Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**1st /2nd**				
Course Title	:	**Introduction to Electronics Engineering**				
Course Code	:	**23CECE15/23CECE25**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Course Category	:	**CEC-1/CEC-2**				
Stream	:	**Other Branches**		**CIE**	:	**50 Marks**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 Hrs T**		**SEE Duration**	:	**03 Hours**
Credits	:	**03**				

Course Learning Objectives: Students will be taught

Sl. No	Course Objectives
1	**Learn** the fundamentals of integrated circuits, communication systems and advanced technologies
2	Familiarise in **applying** the concepts of electronic circuits and devices for the given application
3	Provide the knowledge in **examining** various electronic circuits
4	Impart **design** skills of circuits for real time applications
5	**Equip** with the usage of modern tools to simulate various integrated circuits

Teaching-Learning Process

Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

DSATM

Scheme of Teaching and Examinations for BE Programme -2023-24
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2023-24)

COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	**Digital Electronics:** Binary, Decimal, Octal and hexadecimal Number systems, Number base Conversion, Complements, Basic theorems and properties of Boolean algebra, Boolean functions, Canonical and Standard forms, Digital Logic gates. **Combinational Logic:** Introduction, Adders: Half adder and Full adders. **Text-1**	8
Pedagogy	Mobile Studio	
2	**Operational Amplifiers:** Introduction, Block diagram of OPAMP, OPAMP parameters, Ideal and Practical Characteristics of OPAMP. **OPAMP applications:** Inverting and Non-Inverting Amplifiers, Voltage Follower, Summer, Differentiator, Integrator **Text-2**	8
Pedagogy	Think Pair Share	
3	**Embedded Systems –** Definition, Embedded systems vs General Computing Systems, Classification of Embedded Systems, Major application areas of Embedded Systems, Elements of an Embedded System, Core of the Embedded System, Microprocessor vs Microcontroller, RISC vs CISC. **Text – 3** Sensors, types and its Applications **Text – 5**	8
Pedagogy	Case Studies	
4	**Analog Communication** – Communication system scheme, Information source, and input transducer, Transmitter, Channel or Medium – Hardwired and Soft wired, Noise, Receiver, Multiplexing, Types of communication systems. Types of modulation (only concepts) – AM, FM. **Digital Communication:** Advantages of digital communication over analog communication, ASK, FSK, PSK, Radio signal transmission, Multiple Access Techniques. **Text - 4**	8
Pedagogy	Demonstration	
5	**Cellular wireless networks:** Cellular Telephone system, Cellular concepts, Network topology, wireless LAN, Bluetooth. **Text - 4** **Fundamentals of VLSI:** Evolution of Microelectronics, Basics structures NMOS, PMOS and CMOS, Moore's Law, Depletion Mode and Enhancement mode Transistors, VLSI Design flow. **Text - 5**	8
Pedagogy	Flipped Class Room	

Reference Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN-978-81-203- 0417-84
2	Op-amps and Linear Integrated Circuits, Ramakanth A Gayakwad, Pearson Education, 4th Edition
3	K V Shibu, 'Introduction to Embedded Systems', 2nd Edition, McGraw Hill Education (India), Private Limited, 2016
4	S L Kakani and Priyanka Punglia, 'Communication Systems', New Age International Publisher, 2017
5	Raj Kamal , 'Internet of Things – Architecture and Design Principles', Mc Graw Hill Education

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	Level Indicator
CO1	**Understand** the concepts of integrated circuits, communication systems and advanced technologies.	**L2**	**Understand**
CO2	**Apply** the fundamentals of integrated circuits to provide solution for analog and digital circuits.	**L3**	**Apply**
CO3	**Analyse** the operation of electronic circuits for a given problem scenario.	**L4**	**Analyse**
CO4	**Design** Linear Integrated and logic circuits for real time applications.	**L3**	**Apply**
CO5	**Examine** the performance of various electronic circuits using modern tools.	**L4**	**Analyse**

Mapping of Course Outcomes to Program Outcomes:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**	**-**
CO2	3	-	-	-	-	-	-	-	-	-	-	-	**2**	**-**	**-**
CO3		2	-	-	-	-	-	-	-	-	-	-	**2**	**-**	**-**
CO4	-	-	3	2	-	-	-	-	2	2	-	-	**2**	**-**	**-**
CO5	-	-	-	-	2	-	-	-	2	2	-	2	**2**	**-**	**-**

Weblinks and Video Lectures (e-Resources)

