Name of Institute: Institute of Technology & Engineering
Name of Faculty: Prof. Hardik Prajapati

Course code: EC0116
Course name: Electronics Device & Circuits
Pre-requisites: Semiconductor Physics
Credit points: III
Offered Semester: I

Course coordinator
Full name: Dr. Minesh Thaker
Department with siting location: Electronics & Communication Dept., EC Lab -6, Bhanwar Building
Telephone: M: 9909039918, Extension : 3201
Email: mineshthaker.ec@indusuni.ac.in
Consultation times: Monday to Friday : 4:15 to 4:50, Every second and fourth Saturday

Course lecturer
Full name: Dr. Minesh Thaker
Department with siting location: Electronics & Communication Dept., EC Lab -6, Bhanwar Building
Telephone: M: 9909039918, Extension : 3201
Email: mineshthaker.ec@indusuni.ac.in
Consultation times: Monday to Friday : 4:15 to 4:50, Every second and fourth Saturday

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 be able:
1. To describe the concepts of semiconductor physics.
2. To analyze and recognize basic electronic components and devices used for different electronic functions.
3. To analyze the design and test basic electronic circuits using active components.
4. To describe problem solving techniques in simple electronic circuits

Course Outcomes (CO)
1. Able to recognize various electronics components and understand their applications for design.
2. Able to analyze and test basic electronics circuits.
3. Able to solve basic design problems related to basic electronic circuits.

4. Students will be able to analyze and recognize basic electronic components and devices used for different electronic functions.
5. Students will be able to analyze the design and test basic electronic circuits using active components.
6. Students will be able to describe problem solving techniques in simple electronic circuits

Course Outline

UNIT-I :

Energy Bands in Solids:

Charged Particles, Field Intensity, Potential Energy, The eV Unit of Energy, Nature of Atom, Atomic Energy Levels, Electronic Structure of the Elements, Energy distribution of electrons, Fermi-Dirac function, Energy Band Theory of Crystals, Insulators, Semiconductors and Metals

Transport Phenomena in Semiconductors:

Mobility and Conductivity, Electrons and Holes in an Intrinsic Semiconductor, Donor and Acceptor Impurities, Densities in a Semiconductor, Electrical properties of Ge and Si, Hall Effect, Conductivity Modulation, Generation Recombination of Charges, Diffusion, The Continuity Equation, Injected Minority–Carrier Charge, Potential variation a Graded Semiconductor.

UNIT-II:

Junction –Diode Characteristics:

Open circuit p-n Junction, p-n Junction as a Rectifier, Current Components in a p-n diode, Volt-Ampere Characteristic, Temperature Dependence of the V/I Characteristic, Diode Resistance, Space Charge, Transition Capacitance, Charge- Control Description of a Diode, Diffusion Capacitance, Junction Diode Switching Times, Breakdown Diodes, Tunnel Diode, Semiconductor Photodiode, Photovoltaic Effect, Light –Emitting Diodes, Schottky diode, varactor diode, GUNN diode, SCR

Diode Circuits:

Diode as a Circuit Element, Load-Line Concept, Piecewise Linear Diode Model, Clipping Circuits, Clipping at Two Independent Levels, Comparators, Sampling Gate, Rectifiers, Other Full-Wave Circuits, Capacitor Filters, Additional Diode Circuits

UNIT-III:

Transistor Characteristics:

Junction Transistor, Transistor Current Components, Transistor as an Amplifier, CB Configuration, CE Configuration, CC Configuration, Analytical Expressions for Transistor Characteristics Maximum Voltage Rating, Phototransistor, Transistor biasing.

UNIT-IV:

Field Effect Transistors:

Junction FET, JFET Volt-Ampere Characteristics, MOSFET

Operational Amplifiers:

Introduction to Op Amps, Inverting Amplifier, Non-inverting amplifier, Op Amp applications

Introduction to Data converters:

ADC & DAC

Introduction to Microprocessors and Microcontrollers:

Basic digital ICs, Architecture of processors and controllers

Method of delivery

Lectures, Power Point Slides, Tutorial, Quiz, Test

Study time

3 Hours Per week

CO-PO Mapping (PO: Program Outcomes)

PO / CO	PO 1	2	3	4	5	6	7	8	9	10	11	12
1	√					√	√	√				
2	√		√			√	√	√				
3		√		√						√		
4		√	√	√						√		
5	√	√	√									
6		√		√								

Blooms Taxonomy and Knowledge retention (For reference)

(Blooms taxonomy has been given for reference)

