Name of Institute: Indus Institute of Technology & Engineering
Name of Faculty: Vineeta S. Chauhan

Course code: EL0319
Course name: Analog and Digital Logic
Pre-requisites:

- Basic Electrical & Electronics Engineering
- Fundamentals of Laplace Transforms
- Fundamentals of Differential equations

Credit points: 04

Offered Semester: III

Course coordinator (weeks 01 - 15)
Full name: Vineeta Chauhan
Department with siting location: 2nd floor,EEE LAB -1 Bhanwar Building
Telephone: ext. 3211
Email: vineetachauhan.el@indusuni.ac.in
Consultation times: 4:15 p.m. to 5:00 p.m.

Course lecturer (weeks 01 - 15)
Full name: Vineeta Chauhan
Department with siting location: 2nd floor,EEE LAB -1 Bhanwar Building
Telephone: ext. 3211
Email: vineetachauhan.el@indusuni.ac.in
Consultation times: 4:15 p.m. to 5:00 p.m

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:

- To provide concepts that underpins the disciplines of Analog circuits, digital electronics and Microprocessor systems.
- To provide the concept of various components.
- To provide basic knowledge of designing Analog and digital circuits.

Course Outcomes (CO)

CO-1: Explain the components of analog and digital circuits.[BT-2]

CO-2: Design and Simulate Analog Circuits using OPAMP. [BT-6]

CO-3: Calculate and convertof Binary,Octal, Decimal and hexadecimal number System. [BT-3]

CO-4: Design combinational and sequential circuits.[BT-6]

CO-5: Apply and translate real world problems into digital logic formulations.[BT-5]

CO-6: Explain concepts of microprocessor and micro controller systems using digital circuits.[BT-2]

Course Outline

In this course analog circuit configuration and application is discussed. In this course digital logic, combinational and sequential circuits are also given.

Method of delivery

Face to face lectures, Assignments, Quiz

Study time

3-hour lecture and 2-hour laboratory per week

CO-PO Mapping (PO: Program Outcomes)

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

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

Blooms Taxonomy and Knowledge retention (For reference)

(Blooms taxonomy has been given for reference)

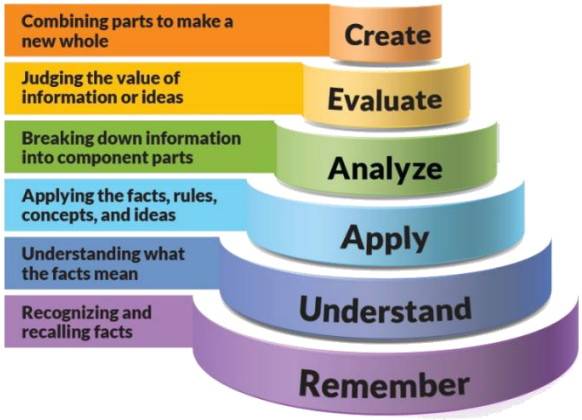

Figure 1: Blooms Taxonomy

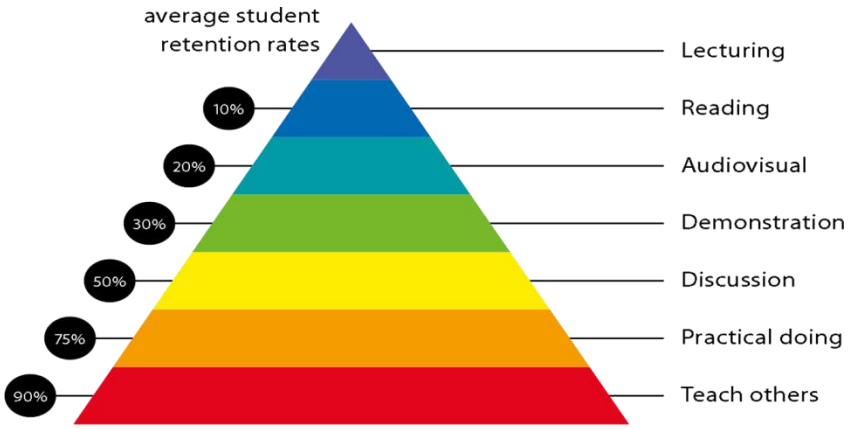

Figure 2: Knowledge retention

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,	**2 Information literacy, gathering & processing**

using a variety of sources and technologies. 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:

1. OP-AMP as Inverting and Non-inverting amplifier.
2. Applications of Op-amp.
3. IC 555 as Astable Multivibrator.
4. Simulation of circuit using Multisim
5. Logic Gates.
6. Code Conversion.
7. Adder & Subtractor
8. Multiplexer, Demultiplexer.
9. Flip-flops using gates and ICs.
10. Design of counter.

Lecture/Lab times

MONDAY 9 :00-9:55 AM (THEORY)
MONDAY 1:30-3:20 PM (LAB)
WEDNESDAY 9:00-9:55 AM (THEORY)
FRIDAY 1:30-2:25 PM (THEORY)

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

- Robert L. Boylestad, Louis Nashelsky, "Electronic devices and circuit Theory", PHI
- Ramakant A. Gaikwad, "Op-amp and linear Integrated circuits", PHI
- R. P. Jain, "Modern Digital Electronics", Tata McGraw Hill.
- M. Morris Mano, "Digital Logic and computer Design", PHI.
- J. Bhasker." VHDL Primer", Pearson Education

Additional Materials

- Martin s. Roden, Gordon L. Carpenter, William R. Wieserman "Electronic Design-From Concept to Reality", Shroff Publishers and Distributors.
- D.roy Choudhury,shail B.jain, "Linear integrated Circuits", New age International Publisher.
- Subrata Ghosal, "Digital Electronics", Cengage Learning.
- Anil K. Maini, "Digital Electronics Principles and Integrated Circuits", Wiley India
- Donald p Leach, Albert Paul Malvino, "Digital principles and Applications", Tata McGraw

Web Resource

- https://www.youtube.com/watch?v=xLPVHQAhJGI
- https://www.youtube.com/watch?v=kiiA6WTCQn0&list=PLwjK_iyK4LLDBB1E9MFbxGCEnmMMOAXOH&index=1
- https://www.geeksforgeeks.org/counters-in-digital-logic/
- https://www.daenotes.com/electronics/digital-electronics/shift-registers

MOOCS:

- https://www.edx.org/
- https://www.nptel.ac.in/
- https://www.coursera.org/

ASSESSMENT GUIDELINES

Final course mark will be calculated from the following:

Theory

CIE 60 marks (40 marks mid semester examination + 20 marks internal evaluation)

Components of internal evaluation
05 marks as attendance bonus for all students having attendance > 80%
05 marks for presentation
10 marks for assignment or case studies

Laboratory

File Work (10 marks)
Lab Participation (20 marks)
Project / Presentation (20 marks)
Viva – Voice (10 marks)

End Term Examination: 40 marks

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)

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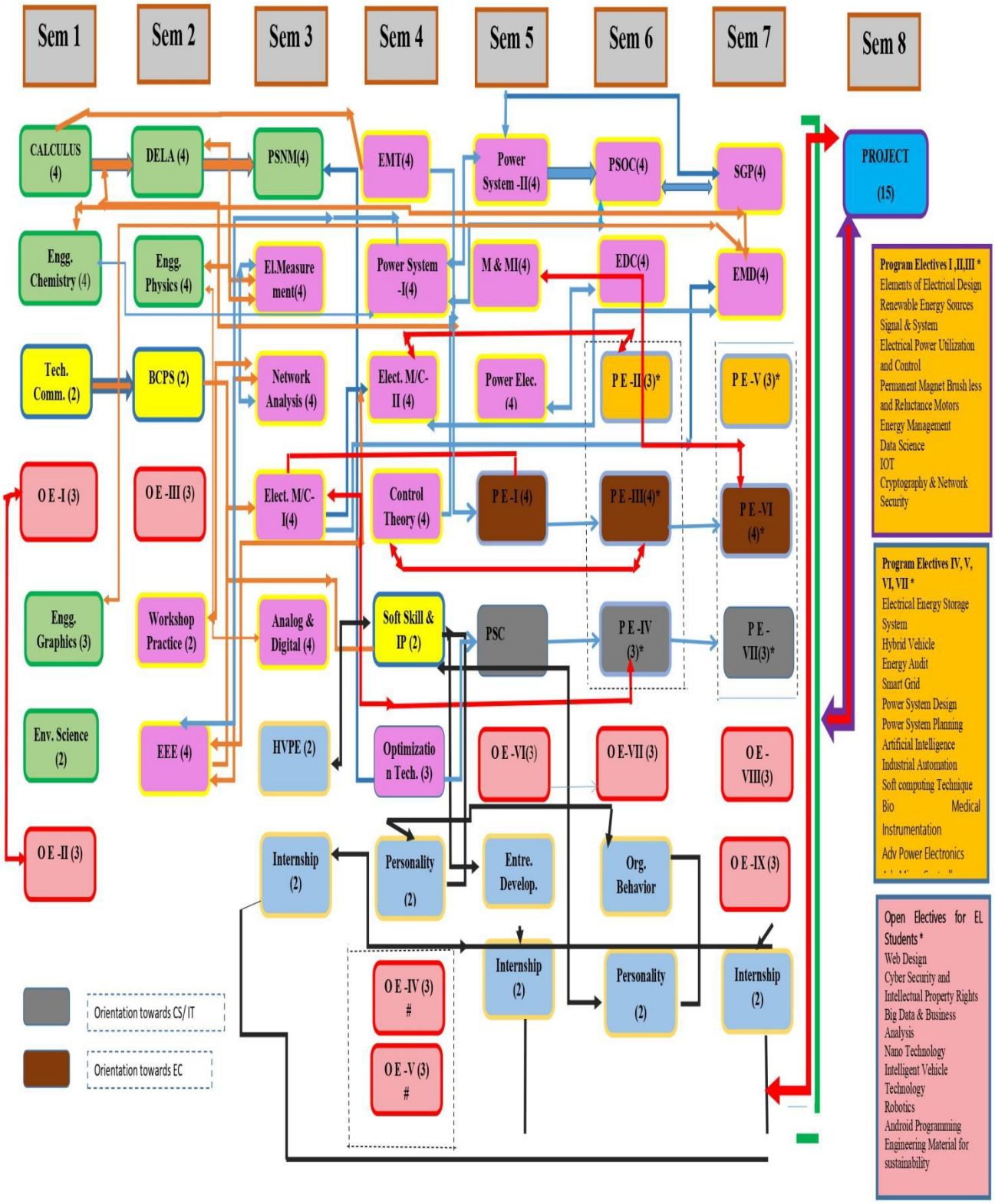
Course schedule (subject to change)

