Curriculum of Diploma Programme

in

Textile Technology

Department of Science, Technology and Technical Education (DSTTE),
Govt. of Bihar

State Board of Technical Education
(SBTE), Bihar

Semester – I

Teaching & Learning Scheme

Course Codes	Category of course	CourseTitles	Teaching & Learning Scheme (Hours/Week)					
			Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
			L	T				
2428101	**PCC**	**Textile Fibres**	03	-	-	02	05	04
2400103C	**ASC**	**Applied Chemistry -C** (TE, CACDDM, GT, FCT)	03	-	04	02	09	06
2425104	**BEC**	**Engg. Mechanics** (CE, EE, ME, ME (Auto), MIE, FTS, AE, CRE, CHE, ELX, ELX (R), TE)	03	-	04	02	09	06
2400105D	**ASC**	**Applied Mathematics -D** (CACDDM, FCT, TE, GT, FPP)	02	01	-	02	05	04
2415105	**BEC**	**Engg. Drawing & Graphics** (MIE, AE, CRE, CE, CHE, FTS, TE, EE, ELX, ELX (R))	-	-	04	02	06	03
2418107	**BCC**	**ICT Tools** (CE, ME, ME (Auto), FTS, CSE, AIML, MIE, CRE, CHE, FPP, TE, CACDDM, GT)	-	-	04	02	06	03
2400008	**NRC**	**Sports, Yoga and Meditation** (Common for All Programmes)	-	-	01	01	02	01
2400108	**NRC**	**Essence of Indian Knowledge System and Tradition** (Common for All Programmes)	01	-	-	-	01	01
2428109	**NRC**	**Business Communication** (TE)	01	-	-	02	03	02
Total			**13**	**1**	**17**	**15**	**46**	**30**

Note: Prefix will be added to Course Code if applicable (T for Theory, P for Practical Paper and S for Term Work)

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

Semester - I
Assessment Scheme

Course Codes	Category of course	Course Titles	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
			Theory Assessment (TA)		Term work & Self-Learning Assessment (TWA)		Lab Assessment(LA)		
			Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2428101	**PCC**	**Textile Fibres**	30	70	20	30	-	-	150
2400103C	**ASC**	**Applied Chemistry -C** (TE, CACDDM, GT, FCT)	30	70	20	30	20	30	200
2425104	**BEC**	**Engg. Mechanics** (CE, EE, ME, ME (Auto), MIE, FTS, AE, CRE, CHE, ELX, ELX (R), TE)	30	70	20	30	20	30	200
2400105D	**ASC**	**Applied Mathematics -D** (CACDDM, FCT, TE, GT, FPP)	30	70	20	30	-	-	150
2415105	**BEC**	**Engg. Drawing & Graphics** (MIE, AE, CRE, CE, CHE, FTS, TE, EE, ELX, ELX (R))	-	-	20	30	20	30	100
2418107	**BCC**	**ICT Tools** (CE, ME, ME (Auto), FTS, CSE, AIML, MIE, CRE, CHE, FPP, TE, CACDDM, GT)	-	-	20	30	20	30	100
2400008	**NRC**	**Sports, Yoga and Meditation** (Common for All Programmes)	-	-	10	-	06	09	25
2400108	**NRC**	**Essence of Indian Knowledge System and Tradition** (Common for All Programmes)	25	-	-	-	-	-	25
2428109	**NRC**	**Business Communication** (TE)	25	-	25	-	-	-	50
Total			**170**	**280**	**155**	**180**	**86**	**129**	**1000**

Note: Prefix will be added to Course Code if applicable (T for Theory, P for Practical Paper and S for Term Work)

Legend:

PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)

PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)

TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.

Note:

- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

A) Course Code : 2428101(T2428101/ S2428101)

B) Course Title : Textile Fibres

C) Pre- requisite Course(s) :

D) Rationale :

Textile fibres are the main raw material for producing any textile products. The textile engineer has to work with different forms and processes of textile material with sound knowledge of attributes of particular material. In this emerging era of technology, there are multiple ways evolved to produce textile products according to the demand of the society. Textile diploma engineers must have the fundamental knowledge of various types of textile fibres, their properties and characteristics, types of raw materials used and their manufacturing processes. This course on textile fibres provides insight into natural and manmade textile fibres used for conventional textiles as well technical textiles and help them to apply basic knowledge of textile fibers in selection and modification of textile processes and products in the textile industry.

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/ laboratory/ workshop/ field/ industry.

After completion of the course, the students will be able to-

CO-1 Select different forms of textile material for various textile manufacturing machines and processes.
CO-2 Apply the knowledge of textile fibre for the product development.
CO-3 Analyze the structure, properties of textile fibres and their co-relation.
CO-4 Select the types of textile fibres for given applications.
CO-5 Identify the textile fibre for reverse engineering of given textile product.

F) Suggested Course Articulation Matrix (CAM):

Course Outcomes (COs)	Programme Outcomes(POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	**PO-2** Problem Analysis	**PO-3** Design/ Development of Solutions	**PO-4** Engineering Tools	**PO-5** Engineering Practices for Society, Sustainability and Environment	**PO-6** Project Management	**PO-7** Life Long Learning	**PSO-1**	**PSO-2**
CO-1	3	-	-	-	-	-	1		
CO-2	3	1	1	1	1	1	1		
CO-3	3	2	2	2	1	1	1		
CO-4	3	2	2	1	1	1	1		
CO-5	3	3	2	2	1	1	1		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

G) Teaching & Learning Scheme:

Course Code	Course Title	Scheme of Study (Hours/Week)					
		Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
		L	T				
2428101	Textile Fibres	03	-	-	02	05	04

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term Work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.

C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

H) Assessment Scheme:

Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
		Theory Assessment (TA)		Term Work & Self-Learning Assessment (TWA)		Lab Assessment (LA)		
		Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2428101	Textile Fibres	30	70	20	30	--	--	150

Legend:

PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)

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I) Course Curriculum Detailing: This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW) and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020 related reforms like Green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS) and others must be integrated appropriately.

