Dayananda Sagar Academy of Technology & Management
(Autonomous Institute under VTU)

Semester	:	**2nd**				
Course Title	:	**Introduction To Mechanical Engineering**				
Course Code	:	**BCECM108/208**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**CEC-2**				
Stream	:	**CSE-DS**		**CIE**	:	**50 Marks**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 Hrs T**		**SEE Duration**	:	**3 Hours**
Credits	:	**03**				

Course Learning Objectives: Students will be taught to

Sl. No	Course Objectives
1	Develop basic knowledge on mechanical engineering, fundamentals, and energy sources.
2	Understand the concept of different types of machine tool operations and modern manufacturing processes like CNC, 3D printing.
3	Know the concept of IC engines and future mobility vehicles.
4	Give exposure in the field of engineering materials and manufacturing processes, technology, and its applications.
5	Acquire a basic understanding of the role of mechanical engineering in robotics and automation in industry.

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	**Module 1: Energy Conversion Systems** **Introduction:** Role of Mechanical Engineering in Industries and Society- Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors. **Energy**: Introduction and applications of Energy sources like Fossil fuels, nuclear fuels, Hydel, Solar, wind, and bio-fuels, Environmental issues like Global warming and Ozone depletion	9
Pedagogy	**Demonstration, PPT, Video Lectures**	
2	**Module 2: Introduction to Manufacturing Science** **Machine Tool Operations:** Working Principle of lathe, Lathe operations: Turning, facing, knurling. Working principles of Drilling Machine, drilling operations: drilling, boring, reaming. Working of Milling Machine, Milling operations: plane milling and slot milling. (No sketches of machine tools, sketches to be used only for explaining the operations). **Introduction to Advanced Manufacturing Systems:** Introduction to CNC Machining, components of CNC Machines, advantages and applications of CNC Machining, Introduction to 3D printing, advantages, and applications of 3D Printing.	9
Pedagogy	**Hands on Sessions, Experimental Learning**	
3	**Module 3: IC Engines and Future Mobility** **Introduction to IC Engines**: Components and Working Principles of IC engines, Petrol and Diesel Engines, Application of IC Engines. **Insight into Future Mobility;** Electric and Hybrid Vehicles, Components of Electric and Hybrid Vehicles. Advantages and disadvantages of EVs and Hybrid vehicles.	9
Pedagogy	**Demonstration, Video Lectures**	

4	**Module 4: Metal Fabrication Process** **Welding:** Introduction to welding, principle of welding, types of Welding, Welding terminologies, types of welded joints, advantages, limitations, and applications **Soldering:** Introduction to Soldering, Principle of soldering, solder and flux, advantages, limitations, and applications **Brazing:** Introduction to Brazing, Principle of brazing, advantages, limitations, and applications **Laser Welding:** Introduction to Laser Welding, principle of Laser Generation, Laser Welding Mechanisms, advantages, limitations, and applications	**9**
Pedagogy	**Demonstration, Hands on Sessions**	
5	**Module 5: Advanced Mechanical Engineering** **Mechatronics and Robotics:** Introduction, components of mechatronics system, Classification of mechatronics systems**,** classification of mechatronics system based on robotics configuration: Applications and Advantages. **Automation in industry:** Introduction, types – Fixed, programmable, and flexible automation, basic elements with block diagrams, advantages, and applications of Automation in industries.	**9**
Pedagogy	**Hands on Sessions, Experimental Learning**	

Reference Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Elements of Mechanical Engineering, Ashok Kumar M S, Vijaya G, LAP LAMBERT Academic Publishing, 2023
2	Elements of Mechanical Engineering, H.G. Patil, B.Y.Patil, Dream Tech Press, 2020
3	Manufacturing Technology- Foundry, Forming and Welding, P.N.Rao Tata McGraw Hill, Volumen 1, 5th Editon Ed., 2018.
4	Workshop Technology Volume-1 Manufacturing Process, SK Hajra Choudhary, AK Hajra Choudhary, Nirjhar Roy, Media Promoters and Publishers Pvt. Ltd., 2018.
5	Elements of Mechanical Engineering, K R Gopala Krishna, Sudhir Gopalakrishna, Dr.Girish H.N, Subhash Publications, 2019.
6	Robotics, Appu Kuttan KK K. International Pvt Ltd, volume 1, 2007

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

CO	Course Outcomes	RBT Level	Level Indicator
CO1	**Understand** the fundamentals of Mechanical Engineering.	L 2	Understand
CO2	**Apply** the Engineering concepts for various Mechanical Systems	L 3	Apply
CO3	**Analyze** an Engineering Systems from the view point of Mechanical Engineering	L 4	Analyze
CO4	**Evaluate** the Performance of an Engineering System from the view point of Mechanical Engineering	L 5	Evaluate

Mapping of Course Outcomes to Program Outcomes:

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

Web links and Video Lectures (e-Resources)	
1	https://onlinecourses.nptel.ac.in/noc22_me28/preview
2	https://archive.nptel.ac.in/courses/112/107/112107219/
3	https://nptel.ac.in/courses/112101098
4	https://onlinecourses.nptel.ac.in/noc21_me76/preview
5	https://www.tlv.com/global/TI/steam-theory/principal-applications-for-steam.html
6	https://www.forbesmarshall.com/Knowledge/SteamPedia/About Steam/Fundamental-Applications-of-Steam
7	https://rakhoh.com/en/applications-and-advantages-of-steam-in-manufacturing-and process- industry/)
8	Videos | Makino (For Machine Tool Operation

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 + Practical				**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 including questions from lab component	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.				