(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	Block diagram representation, Ideal Op-amp, Equivalent circuit, Open-loop configuration, Transfer characteristics	1	BB
	Weeks 2	Op-amp with negative feedback, Frequency response. Op-amp IC 741 specifications. Basic op-amp applications: Adder, Scalar, Subtractor	1,2	BB
	Week 3	Basic op-amp applications: Difference amplifier, I-V converter, V-I converters, Integrator, Differentiator, Instrumentation amplifier using 2 and 3 op-amp stages	1,2	BB
	Week 4	IC 555 Timer, Astable, and Monostable Multivibrator, Number Systems and Codes: Binary, Octal, Decimal	2	BB
	Week 5	Hexadecimal number Systems and their conversion, Binary Addition and Subtraction , Gray Code, BCD Code, Excess-3 code, ASCII Code.	3	BB
	Week 6	Boolean Algebra and Logic Gates: Theorems and Properties of Boolean Algebra, Standard SOP and POS form	3	BB
	Week 7	Reduction of Boolean functions using Algebric method, K -map method (2,3,4 Variable).	3,4	BB
	Week 8	Basic Digital Circuits: NOT, AND, OR, NAND, NOR, EX-OR, EX-NOR	3	BB

		Gates.		
	Week 9	Combinational Logic Design: Introduction, Half and Full Adder, Half and Full Subtractor, Four Bit Binary Adder	3,4	BB
	Week 10	One digit BCD Adder, code conversion, Multiplexers and Demultiplexers, Decoders	4,5	BB
	Week 11	4-bit Magnitude Comparator IC 7485 and ALU IC74181.	5	BB
	Week 12	Sequential Logic Design: Flip Flops: SR, D, JK, JK Master Slave and T Flip Flop, Truth Tables and Excitation Tables	4	BB
	Week 13	Flip-flop conversion. Counters: Design of Asynchronous and Synchronous Counters, Modulo Counters.	5,6	BB
	Week 14	UP- DOWN counter .IC 74193 Shift Registers: Shift Register IC 7496 , SISO, SIPO,PIPO,PISO	6	BB
	Week 15	Bidirectional Shift Register, Universal Shift Register, Ring and Johnson Counter.	6	BB

B.Tech. Electrical Engineering Course Flowchart (IITE, Indus University)



Date:

Analog and Digital Logic-EL0319
Class Test

Total marks-20

Attempt any five. Each question carries 4marks.

1. Draw and explain summing with its derivation.
2. Draw inverting amplifier. Also derive expression.
3. Explain astable multivibrator with suitable diagram.
4. Reduce the following Expression using K-MAP. (i) ∑m(1,2,5,6,7,11,13,14,15) + d(4,10)
5. Convert following expression in minterm F= A'+B+CA.
6. Design 4x16 decoder using two 3x8 decoder.
7. Use multiplexer 8x1 to implement logic function for F = ∑ m(0,1,2,3,4,10,11,14,15).
8. Design full adder using two half adder.

Date:

Assignment
Analog & Digital Logic

1 simplifiy the given boolean expression ABC + A'B + ABC' to minimum numbers of literals

a) B
b) 1
c) ABC + A'B + BC'
d) A

2 simplifiy the given boolean expression a'bc + abc' + abc + a'bc' to minimum numbers of lite

a) 1
b) a
c) b
d) c

3 x + yz = (x + y)(x + z) is

a) De Morgan's Theorem
b) The associative law
c) The commutative Law
d) The distributive law

4 X and Y represent two Boolean expressions where X is in SOP (Sum-of-Products) form wher is in POS (Product of Sum) form. For which of the following cases the Boolean expression X **equal** to Y?

a. X = AB + A'B', Y = (A+B').(A'+B')
b. X = AB + A'B', Y = (A+B).(A'+B')
c. X = AB' + A'B, Y = (A+B').(A'+B)
d. None of the above

5 What is the Minterm equivalent of A' + B'

a. ∑(0,1)
b. ∑(0,1,2)
c. ∑(1,2)
d. ∑(1,2,3)

6 Which of the following expression is dual of

(A + B) (C + D) = AC + AD + BC + BD

a. (AB + CD) = (A + C) (A + D) (B + C) (B + D)
b. (AC + BD) = (A + C) (A + D) (B + C) (B + D)
c. (AB + CD) = (A + B) (A + D) (B + C) (C + D)
d. (AD + BC) = (A + B) (A + C) (B + C) (B + D)

7 What is the Maxterm equivalent of A (B' + A) B

a. Π(0,1)
b. Π(0,1,2)
c. Π(1,2)
d. Π(1,2,3)

8 The sum of products (SOP) for the following expression is

$F(x, y, z) = xy + yz + xy'z$

a) $F(x,y,z) = \Sigma(1,2,4)$
b) $F(x,y,z) = \Sigma(3,5,6,7)$
c) $F(x,y,z) = \Sigma(1,5,6,7)$
d) $F(x,y,z) = \Sigma(2,6,7)$

9 The Boolean function $f(A, B, C, D) = \sum(3, 7, 11, 13, 14, 15)$ simplifies to

a. $AB + BC + CD$
b. $ABC + ABD + CD$
c. $ABC + CD + BD$
d. $A + B + C$

10 The following Boolean function equivalent to.

$F(x, y, z) = \Sigma(0, 2, 4, 5, 6)$

a) $xy+z'$
b) z'
c) $z'+xy'$
d) none of the above

QUIZ

Analog and Digital Logic

* Required

1. Email address *

2. Enrollment No *

3. Name *

4. Which of the following does not represent exclusive NOR of A & B? *
Mark only one oval.

- AB+A'B'
- A' xor B
- A xor B'
- A' xor B'

5. Which of these sets of logic gates are designated as universal gates? *
Mark only one oval.

- NOR, NAND.
- XOR, NOR, NAND.
- OR, NOT, AND.
- NOR, NAND, XNOR.

6. In Boolean algebra A.A is equal to *
Mark only one oval.

- A
- A^2
- 2A
- 1

7. Convert the binary number (1111000011110000) to hexadecimal number *
Mark only one oval.

- 1010
- F0F0
- 7070
- 5050

8. 2's Complement of 10101011 is *

Mark only one oval.

- 01010101
- 00111100
- 10101011
- 10101100

9. When will be the output of an AND gate is HIGH if there are three inputs, A, B, and C ? *

Mark only one oval.

- A = 0, B = 0, C = 0
- A = 1, B = 1, C = 0
- A = 1, B = 0, C = 1
- A = 1, B = 1, C = 1

10. Simplified form of the function f = (x+y+xy')(x+z) *

Mark only one oval.

- x+y
- x+yz
- x+xyz
- y+xz

11. which of the following is correct *

Mark only one oval.

- x + x' = 1
- x . x' =0
- Both A and B
- None

12. In a karnaugh map for an expression having 'don't care terms' the don't cares can be treated as : *

Mark only one oval.

- 0
- 1
- 1 or 0
- none of above

13. The function Y=AC+BD+EF is : *

Mark only one oval.

- POS
- SOP
- Hybrid
- None of above

14. **In order to add 1111+1101, we require** *

Mark only one oval.

- One FA and one HA
- Two FA and one HA
- Two FA and two HA
- Three FA and one HA

15. **The fast carry or look-ahead carry circuits found in most 4-bit parallel-adder circuits :** *

Mark only one oval.

- add a 1 to complemented inputs
- increase ripple delay
- reduce propagation delay
- determine sign and magnitude

SYLLABUS

Subject: Analog and Digital Logic

Program: B.Tech. Electrical Engineering			Subject Code: EL0319				Semester: III	
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 Objective:

1) To provide concepts that underpins the disciplines of Analog circuits, digital electronics and Microprocessor systems.

2) To provide the concept of various components

3) To provide basic knowledge of designing Analog and digital circuits

Course outcomes:

CO-1: Explain the components of analog and digital circuits.[BT-2]

CO-2: Design and Simulate Analog Circuits using OPAMP. [BT-6]

CO-3: Calculate and convert of Binary,Octal, Decimal and hexadecimal number System. [BT-3]

CO-4: Design combinational and sequential circuits to enhance the skill in this area.[BT-6]

CO-5: Apply and translate real world problems into digital logic formulations.[BT-5]

CO-6: Explain concepts of microprocessor and micro controller systems using digital circuits.[BT-2]

SYLLABUS

UNIT-I **[11]**

Operational Amplifiers and linear applications: Block diagram representation, Ideal Op-amp, Equivalent circuit, Open-loop configuration, Transfer characteristics. Op-amp with negative feedback, Frequency response. Op-amp IC 741 specifications. Basic op-amp applications: Adder, Scalar, Subtractor, Difference amplifier, I-V converter, V-I converters, Integrator, Differentiator, Instrumentation amplifier using 2 and 3 op-amp stages. IC 555 Timer, Astable, and Monostable Multivibrator

UNIT-II **[10]**

Number Systems and Codes: Binary, Octal, Decimal and Hexadecimal number Systems and their conversion, Binary Addition and Subtraction , Gray Code, BCD Code, Excess-3 code, ASCII Code. Boolean Algebra and Logic Gates: Theorems and Properties of Boolean Algebra, Standard SOP and POS form, Reduction of Boolean functions using Algebric method, K -map method (2,3,4 Variable).

UNIT-III **[12]**

Basic Digital Circuits: NOT,AND,OR,NAND,NOR,EX-OR,EX-NOR Gates.

Combinational Logic Design: Introduction, Half and Full Adder, Half and Full Subtractor, Four Bit Binary Adder, One digit BCD Adder, code conversion, Multiplexers and Demultiplexers, Decoders, 4-bit Magnitude Comparator IC 7485 and ALU IC74181.

UNIT-IV **[12]**

Sequential Logic Design: Flip Flops: SR, D, JK, JK Master Slave and T Flip Flop, Truth Tables and Excitation Tables, Flip-flop conversion. Counters: Design of Asynchronous and Synchronous Counters, Modulo Counters, UP- DOWN counter .IC 74193 Shift Registers: Shift Register IC 7496 , SISO, SIPO,PIPO,PISO, Bidirectional Shift Register , Universal Shift Register, Ring and Johnson Counter.

Text Books:

1. Robert L. Boylestad, Louis Nashelsky, “Electronic devices and circuit Theory”, PHI
2. Ramakant A. Gaikwad, “Op-amp and linear Integrated circuits”, PHI
3. R. P. Jain, “Modern Digital Electronics”, Tata McGraw Hill.
4. M. Morris Mano, “Digital Logic and computer Design”, PHI.
5. J. Bhasker.“ VHDL Primer”, Pearson Education

Reference Books:

1. Martin s. Roden, Gordon L. Carpenter, William R. Wieserman “Electronic Design-From Concept to Reality”, Shroff Publishers and Distributors.
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4. Anil K. Maini, “Digital Electronics Principles and Integrated Circuits”, Wiley India
5. Donald p Leach, Albert Paul Malvino, “Digital principles and Applications”, Tata McGraw

LABORTARY WORK:

1) OP-amp as Inverting and Non-inverting amplifier.
2) Applications of Op-amp.
3) IC 555 as astable Multivibrator.
4) Simulation of any circuit using Pspice.
5) Logic Gates.
6) Code Conversion.
7) Multiplexer, Demultiplexer.
8) Flip-flops using gates and ICs.
9) Design of Sequential circuits.
10) VHDL for Combinational logic.