Figure 1: Blooms Taxonomy

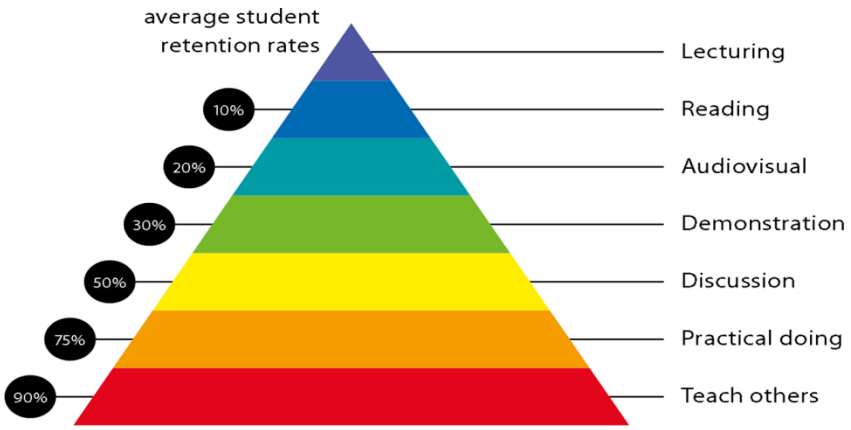


Figure 2: Knowledge retention

Graduate Qualities and Capabilities covered

(Qualities graduates harness crediting this Course)

General Graduate Qualities	Specific Department of _____Graduate Capabilities
Informed 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.	**1 Professional knowledge, grounding & awareness**
Independent learners 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.	**2 Information literacy, gathering & processing**
Problem solvers 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.	**4 Problem solving skills**
Effective communicators 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.	**5 Written communication** **6 Oral communication** **7 Teamwork**

Responsible 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.	**10 Sustainability, societal & environmental impact**

Practical work:

No Practical

Lecture/tutorial times

Lecture	Monday	3.20 – 4.15 PM	Room LH 01
Lecture	Tuesday	2:25 – 3.20 PM	Room LH 01
Lecture	Friday	11:00 – 11:.55 PM	Room LH 01

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.	Integrated Electronics' By J. Millman and C. C. Halkias, Chetan Parikh, 2nd Ed., Tata McGraw Hill Publication

Additional Materials

Reference Books	
1.	*'Electronic Principles' by* Albert *Malvino and David Bates, 7th Ed.,* Tata McGraw Hill Publication
2.	'Electronic Devices and Circuit Theory' by Robert Boylestad and Louis Nashelsky, 9th Ed., Prentice Hall India
3.	"Digital Electronics" by Morris Mano, 2006

Web Resources

1. NPTEL MOOC course on the Basic Electronics (https://onlinecourses.nptel.ac.in/noc17_ee02/preview)

2. NPTEL MOOC course on the Solid State Physics (https://onlinecourses.nptel.ac.in/noc17_ph08/preview)

ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

Test I	10% (week 3)
Test II	10% (week 6)
Test III	10% (week 9)
Test IV	10% (week 10)
Assignment 1	10% (week 4)
Assignment 2	10% (week 8)
Final exam (closed book)	40%

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:

No practical

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.

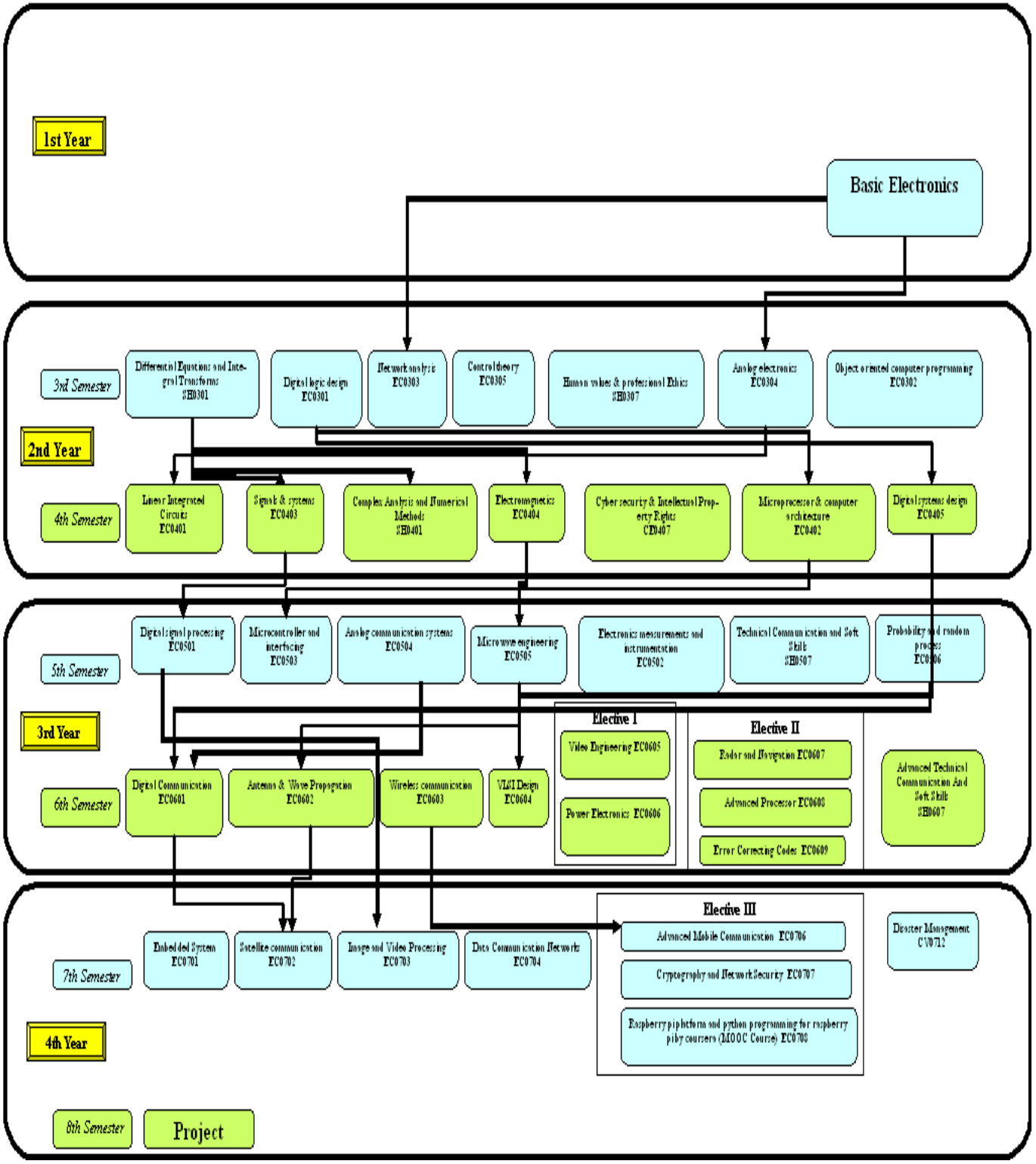
Do not copy the work of other students.
Do not share your work with other students (except where required for a group activity or assessment)