1	https://nptel.ac.in/courses/122106025
2	https://nptel.ac.in/courses/108105132
3	https://nptel.ac.in/courses/117104072
4	https://E-learning.vtu.ac.in

5	https://www.coursera.org/courses/digital-circuits

Assessment Pattern (both CIE and SEE)

Engineering Science Course (ESC) / Emerging Technology Course (ETC) / Programming Language Course (PLC)								
3 credits - Theory								
Assessment Method	**Component**	**Type of Assessments**	**Syllabus Coverage**	**Maximum Marks**	**Average**	**Reduced Marks**	**Minimum Passing Marks**	**Evaluation Details**
Total CIE Theory				**50**			**20**	
CIE	**Theory**	Internal Assessment Test (IAT) - I	Module - 1 & 2	50	(50+50+50) / 3	**25**	10	Average of Three Internal test each of 50 Marks scale down the marks to 25 Marks
		Internal Assessment Test (IAT) - II	Module - 3 & 4	50				
		Internal Assessment Test (IAT) - III	Module - 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives	Considering all the Modules	50	(50+50) / 2	**25**	10	Two CCA methods as per VTU Clause 22OB4.2 of regulations to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives		50				
	Total CIE Theory					**50**	20	Scale down Marks of IAT and CCA to 50

SEE		Theory exam	Entire theory Syllabus	100	----	50	18	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks
CIE + SEE				100	----	----	40	

Assessment Details (both CIE and SEE)
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
The minimum passing mark for the CIE is 40% of the maximum Marks (20 Marks out of 50).
The minimum passing mark for the SEE is 35% of the maximum Marks (18 Marks out of 50).
A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 Marks out of 100) in the total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Possible continuous and comprehensive assessment:
Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Group Problem Solving, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom, storytelling. The assessment of these techniques can be either based on Quiz or rubrics.

The faculty may adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

Continuous Internal Evaluation (CIE):
The CIE Marks for the internal assessment test shall be **25 Marks** and for the continuous and comprehensive assessment (CCA) shall be **25 Marks**.

Internal Assessment test:
The IA test questions are to be framed to map the course outcomes, program outcomes and the Blooms RBT Levels. Emphasis to be given for higher order RBT levels

Three Tests each of **50 Marks**
- First test after 6th week of the semester (syllabus completion of 35 – 40%)
- Second test after 10th week of semester (syllabus completion of 65 – 70%)
- Third test after 14th week of semester (syllabus completion of 90 – 100%)

The average score of three test is taken and scaled down to **25 Marks.**

Continuous and Comprehensive Assessment (CCA):
Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be CCA1+CCA2 and scaled down to **25 Marks**.
- CCA1 after 4th week and CCA2 after 9th week. The evaluation includes either through quiz or rubrics
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **25 Marks**
Total Marks scored for theory component of CIE (IAT + CCA) is **50 Marks**

Semester End Examination (SEE):
- Theory SEE will be conducted as per the scheduled timetable, with common question papers for the subject
- The question paper shall be set for 100 Marks. The medium of the question paper shall be English.

	The duration of SEE is 03 hours. • The question paper will have 10 questions. Two questions per module. Each question is set for 20 Marks. The student must answer 5 full questions, selecting one full question from each module summing up to maximum score of 100 Marks. Marks **scored out of 100 shall proportionally be reduced to 50 Marks**. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module. The two questions shall be of same course outcome, program outcome and Blooms RBT level. Emphasis to be given for higher order RBT levels

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory					Practical
	Continuous Assessment Tests			Continuous Comprehensive Assessment (CCA)		Practical Test
	IAT-1	IAT-2	IAT-3	CCA-1	CCA-2	
	50 Marks	50 Marks	50 Marks	50 Marks	50 Marks	50 Marks
Remember	--	--	--	--	--	NA
Understand	10	20	20	--	--	NA
Apply	25	20	20	20	20	NA
Analyse	15	10	10	20	20	NA
Evaluate	--	--	--	10	10	NA
Create	--	--	--	--	--	NA

CIE Course Assessment Plan

CO's	Marks Distribution					Total Marks	Weightage (%)
	Test-1		Test-2		Test-3		
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	04	06	10	10	20	50	33
CO2	10	05	10	10	20	55	37
CO3	10	05	05	05	10	35	23
CO4	05	05	--	--	--	10	07
CO5	--	--	--	--	--	--	--
Total	29	21	25	25	50	150	100