4 Credit Course – IPCC	
	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 (IAT):** **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, o 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. o 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 **10 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 and **5 Marks** for conducting Open Ended Experiments. • 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 conduction(Observation Book) and 5 Marks for Record Book. Marks of all experiments' write-ups and conduction are added and scaled to **10 Marks.** • The Practical 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 **10 Marks.** • Open Ended Experiments are conducted after the completion of regular Experiments/Programs for 20 Marks and scaled down to **5 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 IC 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

3 Credit Course – Theory	
	Note: A few of the Courses of 3 Credit are Integrated Course Type, for such courses the method suggested for 4 Credit IPCC shall be followed. **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** scaled down to **25 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, o 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. o 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	-	-	-	-	-	-
Understand	10	10	10	-	-	-
Apply	20	20	20	-	-	-
Analyse	20	20	20	-	-	-
Evaluate	-	-	-	50	50	-

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	05	05	05	05	10	30	20
CO2	10	10	10	10	20	60	40
CO3	10	10	10	10	20	60	40
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
Total	25	25	25	25	50	150	100

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	-
Understand	30
Apply	35
Analyse	35
Evaluate	-
Develop	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	6	6	6	6	6	30	30
CO2	7	7	7	7	7	35	35
CO3	7	7	7	7	7	35	35
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
Total	20	20	20	20	20	100	100

Course Contents and Lecture Schedule

Module No.	Topics	No. of Lectures
1	**Introduction to the Course**	1
1	**Module 1: Energy Conversion Systems: Introduction**	1
1	Role of Mechanical Engineering in Industries and Society	1
1	Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive	1
1	Emerging Trends and Technologies in different sectors - Aerospace, and Marine sectors.	1
1	**Energy**: Introduction	1
1	Applications of Energy sources like Fossil fuels	1
1	Hydel, Solar, wind, and bio-fuels	1
1	Environmental issues like Global warming and Ozone depletion	1
2	**Module 2: Introduction to Manufacturing Science: Introduction**	1
2	**Machine Tool Operations:** Working Principle of lathe	1
2	Lathe operations: Turning, facing, knurling.	1
2	Working principles of Drilling Machine, drilling operations: drilling, boring, reaming.	1
2	Working of Milling Machine, Milling operations: plane milling and slot milling. (No sketches of machine tools, sketches to be used only for explaining the operations).	1
2	**Introduction to Advanced Manufacturing Systems:** Introduction	1
2	Components of CNC	1
2	Advantages and applications of CNC	1
2	3D printing	1
3	**Module 3: IC Engines and Future Mobility: Introduction**	1
3	**Introduction to IC Engines**: Introduction	1
3	Components and Working Principles	1
3	4-Strokes Petrol and Diesel Engines	1
3	Application of IC Engines	1
3	**Insight into Future Mobility**	1
3	Electric and Hybrid Vehicles	1
3	Components of Electric and Hybrid Vehicles	1
3	Advantages and disadvantages of EVs and Hybrid vehicles.	1
4	**Module 4: Metal Fabrication Process: Introduction**	1
4	**Welding:** Introduction to welding, principle of welding, types of Welding	1
4	**Welding:** Welding terminologies, types of welded joints, advantages, limitations, and applications	1

4	**Soldering:** Introduction to Soldering, Principle of soldering	**1**
4	**Soldering:** Solder and flux, advantages, limitations, and applications	**1**
4	**Brazing:** Introduction to Brazing, Principle of brazing	**1**
4	**Brazing:** Advantages, limitations, and applications	**1**
4	**Laser Welding:** Introduction to Laser Welding, principle of Laser Generation	**1**
4	**Laser Welding:** Laser Welding Mechanisms, advantages, limitations, and applications	**1**
5	**Module 5: Advanced Mechanical Engineering: Introduction**	**1**
5	**Introduction to Mechatronics and Robotics**: Introduction	**1**
5	Open-loop and closed-loop mechatronics systems	**1**
5	Classification based on robotics configuration: polar cylindrical, Cartesian coordinate and spherical, Application, Advantages, and disadvantages.	**1**
5	Automation in industry, Definition, types – fixed, programmable and flexible automation	**1**
5	Basic elements with block diagrams, advantages	**1**
5	**Introduction to IOT**: Definition and Characteristics, Physical design,	**1**
5	Protocols, Logical design of IoT,	**1**
5	Functional blocks, and communication models.	**1**
Total		**45 Hrs**

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**1st**				
Course Title	:	**ELEMENTS OF MECHANICAL ENGINEERING**				
Course Code	:	**BCECM107/207**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Course Category	:	**CEC - 1**				
Stream	:	**ME**		**CIE**	:	**50 Marks**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50 Marks**
Total Hours	:	**45 Hrs T**		**SEE Duration**	:	**3 Hours**
Credits	:	**03**				

Course Learning Objectives: Students will be taught to

Sl.No	Course Objectives
1	Understand the scope of Energy Conversion Systems.
2	Gather knowledge on Manufacturing Technology.
3	Acquire a basic understanding of IC Engines, Power Transmission, Refrigeration and Air Conditioning
4	Accomplish the working principle of Metal Fabrication Processes
5	To provide insights on recent Advancements in Mechanical Engineering

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	**Module 1: Energy Conversion Systems** **Introduction to Mechanical Engineering:** Role of Mechanical Engineering in Industries and Society- Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors. **Steam formation and Boilers:** Introduction, formation of steam, Steam properties, types of steam and applications of steam, Introduction to Boiler, Classifications of Boilers – Fire Tube Boilers and Water Tube Boilers **Turbines and Pumps:** Introduction to Turbines and Pumps, Energy Conversion, Types of Pumps and Turbines, Working Principle and Operation of various Pumps and Turbines, Advantages, Applications	9
Pedagogy	**Demonstration, PPT, Video Lectures**	
2	**Module 2: Manufacturing Technology** **Metal Casting:** Introduction to Metal casting Process, general steps of Metal Casting, advantages, and applications **Machining Processes:** Introduction to Machine tools such as Lathe Machine, Drilling Machine, shaping machine and Milling Machine, working principles and their operations **Metal Forming Processes:** Introduction, Cold working, Hot Working, Classification of Metal forming processes	9
Pedagogy	**Hands on Sessions, Experimental Learning**	
3	**Module 3: IC Engines, Power Transmission, Refrigeration and Air Conditioning** **IC Engines:** Introduction, Working principles of IC Engines, Types of IC Engines, Application of IC Engines **Power Transmission:** Introduction, Overview of Power transmission devices such as Gear Drives, Belt Drives and Chain Drives, their advantages, and applications **Refrigeration and Air Conditioning:** Introduction, Working Principle of Refrigeration and Air Conditioning systems, applications of Refrigeration and Air Conditioning systems	9

