	Design Thinking		Semester	4
	Course Code	**BVM401**	CIE Marks	100
	Teaching Hours/Week (L: T:P:S)	1:0:0:2	SEE Marks	0
	Total Hours of Pedagogy	25 (each module 05 hours)	Total Marks	100
	Credits	02	Exam Hours	03 Hours
	Examination type (SEE)	**Theory**		

Course Learning Objectives:

CL01: To explain the concept of design thinking for product and service development
CL02: To explain the fundamental concept of innovation and design thinking
CL03: To discuss the methods of implementing design thinking in the real world.
CL04: Understand the core principles and philosophy of Design Thinking.
CL05: Develop a human-centred approach to problem-solving and innovation.
CL06: Apply the Design Thinking process to identify and address complex challenges.

Teaching-Learning Process (General Instructions)

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

1. Lecturer 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 concepts
3. Encourage collaborative (Group Learning) Learning in the class
4. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develops 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.

Module-1

PROCESS OF DESIGN

Understanding Design thinking

Shared model in team-based design – Theory and practice in Design thinking – Explore presentation signers across the globe – MVP or Prototyping

Teaching-Learning Process	Introduction about the design thinking: Chalk and Talk method Theory and practice through presentation MVP and Prototyping through live examples and videos

Module-2

	Tools for Design Thinking Real-time design interaction capture and analysis – Enabling efficient collaboration in digital space – Empathy for design – Collaboration in distributed Design	
	Teaching-Learning Process	Case studies on design thinking for real-time interaction and analysis
	Module-3	
	Design Thinking in IT Design Thinking to Business Process Modelling – Agile in Virtual Collaboration Environment – Scenario based Prototyping	
	Teaching-Learning Process	Case studies on design thinking and business acceptance of the design Simulation on the role of virtual eco-system for collaborated prototyping
	Module-4	
	DT For strategic innovations Growth – Storytelling representation – Strategic Foresight - Change – Sense Making – Maintenance Relevance – Value redefinition - Extreme Competition – Experience Design - Standardization–Humanization - Creative Culture – Rapid prototyping, Strategy and Organization – Business Model design.	
	Teaching-Learning Process	Business model examples of successful designs Presentation by the students on the success of the design Live project on design thinking in a group of 4 students
	Module-5	
	Design thinking workshop Design Thinking Workshop Empathize, Design, Ideate, Prototype and Test	
	Teaching-Learning Process	8 hours design thinking workshop from the expect and then a presentation by the student on the learning from the workshop

Course outcome (Course Skill Set)

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

CO 1: Appreciate various design process procedures
CO 2: Generate and develop design ideas through a different technique
CO 3: Identify the significance of reverse Engineering in understanding products
CO 4: Acquire knowledge of various design thinking tools and techniques.
CO 5: Students will be able to apply design thinking to simple problems, conduct basic user research, and create low-fidelity prototypes.
CO 6: Students will be able to lead design thinking projects, conduct in-depth user research, and create high-fidelity prototypes.

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) and for the SEE minimum passing mark is 35% of the maximum marks(18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation: 100 Marks

1. The examination will be conducted by two internal examiners.
2. Upon completing the task, the Process Journals (thought process, challenges, and learnings throughout the design process) must be submitted. This Journals shall be evaluated for 30 marks
3. Student has to Presenttheir individual ideas or concepts or prototype, This presentation shall be evaluated 50 marks.
4. The two examiners will ask a few viva questions to assess the student's understanding of the process. Marks shall be out of 20.

The sum of marks Journals and prototype and viva marks is actual score of the candidate.

Semester-End Examination:

- SEE is not applicable

Web links and Video Lectures (e-Resources):