Name of Institute: **IITE**
Name of Faculty: **Prof. Rootvesh Mehta**

Department- Automobile Engineering

Course code: **MA0313**
Course name: **Integral Transforms & Numerical Analysis**
Pre-requisites: Calculus, Basic Statistics
Credit points: 4
Offered Semester: III

Course coordinator (weeks 1 - 15)
Full name: Prof.Rootvesh Mehta
Department with siting location: Mathematics Department, ISHLS,4th floor Bhanwar building, Indus University, Ahmadabad
Telephone: 3424
Email: rootveshmehta.gd@indusuni.ac.in
Consultation times:Thursday 4 to 5 , Friday 4 to 5

Course lecturer (weeks 1 - 15)
Full name: Prof.Rootvesh Mehta
Department with siting location: Mathematics Department, ISHLS,4th floor Bhanwar building, Indus University, Ahmadabad
Telephone: 3424
Email: rootveshmehta.gd@indusuni.ac.in
Consultation timesThursday 4 to 5 , Friday 4 to 5

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

Course Objectives:

- To provide mathematical knowledge and skills needed to support their concurrent and subsequent engineering studies.
- To provide an ability to apply knowledge of basic science and engineering fundamentals.
- To provide an ability to undertake problem identification, formulation and solution.
- To provide an ability to analyze different mathematical models within science and technology and work creatively, systematically and critically.

Course Outcomes (CO):

Upon the successful completion of the course, students will be able to:

CO:1	To understand the concepts of Laplace Transforms of various functions	BT - 2
CO:2	To Learn the concept of Fourier series, Fourier integral & Fourier transforms of various functions	BT - 4
CO:3	To evaluate the integral transforms of different functions	BT - 5
CO:4	To learn Numerical Interpolation and its brief information.	BT - 6
CO:5	To understand Numerical Differentiation and Numerical Integration.	BT - 2
CO:6	To solve problems of Algebraic, Transcendental Equations and different Numerical Methods.	BT - 3

-

Course Outline

Laplace Transformation , Fourier series, Interpolation, Numerical Methods

Method of delivery

Unit-1- 1st July to 15th August Online Sessions, Chalk &Talk

Study time

4 Hrs/week

Blooms Taxonomy and Knowledge retention (For reference)

(Blooms taxonomy has been given for reference)

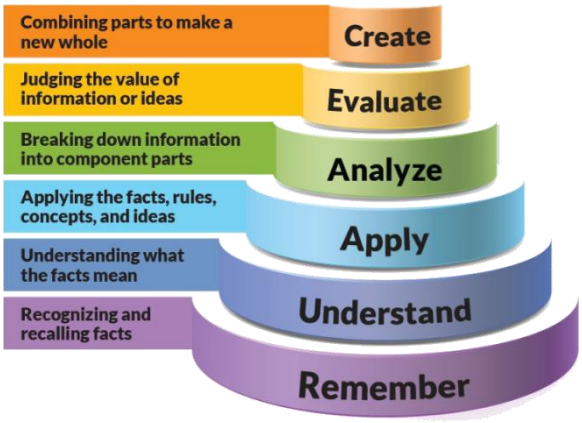

Figure 1: Blooms Taxonomy

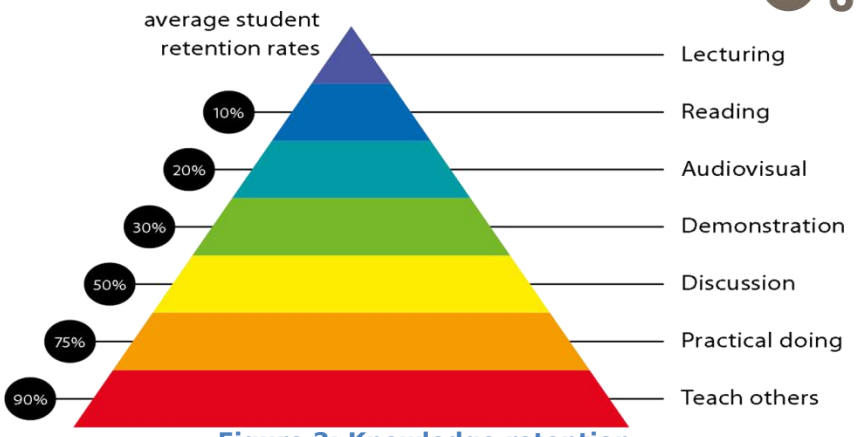

Figure 2: Knowledge retention

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.	**5 Written communication** **6 Oral communication** **7 Teamwork**

Work collaboratively and engage with people in different settings. Recognize how culture can shape communication.	
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:

Practicals form Unit-3 and Unit-4 using Python Programming

Lecture/tutorial times

(Give lecture times in the format below)

Example: Automobile Engineering Department -3rd Semester

Online Lecture – Monday -12.20 am to 1.20 pm
Wednesday-12.20 am to 1.20 pm
Thursday – 9:00 am to 11:00 am
Friday – 10:00 am to 11:00 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 semester examinations.

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. Merel C Potter, J.L. Goldberg, “Advanced Engineering Mathematics” (3rd Edition), Oxford India Publication.
5. Python Programming And Numerical Methods: A Guide For Engineers And Scientists, https://pythonnumericalmethods.berkeley.edu/notebooks/Index.html

ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

Example:

Internal Exam 60% Objectives (2-5)
(40 MSE+ 10 Assignments+5 Attendance + 5 Presentation)

Final exam *(closed book)* 40% Objectives (1-5)

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)

Institute of Sciences, Humanities and Liberal Studies
Department of Mathematics

Subject: Integral Transform and Numerical Analysis								
Program: B. Tech. (Mech., Auto, EL)			**Subject Code: MA0313**			**Semester: III**		
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**	**16/40**	**16/40**	**24/60**	**24/60**	**200**

Course Objectives

- •€To provide mathematical knowledge and skills needed to support their concurrent and subsequent engineering studies.
- •€To provide an ability to apply knowledge of basic science and engineering fundamentals.
- •€To provide an ability to undertake problem identification, formulation and solution.

- €To provide an ability to analyze different mathematical models within science and technology and work creatively, systematically and critically.

Course Outcomes:

Upon the successful completion of the course, students will be able to:

CO:1	To understand the concepts of Laplace Transforms of various functions	BT - 2
CO:2	To Learn the concept of Fourier series, Fourier integral & Fourier transforms of various functions	BT - 4
CO:3	To evaluate the integral transforms of different functions	BT - 5
CO:4	To learn Numerical Interpolation and its brief information.	BT - 6
CO:5	To understand Numerical Differentiation and Numerical Integration.	BT - 2
CO:6	To solve problems of Algebraic, Transcendental Equations and different Numerical Methods.	BT - 3

Content

Unit 1	**Laplace transforms:** Definition, Linearity property, Laplace transforms of elementary functions, shifting theorem, Inverse Laplace transforms, Laplace transforms of derivatives and integrals, Convolution theorem, Application of Laplace transform in solving ordinary differential equations, Laplace transforms of periodic, Unit step and impulse functions	**10 Hours**
Unit 2	**Fourier series, Fourier Integrals and Fourier Transforms:** Fourier series, Drichlet's conditions, Euler's formula. Fourier expansion of periodic functions, Fourier series of even and odd functions, Half range Fourier series. Fourier integral theorem (only statement), Fourier sine and cosine integrals, Complex form of Fourier integral, Fourier transforms, Fourier sine and cosine transforms. **Z-transforms:** Definition and Standard Z-transforms, Linearity Property, dumping Rule and some standard results, some useful Z-transforms.	**11 Hours**
Unit 3	**Interpolation** Finite differences and Interpolation: Finite differences Forward, Backward & Central difference operators and difference tables. Interpolation, Interpolation Formula with equal intervals: Newton's forward, Newton's backward, Central difference interpolation by Stirling's formula Interpolation Formula with unequal intervals: Lagrange's & Newton's divided difference interpolation	**12 Hours**

	Numerical differentiation: Using Newton's forward and backward interpolation formula Numerical Integration: Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule. Romberg's method - Two point and three point Gaussian quadrature formula	
Unit 4	**Numerical Methods** Basic Errors. Solution of Algebraic and Transcendental Equations: Regula-Falsi method, Newton-Raphson method. Convergence condition for these methods. Numerical methods in Linear Algebra: Gauss-Jacobi, Gauss-Seidel method. Largest Eigenvalues and corresponding Eigenvectors: By power method. Numerical Solutions of ordinary differential equations: Taylor's Method, Euler's Method, Improved Euler Method (Heun's Method), Runge-Kutta method of order four. Least square method - Linear curve fitting.	**12 Hours**

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. Merel C Potter, J.L. Goldberg, "Advanced Engineering Mathematics" (3rd Edition), Oxford India Publication.
5. Python Programming And Numerical Methods: A Guide For Engineers And Scientists, https://pythonnumericalmethods.berkeley.edu/notebooks/Index.html

List of Practicals:

1. Programs to find roots of transcendental equations (N-R Method, Bisection Method)
2. Programs to find solutions to linear equations (Gauss seidel method)
3. Programs to find largest eigenvalue and corresponding eigenvector (Power Method)
4. Program to solve ODE (Euler's Method)
5. Program for Numerical Differentiation (Forward and backward interpolation)
6. Program for Numerical Integration (Simpson's Rule and Trapezoidal Rule)

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	Basic Errors, convergence conditions for solution of algebraic and transcendental equations, Bisection method and related examples,	Apply the knowledge of Solution of Algebraic and Transcendental Equations by numerical methods.	Online Lecture, Assignment ,Tutorial
	Weeks 2	Regula-Falsi method and related examples, Newton Raphson method and related examples	Apply the knowledge of Solution of Algebraic and Transcendental Equations by numerical methods.	Online Lecture, Assignment ,Tutorial
	Week 3	Solution of SLE using Gauss-Jacobi Method Solution of SLE using Gauss-Seidel method Largest Eigen value and corresponding eigen vector using power method	Apply the knowledge of the numerical solutions of linear system of equations and ordinary equations.	Online Lecture, Assignment ,Tutorial
	Week 4	Numerical solution of ODE – Taylor's Method Numerical solution of ODE – Euler's Method Numerical solution of ODE – Improved Euler (Heun's) Method Numerical solution of ODE – RungeKutta Method of order four	Apply the knowledge of Solution of Algebraic and Transcendental Equations by numerical methods.	Online Lecture, Assignment ,Tutorial
	Week 5	Understanding interpolation, finite differences (forward and backward), constructing forward, backward and central difference tables Interpolation with equal intervals – Newton forward interpolation Interpolation with equal intervals – Newton backward interpolation Interpolation with equal intervals –	Apply the knowledge of Interpolation to estimate the value of an intermediate function from given sets of	Online Lecture, Assignment ,Tutorial