.

Course schedule (subject to change)

	Week #	Topic & contents	CO Addressed	Teaching Learning Activity (TLA)
	Weeks 1	Charged Particles, Field Intensity, Potential Energy, The eV Unit of Energy, Nature of Atom, Atomic Energy Levels, Electronic Structure of the Elements, Energy distribution of electrons, Fermi-Dirac function, Energy Band Theory of Crystals, Insulators, Semiconductors and Metals	1	PPT,BB
	Weeks 2	Mobility and Conductivity, Electrons and Holes in an Intrinsic Semiconductor, Donor and Acceptor Impurities, Charge Densities in a Semiconductor, Electrical properties of Ge and Si, Hall Effect	1	PPT,BB
	Week 3	Conductivity Modulation, Generation and Recombination of Charges, Diffusion, The Continuity Equation, Injected Minority–Carrier Charge, Potential variation within a Graded Semiconductor Open circuit p-n Junction, p-n Junction as a Rectifier, Current Components in a p-n diode, Volt-Ampere Characteristic,	1,2	PPT,BB
	Week 4	Temperature Dependence of the V/I Characteristic, Diode Resistance, Space Charge, Transition Capacitance, Charge-Control Description of a diode, Diffusion Capacitance, Junction Diode Switching Times	2	PPT,BB
	Week 5	Breakdown Diodes, Tunnel Diode, Semiconductor Photodiode, Photovoltaic Effect, Light – Emitting Diodes, Schottky diode, varactor diode, GUNN diode, SCR	2	PPT,BB

	Week 6	Diode as a Circuit Element, Load-Line Concept, Piecewise Linear Diode Model, Clipping Circuits, Clipping at Two Independent Levels, Comparators	2	PPT,BB
	Week 7	Sampling Gate, Rectifiers, Other Full-Wave Circuits, Capacitor Filters, Additional Diode Circuits , Junction Transistor, Transistor Current Components, Transistor as an Amplifier, CB Configuration	2, 3	PPT,BB
	Week 8	CE Configuration, CC Configuration, Analytical Expressions for Transistor Characteristics Maximum Voltage Rating, Phototransistor, Transistor biasing.	3	PPT,BB
	Week 9	Junction FET, JFET Volt-Ampere Characteristics, MOSFET	4	PPT,BB
	Week 10	**Operational Amplifiers:** Introduction to Op Amps, Inverting Amplifier, Non-inverting amplifier, Op Amp applications	4	PPT,BB
	Week 11	**Introduction to Data converters:** ADC & DAC	4	PPT,BB
	Week 12	**Introduction to Microprocessors and Microcontrollers:** Basic digital ICs, Architecture of processors and controllers	4	PPT,BB