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (100% Theory)
Remember	--

Understand	33%
Apply	50%
Analyse	17%
Evaluate	**--**
Create	**--**

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage (%)
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	05	06	08	06	08	33	33
CO2	05	07	06	08	07	33	33
CO3	--	-	06	06	05	17	17
CO4	**10**	**07**	**--**	**--**	**--**	**17**	**17**
CO5	**--**	**--**	**--**	**--**	**--**	**--**	**--**
Total	**20**	**20**	**20**	**20**	**20**	**100**	**100%**

Course Contents and Lecture Schedule

Module No.	Topics	No. of Lectures
1	**Digital Electronics:** Binary, Decimal, Octal and hexadecimal Number systems,	1
	Number base Conversion,	1
	Complements,.	1
	Basic theorems and properties of Boolean algebra,	1
	Boolean functions,	1
	Canonical and Standard forms, Digital Logic gates.	1
	Combinational Logic: Introduction, Adders: Half adder and	1
	Full adders	1
2	**Operational Amplifiers:** Introduction, Block diagram representation of OPAMP, .	1
	OPAMP parameters,	1
	Ideal Characteristics of OPAMP.	1
	Practical Characteristics of OPAMP.	1
	OPAMP applications: Inverting and Non-Inverting amplifiers,	1
	Voltage Follower, summer,	1
	Differentiator,	1
	Integrator	1
3	**Embedded Systems –** Definition, Embedded systems vs General Computing Systems,	1
	Classification of Embedded Systems, Major application areas of Embedded Systems,	1
	Elements of an Embedded System, Core of the Embedded System,	1
	Microprocessor vs Microcontroller, RISC vs CISC.	1

	Introduction to sensors	1
	Sensor types	1
	Sensor types Contd	1
	Applications of Sensors	1
4	**Analog Communication** – Modern communication system scheme, Information source, and input transducer,	1
	Transmitter, Channel or Medium – Hardwired and Soft wired,	1
	Noise, Receiver, Multiplexing,	1
	Types of communication systems. Types of modulation (only concepts) – AM, FM.	1
	Digital Communication : Advantages of digital communication over analog communication,	1
	ASK, FSK, PSK,	1
	Radio signal transmission,	1
	Multiple Access Techniques.	1
5	**Cellular wireless networks:** Cellular Telephone system,	1
	Cellular concepts, Network topology,	1
	wireless LAN,	1
	Bluetooth.	1
	Fundamentals of VLSI: Evolution of Microelectronics,	1
	Basics structures NMOS, PMOS and CMOS,	1
	Moore's Law, Depletion Mode and Enhancement mode Transistors,	1
	VLSI Design flow,	1
	Total	**40 Hrs**

Dayananda Sagar Academy of Technology & Management

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Semester	:	**2ND**				
Course Title	:	**Basic Electronics**				
Course Code	:	**23CECE26**				
Course Type (Theory/ Practical/ Integrated)	:	**Integrated**				
Course Category	:	**CEC - 2**				
Stream	:	**EC**		**CIE**	:	**50 Marks**
Teaching hr/week (L:T:P:S)	:	**2:0:2:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 Hrs**		**SEE Duration**	:	**3 Hours**
Credits	:	**3**				

Course Learning Objectives: Students will be taught

Sl. No	Course Objectives
1	**Learn** the fundamentals of transistor, integrated circuits, communication systems and IoT in electronics and communication engineering
2	Familiarise in **applying** the concepts of electronic circuits and devices for the given applications
3	Provide the knowledge in **examining** analog and digital circuits
4	Impart **design** skills of circuits for real time applications
5	To **equip** with the usage of modern tools to simulate various integrated circuits

Teaching-Learning Process Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

DSATM

Scheme of Teaching and Examinations for BE Programme -2023-24
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2023-24)

COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	**Bipolar Junction Transistors:** Introduction, BJT Voltages & Currents, BJT Amplification, Common Base Characteristics, Common Emitter Characteristics, Common Collector Characteristics, **BJT Biasing:** Introduction, DC Load line and Bias point. **Field Effect Transistor:** Junction Field Effect Transistor, JFET Characteristics, MOSFETs: Enhancement MOSFETs, Depletion MOSFETs. **Text Book - 1** Introduction to **FinFET**, its structure and VI Characteristics.	8
Pedagogy	Experiential Learning	
2	**Linear Integrated Circuits:** Introduction, The Operational Amplifier, Block Diagram Representation of Typical Op-Amp, Op-Amp parameters Op-Amp Characteristics, The ideal Op-Amp **Op-Amp Applications:** Inverting Configuration, Non-Inverting Configuration, Differential Configuration, Voltage Follower, Integrator, Differentiator. **Text Book - 2**	8
Pedagogy	Think Pair Share	
3	**Digital Electronics:** Binary, Decimal, Octal and hexadecimal Number systems, Number base Conversion, Complements, Basic theorems and properties of Boolean algebra, Boolean functions, Canonical and Standard forms, Digital Logic gates. **Logic circuits:** Introduction, Adders: Half adder and Full adders, Overview of sequential circuits. **Text Book - 3**	8
Pedagogy	Mobile Studio	
4	**Analog Communication System** – Communication system scheme, Information source, and input transducer, Transmitter, Channel or Medium – Hardwired and Soft wired, Noise, Receiver, Multiplexing, Types of communication systems. Types of modulation (only concepts) – AM , FM, PM **Digital Communication System**: Advantages of digital communication over analog communication, ASK, FSK, PSK. (Concepts & waveforms only), Multiple Access Techniques **Text Book – 4**	8
Pedagogy	Demonstration	
5	**Internet of Things:** Introduction, IoT terms and basic definition, Characteristics of IoT, IoT Ecosystem: Enabling technologies in IoT, Application of IoT, Market place of IoT, Vision of IoT. **Transducers:** Introduction to transducers, Sensors, Actuators, and its workflow. **Text Book – 5**	8
Pedagogy	Case Studies	

List of Experiments or Programs

Sl. No	Experiments/Programs Design/implement/analyse the following	COs
1	Basic gate and Universal Gate, Special Gate	CO3, CO4, CO5
2	Realization of Demorgan's Theorem for 2 and 3 variable.	CO3, CO4, CO5
3	Design of Boolean Expression for 3 variable using basic gates	CO3, CO4, CO5
4	Half Adder and Full Adder	CO3, CO4, CO5
5	BJT characteristics for CE configuration	CO3, CO4, CO5
6	FET characteristics	CO3, CO4, CO5
7	OpAmp inverting and non-inverting	CO3, CO4, CO5
8	Transistor as Switch	CO3, CO4, CO5
9	Demonstration of AM(Simulation)	CO1, CO2
10	Demonstration of ASK(Simulation)	CO1, CO2

Reference Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	"Electronic Devices and Circuits", David A Bell, 5th Edition, Oxford, 2016
2	"Op-amps and Linear Integrated Circuits", Ramakanth A Gayakwad, Pearson Education, 4th Edition
3	"Digital Logic and Computer Design", M. Morris Mano, PHI Learning, 2008 ISBN-978-81-203-0417-8
4	"Communication Systems", S L Kakani and Priyanka Punglia, New Age International Publisher, 2017
5	"Internet of Things", Srinivas K G., Siddesh G. M. and Hanumantha Raju R. Cengage Publisher
6	"FinFET and Other Multi-Gate Transistors", Colinge, JP, Springer 2008, pp 1-13

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	Level Indicator
CO1	**Explain** the concepts of transistor, integrated circuits, IoT and communication systems	L2	Understand
CO2	**Apply** the fundamentals of concepts of electronics to provide solution for analog and digital circuits	L3	Apply
CO3	**Analyse** the operation of various electronic circuits for real time applications	L4	Analyse
CO4	**Design** Linear Integrated and logic circuits for a given application	L3	Apply
CO5	**Simulate** various electronic circuits using modern tools	L4	Analyse

Mapping of Course Outcomes to Program Outcomes:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3		2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO4	-	-	2	2	-	-	-	-	2	2	-	-	2	-	-
CO5	-	-	-	-	2	-	-	-	2	2	-	2	2	-	-

Weblinks and Video Lectures (e-Resources)	
1	https://nptel.ac.in/courses/122106025
2	https://nptel.ac.in/courses/108105132
3	https://nptel.ac.in/courses/117104072
4	https://E-learning.vtu.ac.in
5	https://www.coursera.org/courses/digital-circuits
6	https://nptel.ac.in/courses/digital-electronic-circuits

Assessment Pattern (both CIE and SEE)

Engineering Science Course (ESC) / Emerging Technology Course (ETC) / Programming Language Course (PLC)