J) Theory Session Outcomes (TSOs) and Units: T2428101

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 1a. Define basic textile terminologies. *TSO 1b.* Explain various types of textile industry. *TSO 1c.* Draw flow chart of a given textile manufacturing process.	**Unit-1.0 Introduction to Textiles** 1.1 Basic Textile terminologies: Textile, Textile Engineering, Textile Technology, Texture and importance of Textile in our life. 1.2 Overview of Textile Industry 1.3 Flow chart of yarn manufacturing process 1.4 Flow chart of Woven, Non- Woven and Knitted fabric manufacturing process 1.5 Flow chart of chemical processing of textiles.	**CO1**
TSO 2a. Define the terms related to textile fibre and filament with example. *TSO 2b.* Describe the essential and desirable properties of a given textile fibre. *TSO 2c.* Classify various textile fibres on the basis of source of occurrence. *TSO 2d.* Explain fibre morphology of given textile fibre.	**Unit-2.0 Introduction of Textile Fibre** 2.1 Textile fibres, staple fibre and filament Monomer, Polymer, Polymerization, Degree of polymerization, Functionality, Crystallinity and Orientation 2.2 Essential properties of textile fibres: staple length, strength, elasticity, uniformity, cohesiveness or spinnability. 2.3 Desirable properties of textile fibres: absorbency, luster, colour, softness, fineness, resiliency, density and specific gravity, abrasion resistance, flexibility, pliability, plasticity. 2.4 Classification of textile fibres according to source of occurrence. 2.5 Fibre morphology: macro and micro structure of textile fibre and filament	**CO2**
TSO 3a. Explain cultivation process for the given textile fibre. *TSO 3b.* Explain commercial classification of cotton fibre. *TSO 3c.* Explain with sketches the morphological structure of given Natural fibre. *TSO 3d.* Explain the physical and chemical properties of the given type of fibre for specified application. *TSO 3e.* Describe end uses of the given type of fibre. ***TSO 3f.*** **Justify the need of eco fibre.**	**Unit-3.0 Natural Fibres** 3.1 Cotton Fibres: Growth, cultivation and production, grading and growing countries, commercial classification of cotton; Microscopic Appearance and chemical composition of cotton; Physical Properties, Chemical Properties, Thermal Properties, Biological Properties and uses of Cotton fibres 3.2 Wool Fibres: Growing of wool, grading of wool (fine, medium, long, crossbreed. mixed); Types of wool (Merino, British, Cross- breed, and carpet); Microscopic structure and appearance, chemical composition; Physical Properties, Chemical Properties, Thermal properties and Electrical properties; Felting of wool; woolens and worsted yarns; Uses of wool fibres 3.3 Silk: Types of silk (Mulberry, Tassar, Eri and Muga silk); Production of silk:- Sericulture, Reeling of silk and Throwing of silk; Wild silk, spun silk, Degumming of silk, chemical composition of silk; Physical Properties, Chemical Properties and Electrical properties of Silk; Microscopic appearance, uses of silk.	**CO2, CO3, CO4**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
	3.4 Jute Fibre:, Growth and cultivation: Harvesting, Retting and stripping of jute fibres; Properties and Uses of jute fibres. 3.5 Linen Fibre (Flax): Growth and cultivation: Harvesting, Retting and stripping of Linen fibres; Properties and Uses of Linen fibres. 3.6 Others Natural Fibres such as Banana fibres, etc. **3.7 Eco fibres: Characteristics of eco fibres and its importance**	
TSO 4a. Compare Natural, Regenerated and Synthetic fibres on the basis of their properties. *TSO 4b.* Differentiate between staple fibre and filament *TSO 4c.* Use the physical and chemical properties of regenerated fibre for production of fabric of specified characteristics. *TSO 4d.* Identify various end uses of given type of regenerated fibre. *TSO 4e.* Comprehend the properties and uses of the given type of synthetic fibres.	**Unit-4.0 Man-Made Fibres** 4.1 Historical Development of Man-Made Fibre 4.2 Man-made fibre: regenerated and synthetic fibre, Sources of synthetic fibres, Staples Vs. Filaments. 4.3 Differences among Natural, Regenerated and Synthetic fibres. 4.4 Unique properties of synthetic fibres, Advantages and disadvantages of synthetic fibres, Future of synthetic fibres 4.5 Regenerated cellulosic fibers: Properties and uses of Cuprammonium Rayon, Acetate Rayon, Viscose Rayon, Polynosic Rayon 4.6 Synthetic Fibers: Properties and uses of Polyamide Fibres (nylon 6 & nylon 66), Polyester fibers, Acrylic fibers, Polyolefin fibres,	**CO2, CO3, CO4**
TSO 5a. Identify textile fibre using Feeling, Burning and Staining Test. *TSO 5b.* Identify textile fibre using Microscopic, Density measurement and Chemical Test. *TSO 5c.* Identify applications of fibres and textiles.	**Unit-5.0 Identification and Applications of Textile Fibres** 5.1 Identification of textile fibres 5.2 Non-Technical Test: Feeling test, burning test, staining test. 5.3 Technical Test: Microscope test, Density measurement, Chemical test. 5.4 Applications of fibres and textiles	**CO2, CO5**

Note: One major TSO may require more than one Theory session/Period.

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: (Not Applicable)

L) Suggested Term Work and Self Learning: S2428101 Some sample suggested assignments, micro project and other activities are mentioned here for reference.

a. Assignments: Questions/Problems/Numerical/Exercises to be provided by the course teacher in line with the targeted COs.

1. Prepare list of different spinning mills, weaving mills, textile processing units and composite mills from different websites (online assignment)
2. Prepare classification chart of different textile fibres.
3. Collect samples of various natural fibres and label them with neat sketches.
4. Collect samples of various Man-made fibres and label them with neat sketches.
5. Prepare a report by exploring available resources in library for production technologies being used for production of different fibres. (library based).
6. Prepare a catalogue of various textile fibres available in local market.
7. Prepare a list of various chemical test used for identifications of different fibres.

b. Micro Projects:

1. Collect various fibre samples by visiting nearby spinning industries and prepare comparative charts exhibiting their physical properties.
2. Draw a detailed classification chart of fibre used in textile industry with examples of each variety.
3. Collect the information of different fibres used in various types of garments by doing a local market survey and prepare a report.
4. Collect various sample of natural fibres and study the Physical and chemical properties of Textile fibres and prepare compile report.
5. **Collect various sample of organic fibres and study the Physical and chemical properties of Textile fibres and prepare compile report.**
6. Prepare a compile report on raw material, structure, properties and end use application of various high performance fibres.
7. Prepare a sample book of different forms of textile materials and eco fibres from market.

c. Other Activities:

1. Seminar Topics:
   - New generation fibres
   - **Eco-fibres such as Banana fibre**
   - High performance textile fibre
   - Methods of Identification of fibre blends.
   - Applications of fibres and textiles in present day

2. Visits: Visit nearby spinning mills/industry with modern machineries facilities Prepare report of visit with special comments of modern machineries used, material used, single component/ batch production/ mass production and cost of production. Also visit nearby place of Silk sericulture and submit report on sericulture.

3. Self-Learning Topics:
   - **Organic Cotton**
   - BT Cotton
   - Spider Silk
   - Application of Linen fibre.
   - Inorganic fibres.

M) Suggested Course Evaluation Matrix: The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and Term Work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate **CO attainment**.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work & Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	10%	10%	10%	20%	-	-	-
CO-2	20%	20%	20%	20%	-	-	-
CO-3	35%	30%	30%	20%	33%	-	-
CO-4	25%	25%	25%	20%	33%	-	-
CO-5	10%	15%	15%	20%	34%	-	-
Total Marks	**30**	**70**	**20**	**20**	**10**	**-**	**-**
			50				

Legend:

*: Other Activities include self- learning, seminar, visits, surveys, product development, software development etc.

**: Mentioned under point- (N)

#: Mentioned under point-(O)

Note:

- The percentages given are approximate.
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) Suggested Specification Table for End Semester Theory Assessment: Specification table represents the reflection of sample representation of assessment of cognitive domain of full course.

Unit Title and Number	Total Classroom Instruction (CI) Hours	Relevant COs Number(s)	Total Marks	ETA (Marks)		
				Remember (R)	Understanding (U)	Application & above (A)
Unit-1.0 Introduction to Textiles	04	CO1	06	2	2	2
Unit-2.0 Introduction of Textile Fibre	08	CO2	14	4	6	4
Unit-3.0 Natural Fibres	16	CO2, CO3, CO4	24	6	8	10
Unit-4.0 Man-Made Fibres	14	CO2, CO3, CO4	16	4	4	8
Unit-5.0 Identification and Applications of Textile Fibres	06	CO2, CO5	10	4	2	4
Total	**48**	**-**	**70**	**20**	**22**	**28**

Note: Similar table can also be used to design class/mid-term/ internal question paper for progressive assessment.