1st Year
Basic Electronics
3rd Semester
Differential Equations and Integral Transforms SH0301
Digital logic design EC0301
Network analysis EC0303
Control theory EC0305
Human values & professional Ethics SH0307
Analog electronics EC0304
Object oriented computer programming EC0302
2nd Year
4th Semester
Linear Integrated Circuits EC0401
Signals & systems EC0403
Complex Analysis and Numerical Methods SH0401
Electromagnetics EC0404
Cyber security & Intellectual Property Rights CH0407
Microprocessor & computer architecture EC0402
Digital systems design EC0405
5th Semester
Digital signal processing EC0501
Microcontroller and interfacing EC0503
Analog communication systems EC0504
Microwave engineering EC0505
Electronics measurements and instrumentation EC0502
Technical Communication and Soft Skills SH0507
Probability and random process EC0506
3rd Year
Elective I
Video Engineering EC0605
Power Electronics EC0606
Elective II
Radar and Navigation EC0607
Advanced Processor EC0608
Error Correcting Codes EC0609
Advanced Technical Communication And Soft Skills SH0607
6th Semester
Digital Communication EC0601
Antenna & Wave Propagation EC0602
Wireless communication EC0603
VLSI Design EC0604
Elective III
Advanced Mobile Communication EC0706
Cryptography and Network Security EC0707
Raspberry pi platform and python programming for raspberry pi by coursera (MOOC Course) EC0708
Disaster Management CV0712
7th Semester
Embedded System EC0701
Satellite communication EC0702
Image and Video Processing EC0703
Data Communication Network EC0704
4th Year
8th Semester
Project

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 siting location: Computer Lab, Ground Floor, Main Building
Telephone: 9924241816
Email: mamtapillai.gd@indusuni.ac.in

Course Lecturer (weeks 12)
Full name: Ms. Pranjal Bhatt/ Ms. Foram Patel/Ms. Nidhi Singh
Department with siting location: Equinox Lab, Grd Floor (MB)
Telephone: 9429296329/9537384053/8160976525
Email:
pranjalbhatt.gd@indusuni.ac.in/forampatel.ishls@indusuni.ac.in/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)

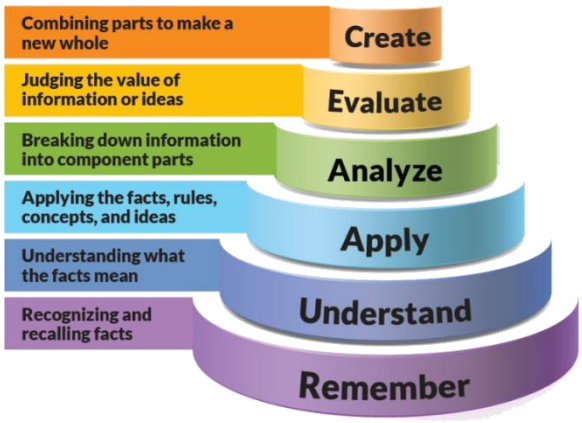


Figure 1: Blooms Taxonomy

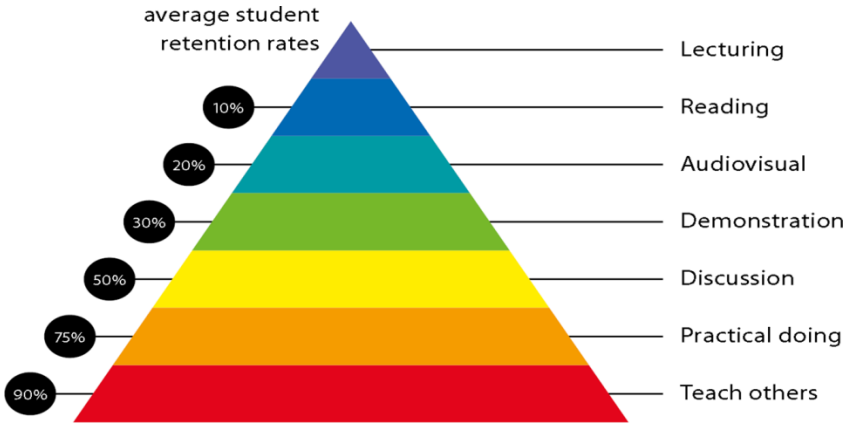


Figure 2: Knowledge retention

Graduate Qualities and Capabilities covered

(Qualities graduates harness crediting this Course)

General Graduate Qualities	Specific Department of _____Graduate Capabilities
Informed 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.	**1 Professional knowledge, grounding & awareness**
Independent learners 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.	**2 Information literacy, gathering & processing**

Acknowledge the work and ideas of others.	
Problem solvers 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.	**4 Problem solving skills**
Effective communicators 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.	**5 Written communication** **6 Oral communication** **7 Teamwork**
Responsible 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.	**10 Sustainability, societal & environmental impact**

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

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	*Business Communication*		*Lecture*
	Week 4	Organizational Behavior	2	Discussion
	Week 5	Developing Paragraph	2	Writing Pair Task
	Week 6	*Understanding Topic sentence, Unity and Coherence*	*1*	*Handouts*
	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

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 and Liberal Studies (IISHLS)
Name of Faculty: Dr. Lokesh Mohan

Course code: PH0011
Course name: Engineering Physics
Pre-requisites: 12th Std Physics (Calculus, Vector analysis, Introduction of Electromagnetism, Quantum concept)
Credit points: 04
Offered Semester: I