www.tutor2u.net/business/presentations/. /productlifecycle/default.html
https://docs.oracle.com/cd/E11108_02/otn/pdf/. /E11087_01.pdf
www.bizfilings.com › Home › Marketing › Product Developmen
https://www.mindtools.com/brainstm.html
https://www.quicksprout.com/. /how-to-reverse-engineer-your-competit
www.vertabelo.com/blog/documentation/reverse-engineering
https://support.microsoft.com/en-us/kb/273814
https://support.google.com/docs/answer/179740?hl=en
https://www.youtube.com/watch?v=2mjSDIBaUlM
thevirtualinstructor.com/foreshortening.html
https://dschool.stanford.edu/.../designresources/.../ModeGuideBOOTCAMP2010L.pdf
https://dschool.stanford.edu/use-our-methods/ 6. https://www.interactiondesign.
org/literature/article/5-stages-in-the-design-thinking-process 7.
http://www.creativityatwork.com/design-thinking-strategy-for-innovation/ 49 8.
https://www.nngroup.com/articles/design-thinking/ 9.
https://designthinkingforeducators.com/design-thinking/ 10.
www.designthinkingformobility.org/wp-content/.../10/NapkinPitch_Worksheet.pdf

Suggested Learning Resources:

Books

1. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press , 2009.
2. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011

Activity Based Learning (Suggested Activities in Class)/ Practical Based Learning

- http://dschool.stanford.edu/dgift/
- Contents-related activities (Activity-based discussions)
- For active participation of students instruct the students to prepare Flowcharts.
- Organising group-wise discussions on topics.
- Quizzes and Discussions, Seminars and assignments.

	Soft Skills Development		Semester	4
	Course Code	**BVM402**	CIE Marks	100
	Teaching Hours/Week (L:T:P:S)	1:0:0:0	SEE Marks	0
	Total Hours of Pedagogy	12 hours (2.5 hours per module)	Total Marks	100
	Credits	01	Exam Hours	01 Hours
	Examination type (SEE)	**Theory**		

Course Learning Objectives:

CLO1: Develop personal and professional effectiveness
CLO2: Increase self-awareness and emotional intelligence.
CLO3: Enhance time management and organizational skills.
CLO4: Build resilience and adaptability.
CLO5: Develop critical thinking and problem-solving abilities.
CLO6: Foster a positive attitude and work ethic.
CLO7: Master public speaking and presentation skills.
CLO8: Build strong relationships and networks.
CLO9: Develop conflict resolution and negotiation skills.
CLO10: Enhance professional etiquette and business communication.
CLO11: Build confidence and assertiveness.
CLO12: Deliver effective presentations to diverse audiences.
CLO13: Conduct successful meetings and facilitate group discussions.

Module-1

Interpersonal Skills

- Building relationships
  - Networking
  - Empathy
  - Conflict resolution
  - Negotiation
- Teamwork
  - Collaboration
  - Team roles
  - Team dynamics

Module-2

Problem-Solving and Decision Making

- Problem identification and analysis
- Creative thinking
- Decision-making techniques
- Critical thinking

Module-3

Professional Ethics and Etiquette

- Ethical behaviour
- Workplace ethics
- Business ethics
- Professional etiquette
- Business etiquette
- Social etiquette

Module-4

Leadership and Management Development

- **Strategic Leadership:**
  - Visionary leadership and organizational change
  - Developing a strategic mindset
  - Coaching and mentoring skills
- **Emotional Intelligence and Resilience:**
  - Building emotional intelligence for leadership
  - Developing resilience and adaptability
  - Managing stress and burnout
- **Team Building and Collaboration:**
  - High-performance team dynamics
  - Conflict resolution and mediation
  - Building trust and collaboration

Module-5

Problem-Solving and Decision Making

- **Critical Thinking and Analysis:**
  - Advanced problem-solving techniques
  - Decision-making frameworks
  - Risk assessment and mitigation
- **Innovation and Creativity:**
  - Fostering a culture of innovation
  - Design thinking and problem-solving
  - Generating creative solutions

Course outcome (Course Skill Set)

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

CO 1: Developed leadership abilities: Ability to inspire, motivate, and guide teams towards achieving common goals.
CO 2: Improved problem-solving and decision-making: Critical thinking skills to analyse complex situations and make informed choices.
CO 3: Stronger interpersonal skills: Building and maintaining positive relationships with colleagues, clients, and stakeholders.
CO 4: Increased emotional intelligence: Understanding and managing emotions effectively for

personal and professional growth.

CO 5: Effective negotiation and conflict resolution: Resolving disputes and reaching mutually beneficial agreements.