3 Credits & 2 Credits Courses – Theory (if Integrated)

Assessment Method	Component	Type of Assessments	Syllabus Coverage	Maximum Marks	Average	Reduced Marks	Minimum Passing Marks	Evaluation Details
Total CIE Theory + Practical				**50**	----	----	**20**	
CIE	**Theory**	Internal Assessment Test (IAT) - I	Module - 1 & 2	50	(50+50+50) / 3	**15**	6	Average of Three Internal test each of 50 Marks scale down the marks to 15 Marks
		Internal Assessment Test (IAT) - II	Module - 3 & 4	50				
		Internal Assessment Test (IAT) - III	Module - 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives	Considering all the Modules	50	(50+50) / 2	**10**	4	Two CCA methods as per VTU Clause 22OB4.2 of regulations to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives		50				
	Total CIE Theory					**25**	10	Scale down Marks of IAT and CCA to 25

CIE	**Practical**	Conduction of Experiments	Continuous Evaluation of each experiment			Average of all Experiments	10	4	Performance of the Experiment (On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. 20 marks are for conducting the experiment and calculations/observations/output)
			Record	05	10				
			Observation book	05					
		Practical Test	Write up	15	50	----	10	4	One Internal Practical Test after conduction of all Experiments for 50 Marks
			Execution	25					
			Viva-voce	10					
		Open Ended Experiment	Write up	05	20	----	5	2	One experiment for 20 marks. 20 marks reduced to 05 marks
			Execution	10					
			Viva-voce	05					
	Total CIE Practical						25	10	Scale down Marks of Experiments, Record, Observation, Practical Test and Open-Ended Experiment

SEE		Theory exam	Entire theory syllabus including questions from lab Component in respective Modules	100	----	50	18	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks
CIE + SEE				100	----	----	40	

- The Minimum Marks to be secured in CIE to appear for SEE shall be 10 (40% of Maximum Marks – 25) in the Theory Component and 10 (40% of Maximum Marks – 25) in the Practical component.
- The Laboratory Component for the IPCC shall be for CIE only.
- However, in SEE, the Questions from the Laboratory Component shall be included in the respective Modules only.

Note: If few of the 3 Credit Courses are Integrated course type, for such courses the method suggested for 4 Credit IPCC Course shall be followed

The Minimum Marks to be secured in CIE to appear for SEE shall be 10marks (40% of Maximum Marks – 25) in the Theory Component and 10 (40% of Maximum Marks -25) in the Practical Component. The Laboratory Component of the IPCC shall be for CIE only. However, in SEE the questions from the Laboratory Component shall be included in the respective Modules only.

Assessment Details (both CIE and SEE)
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
The minimum passing mark for the CIE is 40% of the maximum Marks (20 Marks out of 50).
The minimum passing mark for the SEE is 35% of the maximum Marks (18 Marks out of 50).
A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 Marks out of 100) in the total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Possible continuous and comprehensive assessment:
Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom, storytelling. The assessment of these techniques can be either based on Quiz or rubrics.
The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

Continuous Internal Evaluation (CIE):
The CIE Marks for the theory component of the IPCC shall be **25 Marks** and for the laboratory component **25 Marks**.

CIE for the theory component of the IPCC
Internal Assessment test:

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes(POs) and the Blooms RBT Levels. Emphasis to be given for higher order RBT levels

Three Tests each of **50 Marks**

- First test after 6th week of the semester (syllabus completion of 35 – 40%)
- Second test after 10th week of semester (syllabus completion of 65 – 70%)
- Third test after 14th week of semester (syllabus completion of 90 – 100%)

The average score of three test is taken and scaled down to **15 Marks.**

Continuous and Comprehensive Assessment (CCA):
Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be CCA1+CCA2 and scaled down to **10 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The evaluation includes either through quiz or rubrics
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **10 Marks**

Total Marks scored for theory component of CIE (IAT+ CCA) is **25 Marks**

CIE for the practical component of the IPCC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and Marks shall be awarded on the same day. The **15 Marks** are for conducting the experiment and preparation of the laboratory record, the other **10 Marks shall be for the test** conducted at the end of the semester.
- The CIE Marks awarded in the case of the practical component shall be based on the continuous evaluation of the laboratory report and the conduction. Each experiment report can be evaluated for 05 Marks and conduction for 10Marks. Marks of all experiments' write-ups and conduction are added and averaged to 15 Marks.
- The laboratory test **(duration 03 hours)** at the end of the 15th week of the semester/after completion of all the experiments (whichever is early) shall be conducted for 50 Marks and scaled down to **05 Marks.**
- Scaled-down Marks of write-up, evaluations and tests, will be added as CIE Marks for the laboratory component of IC/IPCC for **25 Marks**.
- The minimum Marks to be secured in CIE to appear for SEE shall be 10 (40% of maximum Marks) in the theory component and 10 (40% of maximum Marks) in the practical component.
- The laboratory component of the IC/IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included**.** The maximum of 05 questions is to be set from the practical component of IC/IPCC, the total Marks of all questions should not be more than 25 Marks.

