorphism or allotropy, direction & planes, slip planes, atom sizes, co-ordination number, atomic packing factor.

**UNIT-III**

**[10 hours]**

Isotropy & anisotropy, Homogenous & heterogeneous, Defects, Types of defects, Stress-strain diagram, Types of deformation elastic & anelastic deformation, viscoelastic behavior, work hardening & strain hardening, dislocation & strain aging.

**UNIT-IV**

**[10 hours]**

Glass transition, Conductors and Resistors: The resistivity range, Free electron theory, conduction by free electrons, conductor, Semi- conductor, insulators and resistor materials.

Ferromagnetism, diamagnetism, paramagnetism, superconductivity, dielectric behavior, thermal conductivity principles.

### **Course Outcomes**

1. To apply the knowledge about the basic structure of metals and alloys, which are the building block for developing macro and micro structure of metallic materials.
2. To apply the knowledge about metallic and non-metallic type of bonding and their differentiation.
3. To apply the concept of polymorphism and others.
4. To solve different numerical pertaining to crystal structure determination & phase diagram determination.

### **Text Books**

1. C. S. Barret & T. B. Massalski, “Structure of Metals – Crystallographic Methods, Principles & Data”, McGraw-Hill Book Company, 3<sup>rd</sup> Edition, 1966, ISBN: 9780070038158.
2. A. H. Cottrell, “Theoretical Structural Metallurgy”, The English Language Book Society & Edward Arnold (Publishers) Ltd., 2<sup>nd</sup> Edition, 1964, OCLC: 959782723.
3. B. D. Cullity, “Elements of X-ray Diffraction”, Pearson New International, 3<sup>rd</sup> Edition, 2014, ISBN: 9781292040547.
4. R. Abbaschian, L. Abbaschian and R. E. Reed-Hill, “Physical Metallurgy Principles”, Stamford CT: Cengage Learning, 4<sup>th</sup> Edition, 2010, ISBN: 9780495438519.

### **Reference Books**

1. V. Raghavan, “Materials Science & Engineering”, Prentice-Hall of India Pvt. Ltd, 6<sup>th</sup> Edition, 2015, ISBN: 9788120350922.

### **Web Resources**

1. MIT Open Courseware on “Materials Science and Engineering”  
(<http://ocw.mit.edu/OcwWeb/Materials-Science-and-Engineering/>)
2. EdX Course on “Materials Science and Engineering”  
(<https://www.edx.org/course/materials-science-engineering-misix-mse1x>)
3. NPTEL MOOC Course on “Physics of Materials”  
([https://onlinecourses.nptel.ac.in/noc16\\_mm08/preview](https://onlinecourses.nptel.ac.in/noc16_mm08/preview))
4. NPTEL MOOC Course on “Physics of Materials”  
([https://onlinecourses.nptel.ac.in/noc15\\_mm03/preview](https://onlinecourses.nptel.ac.in/noc15_mm03/preview))
5. NPTEL MOOC Course on “Nature and Properties of Materials”  
([https://onlinecourses.nptel.ac.in/noc17\\_me27/preview](https://onlinecourses.nptel.ac.in/noc17_me27/preview))  
([https://onlinecourses.nptel.ac.in/noc16\\_me16/preview](https://onlinecourses.nptel.ac.in/noc16_me16/preview))

**Name of Institute: IISHLS**

**Name of Faculty: Prof. Ghanshyam Malaviya**

**Course code: MA0211**

**Course name: Differential Equations and Linear Algebra**

Pre-requisites: None

Credit points: 04

Offered Semester: 02

**Course coordinator (weeks 01 - 15)**

Full name: Prof. Hemlata Jethanandani

Department with sitting location: Department of Mathematics, ISHLS, Fourth floor, Bhanwar Building

Telephone:

Email: hemlatajethanandani.gd@indusuni.ac.in

Consultation times:

**Course lecturer (weeks 01 - 15)**

Full name: Prof. Hemlata Jethanandani

Department with sitting location: Department of Mathematics, ISHLS, Fourth floor, Bhanwar Building

Telephone:

Email: hemlatajethanandani.gd@indusuni.ac.in

Consultation times:

Students will be contacted throughout the session via mail with important information relating to this course.

**Course Objectives**

By participating in and understanding all facets of this course a student will:

1. To provide mathematical knowledge and skills needed to support their concurrent and subsequent engineering studies.
2. To provide an ability to apply knowledge of basic science and engineering fundamentals.
3. To provide an ability to undertake problem identification, formulation and solution.
4. To provide an ability to analyze different mathematical models within science and technology and work creatively, systematically and critically.
5. To provide an ability to find strategies for the solution of different types of mathematical models using knowledge about the possibilities and limitations of the different methods and tools.
6. To provide an ability to develop abstract, logical and critical thinking and the ability to reflect critically upon their work and work of others.
7. To provide an ability to insight their strengths and weakness as learners and to appreciate the value of errors or mistakes as powerful motivators to enhance learning and understanding.

**Course Outcomes (CO)**

- (1) To apply methods to solve the ordinary and partial differential equation.
- (2) To relate the physical problems with the mathematical problems.