Course Coordinator (weeks 01 - 17)
Full Name: Dr. Manisha Vithalpura
Department with sitting location: Physics Department, Physics lab
Telephone: 3314 (sitting location), 7874636405 (Mobile)
Email: manishavithalpura.gd@indusuni.ac.in
Consultation times: 1:30 pm to 4:00 pm (Tuesday)

Course Lecturer (weeks 01 - 17)
Full name: Dr. Lokesh Mohan
Department with sitting location: Physics Department, staff room, fourth floor, Bhanwar building
Telephone: 6360912375 (Mobile)
Email: lokeshmohan.ishls@indusuni.ac.in
Consultation times: 1:30 pm to 4:45 pm (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 describe the basic laws of Physics, mathematical foundations and Engineering theory and to apply the knowledge in modeling and designing a real-world problem **(fundamental engineering analysis skills).**
2) To analyze a problem, identify and formulate using the concept of physics and to solve engineering problem **(engineering problem solving skills).**
3) To analyze and interpret experimental data using concepts of Physics **(information retrieval skills).**

4) To analyze and use current techniques, skills and tools necessary for Physics and engineering practice **(practical engineering analysis skills).**

Course Outcomes (CO)

1. To understand the basic concept of physics in the engineering field
2. To analyze a problem, identify and formulate using the concept of physics and to solve engineering problem
3. To understand the properties of dielectric and magnetic material and their applications in electric and magnetic devices
4. To understand the basic principle of superconductivity and ultrasound with specific applications in engineering
5. To analyze the concept of quantum mechanics and semiconductor physics and its applications in engineering field
6. To understand the optical phenomena of light like Interference and Diffraction and its application in optical devices

Course Outline

UNIT-I : Introduction to Electromagnetic

Module:1 Electrostatics & Dielectrics
Coulomb's law for distribution of charges, Gauss's law and applications, Electric field intensity, Electric flux, Electric dipole moment, Electric field due to dipole, Introduction to dielectrics, Polarizability, Types of polarization – electronic, ionic, orientational, Polarization of dielectrics, Gauss's law in presence of dielectric, Dielectric constant, Electric susceptibility and Permittivity, Internal (Local) field in dielectric, Clausius Mossotti equation (with derivation)

Module:2 Magnetism
Magnetic field, Steady current, Ampere's law, Biot-Savart law and its applications, Faradays law of Induction, Lenz's Law; Effect of magnetic field on current carrying conductor, Lorentz force.
Basic important terms and units in Magnetism, Concept and origin of magnetic moment, magnetic susceptibility, Total angular momentum, Diamagnetism, Paramagnetism, Ferromangnetism, Ferrimagnetism, Antiferromagnetism, Domain theory of Ferromagnetism, Curie temperature and hysteresis loss

UNIT-II : Superconductivity and Sound

Module 1: Superconductivity
Superconductivity: Zero resistance, Critical temperature, Meissner effect, Critical field, General properties of superconductors, Type-I and Type-II superconductors, BCS theory of Superconductor, High temperature superconductors, Applications of Superconductors: SQUID, Maglev etc.

Module 2: Sound

Introduction to sound waves, Characteristics and Properties of Sound, Absorption co-efficient, Reverberation time, Sabine's formula (without derivation), Factors affecting architectural acoustics,
Introduction of Ultrasonic waves, Generation of ultrasonic waves, Detection of ultrasonic waves, Applications of Ultrasonic waves: NDT, SONAR & others.

UNIT-III : Introduction to Quantum and Semiconductor Physics

Module 1: Quantum Mechanics

Black body radiation: Planck's law; Wave nature of Particles: De-Broglie theorem, Uncertainty principle; Schrodinger's wave equation – Time independent and time dependent equations; Born interpretation, probability current; Solution of stationary-state Schrodinger equation for one dimensional problems– particle in a box

Module 2 : Introduction to solids and Semiconductor Physics

Kronig-Penny model (to introduce origin of band gap), Energy bands in solids, E-k diagram; Types of electronic materials: metals, semiconductors, and insulators, Density of states, Occupation probability, Fermi level, Effective mass. Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction diode.

UNIT-IV : Wave Optics& Laser

Module 1: Wave optics

Huygens' principle, superposition of waves and interference of light by wave front splitting and amplitude splitting; Young's double slit experiment, Newton's rings, Farunhofer diffraction from a single slit, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power, Michelson interferometer

Module 2: Laser

Einstein's theory of matter radiation interaction and A and B coefficients; Amplification of light by population inversion, Properties of laser beams: mono-chromaticity, coherence, directionality and brightness; Different types of lasers: gas lasers (He-Ne), solid-state lasers (Neodymium); Applications of lasers in science, engineering and medicine.