Pedagogy	**Demonstration, Video Lectures, Case Studies**	
4	**Module 4: Metal Fabrication Process** **Welding:** Introduction to welding, principle of welding, types of Welding, Welding terminologies, types of welded joints, advantages, limitations, and applications **Soldering:** Introduction to Soldering, Principle of soldering, solder and flux, advantages, limitations, and applications **Brazing:** Introduction to Brazing, Principle of brazing, advantages, limitations, and applications **Laser Welding:** Introduction to Laser Welding, principle of Laser Generation, Laser Welding Mechanisms, advantages, limitations, and applications	**9**
Pedagogy	**Demonstration, Hands on Sessions**	
5	**Module 5: Advancements in Mechanical Engineering** **Advanced Machining Technology:** CNC Machines, Applications of CNC Machining, Laser Machining, applications of Laser Machining **Additive Manufacturing:** Introduction to Additive Manufacturing / 3D printing, advantages, and applications of 3D Printing. **Mechatronics Systems:** Introduction, components of mechatronics system, Classification of mechatronics systems**,** Advantages, and applications. **Robotics Technology:** Introduction to Automation in industries, overview of Robots, types of robots, advantages, and applications of robots in industries, Internet of Things (IoT) for Mechanical Engineering	**9**
Pedagogy	**Hands on Sessions, Experimental Learning, Case Studies**	

Reference Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Elements of Mechanical Engineering, Ashok Kumar M S, Vijaya G, LAP LAMBERT Academic Publishing, 2023
2	Elements of Mechanical Engineering, H.G. Patil, B.Y.Patil, Dream Tech Press, 2020
3	Manufacturing Technology- Foundry, Forming and Welding, P.N.Rao Tata McGraw Hill, Volumen 1, 5th Editon Ed., 2018.
4	Workshop Technology Volume-1 Manufacturing Process, SK Hajra Choudhary, AK Hajra Choudhary, Nirjhar Roy, Media Promoters and Publishers Pvt. Ltd., 2018.
5	Elements of Mechanical Engineering, K R Gopala Krishna, Sudhir Gopalakrishna, Dr.Girish H.N, Subhash Publications, 2019.
6	Robotics, Appu Kuttan KK K. International Pvt Ltd, volume 1, 2007

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

CO	Course Outcomes	RBT Level	Level Indicator
CO1	**Understand** the Essential Concepts of Mechanical Engineering.	L 2	Understand
CO2	**Apply** the Ideas of Mechanical Engineering for Various Applications.	L 3	Apply
CO3	**Analyze** the Working Principles of Various Mechanical Engineering Systems.	L 4	Analyze
CO4	**Evaluate** the Performance Parameters of Various Mechanical Engineering Systems	L 5	Evaluate

Mapping of Course Outcomes to Program Outcomes:

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

Web links and Video Lectures (e-Resources)	
1	https://onlinecourses.nptel.ac.in/noc22_me28/preview
2	https://archive.nptel.ac.in/courses/112/107/112107219/
3	https://nptel.ac.in/courses/112101098
4	https://onlinecourses.nptel.ac.in/noc21_me76/preview
5	https://www.tlv.com/global/TI/steam-theory/principal-applications-for-steam.html
6	https://www.forbesmarshall.com/Knowledge/SteamPedia/About Steam/Fundamental-Applications-of-Steam
7	https://rakhoh.com/en/applications-and-advantages-of-steam-in-manufacturing-and process- industry/)
8	Videos | Makino (For Machine Tool Operation

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 + Practical				**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 including questions from lab component	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.				

4 Credit Course – IPCC	
	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 (IAT):** **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, o 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. o 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 **10 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 and **5 Marks** for conducting Open Ended Experiments. • 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 conduction(Observation Book) and 5 Marks for Record Book. Marks of all experiments' write-ups and conduction are added and scaled to **10 Marks.** • The Practical 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 **10 Marks.** • Open Ended Experiments are conducted after the completion of regular Experiments/Programs for 20 Marks and scaled down to **5 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 IC 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

3 Credit Course – Theory	
	Note: A few of the Courses of 3 Credit are Integrated Course Type, for such courses the method suggested for 4 Credit IPCC shall be followed. **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** scaled down to **25 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	-	-	-	-	-	-
Understand	10	10	10	-	-	-
Apply	20	20	20	-	-	-
Analyse	20	20	20	-	-	-
Evaluate	-	-	-	50	50	-

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	05	05	05	05	10	30	20
CO2	10	10	10	10	20	60	40
CO3	10	10	10	10	20	60	40
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
Total	25	25	25	25	50	150	100

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	-
Understand	30
Apply	35
Analyse	35
Evaluate	-
Develop	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	6	6	6	6	6	30	30
CO2	7	7	7	7	7	35	35
CO3	7	7	7	7	7	35	35
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
Total	20	20	20	20	20	100	100

Course Contents and Lecture Schedule

Module No.	Topics	No. of Lectures
1	**Module 1: Energy Conversion Systems - Introduction**	1
1	Role of Mechanical Engineering in Industries and Society	1
1	Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.	1
1	**Steam formation and Boilers: Introduction**	1
1	Introduction, formation of steam, Steam properties, types of steam and applications of steam	1
1	Introduction to Boiler, Classifications of Boilers – Fire Tube Boilers and Water Tube Boilers	1
1	**Turbines and Pumps: Introduction**	1
1	Energy Conversion, Types of Pumps and Turbines, Working Principle and Operation of various Pumps and Turbines, Advantages, Applications	1
1	Working Principle and Operation of various Pumps and Turbines, Advantages, Applications	1
2	**Module 2: Manufacturing Technology - Introduction**	1
2	**Metal Casting:** Introduction to Metal casting Process	1
2	Advantages, and applications	1
2	**Machining Processes:** Introduction to Lathe Machine, Drilling Machine, Operations	1
2	Introduction to Shaping machine and Milling Machine, Operations	1
2	Introduction to Drilling Machine, Operations	1
2	**Metal Forming Processes:** Introduction	1
2	Introduction to Cold working, Hot Working,	1
2	Classification of Metal forming processes	1
3	**Module 3: IC Engines: Introduction**	1
3	Working principles of IC Engines, Types of IC Engines, Application of IC Engines	1
3	Types of IC Engines, Application of IC Engines	1
3	**Power Transmission:** Introduction, Gear Drives, Applications	1
3	Introduction to Belt Drives and Chain Drives, Applications	1
3	Introduction to Chain Drives, Applications	1
3	**Refrigeration and Air Conditioning:** Introduction	1
3	Working Principle of Refrigeration systems, Applications	1
3	Working Principle of Conditioning systems, Applications	1
4	**Module 4: Metal Fabrication Process: Introduction**	1
4	**Welding:** Introduction to welding, principle of welding, types of Welding	1
4	**Welding:** Welding terminologies, types of welded joints, advantages, limitations, and applications	1