- (3) To calculate the Eigen values and Eigen vectors of matrix.
- (4) Methods to solve Linear homogeneous and nonhomogeneous linear equation systems.

## Course Outline

<b>Unit 1</b>	<b>First order ordinary Differential Equations with applications</b> Revision of ordinary differential equation: Introduction of Mathematical Modeling, Basic Definitions, First Order First Degree Differential Equations, Variable Separable equation, Homogeneous Equation Exact Differential Equations Reduction of Non-Exact Differential Equations to exact form using Integrating Factors First Order Linear Differential Equation, Bernoulli Equation Applications: Orthogonal Trajectories, Simple Electric Circuits.	<b>8 Hours</b>
<b>Unit 2</b>	<b>Higher order ordinary differential equations with applications</b> Solution of Linear differential equations of higher order with constant coefficients, complimentary function and particular integral Application of Linear differential equation - Application of Deflection of Beams, Electric circuits	<b>7 Hours</b>
<b>Unit 3</b>	<b>Partial differential equations with applications</b> Formation of Partial differential equations, Lagrange's method, Directly Integrable equations Method of separation of variables, solution of one dimensional wave equation, heat equation and Laplace equation.	<b>7 Hours</b>
<b>Unit 4</b>	<b>Linear Algebra</b> Concepts of Determinants and Matrices, Types of Matrices Row Echelon and Reduced Row Echelon form Inverse of a Matrix, Rank of a Matrix, Normal Form System of Linear Homogeneous Equations System of Non-Homogeneous Equations, Gaussian Elimination Method Eigen Values and Eigen Vectors - Properties of Eigen Values and Eigen Vectors, Caley Hamilton theorem	<b>8 Hours</b>

## Details of referencing system to be used in written work

**Text Book:** B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill.

### Reference Books:

1. Erwin Kreyszig, "Advanced Engineering Mathematics" (8th Edition), Wiley Eastern Ltd., New Delhi.
2. Dr. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi
3. Murray Spiegel, "Advanced Mathematics for Engineering & Science: Schaum's Outline Series", Tata McGraw Hill Publication
4. MerelC Potter, J.L. Goldberg, "Advanced Engineering Mathematics" (3rd Edition), Oxford India Publication.

**Method of delivery:** Lectures, Self-Study Material

**Study time:** 4 hours per week

## Blooms Taxonomy and Knowledge retention

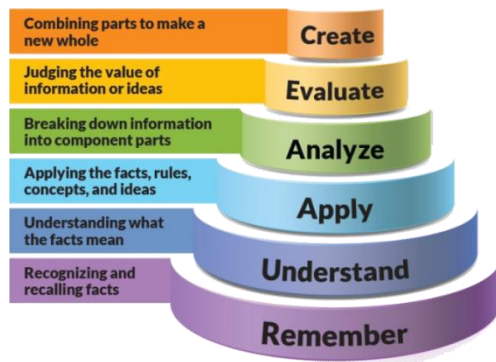


Figure 1: Blooms Taxonomy

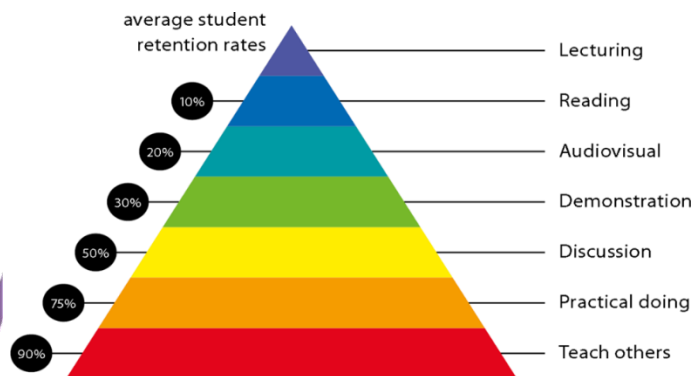


Figure 2: Knowledge retention

## Graduate Qualities and Capabilities covered

General Graduate Qualities	Specific Department of a Graduate Capabilities
<b>Informed</b> Have a sound knowledge of an area of study or profession and understand its current issues, locally and internationally. Know how to apply this knowledge. Understand how an area of study has developed and how it relates to other areas.	<b>1 Professional knowledge, grounding &amp; awareness</b>
<b>Independent learners</b> Engage with new ideas and ways of thinking and critically analyze issues. Seek to extend knowledge through ongoing research, enquiry and reflection. Find and evaluate information, using a variety of sources and technologies. Acknowledge the work and ideas of others.	<b>2 Information literacy, gathering &amp; processing</b>
<b>Problem solvers</b> Take on challenges and opportunities. Apply creative, logical and critical thinking skills to respond effectively. Make and implement decisions. Be flexible, thorough, innovative and aim for high standards.	<b>4 Problem solving skills</b>
<b>Effective communicators</b> Articulate ideas and convey them effectively using a range of media. Work collaboratively and engage with people in different settings. Recognize how culture can shape communication.	<b>5 Written communication</b>
	<b>6 Oral communication</b>
	<b>7 Teamwork</b>
<b>Responsible</b> Understand how decisions can affect others and make ethically informed choices. Appreciate and respect diversity. Act with integrity as part of local, national, global and professional communities.	<b>10 Sustainability, societal &amp; environmental impact</b>