O) Suggested Assessment Table for Laboratory (Practical): (Not Applicable)

P) Suggested Instructional/Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Field Trips, Portfolio Based, Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field Information and Communications Technology (ICT)Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Session, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software: Not Applicable

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	A Text Book of Fibre Science and Technology	S.P. Mishra	New Age International Publishers, 2000 ISBN: 81-224-1250-5
2.	Handbook of Textile fibres Volume-1 & 2	Gordon Cook J.	Woodhead Publishing Limited, 2006, ISBN: 1-855734842, 978-1855734845

3.	Textiles Fiber to Fabric	Bernard P. Corbman,	Mcgraw Hill ,1985 ISBN: 0070662363, 9780070662360
4.	Textiles Science	E. P. G. Gohl, L. D. Vilensky	Longman Cheshire, 2009 ISBN: 9780582685956, 0582685958
5.	Introduction to Textile Fibres	Sreenivasa Murthy H.V.	Woodhead Publishing India in Textiles, 2015, ISBN:9789385059575
6.	Manmade fibres	Moncrieff R.W.	Heywood Books, The Butterworth 1970 ISBN: 0592063321
7.	Production of Synthetic fibres	Vaidya A.A.	Prentice-Hall of India Private Limited, 1988, ISBN: 0876925786, 9780876925782
8.	Textile terms and definitions	Beech S.R.	The Textile Institute, 2002 ISBN: 1870372441, 9781870372441
9.	Manmade fibres: Production, Processing, structure and applications	Gupta V.B. and Kothari V.K.	Indian Institute of Technology,1997, ISBN: 9789401158541
10.	Structure and Properties of High-Performance Fibres	Bhat Gajanan	Woodhead Publishing, 2016, ISBN: 9780081005507
11.	Manufactured Fibre Technology	Gupta, V.B. and Kothari,V.K.	Springer (India) Private Limited. ISBN: 9788132207894

(b) Online Educational Resources:

1. https://archive.nptel.ac.in/courses/116/102/116102026/
2. http://textilelearner.blogspot.in/
3. https://www.fibre2fashion.com/
4. https://textilestudycenter.com/
5. http://www.textileschool.com/
6. http://www.fibresource.com/
7. https://study.com/academy/topic/textile-fibres-fabrics.html
8. https://textilestudycenter.com/textile-books-free-donwload/
9. http://www.cottonsjourney.com/Storyofcotton/page5.asp
10. https://archive.org/details/manmadefibres0000monc/page/n7/mode/2up
11. http://www.textileassociationindia.org/
12. https://www.youtube.com/watch?v=22VC_8xcyrs
13. https://www.youtube.com/watch?v=bILk39zSgqA
14. https://www.youtube.com/watch?v=cn6K1m7yH0I

Note: Teachers are requested to check the creative commons license status/ financial implications of the suggested, online educational recourses before use by the students.

(c) Others:

1. Essentials of Textiles by Marjory L. Joseph
2. Textile Fibres and Their Use by Hess
3. Textiles Fibers, Vol-1 by Shenai V.A., Sevak Publications, Bombay, 1991

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A) Course Code : **2400103C(T2400103C/P2400103C/S2400103C)**

B) Course Title : Applied Chemistry- C (TE, CACDDM, FCT, GT)

C) Pre- requisite Course(s) :

D) Rationale :

Given course is the applied form of Chemistry. It is an application of basic knowledge of chemistry to understand the requirements of the industries related to textile and garments. This course intends to impart technical knowledge along with productive practice to the students of the diploma engineering. Students will learn about the chemical characteristics of materials, such as their reactivity, bonding, and molecular structures, through the chemistry course. With this understanding, students will be able to choose materials intelligently for certain applications and create new materials that fulfil market demands. Diploma engineers have to deal with various chemicals in diverse technical and engineering fields. Dying, bleaching and cleaning fabric in the textile and garment industry and related areas will require engineers to acquire essential knowledge in chemistry to choose appropriate chemicals, dyes, bleaching agents, soap, detergents and enzyme-based detergents which should be economical and eco-friendly. Student will learn about various types of natural and man-made fibres which requires basics of monomers used and polymerization. Basic knowledge of chemistry is essential to treat textile industry effluents containing various types of synthetic dyes, metals, chlorine and other pollutants which has become an environmental concern.

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the accomplishment of the following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/ laboratory/ workshop/ field/ industry.

After completion of the course, the students will be able to-

- **CO-1.** Solve various engineering problems applying the basic concepts of atomic structure, chemical bonding and solutions.
- **CO-2.** Apply the concepts of chemical structure, properties and identification of polymers and fibers in textile and garment industry.
- **CO-3.** Apply suitable **wastewater treatment** techniques in textile industry.
- **CO-4.** Use appropriate chemicals such as dyes, bleaching agents, soaps, detergents and enzyme-based detergents in textile and garment industry.
- **CO-5.** Use concepts of organic molecules and isomerism to solve various engineering problems.

F) Suggested Course Articulation Matrix (CAM):

Course Outcomes (COs)	Programme Outcomes(POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	**PO-2** Problem Analysis	**PO-3** Design/ Development of Solutions	**PO-4** Engineering Tools	**PO-5** Engineering Practices for Society, Sustainability and Environment	**PO-6** Project Management	**PO-7** Life Long Learning	**PSO-1**	**PSO-2**
CO-1	3	-	-	-	-	-	-		
CO-2	3	-	2	-	2	1	2		
CO-3	3	3	1	2	-	1	-		
CO-4	3	-	-	-	1	-	1		
CO-5	3	-	-	-	-	-	1		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

G) Teaching & Learning Scheme:

Course Code	Course Title	Scheme of Study (Hours/Week)					
		Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
		L	T				
2400103C	Applied Chemistry- C	03	-	04	02	09	06

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)

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C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

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H) Assessment Scheme:

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		Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2400103C	Applied Chemistry - C	30	70	20	30	20	30	200

Legend:

PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)

PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)

TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.

Note:

- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

I) Course Curriculum Detailing: This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW) and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020 related reforms like Green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS) and others must be integrated appropriately.