The theory component of the IPCC shall be for both CIE and SEE.

Semester End Examination (SEE):

- Theory SEE will be conducted as per the scheduled timetable, with common question papers for the subject
- The question paper shall be set for 100 Marks. The medium of the question paper shall be English. **The duration of SEE is 03 hours.**
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 Marks. The student has to answer 5 full questions, selecting one full question from each module summing up to maximum score of 100 Marks. Marks **scored out of 100 shall proportionally be reduced to 50 Marks**.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module. The two questions shall be of same course outcome, program outcome and Blooms RBT level. Emphasis to be given for higher order RBT levels

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory					Practical
	Continuous Assessment Tests			Continuous Comprehensive Assessment (CCA)		Practical Test
	IAT-1	IAT-2	IAT-3	CCA-1	CCA-2	
	50 Marks	50 Marks	50 Marks	50 Marks	50 Marks	50 Marks
Remember	-	-	-	-	-	-
Understand	15	10	24	-	-	

Apply	20	20	16	20	20	30
Analyse	15	20	10	20	20	20
Evaluate	-	-	**-**	10	10	**-**
Create	**-**	**-**	**-**	**-**	**-**	**-**

CIE Course Assessment Plan

CO's	Marks Distribution					Total Marks	Weightage (%)
	Test-1		Test-2		Test-3		
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	10	05	05	05	24	49	33
CO2	15	05	10	10	16	56	37
CO3	05	05	08	07	10	35	23
CO4	-	05	05	-	-	10	07
CO5	-	-	-	-	-	-	-
Total	30	20	28	22	50	150	100

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	**-**
Understand	30%
Apply	44%
Analyse	26%
Evaluate	**-**
Create	**-**

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage (%)
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	08	06	-	08	08	30	30
CO2	07	-	05	07	07	26	26
CO3	05	06	05	05	05	26	26
CO4		08	10			18	18
CO5							
Total	**20**	**20**	**20**	**20**	**20**	**100**	**100%**

Course Contents and Lecture Schedule

Module No.	Topics	No. of Lectures
1	**Bipolar Junction Transistors:** Introduction, BJT Voltages & Currents,	1
	BJT Amplification, Common Base Characteristics, Common Emitter Characteristics,	1
	Common Collector Characteristics,	1
	BJT Biasing: Introduction, DC Load line and Bias point.	1
	Field Effect Transistor: Junction Field Effect Transistor, JFET Characteristics	1
	MOSFETs: Enhancement and Depletion mode	1
	Introduction to FinFET and its Structure	1
	VI Characteristics of FinFET	1
2	**Linear Integrated Circuits:** Introduction, The Operational Amplifier,	1
	Block Diagram Representation of Typical Op-Amp,	1
	Op-Amp parameters Op-Amp Characteristics,	1
	The ideal Op-Amp	1
	Op-Amp Applications: Inverting Configuration, Non-Inverting Configuration,	1
	Differential Configuration,	1
	Voltage Follower, Integrator,	1
	Differentiator.	1
3	**Digital Electronics:** Binary, Decimal, Octal and hexadecimal Number systems,	1
	Number base Conversion, Complements,	1
	Basic theorems and properties of Boolean algebra,	1
	Boolean functions, Canonical and Standard forms,	1
	Digital Logic gates.	1
	Logic circuits: Introduction, Adders:	1
	Half adder and Full adders,	1
	Overview of sequential circuits.	1
4	**Analog Communication System** – Modern communication system scheme,	1
	Information source, and input transducer,	1
	Transmitter, Channel or Medium – Hardwired and Soft wired,	1
	Noise, Receiver, Multiplexing, Types of communication systems.	1
	Types of modulation (only concepts) – AM , FM, PM	1
	Digital Communication System: Advantages of digital communication over analog communication	1
	ASK, FSK, PSK. (Concepts & waveforms only)	1
	Multiple Access Techniques	1
5	**Internet of Things:** Introduction, IoT terms and basic definition,	1
	Characteristics of IoT, IoT Ecosystem:	1
	Enabling technologies in IoT, Application of IoT,	1
	Market place of IoT,.	1
	Vision of IoT.	1
	Transducers: Introduction to transducers,	1

	Sensors,	1
	Actuators, and its workflow	1
	Total	40 Hrs