CO 6: Advanced presentation skills: Delivering compelling and persuasive presentations to diverse audiences.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for the Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE, the minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation: 100 Marks

1. Two assignments tests;
2. First assignment after 30% completion of the syllabus for 50 marks
3. Second assignment after completion of 70% of the syllabus for 50 marks
4. The test after completion of 100% syllabus is conducted for 100 marks.
   Two questions are to be set for each module, there are 10 questions with 20 marks each. Each question may or may not have a sub-question. The students have to answer for 100 marks(05 full questions).
5. The sum of the two assignments is scaled down to 50.
6. The marks scored in the test shall be scaled down to 50.
7. The final marks of the course/subject is the sum of the Assignment marks and test marks

(Teacher may conduct the quiz or presentation or other suitable method of assignment in place of two or one assignment mentioned)

Semester-End Examination:

SEE is Not Applicable

Web links and Video Lectures (e-Resources):

https://archive.nptel.ac.in/courses/109/104/109104107/

Suggested Learning Resources:
Books

1. Soft Skills by Ajay R. Tengse,
2. Negotiation: Getting to Yes, Beyond Reason
3. Conflict Resolution: The Art of Conflict Resolution
4. Change Management: Leading Change
5. Time Management: Eat That Frog!

Activity-Based Learning (Suggested Activities in Class)/Practical-Based learning

- Contents-related activities (Activity-based discussions)
- For active participation of students instruct the students to prepare Flowcharts.
- Organising group-wise discussions on topics.
- Quizzes and Discussions, Seminars and assignments.

	Automotive Electronics & Hybrid Vehicles		Semester	4
	Course Code	**BVM403**	CIE Marks	50
	Teaching Hours/Week (L: T:P:S)	2:0:0:2	SEE Marks	50
	Total Hours of Pedagogy	40 (each module 08 hours)	Total Marks	100
	Credits	03	Exam Hours	03 Hours
	Examination type (SEE)	**Theory**		

Course Learning Objectives:

CLO1: Understand the fundamentals of automotive electronics
CLO2: Understand environmental impact
CLO3: Explain the principles of operation of various automotive electronic components and systems.
CLO4: Analyse the performance of hybrid electric vehicles under different driving conditions.
CLO5: Perform battery maintenance and replacement procedures.
CLO6: Calibrate and program automotive electronic control units.

Module-1

Automotive Electronics
Introduction to Automotive Electronics:

- Overview of automotive electrical systems
- Basic components (resistors, capacitors, inductors, diodes, transistors)
- Semiconductor devices (power transistors, MOSFETs, IGBTs)

Sensors and actuators

- Automotive Sensors and Actuators:
- Types of sensors (temperature, pressure, speed, position, etc.)
- Sensor characteristics and calibration
- Actuator types (solenoids, motors, valves)
- Sensor and actuator interfacing with electronic control units (ECUs)

Module-2

Automotive Electrical Systems:

- Charging systems (alternators, voltage regulators)
- Starting systems (starter motors, relays)
- Lighting systems (headlights, taillights, indicators)
- Wiring harnesses and connectors

Engine Management Systems:

- Engine control unit (ECU) architecture
- Fuel injection systems (multi-point, direct injection)
- Ignition systems (electronic ignition, coil-on-plug)
- Exhaust gas recirculation (EGR)
- Emissions control systems (catalysts, oxygen sensors)

Module-3

Hybrid Vehicles

- **Introduction to Hybrid Vehicles:**
  - Types of hybrid vehicles (series, parallel, plug-in)
  - Advantages and disadvantages of hybrid vehicles
  - Environmental impact
- **Electric Vehicle Components:**
  - Electric motors and generators
  - Power electronics (inverters, converters)
  - Battery technology (lithium-ion, nickel-metal hydride)
  - Charging systems

Module-4

Hybrid Vehicle Powertrain:

- Hybrid vehicle architecture
- Energy management strategies
- Power flow control
- Drivetrain components (transmission, differentials)

Hybrid Vehicle Control Systems:

- Hybrid control strategies
- ECU integration
- Vehicle dynamics control

Module-5

Future Trends in Hybrid and Electric Vehicles:

- Fuel cell technology
- Autonomous vehicles
- Vehicle-to-grid (V2G) technology

Course outcome (Course Skill Set)

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

CO 1: Understand the fundamentals of automotive electronics: Grasp the basic principles of electronic components, circuits, and systems used in vehicles.
CO 2: Acquire knowledge of hybrid vehicle technology: Develop a comprehensive understanding of hybrid vehicle architectures, components, and operation.
CO 3: Electric vehicle components and systems: Gain in-depth knowledge of electric motors, power electronics, and battery management systems.
CO 4: Automotive sensors and actuators: Learn about various sensors and actuators used in vehicle systems.
CO 5: Hybrid vehicle powertrain modelling and simulation: Develop models of hybrid powertrains for performance analysis and optimization.
CO 6: Energy management strategies for hybrid vehicles: Design and implement strategies for optimizing energy consumption in hybrid vehicles.