Method of delivery

(Face to face lectures, Power Point Presentation, Self assessment, Active Learning Techniques)

Study time

(3 hours per week for lectures, 2 hours per week for Practical)

Graduate Qualities and Capabilities covered

(Qualities graduates harness crediting this Course)

General Graduate Qualities	Specific Department of _____Graduate Capabilities
Informed 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.	**1 Professional knowledge, grounding & awareness** **Basic concept of basic physics Also application of the physics principle in engineering field**
Independent learners 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.	**2 Information literacy, gathering & processing** Critical and logical thinking is developed through numerical practice. Used various sources of the material and technology to perform the experimental part.
Problem solvers 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.	**4 Problem solving skills** **By practicing numerical, logical and critical thinking will be developed.**
Effective communicators 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.	**5 Written communication** **Conducting frequent unit test will develop their written communication skill**
	6 Oral communication **Arranging presentation on different physics topics throughout the semester**
	7 Teamwork **Group discussion in class and lab is arranged**
Responsible 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.	**10 Sustainability, societal & environmental impact**

Practical work:

Experiment no.	Title
1	**Dielectric constant: T**o determine the dielectric constant of a dielectric substance.
2	To determine the**magnetic field at the center of a coil and its variation with distance and radius of the coil.**
3	To verify the **Faraday's law of electromagnetic induction.**
4	**Hysteresis loss:**To determine the Hysteresis loss in a Ferromagnetic material.
5	**Ultrasonic Interferometer:** To determine the wavelength and velocity of ultrasonic wave through ultrasonic interferometer.
6	**Planck's Constant:**To determine the Planck's Constant using LED
7	To study the **V-I characteristics of p-n junction diode**
8	To verify the Inverse Square Law using Photocell
9	To determine the **refractive index of prism** using Spectrometer
10	**Resolving power of grating**: To determine resolving power of a diffraction grating.
11	**Newton's Ring:**To determine the wavelength of monochromatic light
12.	**Determination of Wavelength of Laser:** To determine the wavelength of LASER using diffraction grating.

Lecture/tutorial times

Example:

Lecture : Monday time: 3.20 pm to 4.10 pm
Thursday time: 9.00 am to 9.55 am
Friday time: 11.00 am to 11.55 am

Practicals : Wednesday: batch-1 time: 1.30 pm to 3.20 pm
Thursday : batch-2 time: 11.00 am to 12.50 pm

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

Unit test will be conducted in the classes and test papers will be kept with course coordinator for the future reference.

Text books

1. Engineering Physics by H K Malik, A K Singh, Tata Mc Graw-Hill Education Pvt. Ltd., 2nd edition, 2018, ISBN: 978-93-5260-695-5

2. Engineering Physics by D.K. Bhattacharya, Poonam Tandon,Oxford University Press, first published, 2015, ISBN-13:978-0-19-945281-1

Additional Materials

1. Engineering Physics;Fundamentals and Modern applications by P. Khare& A. Swarup, Jones & Bartlett Learning, 2009, ISBN-13: 978-0763773748

2. A textbook of Engineering Physics by S.O. Pillai and Sivakami,New Age International, Third edition, 2011, ISBN:978-81-224-3162-9

3. An introduction to Electrodynamics by David Griffiths,Pearson Education, 3th edition, 1999,ISBN:9780138053260

4. Optics by A. Ghatak, McGraw-Hill Education India Private Limited, 6th edition, 2017, ISBN-13:978-9339220907

5. Engineering Electromagnetics by W H Hayt& J A Buck, McGraw-Hill Education, 8th edition, 2017, ISBN-13:978-9339203276

6. Engineering Physics by K. Rajagopal,Prentice Hall of India Pvt. Ltd., 2007, ISBN: 9788120332867

7. A Textbook of Engineering Physics by M. N. Avadhanulu, P. G. Khirsagar, S.Chand Pub., Revised edition, 1992, ISBN: 9788121908177

8. University Physics, Sears and Zemansky, Pearson Education India, 13th edition, 2013, ISBN-13:978-8131790274

Web resources:

1. **Topics: Acoustics & Optics**: http://www.nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Guwahati/engg_physics/index_cont.htm

2. **Course: Engineering Physics**: http://www.nptelvideos.in/search?q=engineering+physics

3. **Topic: Laser:**http://science.howstuffworks.com/laser1.htm

4. **Topic: Optics:** http://www.pitt.edu/~poole/physics.html#light

5. **Topic: Magnetism: https://www.khanacademy.org/science/physics/magnetic-forces-and-magnetic-fields**

6. **Topic: Interference: https://www.khanacademy.org/science/physics/light-waves**

7. **Topic: Quantum Mechanics: https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2016/index.htm**

MOOCs:
https://www.edx.org/course/subject/physics

ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

Continuous Internal Evaluation (Theory)		
Mid-Sem exam	40% , Unit-1/2, Objective (1,2,5)	
Assignment	**10% , Objective (1,2,5)**	
Project/Presentation	5% , Objective (1,2,6)	
Attendance	**5% (end of the semester)**	
Total	**60% (CIE theory)**	
Final exam (*closed book*)	40%	Objectives (1-6)