J) Theory Session Outcomes (TSOs) and Units: T2400103C

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 1a. Explain quantum numbers and their significance briefly. *TSO 1b.* Explain the importance of principles followed in expressing electronic configuration of elements. *TSO 1c.* Explain different types of Chemical Bonding with examples. *TSO 1d.* List different modes of expressing the concentration of solutions-Molarity, Normality, and parts per million. *TSO 1e.* Prepare solution of given concentration. *TSO 1f.* Describe the balancing of chemical equation of redox reaction using ion-electron method.	**Unit-1.0 Atomic Structure, Chemical Bonding, solutions, and Redox Reactions** 1.1 Fundamental particles- mass and charges of electrons, protons, and neutrons with names of the scientists who discovered these fundamental particles. 1.2 Atomic number, atomic mass number. 1.3 Definition of orbit and orbitals, shapes of s and p orbitals, the 1.4 Brief concept of quantum numbers and their significance. 1.5 Introduction to Aufbau's principle, Pauli's exclusion principle and Hund's rule of maximum multiplicity. 1.6 Electronic configurations of elements with atomic number up to 20. 1.7 Chemical bonding- Ionic or Electrovalent bond, Covalent bond, Coordinate bond, Hydrogen bond. 1.8 Solutions, Solute and Solvent, Modes of expressing concentration of solutions-Molarity, Normality, and parts per million. 1.9 General introduction Oxidation and Reduction, Oxidation number, Balancing of Chemical Equations of Redox Reaction by Ion-Electron Method. 1.10 Indian Chemistry: -Philosophy of atom by Acharya Kanad. (IKS)	**CO1**
TSO 2a. Differentiate between addition and condensation polymerization. *TSO 2b.* Explain molecular arrangement of polymers. *TSO 2c.* Describe primary and secondary properties of fibre. *TSO 2d.* Classify Fibre based on origin. *TSO 2e.* List monomers and chemical reactions involved in the synthesis of Rayon, Nylon-6, Nylon-6,6, Polyester, Polyethylene and Spandex. *TSO 2f.* Explain identification tests of fibres. *TSO 2g.* Identify fibers based on physical and chemical tests.	**Unit-2.0 Fibres and Polymers** 2.1 Definition of Monomer, Polymer-types of polymers: homo polymer and copolymer, Degree of Polymerization, Types of polymerization-addition and condensation polymerization, Polymer arrangement: Crystalline and Amorphous arrangement, Orientation of fibre. 2.2 Definition of the Terms: Textile, Fibre, Textile fibre, Staple, Filament, Yarn and thread. 2.3 Primary and secondary properties of textile fibre. 2.4 Fibre classification by origin: Natural fibres- Plant fibre-cotton, bast fibre-jute and flax, Protein/Animal fibre- wool and silk, Mineral 2.5 Fibre – Asbestos, monomers and chemical reaction involved in the synthesis of man-made fibres: Rayon, Nylon (6 & 6,6), Polyester, Acrylic, Olefins (Polyethylene and	**CO2**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
	Polypropylene) and Elastomeric fibres-spandex, Comparison of natural and man-made fibres. 2.6 Identification of fibres- feeling test, burning test, chemical test.	
TSO 3a. Differentiate between hard water and soft water. *TSO 3b.* Estimate the hardness of water using EDTA titration method. *TSO 3c.* Explain the effect of hardness of water in textile industry. *TSO 3d.* Explain the various water softening techniques. *TSO 3e.* Determine the dissolved oxygen (DO) and biological oxygen demand (BOD) of a wastewater sample. *TSO 3f.* Identify given samples as acid, base or neutral. *TSO 3g.* Explain the two parameters BOD and COD to measure water quality and the amount of organic pollutants present in water. *TSO 3h.* Use the Indian standard specification of drinking water.	**Unit-3.0 Water** 3.1 Introduction, Sources of Water, Hardness of water, types of hardness, Degree of Hardness (In terms of CaCO3 equivalent), Unit of Hardness, Quantitative Measurement of Water Hardness by EDTA method. 3.2 Bad effect of hard water in textile industries-scale and sludge formation in boilers, disadvantage of scale formation. 3.3 Water Softening Technique-Soda Lime Process, Zeolites method and cation-anion exchange method. 3.4 Concept of pH and its applications. 3.5 Determination of Dissolved Oxygen, Water Quality Index - Biological Oxygen Demand, Chemical Oxygen Demand, Simple Numerical Problems. 3.6 Indian standard specification of drinking water.	**CO3**
TSO 4a. Differentiate between soap and detergent. *TSO 4b.* Explain the cleansing action of soap. *TSO 4c.* List different types of detergents. *TSO 4d.* Describe the importance of saponification values. *TSO 4e.* Use of different enzyme-based detergents in textile industry. *TSO 4f.* Classify stains and their removal techniques. *TSO 4g.* list different bleaching agents used in textile industry. *TSO 4h.* Describe the use of indigo, phenolphthalein and methyl orange dye in textile industry.	**Unit-4.0 Soap, Detergents and Dyes** 4.1 Cleaning agent: soap- chemical composition, Detergent: chemical composition, types of detergent. Cleansing action of soaps and detergents, difference between soap and detergent. 4.2 Saponification values- Definition, determination, and significance. 4.3 Enzyme based detergents: Introduction to enzyme-based detergents and their types: proteases, amylases, lipases, cellulases, mannanases and pectinases, merits of enzyme-based detergents over synthetic detergents, cleansing action of enzyme-based detergents. 4.4 Stain: Definition of stain, classification, and removal techniques of stains -Protein stain, Tannin stains, Oil – based stains, Dye stains, Combination Stains, Stains require special treatment methods. 4.5 Bleaching agent: Definition of bleaching agent, classification of bleaches: oxidizing bleaches- halogen and peroxide bleaches (universal bleaching agent) and reducing bleaches, purposes of bleaching, advantages, and disadvantages of bleaching. 4.6 Dyes: Definition of dye, classification of dyes, Introduction to some dyes: indigo dye, phenolphthalein, methyl orange.	**CO4**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 5a. Identify the structures of organic compound based on their classification. *TSO 5b.* Classify structures of organic molecules. *TSO 5c.* Draw structures of organic molecules. *TSO 5d.* Identify different types of structural isomerism in different molecules. *TSO 5e.* Differentiate amongst different organic compounds based on the functional group.	**Unit-5.0 Basics of Organic Chemistry** 5.1 Classification of organic compounds (acyclic or open chain compounds, cyclic or closed chain or ring compounds- aromatic compounds). 5.2 Introduction to Functional groups (alkenes, alkynes, halides, alcohols, aldehydes, ketones, nitriles, ethers, carboxylic acids, esters, amines, amides, nitro compounds). 5.3 Isomerism, structural isomerism (chain, position and functional), stereoisomerism (geometrical and optical isomerism)	**CO5**

Note: One major TSO may require more than one Theory session/Period.

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2400103C

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 1.1. Weigh oxalic acid. LSO 1.2. Prepare a solution of oxalic acid.	1.	Preparation of 250ml N/I0 Oxalic acid Solution.	CO1
LSO 2.1. Weigh Sodium Carbonate. LSO 2.2 Prepare a solution of sodium carbonate.	2.	Preparation of 250ml N/10 Sodium Carbonate Solution.	CO1
LSO 3.1. Use of appropriate indicator for acid-base titration. LSO 3.2 Analyze titration curves for weak acid and strong base.	3.	Determination of strength of Sodium Hydroxide Solution by Titrating against Oxalic Acid solution.	CO1
LSO 4.1. Identify given textile fibre using chemicals. LSO 4.2. Distinguish between animal and vegetable fibre.	4.	Identification of textile fibres like cotton, linen, wool, silk, nylon, polyester, and acrylic using chemical tests.	CO2
LSO 5.1. Identify given textile fibre using burning test. LSO 5.2. Distinguish between animal and vegetable fibre.	5.	Identification of textile fibres like cotton, linen, wool, silk nylon, polyester and acrylic by burning test.	CO2
LSO 6.1. Determine the total hardness of given sample of water in terms of CaCO3 by EDTA titration method. LSO 6.2. Draw the structure of complex of metal ions with ethylenediaminetetraacetic acid (EDTA).	6.	Determination of total hardness of water sample in terms of $CaCO_3$ by EDTA titration method using Eriochrome black-T as indicator.	CO3
LSO 7.1. Determine the saponification value of oil. Compare saponification values of some LSO 7.2. given oils.	7.	Determination of saponification value of the given oil/fat.	CO4
LSO 8.1. Perform Baeyer's test LSO 8.2. Perform Bromine Test	8.	Identification of the presence of unsaturation in a given organic compound.	CO5
LSO 9.1. Perform Ceric Ammonium Nitrate test LSO 9.2. Perform Iodoform test	9.	Identification of the presence of alcoholic functional group in a given organic compound.	CO5
LSO 10.1. Perform 2,4-Dinitrophenyl Hydrazine Test LSO 10.2. Perform Fehling's Test LSO 10.3. Perform Tollen's Test	10.	Identification of the presence of aldehyde and ketone functional groups in a given organic compound.	CO5