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) and for the SEE minimum passing mark is 35% of the maximum marks(18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation: 50 Marks

1. Two assignments tests;
2. First assignment after 30% completion of the syllabus for 50 marks
3. Second assignment after completion of 70% of the syllabus for 50 marks(May be quiz or other method of assignments)
4. The test after completion of 90 % syllabus is conducted for 100 marks.
5. The sum of the two assignments is scaled down to 25.
6. The marks scored in the test shall be scaled down to 25.
7. The final marks of the course/subject is the sum of the Assignment marks and test marks
   (The class teacher may conduct the quiz/presentations/other suitable methods of assignment in place of two or one test)

Semester-End Examination: 50 Marks

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub-questions) from each module.

• Each full question will have sub- question covering all the topics under a module.
• The students will have to answer five full questions, selecting one full question from each module.
Marks scored will be scaled down to 50 marks

Web links and Video Lectures (e-Resources):

https://archive.nptel.ac.in/courses/108/103/108103009/

https://archive.nptel.ac.in/courses/107/106/107106088/

Suggested Learning Resources:
Books

1. Mechatronics: Electronics in Automotive Engineering by Konrad Reif
2. Hybrid Electric Vehicles: Principles and Applications by Mehrdad Ehsani, Yimin Gao, Amir Emadi, and Ali Dougal

Activity-Based Learning (Suggested Activities in Class)/Practical-Based learning

- Simulations and Virtual Labs

	Natural Positive Energy for Wellness		Semester	4
	Course Code	**BVM404**	CIE Marks	100
	Teaching Hours/Week (L: T:P:S)	1:0:0:0	SEE Marks	0
	Total Hours of Pedagogy	12 hours (2.5 hours per module)	Total Marks	100
	Credits	01	Exam Hours	01 Hours
	Examination type (SEE)	**Theory**		

Course Learning Objectives:

CLO1: Define and explain the concept of natural positive energy and its impact on overall wellness.
CLO2: Identify various sources of natural positive energy (e.g., nature, relationships, gratitude, physical activity).
CLO3: Understand the relationship between positive emotions, stress reduction, and improved health.
CLO4: Explore the role of mindfulness and meditation in cultivating positive energy.
CLO5: Develop effective techniques for managing stress and negative emotions.
CLO6: Practice mindfulness and relaxation practices to enhance energy levels.
CLO7: Develop better attention, focus, memory, problem-solving, and decision-making abilities.
CLO8: Improve behaviour, reduce impulsivity, and enhance emotional regulation.
CLO9: Support better learning, comprehension, and academic achievement.
CLO10: Build strong social connections and support systems.
CLO11: Incorporate healthy lifestyle habits (e.g., nutrition, sleep, exercise) to boost energy.
CLO12: Set realistic goals and develop action plans for personal growth.
CLO13: Apply learned techniques to improve personal energy levels and well-being.
CLO14: Demonstrate increased resilience to challenges and setbacks.
CLO15: Evaluate the impact of positive energy on various aspects of life (e.g., relationships, work, academics).
CLO16: Communicate effectively about the importance of natural positive energy to others.