4	**Soldering:** Introduction to Soldering, Principle of soldering	**1**
4	**Soldering:** Solder and flux, advantages, limitations, and applications	**1**
4	**Brazing:** Introduction to Brazing, Principle of brazing	**1**
4	**Brazing:** Advantages, limitations, and applications	**1**
4	**Laser Welding:** Introduction to Laser Welding, principle of Laser Generation	**1**
4	**Laser Welding:** Laser Welding Mechanisms, advantages, limitations, and applications	**1**
5	**Module 5: Advancements in Mechanical Engineering: Introduction**	**1**
5	**Advanced Machining Technology:** CNC Machines, Applications of CNC Machining,	**1**
5	**Advanced Machining Technology:** Laser Machining, applications of Laser Machining	**1**
5	**Additive Manufacturing:** Introduction to Additive Manufacturing / 3D printing	**1**
5	**Additive Manufacturing:** Advantages, and applications of 3D Printing.	**1**
5	**Mechatronics Systems:** Introduction, components of mechatronics system	**1**
5	**Mechatronics Systems:** Classification of mechatronics systems**,** Advantages, and applications.	**1**
5	**Robotics Technology:** Introduction to Automation in industries, overview of Robots, types of robots, advantages, and applications of robots in industries	**1**
5	**Robotics Technology:** Internet of Things (IoT) for Mechanical Engineering	**1**
	Total	**45 Hrs**

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**1st / 2nd**				
Course Title	:	**COMPUTER AIDED ENGINEERING DRAWING**				
Course Code	:	**BESCM102/202**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Course Category	:	**ESC**				
Stream	:	**Common to all Branches**		**CIE**	:	**50 Marks**
Teaching hours/ week (L:T:P:S)	:	**2:0:2:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 Hrs Theory**		**SEE Duration**	:	**03 Hours**
Credits	:	**03**				

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	To understand the basic principles and conventions of engineering drawing
2	To visualize and generate pictorial views of engineering components using CAD software
3	To employ drawing as a communication mode

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	**Introduction to Computer Aided Sketching:** Significance of Engineering drawing, Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. **Orthographic Projections of points, Straight lines:** Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants. Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes (No application problems)	8
Pedagogy	Chalk & Talk Use of Models and Software	
2	**Orthographic Projections of Planes:** Introduction, Definitions – projections of plane surfaces–triangle, square, rectangle, square, pentagon, hexagon and circle, planes in different positions by change of position method using first angle of projection only (No problems on side views)	8
Pedagogy	Chalk & Talk Use of Models and Software	
3	**Projections of Solids (First Angle of Projection only):** Introduction, Definitions – Projections of right regular tetrahedron, cube, prisms, pyramids, cylinders and cones in different positions (No problems on freely suspended solids and combination of solids)	8
Pedagogy	Chalk & Talk Use of Models and Software	
4	**Isometric Projections (Using Isometric Scale Only):** Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, cube, right regular prisms, pyramids, cylinders, cones, spheres, hemispheres and combination of two simple solids	8
Pedagogy	Chalk & Talk Use of Models and Software	
5	**Development of Lateral surfaces:** Development of lateral surfaces of above solids, their frustums and truncations. (No problems on lateral surfaces of trays, tetrahedrons, spheres and transition pieces)	8
Pedagogy	Chalk & Talk Use of Models and Software	

Reference Books

	Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)
1	K. R. Gopalakrishna, & Sudhir Gopalakrishna: Textbook of Computer Aided Engineering Drawing, 39th Edition, Subash Stores, Bangalore, 2017
2	Bhatt, N.D., Engineering Drawing: Plane and Solid Geometry, 53rd edition, Charotar Publishing House Pvt. Limited, 2019.

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

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Apply drafting tools to demonstrate orthographic projections of points, straight lines, and planes	A	L3
CO2	Utilize drafting software to apply orthographic projections of various solids	A	L3
CO3	Implement isometric projections and development of lateral surfaces of solids using software applications	A	L3
CO4	Apply manual sketching techniques to create orthographic projections of planes and solids	A	L3
CO5	Apply manual sketching methods to generate isometric projections and development of lateral surfaces of solids	A	L3

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	https://nptel.ac.in/courses/112104031
2	https://www.mooc-list.com/tags/engineering-drawing
3	https://www.mygreatlearning.com/academy/learn-for-free/courses/engineering-graphics-drawing

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 + Practical				**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	50				
		Internal Assessment Test (IAT) - III	Module – 4 & 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 including questions from lab component	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.				

4 Credit Course – IPCC

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 (IAT):

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 **10 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 and **5 Marks** for conducting Open Ended Experiments. • 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 conduction(Observation Book) and 5 Marks for Record Book. Marks of all experiments' write-ups and conduction are added and scaled to **10 Marks.** • The Practical 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 **10 Marks.** • Open Ended Experiments are conducted after the completion of regular Experiments/Programs for 20 Marks and scaled down to **5 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 IC 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

3 Credit Course – Theory	
	Note: A few of the Courses of 3 Credit are Integrated Course Type, for such courses the method suggested for 4 Credit IPCC shall be followed. **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** scaled down to **25 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	-	-	-	-	-	-
Understand	-	-	-	-	-	-
Apply	50	50	50	50	50	-
Analyse	-	-	-	-	-	-
Evaluate	-	-	-	-	-	-

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	50	50	-	-	-	50	33.33
CO2	-	-	50	-	-	50	33.33
CO3	-	-	-	50	50	50	33.33
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-
Total	50	50	50	50	50	150	100

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (in % Questions)
Remember	--
Understand	--
Apply	100
Analyse	--
Evaluate	--
Create	--
Note: Full marks can be awarded for computer printouts provide student answers all the questions completely	

Scheme of Evaluation for SEE

Question No.	Module	Marks
1	Module 1 or Module 2	**30**
2	Module 3	**40**
3	Module 4 or Module 5	**30**
Note: SEE marks will be reduced to 50 marks		

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	30	30	-	-	-	30	30
CO2	-	-	40	-	-	40	40
CO3	-	-	-	30	30	30	30
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
Total	30	30	40	30	30	100	100