		Stirling's formulae	functions.	
	Week 6	Interpolation with unequal intervals – Lagrange's interpolation Interpolation with unequal intervals – Newton's divided difference interpolation Numerical differentiation using Newton's forward and backward interpolation Related examples on numerical differentiation	Apply the knowledge of Interpolation to estimate the value of an intermediate function from given sets of functions.	Online Lecture, Assignment ,Tutorial
	Week 7	Numerical Integration –Trapezoidal rule Numerical Integration –Simpson's 1/3rd rule Numerical Integration –Simpson's 3/8th rule	Apply the knowledge of Interpolation to estimate the value of an intermediate function from given sets of functions.	Chalk & Talk, Assignment Submission, Unit Test.
	Week-8	Basics of Laplace Transforms,Linearity property, Laplace transforms of elementary functions	Understand the basic concepts of L.T	Chalk & Talk, Assignment Submission, Unit Test.
	Week-9	Shifting theorem Problems and Inverse Laplace Transforms & Problems	Understand the basic concepts of I.L.T	Chalk & Talk, Assignment Submission, Unit Test.
	Week-10	Inverse Laplace Transforms & Problems Laplace transforms of derivatives and integrals,Convolution theorem	Understand the basic concepts of I.L.T,Convolution thm.	Chalk & Talk, Assignment Submission, Unit Test.
	Week-11	Application of Laplace transform in solving ordinary differential equations	Apply the knowledge of L.T in solving Differential Equations	Chalk & Talk, Assignment Submission, Unit Test.
	Week-12	Fourier series, Drichlet's conditions, Euler's formula,Fourier expansion of periodic functions,Problems	Understand the basic concepts of Fourier sereis	Chalk & Talk, Assignment Submission, Unit Test.

	Week-13	Fourier series of even and odd functions,Half range Fourier series Problems	Understand the basic concepts of Fourier series	Chalk & Talk, Assignment Submission, Unit Test.
	Week-14	Fourier integral theorem (only statement),Fourier sine and cosine integrals, Complex form of Fourier integral	Understand the basic concepts of Fourier Transform & Integrals	Chalk & Talk, Assignment Submission, Unit Test.
	Week-15	Fourier transforms, Fourier sine and cosine transforms, Introduction to Z-transforms: Definition and Standard Z-transforms	Understand the basic concepts of Fourier Transform & Integrals, Z-tansform	Chalk & Talk, Assignment Submission, Unit Test.

PROGRAM MAP for Bachelor of Technology
(Department of Mathematics, IISHLS)

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
8	VIII	-	-

Name of Institute: Institute of Technology & Engineering
Name of Faculty: Prof. Rashmi Sharma

Course code: EL0321
Course name: Electrical Machine-I

Pre-requisites:

1) Basic Electrical Engineering Concepts and basic circuit theory concept
2) Basic concepts of law of conservation of energy, electro mechanical energy conversion process.

Credit points: 04

Offered Semester: III

Course coordinator (weeks 01 - 15)
Full name: Prof. Rashmi Sharma
Department with siting location: 2nd floor, Bhawar Building
Telephone: 3212
Email: rashmisharma.el@indusuni.ac.in
Consultation times: 9:00 a.m. to 5:00 p.m.

Course lecturer (weeks 01 - 15)
Full name: Prof. Rashmi Sharma
Department with siting location: 2nd floor, Bhawar Building
Telephone: 3212
Email: rashmisharma.el@indusuni.ac.in
Consultation times: 9:00 a.m. to 5:00 p.m.

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 learn different types of machines used in electrical engineering and electromechanical energy conversion process.
2. To know working principle, construction and types of dc machine, types of dc winding and performance characteristics of dc machine
3. To learn the concept of armature reaction and commutation in dc machine.
4. To know the concept of Single-phase Transformers and three phase transformers, their types, construction, operation and connections, to understand different phase conversion process and learn about auto transformer.

Course Outcomes (CO)

1) Explain the basic principles of electromechanical energy conversion.
2) Understand the general construction of D.C. Machines construction, working principle, types and its performance.
3) Analyze the characteristics and the concept of armature reaction and commutation in dc machines.
4) Calculate the circuit parameters, losses and efficiency of the dc machines.
5) Understand the single phase and poly phase transformer types, operation and constructions.
6) Calculate the equivalent circuit parameters, obtain the phasor diagrams and the different types of tests in transformer.

Course Outline

In this course different dc machines like dc generator, dc motor, and their operation and performance will be studied. Also 1-ph transformer and 3-ph transformer working and their applications in electrical engineering will be studied.

Method of delivery

Face to face lectures, Assignments, Quiz

Study time

3-hour lecture and 2-hour practical per week

CO-PO Mapping (PO: Program Outcomes)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	3	3	2	1	1	1	-	-	-	-	-	1
CO2	3	2	2	1	1	1	-	-	-	-	-	-
CO3	3	3	3	2	2	1	-	-	-	-	-	-
CO4	2	3	3	3	2	1	-	-	-	-	-	-
CO5	3	2	2	1	1	1	-	-	-	-	-	-
CO6	2	3	3	2	2	1	-	-	-	-	1	-

Blooms Taxonomy and Knowledge retention(For reference)

(Blooms taxonomy has been given for reference)

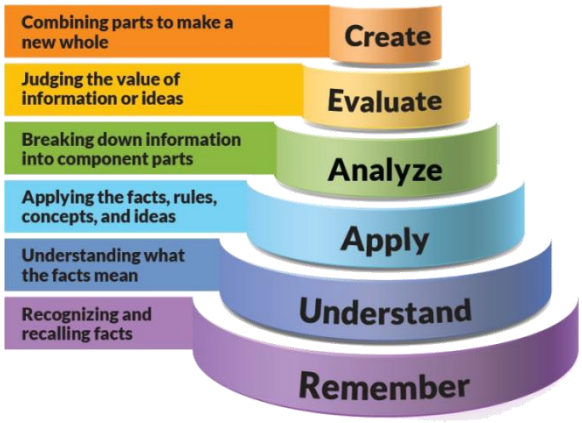

Figure 1: Blooms Taxonomy

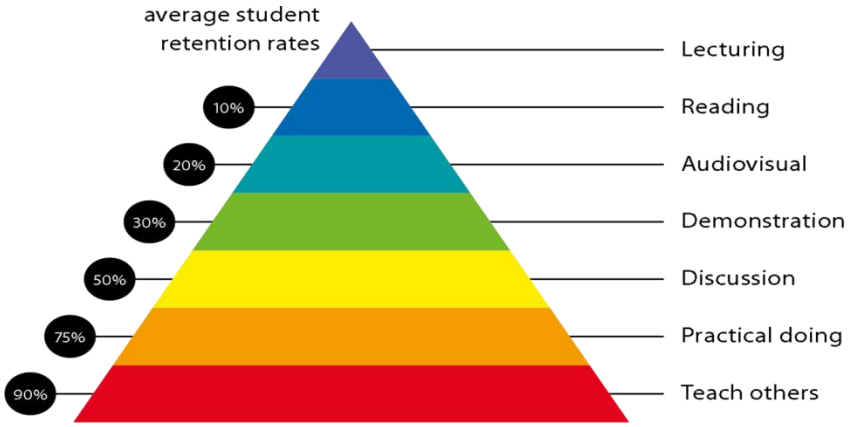

Figure 2: Knowledge retention

Graduate Qualities and Capabilities covered

(Qualities graduates harness crediting this Course)

General Graduate Qualities	Specific Department of _____Graduate Capabilities
Informed 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	**4 Problem solving skills**

creative, logical and critical thinking skills to respond effectively. Make and implement decisions. Be flexible, thorough, innovative and aim for high standards.	
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:

2 hours per week laboratory hands-on session

Lecture/tutorial times

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) Fitzgeraid A. E., Kingsley C. and Kusko A., "Electric Machinery", 6th Ed., McGraw-Hill International Book Company. 2008

2) Say M. G. and Taylor E. O., "Direct Current Machines", 3rd Ed.,ELBS and Pitman. 1986.

Additional Materials

1) Nagrath I. J. and Kothari D. P., "Electrical Machines", 3rd Ed., Tata McGraw-Hill Publishing Company Limited. 2008.

2) Clayton A. E. and Hancock N., "The Performance and Design of DC Machines", CBS Publishers and Distributors. 2003.

3) J.B. Gupta, 'Theory and Performance of Electrical Machines', Katson Publication.

Web Resource

1) https://nptel.ac.in/downloads/108105017/

2) http://www.nptelvideos.in/2012/11/electrical-machines-i.html

3) https://onlinecourses.nptel.ac.in/noc17_ec10/preview

MOOCS:

i) https://www.edx.org/

ii) https://www.nptel.ac.in/

iii) https://www.coursera.org/

ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

40 marks - mid semester examination
20 marks- internal assessment evaluation

Internal Assessment of 20 marks will include:
Attendance : 05 marks bonus (for all students having attendance >80%)
Presentation: 05 marks
Assignment : 10 marks

End Semester Exam: 40 marks.

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:

Practical work-related lab file/manual to be made by the student on completion of each experiment. Experiment list is given below

1. Polarity test on transformer
2. Open and short circuit tests on a single-phase transformer
3. Load test on single phase transformer
4. Parallel operation on single phase transformer
5. Study of dc machine components
6. Open circuit and load characteristics of dc shunt generator
7. Open circuit and load characteristics of dc series generator
8. Speed control of dc shunt motor
9. Speed control of dc series motor
10. Different connections in three phase transformers
11. Open circuit and short circuit tests on three phase transformers

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.**

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Do not copy the work of other students.