Module-1

Learning made easy with Positive Energy:

1. **Breathwork for Well-being**
   - Understanding Breath
   - Basic Breathing Techniques
   - Breathing for Relaxation and Stress Management
   - Breathing for Performance and Energy
   - Breathing for Healing and Well-being

2. **a. Brain Balance Techniques**

- **Relaxation Techniques:**
  - Deep breathing exercises
  - Progressive muscle relaxation
  - Meditation and mindfulness
  - Visualization and guided imagery
- **Physical Exercise and Brain Health:**
  - The benefits of physical activity for brain health
  - Incorporating exercise into daily routine

b. Affirmations for Brain Balance

- **Creating Effective Affirmations:**
  - The art of writing powerful affirmations
  - Identifying limiting beliefs and transforming them into affirmations
- **Affirmation Practices:**
  - Daily affirmation routines
  - Affirmation journaling
  - Affirmation meditation
- **Affirmations for Specific Areas of Life:**
  - Affirmations for stress management
  - Affirmations for self-esteem
  - Affirmations for focus and concentration
  - Affirmations for emotional balance

c. Memory and Intelligence Through the Lens of the Ajna Chakra

- **Memory and the Ajna Chakra:**
  - The mind-body connection in memory
  - The role of intuition and insight in memory recall
  - Meditation and mindfulness for memory enhancement
  - Visualization techniques for improving memory
- **Intelligence and the Ajna Chakra:**
  - Higher intelligence and the Ajna Chakra
  - Developing intuition and wisdom
  - Creativity and innovation through the Ajna Chakra
  - Spiritual intelligence

Module-2

I. Cutting Unwanted Thought Forms

1. Understanding Thought Forms
2. Identifying Unwanted Thought Forms
3. Tools for Transformation
   - Meditation and mindfulness practices
   - Affirmations and positive visualization
   - Energy healing techniques
   - Forgiveness and letting go
4. Creating New Thought Patterns
   - Cultivating gratitude and abundance mindset
   - Building self-esteem and self-love
   - Empowering beliefs and affirmations

II. White Light Protection and Aura Cleansing

1: Introduction to Energy and Auras

- The concept of energy and its role in human life
- Understanding the aura: its layers and functions
- The importance of energy balance and protection

2: Identifying Energy Imbalances

- Common signs of energy imbalance
- Techniques for energy assessment
- The impact of emotions on energy

3: Grounding and Centering

- The importance of grounding
- Grounding techniques (e.g., visualization, physical grounding)
- Cantering exercises for energy balance

4: White Light Protection

- The concept of white light
- Visualizing and creating a protective white light shield
- Maintaining and strengthening the protective shield

5: **Aura Cleansing Techniques**

- Smudging and other cleansing methods
- Chakra balancing for aura cleansing
- Energy cord cutting

III. Truthfulness:

- **Defining truthfulness:** Exploring the concept of truth, honesty, integrity, and their importance.
- **Real-life scenarios:**Analysing case studies or role-playing situations involving truthfulness.
- **Ethical dilemmas:** Discussing complex situations where truthfulness might conflict with other values.
- **Building trust:** Understanding the relationship between truthfulness and trust.

IV. Thankfulness

1: Understanding Gratitude
- Definition and history of gratitude
- Psychological benefits of gratitude (e.g., happiness, optimism, resilience)
- Neuroscience of gratitude
- Gratitude and its connection to spirituality and religion (optional)

2: Cultivating Gratitude
- Gratitude journaling
- Gratitude meditation and mindfulness
- Gratitude lists and affirmations
- Gratitude challenges and games
- Gratitude in relationships: expressing thanks to others

3: Gratitude in Action
- Gratitude and adversity
- Overcoming negative thinking patterns
- Gratitude and goal setting
- Gratitude and service
- Creating a gratitude-focused lifestyle

4: Sharing Gratitude
- The power of gratitude in communities
- Gratitude and social connection
- Gratitude and leadership
- Gratitude and global citizenship

V. FORGIVENESS

1: Understanding Forgiveness
- Defining forgiveness
- Forgiveness vs. reconciliation vs. justice
- Psychological theories of forgiveness
- The role of emotions in forgiveness

2: Forgiveness in Context
- Forgiveness in different cultures and religions
- Forgiveness in the context of trauma and victimization
- Forgiveness in interpersonal relationships
- Forgiveness in the public sphere

3: The Challenges of Forgiveness
- Obstacles to forgiveness
- The role of power and justice in forgiveness
- Forgiveness and victim blaming
- The limits of forgiveness

4: Cultivating Forgiveness
- Forgiveness practices and techniques
- The role of empathy and compassion in forgiveness
- Forgiveness as a personal journey
- The impact of forgiveness on well-being

Module-3

KEEPING BODY FIT: Eye rotation, Neck left right, up down, Upper body twist, Both hand rotation, Hip rotation, Half sit-up, Bending & Stretching Exercises, Knee rotation, Foot rotation, Foot rotation, Foot bend Forward and backward.