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 11.1. Determine the pH of the given sample using; pH paper, Universal indicator and pH meter.	11.	Determination of pH-Values of given Solution by using pH paper, Universal Indicator and pH-meter.	CO3
LSO 12.1. Perform Fehling's Test LSO 12.2. Perform Sodium Bicarbonate Test	12.	Identification of the presence of a carboxylic acid functional group in a given organic compound.	CO5
LSO13.1. Describe the principle behind the estimation of the dissolved oxygen in water LSO13.2. Determine the oxygen content of the different aquatic habitats.	13.	Determination of Dissolved Oxygen (DO) in the given Sample of Water.	CO3

L) **Suggested Term Work and Self Learning: S2400103C** Some sample suggested assignments, micro project and other activities are mentioned here for reference.

a. Assignments: Questions/Problems/Numerical/Exercises to be provided by the course teacher in line with the targeted Cos such as

1. Write the exceptional behavior of elements Chromium and copper based on their electronic configuration.
2. Prepare the chart displaying different steps involved in **wastewater treatment** in textile industries.
3. Prepare the model, showing the difference between covalent and ionic bond.
4. Prepare a report on the impact of waste generated from textile production on the environment.

b. Micro Projects:

1. Prepare a report by analyzing the cleansing capacity of the different soaps in distilled water and tap water.
2. Collect the sample of water from various water bodies nearby and analyze pH, temperature and dissolved oxygen prepare a report on the same.
3. Sterilization of water samples using bleaching powder.
4. Collect and measure the hardness of different water samples from different sources by using the EDTA titration method.
5. Collect the water samples containing bleaching powder from various sources and measure the percentage of available Chlorine in the collected samples.

c. Other Activities:

1. Seminar Topics:
   - Methods for **Wastewater treatment** in textile/ garment industry
   - Dye used for the given fiber in textile/ garment industry.
   - Chemistry of Dyeing
   - Application of chemistry in textile/ garment industry
   - Application of enzymes in textile/ garment industry
   - Cleansing action of soap and detergents

Visits:

- Organize a visit to the nearby garments industry related to printing and embroidery followed by garment production. There they can explore the different sections like store section, embroidery section, pattern making, drafting section, cutting section, stitching, finishing section, workshop etc.

- Organize a visit to nearby traditional dying and synthetic dying shops to comprehend the different stages and types of dyeing.
- Visit textile industries to learn the bleaching process.

2. Self-Learning Topics:
   - Basic structure of atom
   - Basics of organic chemistry
   - Cleansing action of soap and detergents
   - **Wastewater treatment**
   - Dyes

M) Suggested Course Evaluation Matrix: The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and Term Work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate CO attainment.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work & Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	10%	10%	15%	15%	15%	10%	10%
CO-2	15%	15%	20%	20%	20%	20%	20%
CO-3	30%	25%	20%	20%	20%	25%	25%
CO-4	15%	20%	20%	20%	20%	15%	15%
CO-5	30%	30%	25%	25%	25%	20%	20%
Total Marks	**30**	**70**	**20**	**20**	**10**	**20**	**30**
			50				

Legend:

*: Other Activities include self- learning, seminar, visits, surveys, product development, software development etc.

**: Mentioned under point- (N)

#: Mentioned under point-(O)

Note:

- The percentages given are approximate.
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) Suggested Specification Table for End Semester Theory Assessment: Specification table represents the reflection of sample representation of assessment of cognitive domain of full course.

Unit Title and Number	Total Classroom Instruction (Cl) Hours	Relevant Cos Number(s)	Total Marks	ETA (Marks)		
				Remember (R)	Understanding (U)	Application & above (A)
Unit-1.0 Atomic Structure, Chemical Bonding and Solutions	12	CO1	18	6	8	4
Unit-2.0 Fibre and Polymers	7	CO2	10	3	3	4
Unit-3.0 Water	5	CO3	08	3	3	2
Unit-4.0 Soap, Detergents and Dyes	12	CO4	17	5	7	5
Unit-5.0 Basics of Organic Chemistry	12	CO5	17	5	7	5
Total	**48**	**-**	**70**	**22**	**28**	**20**

Note: Similar table can also be used to design class/mid-term/ internal question paper for progressive assessment.

O) Suggested Assessment Table for Laboratory (Practical):

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
1.	Preparation of 250ml N/I0 Oxalic acid Solution.	CO1	40	50	10
2.	Preparation of 250ml N/10 Sodium Carbonate Solution.	CO1	40	50	10
3.	Determination of the strength of Sodium Hydroxide Solution by Titrating against Oxalic Acid Solution.	CO1	30	60	10
4.	Identification of textile fibres like cotton, linen, wool, silk, nylon, polyester and acrylic using chemical tests.	CO2	30	60	10
5.	Identification of textile fibres like cotton, linen, wool, silk nylon, polyester and acrylic by burning test.	CO2	30	60	10
6.	Determination of the total hardness of water sample in terms of CaCO3 by EDTA titration method using Eriochrome black-T as indicator.	CO3	30	60	10
7.	Determination of pH-Values of given samples of Solution by using pH paper, Universal Indicator and pH-meter.	CO3	30	60	10
8.	Determination of saponification value of the given oil/fat.	CO5	30	60	10
9.	Identification of the presence of unsaturation in a given organic compound.	CO5	40	50	10
10.	Identification of the presence of alcoholic functional group in a given organic compound.	CO5	40	50	10
11.	Identification of the presence of aldehyde and ketone functional group in a given organic compound.	CO5	40	50	10
12.	Identification of the presence of a carboxylic acid functional group in a given organic compound.	CO5	30	60	10
13.	Determination of Dissolved Oxygen (DO) in the given Sample of Water.	CO3	30	60	10

Legend:

PRA*: Process Assessment

PDA**: Product Assessment

Note: This table can be used for both end semester as well as progressive assessment of practical. Rubrics need to be prepared by the course teacher for each experiment/practical to assess the student performance.

P) Suggested Instructional/Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Field Trips, Portfolio Based, Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field Information and Communications Technology (ICT)Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Session, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software:

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/Practical Number
1.	Electronic Weighing Balance	Type of Laboratory Balance: Analytical, Sensitivity (mg): 1 mg, Maximum Capacity of weighing (grams): 200 g, Shape of PAN: Circular, Power Supply: Single Phase, display: LED.	1,2,3, 6, 7, 13
2.	Hot plate magnetic stirrer	Hot plate with Magnetic stirrer: Number of stirring Positions:1, Calibration: Automatic Calibration, Magnetic stirrer with a hot plate, Speed Control Accuracy of set speed (+/-) (RPM): 5, Maximum Stirring capacity per position: 3000 ml, Top plate Material: Stainless steel	7
3.	Digital pH meter	Digital pH Meter: Type: Microcontroller Based, Display: LED / LCD / Touch Screen, 3 digits, Calibration: up to 3 points with auto buffer, pH Range (pH): 0.00 to 14.00, +/- 0.05, Power Requirements: 230 V +/- 10, 50 Hz AC, Modes: pH mV- C, Temperature Compensation Type: Automatic, Temperature Compensation Range (Degree C): 0 to 100, Temperature Accuracy (Degree C): +/- 0.3, Resolution (pH): 0.01	8

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Engineering Chemistry	Jain & Jain	Dhanpat Rai Publishing Co.(P) Ltd., New Delhi, 2015, ISBN: 93-521-6000-2
2.	A Textbook of Engineering Chemistry	Dr S. S. Dara & Dr S. S. Umare	S. Chand & Co.(P) Ltd., New Delhi, 2014, ISBN:81-219-0359-9
3.	Textbook of Chemistry for Class XI & XII (Part-I & II)	NCERT	NCERT, New Delhi, 2017-18, Class-XI, ISBN: 81-7450-494-X (part-I), 81-7450-535-O (part-II), Class-XII, ISBN: 81-7450-648-9 (part-I), 81-7450-716-7 (part-II)
4.	A Textbook of Polymer Chemistry	Dr. M. S. Bhatnagar	S. Chand & Co.(P) Ltd., New Delhi, 2012, ISBN: 9788121941129
5.	Textile Science	E.P.G.Gohl & L.D. Vilensky	CBS, 2nd edition, ISBN-13: 978-8123910383
6.	Textile Auxiliaries and Chemicals with Processes & Formulations	Eiri Board	Engineers India Research Institute (1 December 2009), ISBN : 978-8186732939
7.	Applied Chemistry with Lab manual	Anju Rawlley Devdatta V. Saraf	Khanna Book Publishing Co. (P) Ltd. New Delhi, 2021, ISBN- 978-93-91505-44-8.