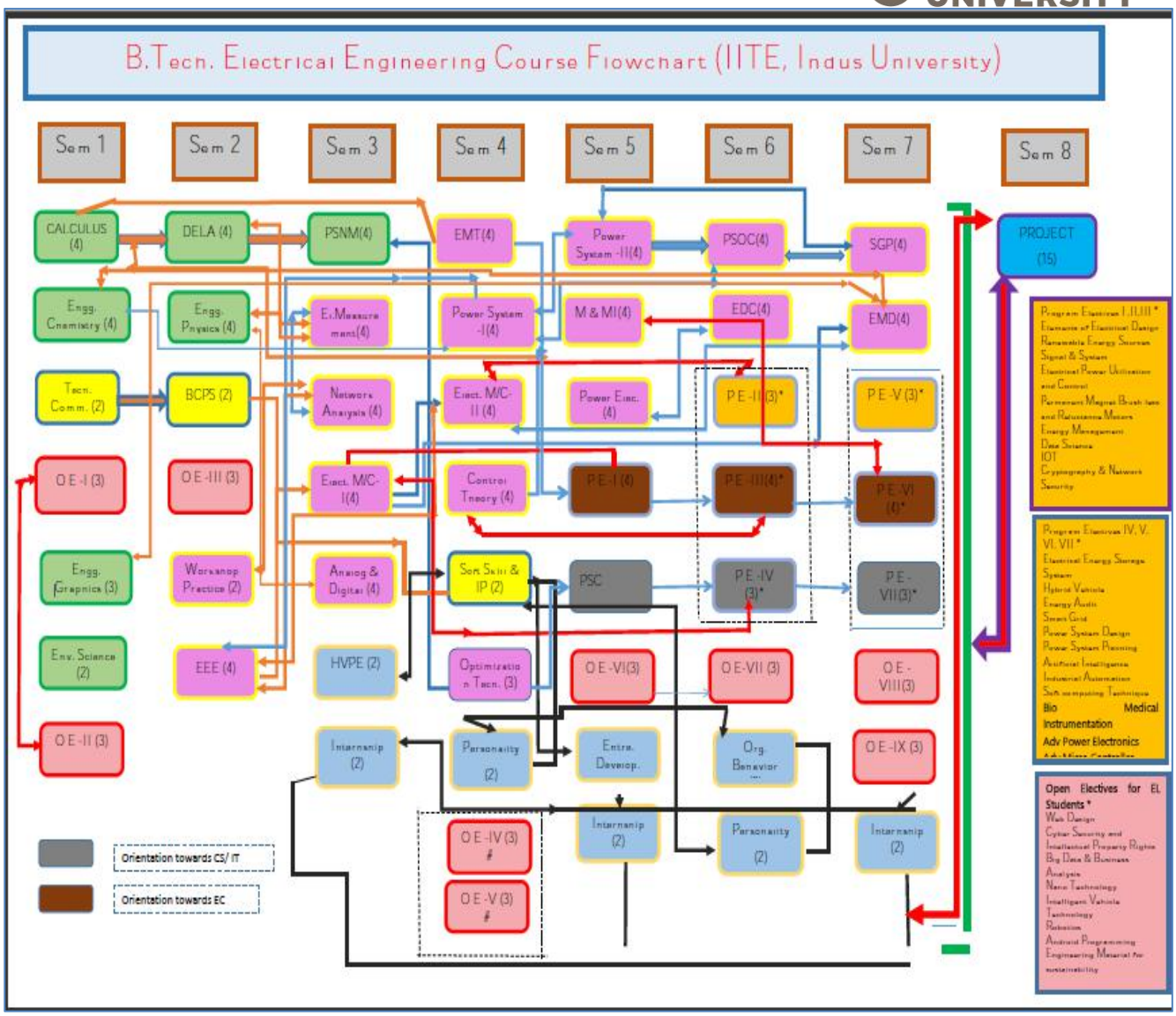
Do not share your work with other students (except where required for a group activity or assessment)

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	Electromechanical Energy Conversion- Electromechanical Energy Conversion devices, features, energy balance equations.	1	BB
	Weeks 2	D.C. Generator: Principle of D.C. generator and motor, construction, types of generators, E.M.F. equation, voltage build up process, critical resistance and speed,	2	BB, PPT
	Week 3	Characteristics of generators, performance equation and efficiency, No load & load characteristics, power stage diagram, Performance of shunt, series and compound generators, Simplex lap and wave windings,	*2,3*	BB, PPT
	Week 4	Interaction of the fields produced by excitation circuit and armature (armature reaction), Commutation, Causes of bad commutation, methods of improving commutation, effects of brush shifts; Compensating winding, interpole winding.	2,3,4	BB, PPT
	Week 5	DC Motors Type of dc motors, back emf, torque equation, shaft torque, power equation, power stage diagram, condition for maximum power, losses and efficiency	2,3,4	BB
	Week 6	Starters: Necessity of starter, Three point & four-point starter, characteristics of shunt, series & compound motors	2,3	BB, PPT
	Week 7	Speed control of shunt, series & compound motors, Basic concept of Static speed control of DC machines,	3,4	BB, PPT
	Week 8	Ward Leonard method. direct load test and swinburne test, applications of dc motors.	2,3	BB
	Week 9	Single-phase Transformers Construction, types, working principle, operation of ideal and practical transformer,	5,6	BB

	Week 10	phasor diagram under load and no-load condition for resistive, inductive and capacitive load. O/C and S/C test,	5,6	BB,PPT
	Week 11	derivation of transformer parameter, separation of losses, condition of maximum efficiency, all day efficiency, voltage regulation, % impedance, equivalent circuit, Parallel operation.	5,6	BB
	Week 12	Three-phase Transformers Various connections and their comparative features, effect of connections and construction on harmonics;	5	BB,PPT
	Week 13	Transformer rating, Cooling, Parallel operation of three-phase transformers, sharing of load, Various types of transformer construction as per the type of insulations. O.C and S.C test of 3-ph transformer,	5,6	BB,PPT
	Week 14	Phase Conversion – Open delta or V-V Connection, Scott or T-T Connection 3-phase to 2-phase conversion, 3-phase to 6- phases conversion and vice versa, Testing of transformers- Sumpner's test.	5,6	BB,PPT
	Week 15	Autotransformers, Principle of operation, advantages, disadvantages, comparison with two winding transformers, application of auto-transformer, voltage and current ratios.	5,6	BB,PPT


B.Tech. Electrical Engineering Course Flowchart (IITE, Indus University)
Sem 1
Sem 2
Sem 3
Sem 4
Sem 5
Sem 6
Sem 7
Sem 8
CALCULUS (4)
DELA (4)
PSNM(4)
EMT(4)
Power System -II(4)
PSOC(4)
SGP(4)
PROJECT (15)
Engg. Chemistry (4)
Engg. Physics (4)
E.Measurements(4)
Power System -I(4)
M & MI(4)
EDC(4)
EMD(4)
Tech. Comm. (2)
BCPS (2)
Network Analysis (4)
Elect. M/C-II (4)
Power Elec. (4)
PE-II (3)*
PE-V (3)*
OE-I (3)
OE-III (3)
Elect. M/C-I(4)
Control Theory (4)
PE-I (4)
PE-III(4)*
PE-VI (3)*
Engg. Graphics (3)
Workshop Practice (2)
Analog & Digital (4)
Sen Skill & IP (2)
PSC
PE-IV (3)*
PE-VII(3)*
Env. Science (2)
EEE (4)
HVPE (2)
Optimization Tech. (3)
OE-VI(3)
OE-VII (3)
OE-VIII(3)
OE-II (3)
Internship (2)
Personality (2)
Entre. Develop.
Org Behavior
OE-IX (3)
OE-IV (3) #
OE-V (3) #
Internship (2)
Personality (2)
Internship (2)
Orientation towards CS/ IT
Orientation towards EC
Program Electives I, II, III *
Elements of Electrical Design
Renewable Energy Sources
Signal & System
Electrical Power Utilization and Control
Permanent Magnet Brush less and Reluctance Motors
Energy Management
Data Science
IOT
Cryptography & Network Security
Program Electives IV, V, VI, VII *
Electrical Energy Storage System
Hybrid Vehicle
Energy Audit
Smart Grid
Power System Design
Power System Planning
Artificial Intelligence
Industrial Automation
Soft computing Techniques
Bio Medical Instrumentation
Adv Power Electronics
Open Electives for EL Students *
Web Design
Cyber Security and Intellectual Property Rights
Big Data & Business Analysis
Nano Technology
Intelligent Vehicle Technology
Robotics
Android Programming
Engineering Material for sustainability

Subject: Electrical Machine-I								
Program: B.Tech. Electrical Engineering				**Subject Code: EL0321**			**Semester: III**	
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	5	40	40	60	60	200

Prerequisites:

1) Basic Electrical Engineering Concepts and basic circuit theory concept
2) Basic concepts of law of conservation of energy, electro mechanical energy conversion process.

Course Objectives:

1) To learn different types of machines used in electrical engineering and electromechanical energy conversion process.
2) To know working principle, construction and types of dc machine, types of dc winding and performance characteristics of dc machine.
3) To learn the concept of armature reaction and commutation in dc machine.
4) To know the concept of Single-phase Transformers and three phase transformers, their types, construction, operation and connections, to understand different phase conversion process and learn about auto transformer.

Course Outcome:

CO-1: Describe the basic principles of electro-mechanical energy conversion.(BT-1)

CO-2: Explain the general construction of electrical machines used in electrical engineering.(BT-2)

CO-3: Illustrate D.C. Machines construction, working principle, types and calculate its performance (BT-3)

CO-4: Apply the concept of armature reaction and commutation in dc machines.(BT-4)

CO-5: Describe the single Phase and poly phase transformer, and Compare its types, operation and constructions (BT-2,5)

CO-6: Design equivalent circuit, phasor diagrams of transformer and perform different types of tests on transformer, thus helping to develop skills to impart practical knowledge in real time solutions.(BT-6)

SYLLABUS

UNIT-I **[12]**

Electromechanical Energy Conversion- Electromechanical Energy Conversion devices, features, energy balance equations.

D.C. Generator:

Principle of D.C. generator and motor, construction, types of generators, E.M.F. equation, voltage build up process, critical resistance and speed, characteristics of generators, performance equation and efficiency, No load & load characteristics, power stage diagram, Performance of shunt, series and compound generators, Simplex lap and wave windings, interaction of the fields produced by excitation circuit and armature(armature reaction), Commutation, Causes of bad commutation, methods of improving commutation, effects of brush shifts; Compensating winding, interpole winding.

UNIT-II **[11]**

DC Motors

Type of dc motors, back emf, torque equation, shaft torque, power equation, power stage diagram, condition for maximum power, losses and efficiency, starters : Necessity of starter, Three point & four point starter, characteristics of shunt, series & compound motors, Speed control of shunt, series & compound motors, Basic concept of Static speed control of DC machines, Ward Leonard method. direct load test and swinburne test, applications of dc motors. Permanent magnet materials and motors

UNIT-III **[11]**

Single-phase Transformers

Construction, types, working principle, operation of ideal and practical transformer, phasor diagram under load and no-load condition for resistive, inductive and capacitive load. O/C and S/C test, derivation of transformer parameter, separation of losses, condition of maximum efficiency, all day efficiency, voltage regulation, % impedance, equivalent circuit, Parallel operation.

UNIT-IV **[11]**

Three-phase Transformers

Various connections and their comparative features, effect of connections and construction on harmonics; Transformer rating, Cooling, Parallel operation of three-phase transformers, sharing of load, Various types of transformer construction as per the type of insulations. O.C and S.C test of 3-ph transformer, Phase Conversion – Open delta or V-V Connection, Scott or T-T Connection 3-phase to 2-phase conversion, 3-phase to 6- phases conversion and vice versa, Testing of transformers- Sumpner's test.

Autotransformers

Principle of operation, advantages, disadvantages, comparison with two winding transformer, application of auto-transformer, voltage and current ratios.

Text Books

1) Fitzgeraid A. E., Kingsley C. and Kusko A., "Electric Machinery", 6th Ed., McGraw-Hill International Book Company. 2008
2) Say M. G. and Taylor E. O., "Direct Current Machines", 3rd Ed.,ELBS and Pitman. 1986.