Course Contents and Lecture Schedule

Module No.	Topics	No. of Lectures
1	**Introduction:** Significance of Engineering drawing, Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment.	**2**
1	**Orthographic Projections of Points, Straight Lines:** Introduction to Orthographic projections: Orthographic projections of points in 1st and 3rd quadrants	**2**
1	Orthographic projections of lines (Placed in First quadrant only)	**2**
2	**Orthographic Projections of Planes (First Angle of Projection only):** Understanding Orthographic projections of planes viz triangle, square (Placed in First quadrant only)	**2**
2	Orthographic projections of planes viz rectangle, pentagon (Placed in First quadrant only)	**2**
2	Orthographic projections of planes viz pentagon, hexagon, and circular laminae (Placed in First quadrant only)	**2**
2	Orthographic projections of planes viz pentagon, hexagon, and circular laminae (Placed in First quadrant only)	**2**
3	**Projections of Solids (First Angle of Projection only):** Orthographic projection of right regular solids (Solids Resting on HP only)	**2**
3	Prisms & Pyramids (triangle, square)	**2**
3	Prisms & Pyramids (rectangle, pentagon)	**2**
3	Prisms & Pyramids (hexagon & cylinders)	**2**
3	Cones, Cubes &Tetrahedron.	**2**
3	Development of Solid models –A Group work	**2**
4	**Isometric Projections:** Isometric scale, Isometric projection of hexahedron, right regular prisms	**2**
4	Isometric projection of hexahedron, right regular prisms	**2**

4	Isometric projection of pyramids, cylinders	**2**
4	Isometric projection of cones, spheres and combination of two simple solids	**2**
5	**Development of lateral surfaces:** Development of lateral surfaces of right regular pyramids and cones resting with base on HP only.	**2**
5	Development of their frustums and truncations.	**2**
5	Development of their frustums and truncations.	**2**
Total		**40 Hrs**

Dayananda Sagar Academy of Technology & Management

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Semester	**:**	**1st**				
Course Title	**:**	**Indian Constitution**				
Course Code	**:**	**BICNC107/207**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Theory**				
Course Category	**:**	**HSSC**				
Stream	**:**	**Common to all**		**CIE**	**:**	**50 Marks**
Teaching hours/ week (L:T:P:S)	**:**	**1:0:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**15 Hrs**		**SEE Duration**	**:**	**2 Hours**
Credits	**:**	**01**				

Course Learning Objectives: Students will be taught about the

Sl. No	Course Objectives
1	The basic structure of Indian Constitution.
2	The Fundamental Rights (FR's), DPSP's and Fundamental Duties (FD's) of our constitution.
3	The Union Government, political structure & codes, procedures.
4	The State Executive & Elections system of India.
5	Other important provisions given by the constitution.

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	**Module 1: Introduction to the Indian constitution** Importance of Indian Constitution, drafting of the Constitution, Salient features of India Constitution. Preamble of Indian Constitution, structure of the Indian Constitution	03
Pedagogy	Direct instructional method (Low/Old Technology) Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students	
2	**Module 2: Fundamental Rights and Directive Principles of State Policy** Fundamental Rights (FR's) and its Restriction and limitations, Directive Principles of State Policy (DPSP's) and its present relevance in Indian society, Fundamental Duties and its Scope and significance in Nation	03
Pedagogy	Flipped classrooms (High/advanced Technological tools) Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students	
3	**Module 3: The Union Executive** Union Executive: Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Judicial System of India, Supreme Court of India, Judges of Supreme Court	03
Pedagogy	Blended learning (Combination of Low/Old Technology and High/advanced Technological tools) Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students	
4	**Module 4: The State Executive** State Executive: State Legislature System, State Executive – Governor, Chief Minister, State Cabinet, State Legislature – Vidhana Sabha and Vidhana Parishad, Judicial System of state, High Court of State, Judges of High Court	03
Pedagogy	Enquiry and evaluation-based learning	

	Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students	
5	**Module 5: Elections, Emergency Provisions and Constitutional Amendments** Election Commission of India, Elections & Electoral Process, Emergency Provisions, types of emergencies, effects of emergency, Amendment to Constitution, and Important Constitutional Amendments till today, Special Provisions for certain classes.	**03**
Pedagogy	Personalized learning Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students	

Reference Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	The Indian Constitution: A Ready Reference Textbook as per VTU Syllabus, by Dr. Abhinav, Shashwat Publication, First Edition, 2023.
2	Constitution of India with important Case Laws, MCQs covering Constitutional Aspects of Indian Polity for Students, Competitive/ Civil Services Exams, Legal Fraternity, Practitioners, Legal, by Professionals, Professional Book Publishers,Edition-1 ,2023.
3	Introduction to the Constitution of India, by Durga Das Basu, Lexis Nexis Publication, 24rt Edition, 2019.
4	Constitution of India, Professional Ethics and Human Rights by Shubham Singles, Charles E. Haries, and et al., Cengage India Pvt.Ltd. Publications, Latest Edition, 2019.
5	Constitution of India -For Competitive Exams - Naidhruva Edutech Learning Solutions Publication, Latest Edition, 2022.

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

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Understand and recall the concepts related to the Indian Constitution such as its historical context, key framers, structure, and basic functions.	Understand	L2
CO2	Comprehend the significance and principles underlying Fundamental Rights, Directive Principles of State Policy, and Fundamental Duties within the Indian Constitution	Understand	L2
CO3	Comprehend and grasp the structure and functioning of Union Executive	Understand	L2
CO4	Understand the structure and functioning of State Executive	Understand	L2
CO5	Understand the importance of Election Commission of India, Emergency Provisions, Amendment to Constitution, and Special Provisions under the constitution of India.	Understand	L2

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	--	--	--	--	--	**3**	--	--	--	--	--	**02**	--	--
CO2	--	--	--	--	--	**3**	--	--	--	--	--	**02**	--	--
CO3	--	--	--	--	--	**3**	--	--	--	--	--	**02**	--	--
CO4	--	--	--	--	--	**3**	--	--	--	--	--	**02**	--	--
CO5	--	--	--	--	--	**3**	--	--	--	--	--	**02**	--	--

Weblinks and Video Lectures (e-Resources)	
1	**https://archive.nptel.ac.in/courses/129/106/129106003/**
2	**https://web.iitd.ac.in/~burra/teaching/burra19aud-lectures-contents.pdf**

Assessment Pattern (both CIE and SEE)

Constitution of India / Samskruthika Kannada / Communicative English / Professional writing skills in English/ Innovation Design & Thinking								
1 Credit Courses – 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 (MCQ)	Module - 1 & 2	50	(50+50+50) / 3	**25**	10	Average of Three Internal test each of 50 Marks scale down the marks to 15 Marks
		Internal Assessment Test (IAT) – II (MCQ)	Module - 3 & 4	50				
		Internal Assessment Test (IAT) – III (QUIZ)	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 – (MCQ Type)	Entire syllabus	50	----	50	18	SEE Exam is theory Exam with MCQ type Question Papers of 50 Questions with each question 1 Mark each. Examination duration is 1 Hour
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.