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:

Student has to complete the experiment in their respective lab in a week, will be evaluated weekly basis. A report on practical work is to be submitted after completion of the lab 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)

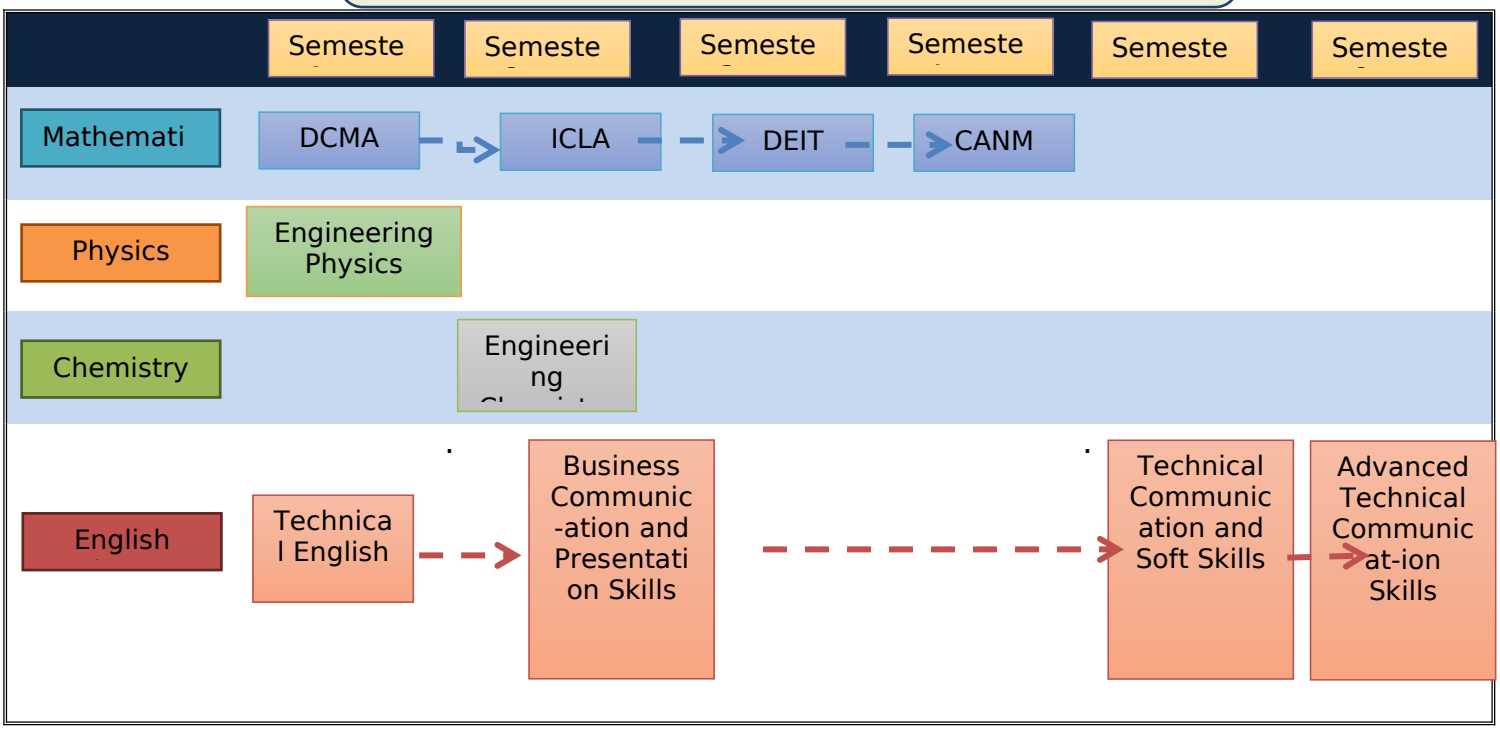
	Weeks 1	**M-1**: Coulomb's law for distribution of charges, Gauss's law and applications, Electric current and Equation of continuity, Electric field intensity, Electric flux, Electric dipole moment, Divergence and curl of electrostatic field, Introduction to dielectrics, Polarizability, Types of polarization – electronic, ionic, orientational, Polarization of dielectrics, Gauss's law in presence of dielectric, Dielectric constant, Electric susceptibility and Permittivity,	1,2,5	PPt, chalk and board
	Weeks 2	Internal (Local) field in dielectric, Clausius Mossotti equation (with derivation), **M-2:** Magnetic field, Steady current, Biot-Savart law, Ampere's law, Divergence and curl of static magnetic field, vector potential and calculating it for a given magnetic field using Stokes' theorem,	1,2,3	Chalk and Board
	Week 3	Effect of magnetic field on current carrying conductor, Lorentz force, Faraday's law in terms of EMF produced by changing magnetic flux; Lenz's law; **M-3:** Basic important terms and units in Magnetism, Concept and origin of magnetic moment, magnetic susceptibility, Total angular momentum	1,2,3	Chalk and Board
	Week 4	Diamagnetism, Paramagnetism, Ferromangnetism, Domain theory of Ferromagnetism, hysteresis loss, numerical,	1,2,3	Chalk and Board
	Week 5	Introduction to Superconductors and its properties, types of it	1,2,4	PPT and chalk-board
	Week 6	Numerical practice, Test	1,2,4	Chalk and board