**Practical work: NOT APPLICABLE**

### Lecture/tutorial times

Lecture/Tutorial	Day	Time	Location
Lecture	Monday	3.10-12.20 PM	-
Lecture	Wednesday	12:20-01:20 PM	-
Lecture	Thursday	2:00-3:00 PM	-
Lecture	Friday	11:10-12:10 PM	-

### Attendance Requirements

The University norms states that it is the responsibility of students to attend all lectures, tutorials, seminars and practical work as stipulated in the course outline. Minimum attendance requirement as per university norms is compulsory for being eligible for semester examinations.

### ASSESSMENT GUIDELINES

Your final course mark will be calculated in the following manner:

Type of Examination	Weightage	Method of Assessment
Internal Examination	60%	30% Closed book examination 10% Tutorials 10% Attendance 10% MCQ/Presentation/Quiz
External Examination	40%	Closed Book Examination

## SUPPLEMENTARY ASSESSMENT

Students who receive an overall mark less than 40% in internal component or less than 40% in the end semester will be considered for supplementary assessment in the respective components (i.e internal component or end semester) of semester concerned. Students must make themselves available during the supplementary examination period to take up the respective components (internal component or end semester) and need to obtain the required minimum 40% marks to clear the concerned components.

**Practical Work Report/Laboratory Report:** Not Applicable

### Late Work

Late assignments will not be accepted without supporting documentation. Late submission of the reports will result in a deduction of percentage of the maximum mark per calendar day.

### Format

All assignments must be presented in a neat, legible format with all information sources correctly referenced. **Assignment material handed in throughout the session that is not neat and legible will not be marked and will be returned to the student.**

### Retention of Written Work

Written assessment work will be retained by the Course coordinator/lecturer for two weeks after marking to be collected by the students.

### University and Faculty Policies

Students should make themselves aware of the University and/or Faculty Policies regarding plagiarism, special consideration, supplementary examinations and other educational issues and student matters.

**Plagiarism** - Plagiarism is not acceptable and may result in the imposition of severe penalties. Plagiarism is the use of another person's work, or idea, as if it is his or her own - if you have any doubts at all on what constitutes plagiarism, please consult your Course coordinator or lecturer. Plagiarism will be penalized severely.

***Do not copy the work of other students.***

***Do not share your work with other students (except where required for a group activity or assessment)***

## Course schedule (subject to change)

	Week #	Topic & contents	CO Addressed	Teaching Learning Activity (TLA)
	Weeks 1	Unit-1: Basic Definitions, variable separable differential equation, homogeneous differential equation, differential equations reducible to the above equations.	CO3	
	Weeks 2	Unit-1: Exact differential equations, use of integrating factor to reduce non-exact into exact differential equations.	CO1	
	Week 3	Unit-1: First order differential equation and Bernoulli equation	CO5	
	Week 4	Unit-1: Applications to orthogonal trajectory and simple electric circuit.	CO2	
	Week 5	Unit-2: Introduction to higher order differential equations, solution of homogeneous differential equations (finding complimentary function)	CO5	
	Week 6	Unit-2: Solution of non-homogeneous linear differential equation with $X = e^{ax}$ , $\sin ax$ , $\cos ax$ , $x^n$	CO2	
	Week 7	Unit-2: Application to deflection of beams and electric circuits	CO1	
	Week 8	Unit-3: Introduction to partial differential equations, formation of partial differential equations and directly integral equations	CO6	
	Week 9	Unit-3: Solution of partial differential equations using Lagrange method, examples related to it.	CO7	
	Week 10	Unit-3: Application to solve one dimensional wave equation, heat equation and Laplace equation	CO4	
	Week 11	Unit-4: Revision of concepts on determinants, matrices (including types of matrices, operations on matrices), Reduction of matrices into row echelon form, reduced row echelon form and normal form	CO3	

	Week 12	Unit-4: Finding the rank of the matrix and find the inverse of a square matrix	CO4	
	Week 13	Unit-4: System of equations – Homogeneous and nonhomogenous using Gauss elimination method	CO5	
	Week 14	Unit-4: Eigen values and Eigen vectors of a square matrix and related properties	CO2	
	Week 15	Unit-4: More examples on Eigen values, Eigen vectors of a matrix and concept of Cayley Hamilton theorem	CO7	

**PROGRAM MAP for Bachelor of Engineering**  
**(Department of Mathematics,ISHLS)**

## Subject Mind Mapping

Sr.No.	Semester	Course Name	Compulsory/Open Elective
1	I	Calculus	Compulsory
2	II	Linear Algebra and Differential Equations	Compulsory
3	III	Probability , Statistics and Numerical methods	Compulsory
4	IV	Complex Analysis / Discrete Mathematics	Open elective
5	V	Finite Element method	Open elective
6	VI	Graph Theory	Open elective
7	VII	Optimization Techniques / Artificial neural network and soft computing	Open elective