1 Credit Course - Theory	
	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:** Crossword, Maize, Debate, Role Play, Community Service, Mind Map, Concept Map, Case Study, Group Discussions, Ideathon 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 (MCQ) 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 to be conducted after 4th week • CCA2 to be conducted after 9th week. • The evaluation of CCAs includes either through quiz or rubrics 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 50 Marks. The medium of the question paper shall be English. **The duration of SEE is 01 hours.** • The question paper will have 50 MCQs **covering all modules**. The questions shall map with the course outcome, program outcome and Blooms RBT level.

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	50	50	50	50	50	-
Apply	-	-	-	-	-	-
Analyse	-	-	-	-	-	-
Evaluate	-	-	-	-	-	-
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	-	-	-	-	-	-	-
CO2	25	25	25	25	50	150	100
CO3	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-
Total	25	25	25	25	50	150	100

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	--
Understand	50
Apply	--
Analyse	--
Evaluate	--
Create	--

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	10	--	--	--	--	10	20%
CO2	--	10	--	--	--	10	20%
CO3	--	--	10	--	--	10	20%
CO4	--	--	--	10	--	10	20%
CO5	--	--	--	--	10	10	20%
Total	10	10	10	10	10	50	100%

Course Contents and Lecture Schedule

Module No.	Topics	No. of Lectures
1	**Module 1: Introduction to the Indian constitution** Introduction to the Indian constitution, importance of Indian Constitution	1
1	Drafting of the Constitution, Salient features of India Constitution	1
1	Preamble of Indian Constitution, structure of the Indian Constitution	1
2	**Module 2: Fundamental Rights and Directive Principles of State Policy** Fundamental Rights (FR's) and its Restriction and limitations,	1
2	Directive Principles of State Policy (DPSP's) and its present relevance in Indian society	1
2	Fundamental Duties and its Scope and significance in Nation	1
3	**Module 3: The Union Executive** Union Executive: Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet	1
3	Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies	1
3	Judicial System of India, Supreme Court of India, Judges of Supreme Court	1
4	**Module 4: The State Executive** State Executive: State Legislature System, State Executive – Governor, Chief Minister, State Cabinet	1
4	State Legislature – Vidhana Sabha and Vidhana Parishad	1
4	Judicial System of state, High Court of State, Judges of High Court	1
5	**Module 5: Elections, Emergency Provisions and Constitutional Amendments** Election Commission of India, Elections & Electoral Process	1
5	Emergency Provisions, types of emergencies, effects of emergency	1
5	Amendment to Constitution, and Important Constitutional Amendments till today, Special Provisions for certain classes.	1
	Total	**15 Hrs**

Dayananda Sagar Academy of Technology & Management

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Semester	:	**II**				
Course Title	:	**Engineering Mathematics – II for ME & CE Stream**				
Course Code	:	**BMATM/V201**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Course Category	:	**ASC**				
Stream	:	**ME & CE**		**CIE**	:	**50 Marks**
Teaching hour/week (L: T:P:S)	:	**3:2:0:0**		**SEE**	:	**50 Marks**
Total Hours	:	**50 Hrs**		**SEE Duration**	:	**3 Hours**
Credits	:	**4**				

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	Acquire basic knowledge of mathematical concepts for understanding engineering problems
2	Use concepts of Differential equations and Laplace Transforms in solving problems
3	Analyze problems using concepts of Differential equations and Laplace Transforms
4	Use MATLAB to obtain solutions of various mathematical problems

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
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COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	**Ordinary Differential Equations of first order:** Linear differential equation, exact differential equation, reducible to exact differential equation, Newton's law of cooling, LR circuits, flow problems.	10
Pedagogy	**Chalk and board, group discussion, ppt, videos**	
2	**Ordinary Differential Equations of second and higher order:** Second and higher order differential equations, inverse differential operator, Cauchy's differential equations, method of variation of parameters, LCR circuits, Vibration problems.	10
Pedagogy	**Chalk and board, group discussion, ppt, videos**	
3	**Numerical solution of Ordinary Differential Equations:** Taylor's series method, Runge-Kutta method of fourth order, Milne's predictor and corrector method, Milne's predictor and corrector method for second order ODE.	10
Pedagogy	**Chalk and board, group discussion, ppt, videos**	
4	**Partial differential equations:** Formation of partial differential equation by eliminating arbitrary constants, solution of PDE by direct method, numerical solution of Laplace equation using standard five-point formula, numerical solution of heat equation by Schmidt explicit formula, numerical solution of the wave equation.	10
Pedagogy	**Chalk and board, group discussion, ppt, videos**	
5	**Laplace transform and Inverse Laplace transform:** Definition, transforms of elementary functions, properties of Laplace transform- Laplace transform of $e^{at} f(t)$, $t f(t)$, $f(t)/t$, inverse Laplace transform using partial fractions, convolution theorem, solution of linear differential equations using Laplace transform.	10
Pedagogy	**Chalk and board, group discussion, ppt, videos**	

List of Experiments or Programs

Sl.No	Experiments/Programs	COs
	NIL	

Text Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Differential Equations, Richard Bronson, Gabriel B Costa, Schaum's outline series, McGraw Hill Publications, 3rd Edition
2	Numerical Methods, M. K. Jain, S. R. K. Iyengar, R. K. Jain, New Age Publications, 6th Edition
3	Higher Engineering Mathematics, B. S. Grewal, Khanna Publications, 44th Edition, 2022.