(b) Online Educational Resources:

1. https://ncert.nic.in/textbook/pdf/kech102.pdf
2. https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Supplemental_Modules_and_Websites_(Inorganic_Chemistry)/Chemical_Compounds/Introduction_to_Chemical_Bonding
3. https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Electrochemistry/Redox_Chemistry/Balancing_Redox_reactions
4. https://www.onlinetextileacademy.com/basics-of-textile-fibres/
5. https://www.ancient-origins.net/history-famous-people/indian-sage-acharya-kanad-001399
6. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=31024

7. http://ecoursesonline.iasri.res.in/course/view.php?id=235
8. https://ncert.nic.in/textbook/pdf/lech206.pdf
9. https://www.canada.ca/en/conservation-institute/services/conservation-preservation-publications/canadian-conservation-institute-notes/identification-natural-fibres.html
10. https://www.sctce.ac.in/faculty/facultylogin/Admin/Attachments/Upload/1559025037_1559025037.pdf
11. https://chem.libretexts.org/Bookshelves/Introductory_Chemistry/Chemistry_for_Allied_Health_(Soult)/08%3A_Properties_of_Solutions/8.06%3A_The_pH_Concept
12. https://textilelearner.net/soap-and-micelle-in-textile-wet-processing/
13. https://textilelearner.net/stain-removal-techniques-from-clothes/
14. https://archive.epa.gov/water/archive/web/html/vms52.html
15. https://infinitabiotech.com/blog/overview-on-detergent-enzymes/
16. https://www.textileadvisor.com/2022/01/objectives-of-bleaching-process-types.html
17. https://textilelearner.net/different-types-of-dyes-with-chemical-structure/
18. https://ncert.nic.in/ncerts/l/lech205.pdf

Note: Teachers are requested to check the creative commons license status/ financial implications of the suggested, online educational recourses before use by the students.

(c) Others:

1. Learning Packages
2. Lab Manuals
3. Manufacturers' Manual
4. Users' Guide

******

A) Course Code : **2425104 (T2425104/P2425104/S2425104)**

B) Course Title : Engineering Mechanics
(ELX, ELX (R), TE, CE, ME, EE, ME (Auto), MIE, FTS, AE, CRE, CHE)

C) Pre- requisite Course(s) :

D) Rationale :

In day-to-day working we come across different types of structures created for different purposes and functions, while designing the structures, analysis of forces and stresses' is an important and prerequisite step. Correct analysis is possible only when one knows the types and effects of forces acting on the structures. This course provides the scope to understand fundamental concepts of laws of mechanics and their applications to different engineering problems. This course is designed to provide basic understanding about the different types of forces, moments and their effects on structural elements and to analyze different structural systems.

The aim of this course is to help the student to comprehend the importance of applied mechanics and apply the principles of engineering mechanics to solve engineering problems.

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/ laboratory/ workshop/ field/ industry.

After completion of the course, the students will be able to-

- **CO-1** Compute the force to solve the problems.
- **CO-2** Analyze various analytical and graphical conditions required for equilibrium of engineering systems.
- **CO-3** Apply the principles of friction in various conditions to solve problems.
- **CO-4** Calculate centroid, center of gravity and moment of Inertia of different geometrical shapes.
- **CO-5** Select the relevant lifting machine(s) for the given purposes.

F) Suggested Course Articulation Matrix (CAM):

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	**PO-2** Problem Analysis	**PO-3** Design/ Development of Solutions	**PO-4** Engineering Tools	**PO-5** Engineering Practices for Society, Sustainability and Environment	**PO-6** Project Management	**PO-7** Life Long Learning	**PSO-1**	**PSO-2**
CO-1	3	-	-	2	1	-	-		
CO-2	2	3	3	3	2	-	-		
CO-3	3	3	3	2	2	1	1		
CO-4	3	3	3	2	2	1	1		
CO-5	3	2	2	3	3	1	2		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

G) Teaching & Learning Scheme:

Course Code	Course Title	Scheme of Study (Hours/Week)					
		Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
		L	T				
2425104	Engineering Mechanics	03	-	04	02	09	06

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term Work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.

C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

H) Assessment Scheme:

Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
		Theory Assessment (TA)		Term Work & Self-Learning Assessment (TWA)		Lab Assessment (LA)		
		Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2425104	Engineering Mechanics	30	70	20	30	20	30	200

Legend:

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J) Theory Session Outcomes (TSOs) and Units: T2425104