Reference Books

1) Nagrath I. J. and Kothari D. P., "Electrical Machines", 3rd Ed., Tata McGraw-Hill Publishing Company Limited. 2008.
2) Clayton A. E. and Hancock N., "The Performance and Design of DC Machines", CBS Publishers and Distributors. 2003.
3) J.B. Gupta, 'Theory and Performance of Electrical Machines', Katson Publication.

Web resources

1) https://nptel.ac.in/downloads/108105017/
2) http://www.nptelvideos.in/2012/11/electrical-machines-i.html
3) https://onlinecourses.nptel.ac.in/noc17_ec10/preview

MOOCs

i) https://www.edx.org/
ii) https://www.nptel.ac.in/
iii) https://www.coursera.org/

Name of Institute: Institute of Technology & Engineering
Name of Faculty: Dr. Jaydeep Chakravorty

Course code: EL0317
Course name: Network Analysis
Pre-requisites:

i) Basic Electrical & Electronics Engineering
ii) Fundamentals of Laplace Transforms
iii) Fundamentals of Differential equations

Credit points: 04

Offered Semester: III

Course coordinator (weeks 01 - 15)
Full name: Dr. Jaydeep Chakravorty
Department with siting location: 3rd floor, Bhawar Building
Telephone:
Email: el.hod@indusuni.ac.in
Consultation times: 3:00 p.m. to 5:00 p.m.

Course lecturer (weeks 01 - 15)
Full name: Dr. Jaydeep Chakravorty
Department with siting location: 3rd floor, Bhawar Building
Telephone:
Email: el.hod@indusuni.ac.in
Consultation times: 3:00 p.m. to 5:00 p.m.

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:

(i) To understand different types of Theorems for AC circuit.
(ii) To learn the techniques to apply different theorems and how to solve them.
(iii) To provide knowledge about different network topologies.
(iv) To understand the application of Laplace in analysis of electrical circuits
(v) To understand the concept Laplace Transformation.
(vi) To understand pole and zero concepts & network stability.
(vii) To understand the concept of two port network.
(viii) To understand different parameter calculation process

(ix) To understand the application of computers in network analysis.

Course Outcomes (CO)

CO 1: Understand and define all the terms and definitions in Network Analysis.
CO 2: Analyze the working of various components of a circuit
CO 3: Apply the knowledge of different network reduction techniques in solving the given circuit with dependent
CO 4: Evaluate frequency response, behavior of different passive elements, different network parameters and enabling the design of complex circuits depending on specifications
CO 5: Understand the theories represent mathematical approximations to reality and limitations of those approximations
CO 6: Analyze given electric circuit in terms of ABCD, Z, Y and H parameter model and solve the circuit.

Course Outline

In this course different techniques to solve a complex electrical circuit is discussed. In this course application of Laplace transform and Differential equations in electrical engineering is also given.

Method of delivery

Face to face lectures, Assignments, Quiz

Study time

3-hour lecture and 1-hour tutorial per week

CO-PO Mapping (PO: Program Outcomes)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	3	2	2	1	1	1	1	-	1	1	-	2
CO2	3	2	2	1	1	1	1	-	1	1	-	2
CO3	3	3	3	2	2	1	1	1	1	1	1	2
CO4	3	3	3	3	2	1	1	2	2	1	1	2
CO5	3	2	2	1	1	1	1	-	1	1	-	2
CO6	3	3	3	2	2	1	1	1	1	1	1	2

Blooms Taxonomy and Knowledge retention (For reference)

(Blooms taxonomy has been given for reference)

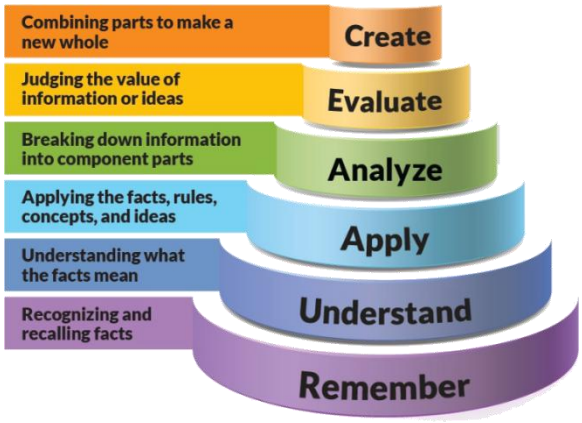


Figure 1: Blooms Taxonomy

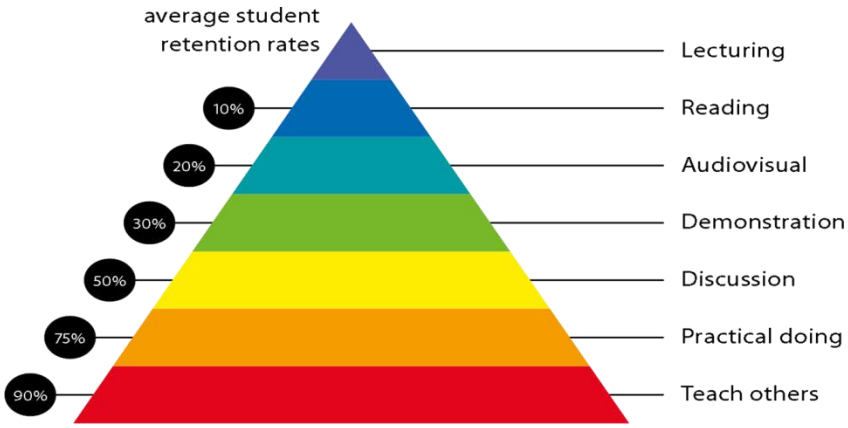


Figure 2: Knowledge retention

Graduate Qualities and Capabilities covered

(Qualities graduates harness crediting this Course)

General Graduate Qualities	Specific Department of _____Graduate Capabilities
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:

N.A.

Lecture/tutorial times

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

i) Network Analysis, M E Van Valkenburg, PHI

ii) Circuit Theory- Analysis and Synthesis, A Chakrabarti, DhanpatRai Publications

Additional Materials

iii) Electric Circuits and Networks :- By K. S. Suresh Kumar – Pearson Education

iv) Linear Circuits Analysis 2nd edition :-By DeCarlo/ Lin – Oxford University Press (Indian edition)

v) Engineering Circuit Analysis : - By W H Hayt, J E Kemmerly, S M Durbin 6th Edition TMH Publication

vi) Network Analysis & Synthesis By Franklin S. KUO, Wiley Publication

Web Resource

i) https://www.youtube.com/watch?v=cpwMPTFPFKM

ii) https://www.youtube.com/watch?v=UIn8uZSdV3c

iii) https://www.youtube.com/watch?v=3YinmbkU0DE

iv) https://www.youtube.com/watch?v=26GM8Z5vlqw

MOOCS:

i) https://www.edx.org/

ii) https://www.nptel.ac.in/

iii) https://www.coursera.org/

ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

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:

N.A.

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)

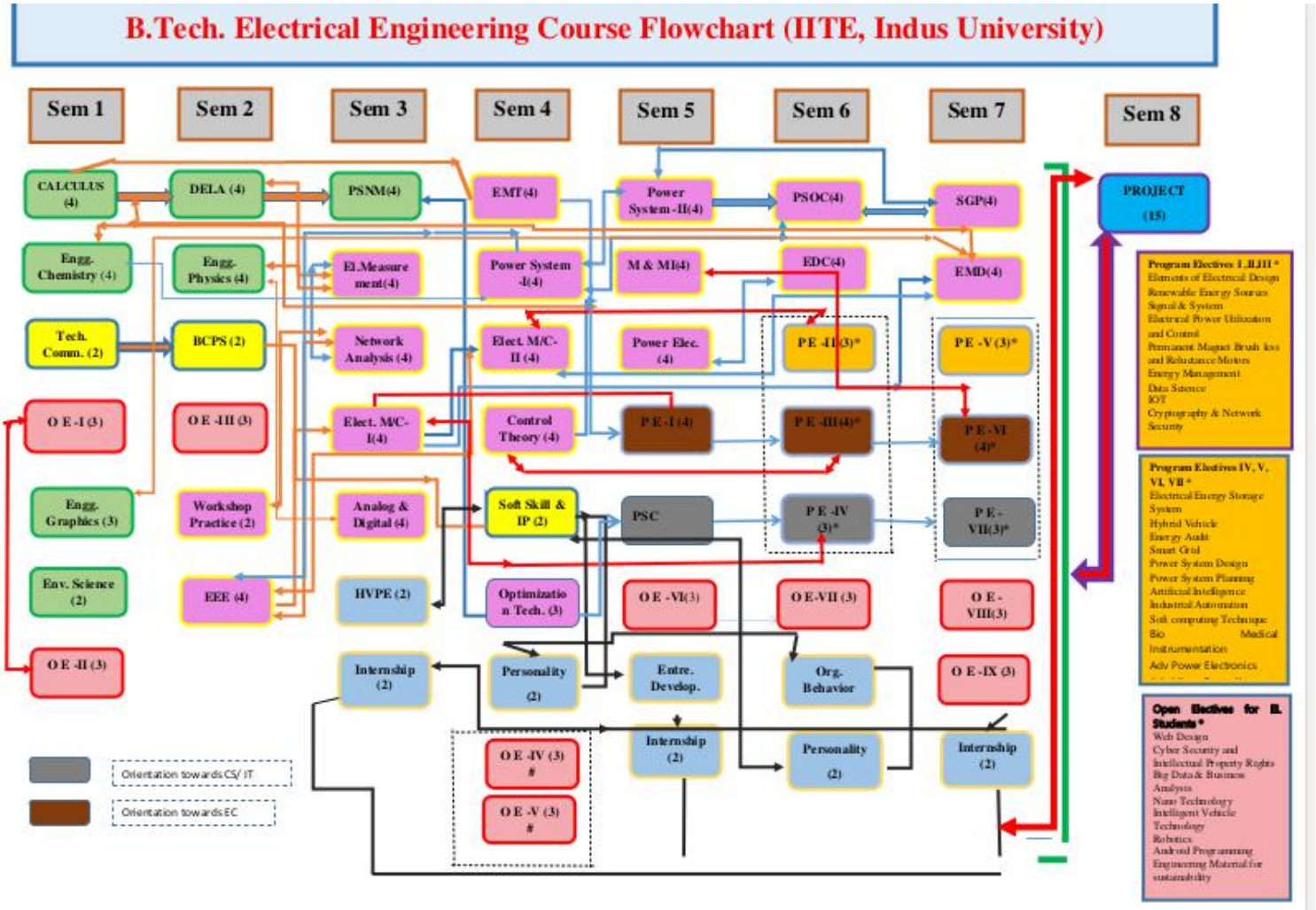
.