	Week 7	Types-I , II superconductor, BCS theory and introduction to Sound wave	1,2,4	Ppt and chalk and board
	Week 8	Audible sound and its characteristics, factor affecting and ultrasound	1,2,4	Ppt and chalk-board
	Week 9	Introduction to subject, **M-1**: Introduction, Black body radiation and laws if Black body radiation, De-Broglie theorem, Uncertainty principle; Schrodinger's wave equation	1,2,5	PPt, chalk and board
	Week 10	Born interpretation, probability current; Solution of stationary-state, Schrodinger equation for one dimensional problems– particle in a box, Numerical practice	1,2,5	PPt, chalk and board
	Week 11	Types of electronic materials: metals, semiconductors, and insulators, Density of states, Occupation probability, Fermi level, Effective mass., Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics),	1,2,5	Chalk and board
	Week 12	Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction diode & Numericals, Unit test-1	1,2,5	Chalk and board
	Week 13	**M-1:** Wave front, Huygens' principle, superposition of waves and interference of light by wave front splitting and amplitude splitting, Young's double slit experiment, Newton's rings, Numerical, test II	1,2,6	PPTs and Chalk and board
	Week 14	Farunhofer diffraction from a single slit, the Rayleigh criterion for limit of resolution and its application to vision;, Diffraction gratings and their resolving power, Michelson interferometer, numerical	1,2,6	PPTs and Chalk and Board

	Week 15	**M-2:** Einstein's theory of matter radiation interaction and A and B coefficients; Amplification of light by population inversion, Properties of laser beams: mono-chromaticity, coherence, directionality and brightness; Different types of lasers: gas lasers (He-Ne), solid-state lasers (Neodymium);	1,2,6	PPTs
	Week 16	Applications of lasers in science, engineering and medicine., Numerical problems	1,2,6	PPTs
	Week 17	Revision	1-6	PPT

PROGRAM MAP for Bachelor of Engineering
(Institute of Sciences, Humanities and Liberal Studies)

Subject Mind Mapping



To be used for the following Branches: Automobile Engineering

Name of Institute: IISHLS
Name of Faculty: Prof. Hemlata Jethanandani

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 siting 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 siting 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

Unit 1	**First order ordinary Differential Equations with applications** 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.	**8 Hours**
Unit 2	**Higher order ordinary differential equations with applications** 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	**7 Hours**
Unit 3	**Partial differential equations with applications** 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.	**7 Hours**
Unit 4	**Linear Algebra** 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	**8 Hours**

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

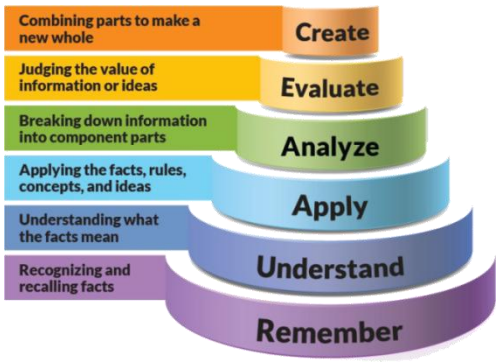


Figure 1: Blooms Taxonomy

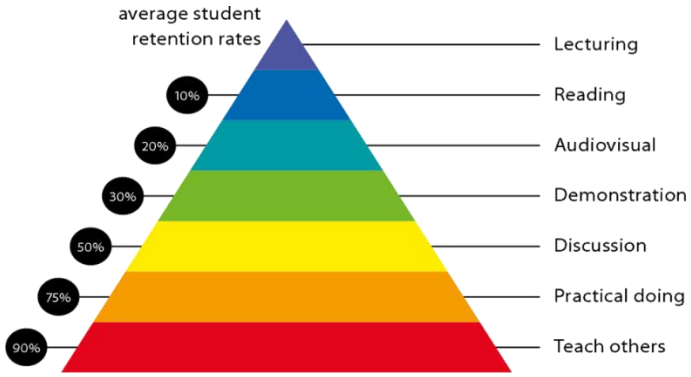


Figure 2: Knowledge retention

Graduate Qualities and Capabilities covered

General Graduate Qualities	Specific Department of a Graduate Capabilities
Informed 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.	**1 Professional knowledge, grounding & awareness**
Independent learners 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.	**2 Information literacy, gathering & processing**
Problem solvers 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.	**4 Problem solving skills**
Effective communicators 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.	**5 Written communication** **6 Oral communication** **7 Teamwork**
Responsible 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.	**10 Sustainability, societal & environmental impact**

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	CO3	

		form		
	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