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 1a. Explain concepts of the given terms. *TSO 1b.* Use relevant units of various quantities in the given situations. *TSO 1c.* Explain effects of a force on the given object. *TSO 1d.* Resolve the given single force. *TSO 1e.* Calculate the resultant of the given force system. *TSO 1f.* Find the resultant of the given force system using law of parallelogram *TSO 1g.* Determine graphically the resultant of the given force system by triangle law and polygon law.	**Unit-1.0 Mechanics and Force System** 1.1 Significance and relevance: Mechanics, applied mechanics, statics and dynamics. 1.2 Space, time, mass, particle, body, rigid body. 1.3 Scalar and vector quantity, Units of measurement (SI units) Fundamental units and derived units. 1.4 Force - unit, representation as a vector and by Bow's notation, characteristics and effects of a force, Principle of transmissibility of force. Force system and its classification. 1.5 Resolution of a force - Orthogonal and Non-Orthogonal components of a force, moment of a force, Avignon's Theorem. 1.6 Composition of forces - Resultant, analytical method of determination of resultant for concurrent, non-concurrent and parallel co-planar force systems -Law of triangle, Law of parallelogram and law of polygon of forces. 1.7 Graphic statics, graphical representation of force, Space diagram, force diagram, polar diagram and funicular polygon, Graphical method of determination of resultant for concurrent and parallel co-planar force systems.	**CO1, CO2**
TSO 2a. Draw the free body diagram for the given condition. *TSO 2b.* Determine unknown force in the given situation using Lami's theorem. *TSO 2c.* Identify the types of beams required for the given situation. *TSO 2d.* Determine reactions in the given type of beam analytically. *TSO 2e.* Solve problems using free body diagram and Lami‟s theorem.	**Unit-2.0 Static Equilibrium** 2.1 Equilibrium and Equilibrant, Free body and Free body diagram, Analytical and graphical conditions of equilibrium. 2.2 Equilibrium of force systems analytically 2.3 Lami's Theorem. 2.4 Types of beam (determinate and indeterminate), supports (simple, hinged, roller and fixed) and loads acting on beam (vertical and inclined point load, distributed load, load, couple), span of beam. 2.5 Beam reaction for cantilever, simply supported beam with or without overhang - subjected to combination of Point load and LTD load or Vertical Point load and couple. 2.6 Beam reaction for simply supported beam subjected to vertical loads only.	**CO1, CO2**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 3a. Calculate force of friction and coefficient of friction for the given condition or situation *TSO 3b.* Describe the conditions for friction for the given situation. *TSO 3c.* Identify the various forces acting on a ladder for the given conditions using free body diagram. *TSO 3d.* Compare the value of coefficient of friction between different surfaces. *TSO 3e.* Interpret the effect of change of masses, change of angle of inclination or both on the coefficient of friction *TSO 3f.* Calculate forces acting on a body that is moving on a horizontal rough surface *TSO 3g.* Determine the forces acting on a body that is moving on an inclined plane	**Unit 3.0 Friction** 3.1 Friction and its relevance in engineering, types and laws of friction, limiting equilibrium, limiting friction, co-efficient of friction, angle of friction, angle of repose, relation between co-efficient of friction and angle of friction. 3.2 Equilibrium of bodies on level surface subjected to force parallel and 3.3 inclined to plane. 3.4 Equilibrium of bodies on inclined plane subjected to force parallel to the plane only. FBD of ladder in friction	**CO3, CO4**
TSO 4a. Distinguish between centroid and center of gravity *TSO 4b.* Calculate the centroid of geometrical plane figures. *TSO 4c.* Calculate centroid of the given composite plane lamina *TSO 4d.* Determine centre of gravity of the given simple solid. *TSO 4e.* Determine centre of gravity of the given composite solid. *TSO 4f.* Calculate Moment of Inertia of different geometric shapes.	**Unit 4.0 Centroid, Centre of Gravity and Moment of Inertia** 4.1 Introduction to Centroid, Centre of Gravity and Areas 4.2 Centroid of geometrical plane figures (square, rectangle, triangle, circle, semi-circle, quarter circle). 4.3 Centroid of composite figures composed of not more than three geometrical figures and centroid of perforated section, axis of symmetry 4.4 Centre of Gravity of simple solids (Cube, cuboid, cone, cylinder, sphere, hemisphere). 4.5 Centre of Gravity of composite solids composed of not more than two simple solids. 4.6 Moment of inertia - Introduction, calculation of moment of inertia by integration method, theorem of perpendicular axis, theorem of parallel axis, moment of inertia of a rectangular section, hollow rectangular section, circular section, hollow circular section, triangular section	**CO4**
TSO.5a Describe the components of the given lifting machine. TSO.5b Differentiate the working principle of the given two types of lifting machines. TSO.5c Determine velocity ratio, efficiency of the given lifting machine. TSO.5d Calculate effort required and load lifted by the given lifting machine. TSO.5e Draw the graph with the given data TSO.5f Interpret the given graphs TSO.5g Select the relevant lifting machine for the given purpose with justification	**Unit-5.0 Simple Lifting Machine** 5.1 Simple lifting machine, load, effort, mechanical advantage, Applications and advantages. Velocity ratio, efficiency of machines, Law of machine. 5.2 Ideal machine, friction in machine, maximum Mechanical advantage and efficiency, reversible and non-reversible machines, condition for reversibility 5.3 Velocity ratios of Simple axle and wheel, Differential axle and wheel, Worm and worm wheel, Single purchase and double purchase crab winch, Screw jack, Weston's differential pulley block, geared pulley block.	**CO2, CO5**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
	5.4 Graphs of Load verses Effort, Load verses ideal Effort, Load verses Effort lost in friction, Load verses MA, Load verses Efficiency.	

Note: One major TSO may require more than one Theory session/Period.

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2425104

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 1.1. Use force polygon table to determine the resultant of concurrent forces	1.	Determine resultant of concurrent coplanar force system using force polygon table.	CO1, CO2
LSOs 2.1 Apply Lami's theorem LSOs 2.2 Use simply supported beams to find reactions	2.	Determine unknown force in a concurrent balance force system using Lami's Theorem.	CO1, CO2
	3	Find reactions at the supports of a simply supported beam and compare the results with analytical values.	
	4	Determine the support reactions for simply supported beam by • Beam reaction apparatus • Circular dial type weight	
LSO 3.1. Apply law of friction on horizontal plane and inclined plane *LSO 3.2.* Coefficient of friction between different materials *LSO 3.3.* Coefficient of friction between belt and pulley.	5	Determine coefficient of friction on horizontal and inclined plane.	CO2, CO3
	6	Determine the co efficient of friction between two surfaces by • angle of repose methods • friction plane method	
	7	Find the coefficient of friction between belt and pulley in a belt friction set up.	
LSO 4.1. Determine the centroid of different geometrical figures. *LSO 4.2.* Find moment of inertia	8	Determine the centroid of geometrical plane figures (squares, rectangle, triangle)	CO4
	9	Determine the moment of inertia of a fly wheel	
LSOs 5.1 Use simple screw jack *LSOs 5.2* Use differential axle and wheel *LSOs 5.3* Use single and double purchase crab winch *LSOs 5.4* Use jib crane *LSOs 5.5* Use worm and worm wheel apparatus	10	Find M.A, V.R and efficiency of screw jack.	CO5
	11	Find M.A, V.R and efficiency of differential wheel and axle	
	12	Calculate the efficiency of single purchase crab winch and double purchase crab winch	
	13	Determine forces in jib crane.	
	14	Determine the efficiency of worm and worm wheel.	

L) Suggested Term Work and Self Learning: S2425104 Some sample suggested assignments, micro project and other activities are mentioned here for reference.

a. Assignments: Questions/Problems/Numerical/Exercises to be provided by the course teacher in line with the targeted COs.

b. Micro Projects:

- Visit nearby tool room/industry and collect information regarding lifting machine used with their technical specification and their application and prepare comparison chart.
- prepare model of simple lifting machine.
- Prepare models of beam subject to point load, uniformly distributed loads, simply supported, overhang beam.
- Prepare chart showing real-life examples including various types of forces.

c. Other Activities:

1. Seminar Topics:
   - Collision of elastic bodies
   - Law of conservation of energy
   - concept of parallel axis and perpendicular axes theorem

2. Visits: Visit nearby tool room/industry with workshop facilities. Prepare report of visit with special comments of simple lifting machine to be used.

3. Self-Learning Topics:
   - Types of load and beam.
   - Various force system.
   - Simple lifting machine.
   - Centroid of various plane figure

M) Suggested Course Evaluation Matrix: The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and Term Work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate CO attainment.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work & Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	15%	30%	15%	-	-	20%	20%
CO-2	10%	20%	10%	25%	-	10%	20%
CO-3	15%	20%	15%	25%	33%	15%	20%
CO-4	30%	10%	30%	25%	33%	15%	20%
CO-5	30%	20%	30%	25%	34%	40%	20%
Total Marks	**30**	**70**	**20**	**20**	**10**	**20**	**30**
			50				

Legend:
*: Other Activities include self- learning, seminar, visits, surveys, product development, software development etc.
**: Mentioned under point- (N)
#: Mentioned under point-(O)

Note:

- The percentages given are approximate.
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) Suggested Specification Table for End Semester Theory Assessment: Specification table represents the reflection of sample representation of assessment of cognitive domain of full course.

Unit Title and Number	Total Classroom Instruction (CI) Hours	Relevant COs Number(s)	Total Marks	ETA (Marks)		
				Remember (R)	Understanding (U)	Application & above (A)
Unit-1.0 Mechanics and force system	14	CO1, CO2	16	5	3	8
Unit-2.0 Static Equilibrium	10	CO1, CO2	14	4	2	8
Unit-3.0 Friction	8	CO2, CO3	14	5	3	6
Unit-4.0 Centroid, Centre of gravity and Moment of Inertia	6	CO4	12	2	2	8
Unit-5.0 Simple lifting machine	10	CO2, CO5	14	4	4	6
Total	**48**	**-**	**70**	**20**	**14**	**36**

Note: Similar table can also be used to design class/mid-term/ internal question paper for progressive assessment.