Reference Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Advanced Engineering Mathematics, Erwin Kreyzig, Wiley Publications, 10th Edition
2	Advanced mathematics for Engineers and Scientists, Murray R Spiegel, Schaum's outline series, McGraw Hill publications.
3	Higher Engineering Mathematics, H. K. Dass and Er. Rajnish Verma, S. Chand Publication, 3rd Edition

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

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Understand the basic concepts of differential equations and Laplace transforms	**Understand**	**L2**
CO2	Apply techniques of differential equations and Laplace transforms to solve engineering problems	**Apply**	**L3**
CO3	Analyze engineering problems using differential equations and Laplace transforms	**Analyse**	**L4**
CO4	Develop mathematical solutions to various real time problems using MATLAB.	**Evaluate**	**L5**

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3													
CO3		1												
CO4			2		2				1	1				

Weblinks and Video Lectures (e-Resources)	
1	https://archive.nptel.ac.in/courses/111/106/111106100/
2	https://nptel.ac.in/courses/111106101
3	https://archive.nptel.ac.in/courses/111/106/111106139/

Assessment Pattern (both CIE and SEE)

Applied Science Courses								
3 credits - Theory								
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 & 3(half module)	50	(50+50) / 2	**25**	10	Average of Two Internal test each of 50 Marks scale down the marks to 25 Marks
		Internal Assessment Test (IAT) - II	Module - 3(half module), 4 & 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 including questions from lab component	100	----	50	20	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.				

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 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 IC shall be **25 Marks** and for the laboratory component **25 Marks**.

CIE for the theory component of the IC
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

Two Tests each of **50 Marks** scaled down to **25 Marks**

- First test after 7th week of the semester (syllabus completion of 50%)
- Second test after 14th week of semester (syllabus completion of 100%)

The average score of two tests 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**

CIE for the practical component of the IC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and Marks shall be awarded on the same day. The **10 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 and **5 Marks** for conducting Open Ended Experiments.
- 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 conduction(Observation Book) and 5 Marks for Record Book. Marks of all experiments' write-ups and conduction are added and scaled to **10 Marks.**
- The Practical 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 **10 Marks.**
- Open Ended Experiments are conducted after the completion of regular Experiments/Programs for 20 Marks and scaled down to **5 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 IC 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 (**duration 03 hours)**
- 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 should 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	CCA-1	CCA-2	
	50 Marks	50 Marks	50 Marks	50 Marks	50 Marks
Remember			30		
Understand	10	10	20		
Apply	30	30			
Analyse	10	10			
Evaluate				50	
Create					

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module-3	Module-3	Module-4	Module-5		
CO1	5	5	5		5	5	25	25%
CO2	10	10	5	5	10	10	50	50%
CO3	5	5		5	5	5	25	25%
CO4								
CO5								
CO6								
Total	20	20	10	10	20	20	100	

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	
Understand	5
Apply	35
Analyse	10
Evaluate	
Create	

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	5					5	10%
CO2	5	5	10	5	10	35	70%
CO3		5			5	10	20%
CO4							
CO5							
CO6							
Total	10	10	10	10	10	50	

Course Contents and Lecture Schedule

Module No.	Topics	No. of Lectures
1	Linear differential equations of first order and first degree	1
1	Problems continued on the above	1
1	Exact equations	1
1	Problems continued on the above	1
1	Equations reducible to exact	1
1	Problems continued on the above	1
1	Newton's law of cooling and problems	1
1	Problems continued on the above	1
1	LR Circuits	1
1	Flow problems	1
2	Second and higher order differential equations	1
2	Homogeneous differential equations	1
2	Problems continued on the above	1
2	Inverse differential operator, three types	1

2	Problems continued on type-I	**1**
2	Problems continued on type-II	**1**
2	Problems continued on type-III	**1**
2	Cauchy's differential equation and problems	**1**
2	LCR Circuit	**1**
2	Vibration problems	**1**
3	Numerical solution of ODE by Taylor's series method	**1**
3	Problems continued on the above	**1**
3	Problems continued on the above	**1**
3	Runge-Kutta method of fourth order	**1**
3	Problems continued on the above	**1**
3	Problems continued on the above	**1**
3	Milne's predictor and corrector method	**1**
3	Problems continued on the above	**1**
3	Milne's predictor and corrector method of second order	**1**
3	Problems continued on the above	**1**
4	Method of elimination of arbitrary constants	**1**
4	Solution of PDE by direct integration	**1**
4	Problems continued on the above	**1**
4	Solution of one-dimensional heat equation	**1**
4	Solution of one-dimensional wave equation	**1**
4	Numerical solution of Laplace equation	**1**
4	Numerical solution of heat equation	**1**
4	Problems continued on the above	**1**
4	Numerical solution of wave equation	**1**
4	Problems continued on the above	**1**
5	Introduction and definition of Laplace transform	**1**
5	Laplace transform of some standard functions	**1**
5	Basic properties of Laplace transforms	**1**
5	Problems on the above	**1**
5	Inverse Laplace transforms	**1**
5	Inverse Laplace Transforms by Partial fractions	**1**
5	Problems on the above	**1**
5	Convolution theorem	**1**
5	Solution of LDE using Laplace transform	**1**
5	Problems on the above	**1**
		50 hrs

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**I**				
Course Title	:	**Engineering Mathematics – I for ME & CE Stream**				
Course Code	:	**BMATM/V101**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Course Category	:	**ASC**				
Stream	:	**ME & CE**		**CIE**	:	**50 Marks**
Teaching hour/week (L: T:P:S)	:	**3:2:0:0**		**SEE**	:	**50 Marks**
Total Hours	:	**50 Hrs**		**SEE Duration**	:	**3 Hours**
Credits	:	**4**				

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	Acquire basic knowledge of mathematical concepts for understanding engineering problems
2	Use concepts of Calculus, Linear Algebra and Numerical methods in solving problems
3	Analyze problems using concepts of Calculus, Linear Algebra and Numerical methods
4	Use MATLAB to obtain solutions of various mathematical problems

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	**Linear Algebra** Elementary transformations on a matrix, echelon form & rank of a matrix, Gauss elimination, eigen values and eigen vectors of a matrix, Rayleigh power method, application of linear algebra to balance chemical equations.	10
Pedagogy	**Chalk and board, group discussion, ppt, videos**	
2	**Numerical methods** Solution of equations - Newton-Raphson method, finite differences, interpolation/ extrapolation using Newton's forward and backward difference formulae, Newton's divided difference, numerical integration- Simpson's one-third rule and Simpson's three-eighth rule and application problems.	10
Pedagogy	**Chalk and board, group discussion, ppt, videos**	
3	**Polar curves** Cartesian and polar coordinates, polar curves, angle between polar curves, pedal equations, radius of curvature in cartesian and polar form.	10
Pedagogy	**Chalk and board, group discussion, ppt, videos**	
4	**Partial differentiation** Partial derivatives, total derivatives-differentiation of composite functions, Jacobians, application: maxima and minima for a function two variables.	10
Pedagogy	**Chalk and board, group discussion, ppt, videos**	
5	**Vector Calculus** Derivative of a vector, scalar and vector fields, gradient, directional derivative, curl and divergence-physical interpretation, solenoidal and irrotational vector fields, application: velocity and acceleration of a moving particle.	10
Pedagogy	**Chalk and board, group discussion, ppt, videos**	