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	Thevenin ' s, Norton ' s, and Superposition Theorem	1	BB
	Weeks 2	Maximum power transfer theorem Compensation and Reciprocity	1	BB
	Week 3	Tellegen's theorems, Millman Theorem.	*1*	BB
	Week 4	Substitution Theorem and Problem solving	2	BB
	Week 5	Concept of network graphs, tree, link, cut set, network matrices, node incidence matrix, loop incidence matrix.	2	BB
	Week 6	Cut set incidence matrix, network analysis using network incidence matrices and tie set matrix.	*3*	BB
	Week 7	Self-inductance and Mutual inductance, Coefficient of coupling, dot convention, Ideal Transformer.	3,4	BB
	Week 8	Analysis of multi-winding coupled circuits, Analysis of single tuned and double tuned coupled circuits.	4	BB
	Week 9	Laplace transform fundamentals, properties and theorems, unit step function, other unit functions, the impulse ramp and doublet, Laplace transforms for shifted singular functions, initial and final value theorems Convolution integral.	*4*	BB
	Week 10	Response of RL RC and RLC networks using Laplace Transforms for unit step	5	BB

	Week 11	Response of RL RC and RLC networks using Laplace Transforms , impulse and ramp inputs	5	BB
	Week 12	Terminal pairs, network function for one port and two port network, ladder network and non-ladder network.	5,6	BB
	Week 13	Concept of poles & zeros of network functions, Restriction on Pole and Zero locations of network function.	5,6	BB
	Week 14	Open circuit, short circuit, Z-parameter, hybrid, inverse hybrid and transmission parameters	6	BB
	Week 15	Series, parallel and tandem connections of two-port networks, multi-port networks, multi-terminal networks; Indefinite admittance matrix and its properties	6	BB



Subject: Network Analysis

Program: B.Tech. Electrical Engineering			Subject Code: EL0317					Semester: III
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	1	0	4	40	0	60	0	100

Perquisites:

iv) Basic Electrical & Electronics Engineering

v) Fundamentals of Laplace Transforms

vi) Fundamentals of Differential equations

Course Objective:

(x) To understand different types of Theorems for AC circuit.

(xi) To learn the techniques to apply different theorems and how to solve them.

(xii) To provide knowledge about different network topologies.

(xiii) To understand the application of Laplace in analysis of electrical circuits

(xiv) To understand the concept Laplace Transformation.

(xv) To understand pole and zero concepts & network stability.

(xvi) To understand the concept of two port network.

(xvii) To understand different parameter calculation process

(xviii) To understand the application of computers in network analysis.

Course Outcome:

CO-1: Able to Define all the terms and definitions in Network Analysis. (BT-1)

CO-2: Able to Explain the theories represent mathematical approximations to reality and limitations of those approximations. (BT-2)

CO-3: Apply the knowledge of different network reduction techniques in solving the given circuit with dependent source. (BT-3)

CO-4: Analyze the working of various components of a circuit There by developing skill and employability in various types of network solving techniques. (BT-4)

CO-5: Evaluate frequency response, behavior of different passive elements, different network parameters and enabling the design of complex circuits depending on Specifications. (BT-5)

CO-6: Develop a given electric circuit in terms of ABCD, Z, Y and H parameter model and solve the circuit. (BT-6).

SYLLABUS

UNIT-I **[12]**

Network Theorems

Thevenin ' s, Norton ' s, superposition and maximum power transfer theorem Compensation, reciprocity and Tellegen's theorems, Millman Theorem, Substitution Theorem.(With AC source & dependent source).

UNIT-II **[12]**

Network Topology

Concept of network graphs, tree, link, cut set, network matrices, node incidence matrix, loop incidence matrix, cut set incidence matrix, network analysis using network incidence matrices and tie set matrix.

Coupled Circuit

Self-inductance and Mutual inductance, Coefficient of coupling, dot convention, Ideal Transformer, Analysis of multi-winding coupled circuits, Analysis of single tuned and double tuned coupled circuits

UNIT-III **[09]**

Laplace Transformation

Laplace transform fundamentals, properties and theorems, unit step function, other unit functions, the impulse ramp and doublet, Laplace transforms for shifted singular functions, initial and final value theorems Convolution integral.

Transient Network Analysis

Response of RL RC and RLC networks using Laplace Transforms for unit step, impulse and ramp inputs.

UNIT-IV **[12]**

Network Functions

Terminal pairs, network function for one port and two port network, ladder network and non-ladder network. Concept of poles & zeros of network functions, Restriction on Pole and Zero locations of network function.

Two Port Networks and their Characterization

Open circuit, short circuit, Z-parameter, hybrid, inverse hybrid and transmission parameters Series, parallel and tandem connections of two-port networks, multi-port networks, multi-terminal networks; Indefinite admittance matrix and its properties

Text Books

vii) Network Analysis, M E Van Valkenburg, PHI

viii) Circuit Theory- Analysis and Synthesis, A Chakrabarti, DhanpatRai Publications

Reference Book

ix) Electric Circuits and Networks :- By K. S. Suresh Kumar – Pearson Education

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Web Resource

v) https://www.youtube.com/watch?v=cpwMPTFPFKM

vi) https://www.youtube.com/watch?v=UIn8uZSdV3c

vii) https://www.youtube.com/watch?v=3YinmbkU0DE

viii) https://www.youtube.com/watch?v=26GM8Z5vlqw

MOOCS:

iv) https://www.edx.org/

v) https://www.nptel.ac.in/

vi) https://www.coursera.org/

Name of Institute: Institute of Technology & Engineering

Name of Faculty: Dr. Jaydeep Chakravorty

Course code: EL0320

Course name: Signals & Systems

Pre-requisites:

i) Basic mathematics
ii) Fundamentals of electrical circuits
iii) Fundamentals of Differential equations

Credit points: 04

Offered Semester: III

Course coordinator (weeks 01 - 15)

Full name: Dr. Jaydeep Chakravorty

Department with siting location: 3rd floor, Bhawar Building

Telephone:

Email: el.hod@indusuni.ac.in

Consultation times: 3:00 p.m. to 5:00 p.m.

Course lecturer (weeks 01 - 15)

Full name: Dr. Jaydeep Chakravorty

Department with siting location: 3rd floor, Bhawar Building

Telephone:

Email: el.hod@indusuni.ac.in

Consultation times: 3:00 p.m. to 5:00 p.m.

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:

I) Understand mathematical description and representation of continuous and discrete time signals and systems.

II) Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system.

III) Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms.

IV) Understand the limitations of Fourier transform and need for Laplace transform and develop the ability to analyze the system in s- domain.

V) Understand the basic concept of probability, random variables & random signals and develop the ability to find correlation, CDF, PDF and probability of a given event.

Course Outcomes (CO)

CO1: Apply the knowledge of linear algebra topics like vector space, basis, dimension, inner product, norm and orthogonal basis to signals.

CO2: Analyse the spectral characteristics of continuous-time periodic and a periodic signals using Fourier analysis.

CO3: Classify systems based on their properties and determine the response of LSI system using convolution.

CO4: Analyze system properties based on impulse response and Fourier analysis.

CO5: Apply the Laplace transform and Z- transform for analyze of continuous-time and discrete-time signals and systems.

CO6: Understand the process of sampling and the effects of under sampling.

Course Outline

In this course representation of various electrical signals and their analysis will be discussed. Application of various signals on electrical systems will be carried out.

Method of delivery

Face to face lectures, Assignments, Quiz

Study time

3-hour lecture and 1-hour tutorial per week

CO-PO Mapping (PO: Program Outcomes)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	3	2	1	1								1
CO2	3	2	2	3	2							1
CO3	3	2	2									1
CO4	3	2	1	2	1							1
CO5	3	2			1							1
CO6	3	1										

Blooms Taxonomy and Knowledge retention (For reference)

(Blooms taxonomy has been given for reference)

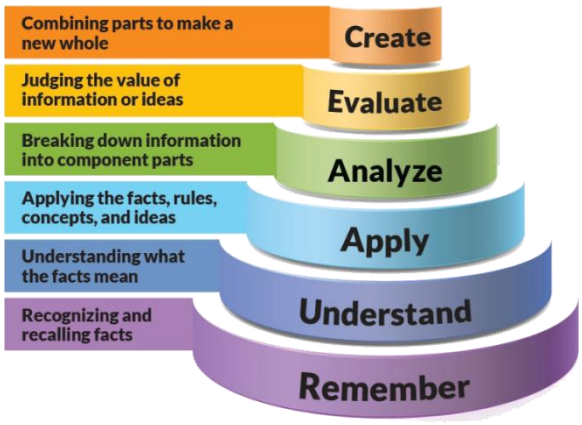

Figure 1: Blooms Taxonomy

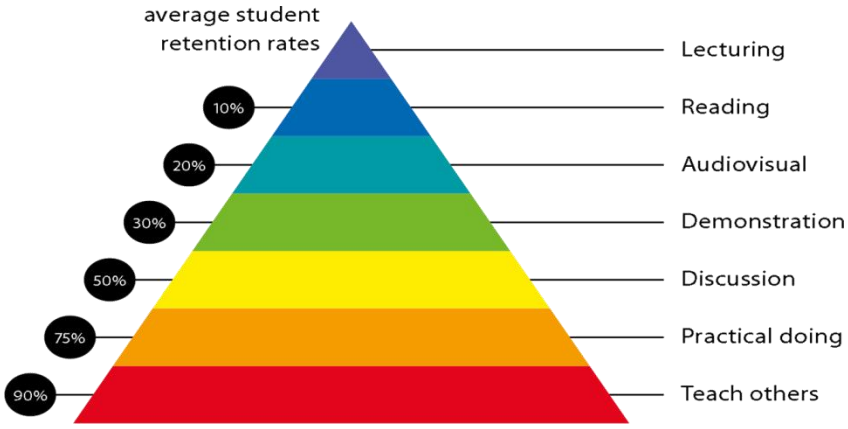

Figure 2: Knowledge retention

Graduate Qualities and Capabilities covered

(Qualities graduates harness crediting this Course)

General Graduate Qualities	Specific Department of _____Graduate Capabilities
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	**10 Sustainability, societal & environmental impact**

integrity as part of local, national, global and professional communities.	

Practical work:

N.A.

Lecture/tutorial times

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

i) AlanV.Oppenheim, Alan S.Willsky with S.Hamid Nawab, Signals & Systems, 2nd edn., Pearson Education, 1997.

Additional Materials

i) John G. Proakis and Dimitris G. Manolakis, Digital Signal Processing, Principles, Algorithms and Applications, 3rd edn., PHI, 2000.

ii) M.J.Roberts, Signals and Systems Analysis using Transform method and MATLAB, TMH 2003.

iii) Simon Haykin and Barry Van Veen, Signals and Systems, John Wiley, 1999.

Web Resource

i) https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/

MOOCs

i) https://www.edx.org/

ii) https://www.nptel.ac.in/

iii) https://www.coursera.org/

ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

Attendance: 05 marks Assignment:05 marks PPT: 10 marks Mid Term Examination: 40 marks End Term Examination: 40 marks

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:

N.A.