SUPER BRAIN YOGA: Introduction to Super Brain Yoga

1. Basic Posture:
2. Squatting Motion:
3. Variations:

Module-4

Aura Reading, Energy Understanding, Product Scanning

- Understanding the concept of the aura and its layers
- The connection between the aura and physical, emotional, and spiritual well-being
- Aura sensing and visualization techniques
- Use of aura scanning tools (if applicable)
- Aura reading and interpretation
- Aura cleansing and balancing techniques
- Case studies and practical exercises

Module-5

Harnessing Natural Energy: The concept of energy healing

Course outcome (Course Skill Set)

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

CO 1: Understanding of the relationship between nature, positive energy, and human well-being.
CO 2: Knowledge of various natural elements and their impact on physical, mental, and emotional health.
CO 3: Awareness of different techniques for harnessing and utilizing natural energy for wellness.
CO 4: Ability to incorporate natural elements into daily life for improved well-being.
CO 5: Skill in practicing mindfulness and grounding techniques to connect with nature.
CO 6: Capacity to create a harmonious and positive environment through natural means.
CO 7: Enhanced ability to manage stress and promote relaxation using natural energy practices.
CO 8: Increased sense of connection with nature and oneself.
CO 9: Improved overall well-being through the integration of natural energy practices.
CO 10: Development of a positive and optimistic outlook on life.
CO 11: Enhanced self-awareness and self-care practices.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for the Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE, the minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation: 100 Marks

1. The examination will be conducted by two internal examiners.
2. Students can be assigned topics related to techniques to present to the class, This shall be evaluated for 30 marks
3. Evaluation of students' ability to practice meditation and relaxation techniques effectively.
   This presentation shall be evaluated 30 marks.
4. Regular assessment of students' ability to perform various techniques correctly and with proper alignment. This presentation shall be evaluated 20 marks.
5. Regular attendance is crucial for practice. 20 Marks

Semester-End Examination:

- SEE is not applicable

Web links and Video Lectures (e-Resources):

https://www.youtube.com/watch?v=9ZxfNvPe8jI
https://www.youtube.com/watch?v=iD6MTVXyR3w
https://www.youtube.com/watch?v=1ho0cfxH960
https://www.youtube.com/watch?v=X0ekRm011g0
https://www.youtube.com/watch?v=X0ekRm011g0
https://www.youtube.com/watch?v=S-EcCSmAGSw
https://www.youtube.com/watch?v=48CumFpYacI

Suggested Learning Resources:

Books

1. Learning made easy with Positive Energy: Powerful Practices for Buoyant Living, by Rohan Shiri (Author), Ragavendra Prabhu (Editor), Shammy Shiri (Editor)

Activity-Based Learning (Suggested Activities in Class)/Practical-Based learning

- Yoga and Meditation
- Breathing Exercises
- Group Sharing Circles: Creating a safe space for sharing experiences and support.
- Volunteer Activities: Engaging in community service to boost well-being.
- Nature Walks and Discussions: Connecting with nature and fostering social connection.

	Digital Electronics		Semester	4
	Course Code	**BVM405**	CIE Marks	50
	Teaching Hours/Week (L: T:P:S)	2:0:2:2	SEE Marks	50
	Total Hours of Pedagogy	50(Each Module 10 hours)	Total Marks	100
	Credits	04	Exam Hours	03 Hours
	Examination type (SEE)	**Theory**		

Course Learning Objectives:

CLO1: Number Systems: Understand and convert between different number systems (binary, decimal, octal, hexadecimal).

CLO2: Boolean Algebra: Apply Boolean algebra theorems and identities to simplify digital expressions.

CLO3: Logic Gates: Analyse and design digital circuits using basic logic gates (AND, OR, NOT, NAND, NOR, XOR, XNOR).

CLO4: Combinational Circuits: Design and analyse combinational circuits (adders, subtractors, multiplexers, decoders, encoders).

CLO5: Sequential Circuits: Understand the operation of flip-flops (SR, JK, D, T) and design sequential circuits (counters, registers, shift registers).