List of Experiments or Programs

Sl.No	Experiments/Programs	COs
	NIL	

Text Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Linear Algebra, Seymour Lipschutz, Marc Lipson, Schaum's Outlines, Mc Graw Hill Publications, 4th Edition
2	Numerical Methods, M. K. Jain, S. R. K. Iyengar, R. K. Jain, New Age Publications, 6th Edition
3	Theory and problems of Differential and integral calculus, Frank Ayres and Elliott Mendelson, Schaum's outline series, McGraw Hill publications, 3rd Edition
4	Higher Engineering Mathematics, B. S. Grewal, Khanna Publications, 44th Edition

Reference Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Advanced Engineering Mathematics, Erwin Kreyzig, Wiley Publications, 10th Edition.
2	Advanced mathematics for Engineers and Scientists, Murray R Spiegel, Schaum's outline series, McGraw Hill publications.
3	Higher Engineering Mathematics, H. K. Dass and Er. Rajnish Verma, S. Chand Publication, 3rd Edition.

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

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Understand the basic concepts of calculus, Linear Algebra and Numerical methods	**Understand**	**L2**
CO2	Apply techniques of Calculus, Linear Algebra and Numerical methods to solve Engineering Problems	**Apply**	**L3**
CO3	Analyze Engineering problems using Calculus, Linear Algebra and Numerical methods	**Analyse**	**L4**
CO4	Develop mathematical solutions to various real time problems using MATLAB	**Evaluate**	**L5**

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3													
CO3		1												
CO4			2		2				1	1				

Weblinks and Video Lectures (e-Resources)	
1	https://nptel.ac.in/courses/111105122
2	https://nptel.ac.in/courses/111103021
3	https://nptel.ac.in/courses/111106101

Assessment Pattern (both CIE and SEE)

Applied Science Courses								
4 credits - Theory								
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 & 3(half module)	50	(50+50) / 2	**25**	10	Average of Two Internal test each of 50 Marks scale down the marks to 25 Marks
		Internal Assessment Test (IAT) - II	Module - 3(half module), 4 & 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 including questions from lab component	100	----	50	20	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.				

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 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 IC shall be **25 Marks** and for the laboratory component **25 Marks**.

CIE for the theory component of the IC
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

Two Tests each of **50 Marks** scaled down to **25 Marks**

- First test after 7th week of the semester (syllabus completion of 50%)
- Second test after 14th week of semester (syllabus completion of 100%)

The average score of two tests 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**

CIE for the practical component of the IC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and Marks shall be awarded on the same day. The **10 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 and **5 Marks** for conducting Open Ended Experiments.
- 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 conduction(Observation Book) and 5 Marks for Record Book. Marks of all experiments' write-ups and conduction are added and scaled to **10 Marks.**
- The Practical 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 **10 Marks.**
- Open Ended Experiments are conducted after the completion of regular Experiments/Programs for 20 Marks and scaled down to **5 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 IC 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 (**duration 03 hours)**
- 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 should 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	CCA-1	CCA-2	
	50 Marks	50 Marks	50 Marks	50 Marks	50 Marks
Remember			30		
Understand	10	10	20		
Apply	30	30			
Analyse	10	10			
Evaluate				50	
Create					

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module-3	Module-3	Module-4	Module-5		
CO1	5	5	5		5	5	25	25%
CO2	10	10	5	5	10	10	50	50%
CO3	5	5		5	5	5	25	25%
CO4								
CO5								
CO6								
Total	20	20	10	10	20	20	100	

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	
Understand	5
Apply	35
Analyse	10
Evaluate	
Create	

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	5					5	10%
CO2	5	5	10	5	10	35	70%
CO3		5			5	10	20%
CO4							
CO5							
CO6							
Total	10	10	10	10	10	50	

Course Contents and Lecture Schedule

Module No.	Topics	No. of Lectures
1	Elementary transformations on a matrix	1
1	Echelon form of a matrix	1
1	Rank of a matrix	1
1	Gauss – elimination method to solve system of linear equations	1
1	Problems continued on the above	1
1	Eigen values and eigen vectors of a matrix	1
1	Problems continued on the above	1
1	Problems continued on the above	1
1	Rayleigh power method to determine the dominant eigen value of a matrix	1
1	Problems continued on the above	1
2	Introduction, Numerical solution of algebraic and transcendental equations	1
2	Newton - Raphson method and problems	1
2	Problems continued on the above	1
2	Finite differences	1

2	Interpolation: Newton's forward and backward interpolation formulae	**1**
2	Problems continued on the above	**1**
2	Newton's divided difference formula	**1**
2	Problems continued on the above	**1**
2	Numerical integration: Simpson's one-third, three-eighth	**1**
2	Problems on the above rules	**1**
3	Cartesian and Polar coordinates	**1**
3	Polar Curves	**1**
3	Angle between two curves	**1**
3	Problems continued on the above	**1**
3	Pedal equations	**1**
3	Problems continued on the above	**1**
3	Radius of curvature in cartesian form	**1**
3	Problems continued on the above	**1**
3	Radius of curvature in polar form	**1**
3	Problems continued on the above	**1**
4	Partial derivatives- Definition and problems	**1**
4	Problems continued on above	**1**
4	Total Derivatives- problems	**1**
4	Partial Differentiation of Composite functions	**1**
4	Problems continued on above	**1**
4	Jacobians – Definition and problems	**1**
4	Problems continued on above	**1**
4	Maxima and Minima for a function of two variables	**1**
4	Problems continued on above	**1**
4	Problems continued on above	**1**
5	Scalar and vector fields	**1**
5	Gradient of a scalar and problems	**1**
5	Problems continued on above	**1**
5	Directional derivative and problems	**1**
5	Problems continued on above	**1**
5	Curl and divergence; physical interpretation	**1**
5	Problems continued on above	**1**
5	Solenoidal and irrotational vectors	**1**
5	Problems continued on above	**1**
5	Problems continued on above	**1**
		50 hrs