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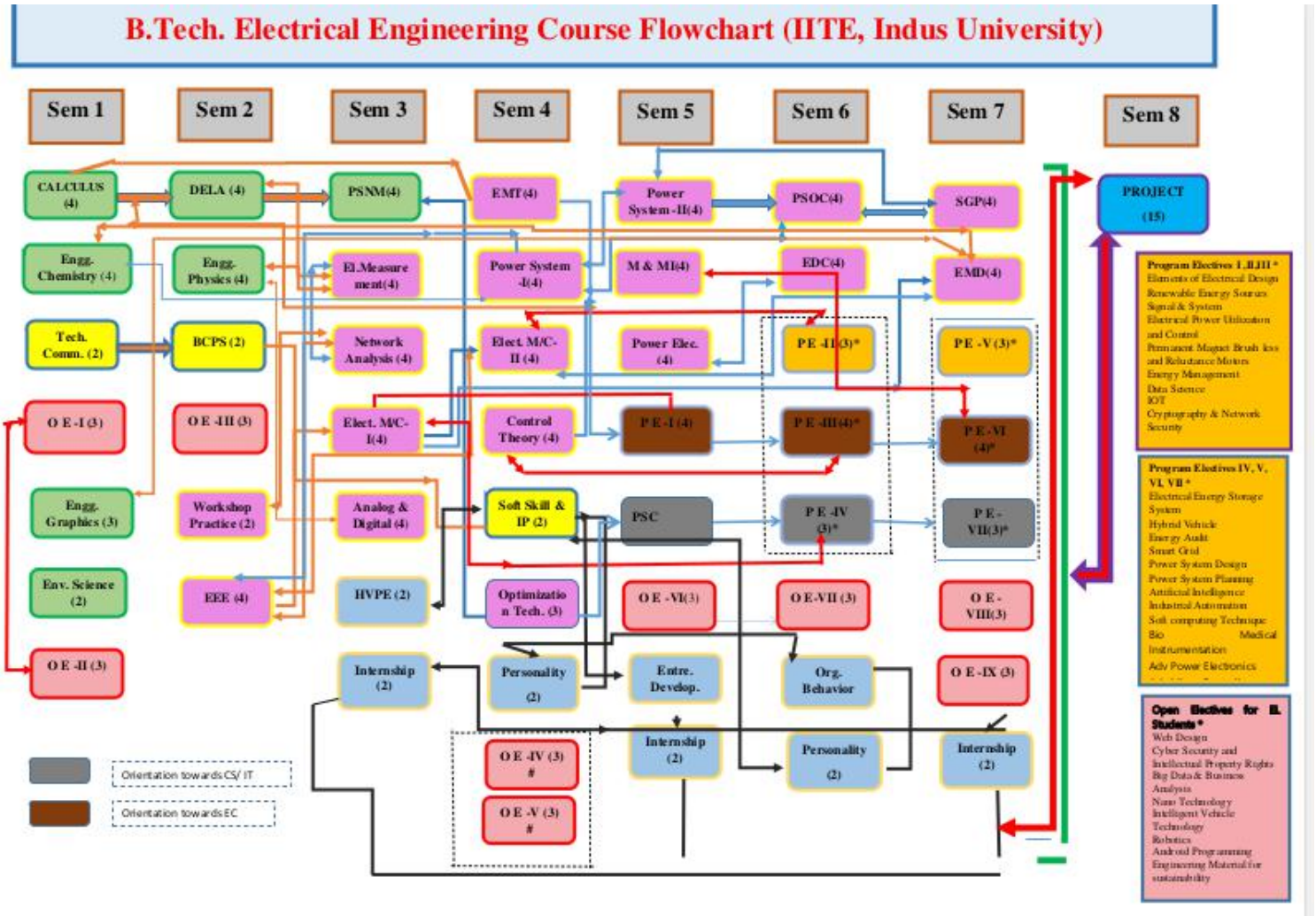
Do not copy the work of other students.
Do not share your work with other students (except where required for a group activity or assessment)

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	Discrete-Time LTI Systems:	1	BB
	Weeks 2	The Convolution Sum. Continuous-Time LTI Systems:	1	BB
	Week 3	The Convolution Integral, Properties of Linear Time-Invariant Systems.	*1*	BB
	Week 4	Representation of a Continuous-Time Signal by Its Samples	2	BB
	Week 5	The Sampling Theorem, Reconstruction of a Signal from Its Samples Using Interpolation	2	BB
	Week 6	The Effect of under sampling: Aliasing, Discrete-Time Processing of Continuous-Time Signal	*3*	BB
	Week 7	Sampling of Discrete-Time Signals.	3,4	BB
	Week 8	The Laplace Transform. The Region of Convergence for Laplace Transforms.	4	BB
	Week 9	The Inverse Laplace Transform. Properties of the Laplace Transform, Some Laplace Transform Pairs.	*4*	BB
	Week 10	The z-Transform, Region of Convergence for the z-Transform, Inverse z-Transform. Properties of the z-Transform, some Common z-Transform Pairs,	5	BB

	Week 11	Analysis and Characterization of LTI Systems using z-Transforms, System Function Algebra and Block Diagram Representations, The Unilateral z-Transforms.	5	BB
	Week 12	he Response of LTI Systems to Complex Exponentials, Fourier series Representation of Continuous-Time Periodic Signals, Properties of Continuous-Time Fourier series,	5,6	BB
	Week 13	Fourier series Representation of Discrete-Time Periodic Signals, Properties of Discrete-Time Fourier series, Fourier series and LTI Systems.	5,6	BB
	Week 14	Representation of a periodic Signal: The Continuous-Time Fourier Transform. The Fourier Transform for Periodic Signals. Properties of the Continuous-Time Fourier Transform,	6	BB
	Week 15	The Convolution Property, The Multiplication Property, Tables of Fourier Properties and Basic Fourier Transform Pairs.	6	BB


B.Tech. Electrical Engineering Course Flowchart (IITE, Indus University)
Sem 1
Sem 2
Sem 3
Sem 4
Sem 5
Sem 6
Sem 7
Sem 8
CALCULUS (4)
DELA (4)
PSNM(4)
EMT(4)
Power System -II(4)
PSOC(4)
SGP(4)
PROJECT (15)
Engg. Chemistry (4)
Engg. Physics (4)
El.Measurement(4)
Power System -I(4)
M & MI(4)
EDC(4)
EMD(4)
Tech. Comm. (2)
BCPS (2)
Network Analysis (4)
Elect. M/C-II (4)
Power Elec. (4)
PE -II (3)*
PE -V (3)*
O E -I (3)
O E -III (3)
Elect. M/C-I(4)
Control Theory (4)
P E -I (4)
P E -III(4)*
P E -VI (4)*
Engg. Graphics (3)
Workshop Practice (2)
Analog & Digital (4)
Soft Skill & IP (2)
PSC
P E -IV (3)*
P E - VII(3)*
Env. Science (2)
EEE (4)
HVPE (2)
Optimization Tech. (3)
O E -VI(3)
O E-VII (3)
O E - VIII(3)
O E -II (3)
Internship (2)
Personality (2)
Entre. Develop.
Org. Behavior
O E -IX (3)
O E -IV (3) #
O E -V (3) #
Internship (2)
Personality (2)
Internship (2)
Orientation towards CS/ IT
Orientation towards EC
Program Electives I, II,III *
Elements of Electrical Design
Renewable Energy Sources
Signal & System
Electrical Power Utilization and Control
Permanent Magnet Brush less and Reluctance Motors
Energy Management
Data Science
IOT
Cryptography & Network Security
Program Electives IV, V, VI, VII *
Electrical Energy Storage System
Hybrid Vehicle
Energy Audit
Smart Grid
Power System Design
Power System Planning
Artificial Intelligence
Industrial Automation
Soft computing Technique
Bio Medical Instrumentation
Adv Power Electronics
Open Electives for EL Students *
Web Design
Cyber Security and Intellectual Property Rights
Big Data & Business Analysis
Nano Technology
Intelligent Vehicle Technology
Robotics
Android Programming
Engineering Material for sustainability

Subject: Signal and System								
Program: B.Tech. Electrical Engineering			**Subject Code:EL0322**				**Semester: III**	
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	1	0	4	40	-	60	-	100

Perquisites:

i) Differential equations and Integrals (advanced level)

ii) Laplace transform

iii) Ordinary differential equations (and inverse Laplace transform)

iv) Complex numbers (and complex Laplace transform)

v) Series and expansions

vi) Fourier analysis (and complex Fourier Series/transform)

Course Objectives:

(i) To understand the different types of signals & systems.

(ii) To learn the sampling theorem & convolution of LTI System.

(iii) Will learn the Laplace and z-transform in discrete and continuous domain.

(iv) To understand the Fourier series and transform

Course Outcome:

i) Getting familiar with the different types of signals.

ii) Understand and learn the properties of the systems.

iii) Able to do convolution of any LTI System.

iv) Understand the sampling Theorem.

v) Learn and solve the Laplace, Inverse Laplace problem z-Transform and Inverse z-Transform problem.

vi) Able to know the properties and application of Fourier series and Fourier Transform.

SYLLABUS

UNIT-I **[11]**

Signals and Systems:

Continuous-Time and Discrete-Time Signals, Transformations of the Independent Variable, Exponential and Sinusoidal Signals, The Unit Impulse and Unit Step Functions, Continuous-Time and Discrete-Time Systems, Basic System Properties.

UNIT-II **[12]**

Linear Time-Invariant Systems:

Discrete-Time LTI Systems: The Convolution Sum. Continuous-Time LTI Systems: The Convolution Integral, Properties of Linear Time-Invariant Systems.

Sampling:

Representation of a Continuous-Time Signal by Its Samples: The Sampling Theorem, Reconstruction of a Signal from Its Samples Using Interpolation. The Effect of under sampling: Aliasing, Discrete-Time Processing of Continuous-Time Signals, Sampling of Discrete-Time Signals.

UNIT-III **[11]**

The Laplace Transform:

The Laplace Transform. The Region of Convergence for Laplace Transforms. The Inverse Laplace Transform. Properties of the Laplace Transform, Some Laplace Transform Pairs.

The Z-Transform:

The z-Transform, Region of Convergence for the z-Transform, Inverse z-Transform. Properties of the z-Transform, some Common z-Transform Pairs, Analysis and Characterization of LTI Systems using z-Transforms, System Function Algebra and Block Diagram Representations, The Unilateral z-Transforms.

UNIT-IV **[11]**

Fourier series Representation of Periodic Signals:

The Response of LTI Systems to Complex Exponentials, Fourier series Representation of Continuous-Time Periodic Signals, Properties of Continuous-Time Fourier series, Fourier series Representation of Discrete-Time Periodic Signals, Properties of Discrete-Time Fourier series, Fourier series and LTI Systems.

The Continuous-Time Fourier Transform:

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