CLO6: Digital ICs: Utilize standard digital ICs (TTL, CMOS) for circuit implementation.

Module-1

Number System: Binary, Decimal, Octal, Hexadecimal conversion from one Number System to another, Binary addition, subtraction, One's and Two's Compliment no. subtraction using 1's & 2's Compliment no. BCD Arithmetic, Codes: BCD, Excess- 3, Gray, ASCII, Error Code.

Logic Gate: Standard logic Gates (NOT/OR/AND/XOR/XNOR) it's characteristic. Universal logic gate (NAND/NOR).

Module-2

Boolean Algebra & Logic Family: Relation of Boolean algebra to switching elements and operation of logic gates. Obtaining a Boolean expression from a truth table. Definition of combination logic K - map method and its use. Graphical description ofBoolean function. Brief idea (Fan in, Fan out, Propagation delay time, Voice margins) about: RTL, DTL, TTL, CMOSIntroduction of Logic gate IC's (TTL & CMOS).

Function of Logic ckt: Half adder, Full adder, Half Subtractor, Full Subtractor. Decoder & Encoder. Code converter. Multiplexer& De - multiplexer. Parity checkers / generator, comparator.

Module-3

Flip - Flops: Flip - Flop using basic gate. Construction of different ckts. a) R - S flip flop, b) T - flip flop, c) J - K flip flop, d) D - flip flop, e) Master Slave JK - flip flop.

Counter & Shift Resisters: Asynchronous counter (Ripple). Synchronous counter (parallel). Up counter, Down Counter, Up -Down Counter, MOD - N - Counter. Presettable counter, Shift

	Reg. Parallel - in - serial - out (PISO). Shift registers function. Serial - in - serial - out (SISO, Shift Reg. Serial - in—parallel - out (SIPO), Shift Reg. Parallel - in - parallel - out (PIPO), Shift Reg. Shift & Ring counter. Application of Shift Reg.
	Module-4
	D/A and A/D conversion: Digital to Analog converter circuit. D/A application. Different method of A/D conversions: - Dual slope counter type, Successive approximation type.
	Module-5
	Memory Organization: Characters and functions of: Different types of memory as semiconductor and magnetic, Read/Write memory (RAM) - Static & Dynamic Read only Memory (ROM), (PROM) - Fixed & Erasable (EPROM).

Course outcome (Course Skill Set)

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

CO 1: Understand and apply Boolean algebra: Students should be able to manipulate Boolean expressions, simplify them, and implement them using logic gates.

CO 2: Design and analyse combinational circuits: Students should be able to design and analyse circuits like adders, subtractors, multiplexers, decoders, and encoders.

CO 3: Design and analyse sequential circuits: Students should be able to understand flip-flops, counters, registers, and state machines.

CO 4: Convert between number systems: Students should be able to convert numbers between binary, octal, decimal, and hexadecimal systems.

CO 5: Understand digital logic families: Students should be familiar with different logic families (TTL, CMOS, etc.) and their characteristics.

CO 6: Apply digital electronics in practical applications: Students should be able to apply their knowledge to real-world problems and design simple digital systems.

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) and for the SEE minimum passing mark is 35% of the maximum marks(18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation: 50 Marks

1. Two assignments tests;
2. First assignment after 30% completion of the syllabus for 50 marks
3. Second assignment after completion of 70% of the syllabus for 50 marks(May be quiz or other method of assignments)
4. The test after completion of 90 % syllabus is conducted for 100 marks.
5. The sum of the two assignments is scaled down to 25.
6. The marks scored in the test shall be scaled down to 25.
7. The final marks of the course/subject is the sum of the Assignment marks and test marks **(The class teacher may conduct the quiz/presentations/other suitable methods of assignment in place of two or one test)**

Semester-End Examination: 50 Marks

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub-questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Marks scored will be scaled down to 50 marks

Web links and Video Lectures (e-Resources):

https://onlinecourses.nptel.ac.in/noc22_ee55/preview

Suggested Learning Resources:

Books

- Digital Circuits and Logic Design, S. Salivahanan
- Digital Electronics, S. Salivahanan
- Digital computer electronics, Malvino and Brown

Activity-Based Learning (Suggested Activities in Class)/Practical-Based learning

- **Breadboarding and Prototyping:** Building circuits on breadboards to understand their functionality.
- **Logic Analyzers and Oscilloscopes:** Using these instruments to analyze digital signals and waveforms.
- **Digital Electronics Kits:** Using pre-designed kits to experiment with different circuits.
- **Industry Visits:** Visiting electronics manufacturing facilities to observe real-world applications.

	Electrical Machines and Drives		Semester	4
	Course Code	**BVM406**	CIE Marks	50
	Teaching Hours/Week (L: T:P:S)	1:0:2:2	SEE Marks	50
	Total Hours of Pedagogy	40(Each Module 08 hours)	Total Marks	100
	Credits	03	Exam Hours	03 Hours
	Examination type (SEE)	**Theory**		

Course Learning Objectives:

CLO1: Define electric drives, their components, and classification.
CLO2: Understand the role of power electronics in electric drives.
CLO3: Explain the operating principles of DC motors.
CLO4: Understand the principles of operation of induction and synchronous motors.
CLO5: Apply electric drive systems to various industrial applications (pumps, fans, compressors, conveyors, etc.).
CLO06: Evaluate the energy efficiency and performance of electric drive systems.

Module-1

Transformers: Operating principle, classification, construction, emf equation, phasor diagrams, equivalent circuit model, losses & efficiency, voltage regulation, frequency response, polarity test, autotransformers, three-phase transformer connections, impedance matching, isolation & instrument transformers.

Module-2

D.C. Machines: Operating principle, generator & motor action, construction, types of excitation, emf & torque equations, power stages & efficiency. Commutation & Armature Reaction, characteristics & application of d.c generators, starting & speed control of d.c motors, characteristics & applications of d.c motors, electric braking.

Design of D.C Machines: Output equation, Main dimensions, Armature design, Armature windings, Design of commutator and brushes, Design of Field systems, Design of interlopes.

Module-3

Induction Machines: Three-phase induction motors. Principle of operation, construction, types. Rotating magnetic field, emf equation of an AC Machine, torque developed in an induction motor, equivalent circuit model, torque-speed characteristics, starting & speed control.

Single phase induction motors: starting, application.

Module-4

Synchronous Machines: Construction, types & operating principle of synchronous generator, A.C armature windings, equivalent circuit, phasor diagrams, voltage regulation, parallel operation, synchronization, Power Angle characteristics, effect of field excitation change.

Synchronous Motor: principle, starting, hunting, damper windings.

Special Purpose Motors: Stepper Motor, Universal Motor, shaded-pole Motor.

Module-5

Introduction to Electric Drives

- Concept of electric drive
- Classification of electric drives
- Power flow in electric drives
- Performance parameters
- Steady-state and dynamic analysis

DC Motor Drives

- DC motor characteristics
- Speed control methods (armature voltage control, field control)
- Chopper-controlled DC drives
- Regenerative braking
- Closed-loop control of DC drives

Synchronous Motor Drives

- Synchronous motor characteristics
- Variable frequency control
- Self-controlled synchronous motor
- Permanent magnet synchronous motor drives

AC Motor Drives

- Single-phase AC motor drives
- Stepper motor drives
- Servo motor drives

Course outcome (Course Skill Set)

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

CO 1: To study transformer construction, operation, various tests, efficiency and voltage regulation.

CO 2: To study about DC machines, operation, performance, applications, recent advancements.

CO 3: To study induction motor operation, find efficiency and speed regulation.

CO 4: To study of synchronous machine and its applications.

Assessment Details (both CIE and SEE)

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- The students will have to answer five full questions, selecting one full question from each module.

Marks scored will be scaled down to 50 marks

Web links and Video Lectures (e-Resources):

https://nptel.ac.in/courses/108105017/

https://nptel.ac.in/courses/108105017/

https://nptel.ac.in/courses/108105131/

https://nptel.ac.in/courses/108105131/

Suggested Learning Resources:
Books

1. "Electric Machinery", Fitzgerald, Kingslay, Umans, Tata McGraw-Hill.

2. "Electric Machinery Fundamentals", Chapman, McGraw-Hill Higher Education.

3. "Electric Machines", Nagrath and Kothari, Tata McGraw-Hill.

Activity-Based Learning (Suggested Activities in Class)/Practical-Based learning

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