O) Suggested Assessment Table for Laboratory (Practical):

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
1.	Determine resultant of concurrent coplanar force system using force polygon table.	CO1	45	45	10
2.	Determine unknown force in a concurrent balance force system using Lami's Theorem.	CO2	40	50	10
3.	Find reactions at the supports of a simply supported beam and compare the results with analytical values.	CO2	30	60	10
4.	Determine the support reactions for simply supported beam by • Beam reaction apparatus • Circular dial type weight	CO1, CO2	30	60	10
5.	Determine coefficient of friction on horizontal and inclined plane.	CO2, CO3	40	50	10
6.	Determine the co efficient of friction between two surfaces by • Angle of repose method • Friction plane method	CO2, CO3	40	50	10
7.	Find the coefficient of friction between belt and pulley in a belt friction set up.	CO2, CO3	30	60	10
8.	Determine the centroid of geometrical plane figures (squares, rectangle, triangle)	CO4	40	50	10
9.	Determine the moment of inertia of a fly wheel	CO4	40	50	10

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
10.	Find M.A, V.R and efficiency of screw jack.	CO2, CO5	30	60	10
11.	Find M.A, V.R and efficiency of differential wheel and axle	CO2, CO5	30	60	10
12.	Calculate the efficiency of single purchase crab winch and double purchase crab winch	CO2, CO5	30	60	10
13.	Determine forces in jib crane.	CO1, CO2	40	50	10
14.	Determine the efficiency of worm and worm wheel	CO2, CO5	40	50	10

Legend:
PRA*: Process Assessment
PDA**: Product Assessment

Note: This table can be used for both end semester as well as progressive assessment of practical. Rubrics need to be prepared by the course teacher for each experiment/practical to assess the student performance.

P) Suggested Instructional/Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Field Trips, Portfolio Based, Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field Information and Communications Technology (ICT)Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Session, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software:

S. No.	Name of Equipment and Tools	Broad Specifications	Relevant Experiment/Practical Number
1.	Differential axle and wheel	wall mounted unit with the wheel of 40 cm diameter and axles are insteps of 20 cm and 10 cm reducing diameter	11
2.	Simple screw Jack	Table mounted metallic body, screw with a pitch of 5 mm carrying a double flanged turn table of 20 cm diameter.	10
3.	Worm and worm wheel	wall mounted unit with threaded spindle. load drum. effort wheel: with necessary slotted weights. hanger and thread.	14
4.	Single Purchase Crab winch	Table mounted heavy cast iron body. The wheel is of C.L material of 25 cm diameter mounted on a shaft of about 40mm dia. On the same shaft a geared wheel of 15 cm dia.	12
5.	Double Purchase Crab winch	Having assembly same as above but with double set of gearing arrangement.	11
6.	Weston's Differential pulley block	Consisting of two pulleys; one bigger and other smaller	13
7.	Weston's Differential worm geared pulley block	Consists of a metallic (preferably steel) cogged wheel of about 20 cm along with a protruded load drum of 10 cm dia to suspend the weights of 10 kg, 20 kg-2 weights and a 50 kg weight.	13
8.	Universal Force Table	Consists of a circular 40 cm dia. Aluminum disc. graduated into 360 degrees. with all accessories.	1, 2
9	Beam Reaction apparatus	The apparatus is with two circular dial type 10 kg.	3,4

S. No.	Name of Equipment and Tools	Broad Specifications	Relevant Experiment/Practical Number
10.	Friction apparatus for motion along horizontal and inclined plane	Base to which a sector with graduated arc and vertical scale is provided. The plane may be clamped at any angle up to 45 degrees_ pan. Two weight boxes (each of 5 gm.10 cm, 2-20 gm. 2-50 gm, 2-100 gm, weight.	5,6
11	Set-up for belt friction apparatus	V and Flat Belt, Cap screw, Spring balance, Belt pulley, Torque cord, Load hanger x2, Weights	7
12	Fly wheel apparatus	flywheel, weight hanger with slotted weights, stop clock, metre scale etc	9
13	Jib crane	Jib Apparatus, Weight, Meter Rod, Set Square	13
14	Models of geometrical figures	Models of geometrical figures	8

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Applied Mechanics	R.S. Khurmi	S.Chand &Co. New Delhi 2014 ISBN: 9788121916431
2.	Engineering Mechanics	S. Ramamrutham	S Chand & Co. New Delhi 2008ISBN:9788187433514
3.	Foundations and Applications of Applied Mechanics	H.D. Ram A.K Chauhan	Cambridge University Press. Thomson Press India Ltd., NewDelhi, 2015, ISBN: 9781107499836
4.	Engineering Mechanics- Statics, Vol.1	J.L. Meriam L.G Kraige	Wiley Publication, New Delhi, ISBN: 978-81-265-4396
5.	Applied mechanics	R.K.Rajput	Laxmi publications (p) ltd. ISBN-13: 8105809631
6	Engineering Mechanics	A.R. Basu	TMH Publication, New Delhi
7	Engineering Mechanics	Timosheenko, Young & Rao	TATA McGraw-Hill Education, New Delhi

(b) Online Educational Resources:

1. http://www.asnu.com.au
2. www.youtube.com for videos regarding machines and applications, friction
3. www.nptel.ac.in
4. www.discoveryforengineers.com

Note: Teachers are requested to check the creative commons license status/ financial implications of the suggested, online educational recourses before use by the students.

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A) Course Code : **2400105D (T2400105D/ S2400105D)**

B) Course Title : Applied Mathematics -D (CACDDM, FCT, TE, GT, FPP)

C) Prerequisite Course(s) : Algebra, Trigonometry, Coordinate Geometry

D) Rationale :

Mathematics is the core course to develop the competencies of most of the technological courses. It provides students with a fundamental understanding of mathematical principles and concepts necessary for solving engineering problems. Textile engineering and allied programs involve dealing with various quantitative aspects, including measurements, material properties, production data, and quality control. Proficiency in basic engineering mathematics enables students to analyze and interpret these quantitative data accurately. Statistical methods are useful to evaluate and optimize textile processes, conduct experiments, analyze experimental data, and make data-driven decisions for process improvement and quality enhancement. The application of basic engineering mathematics in various aspects of textile engineering, including problem-solving, quantitative analysis, design, optimization, and computer-aided tools, makes this course an indispensable subject for aspiring textile engineers. The course provides an insight to analyze engineering problems scientifically using differentiation, trigonometry, coordinate geometry, mensuration, and statistics.

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the accomplishment of the following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor, and Affective) in classroom/laboratory/workshop/field/ industry.

After completion of the course, the students will be able to-

- **CO-1** Demonstrate the ability to solve branch-specific engineering-related problems using applications of differentiation.
- **CO-2** Demonstrate the ability to algebraically analyze basic functions using Trigonometry.
- **CO-3** Solve engineering-related problems based on Straight lines.
- **CO-4** Solve the problems based on measurements of regular close figures and regular solids.
- **CO-5** Apply the concept of statistics to solve engineering-related problems.

F) Suggested Course Articulation Matrix (CAM):

Course Outcomes (COs)	Program Outcomes (POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	**PO-2** Problem Analysis	**PO-3** Design/ Development of Solutions	**PO-4** Engineering Tools	**PO-5** Engineering Practices for Society, Sustainability and Environment	**PO-6** Project Management	**PO-7** Life-Long Learning	**PSO-1**	**PSO-2**
CO-1	3	-	-	-	-	-	-		
CO-2	3	1	1	-	-	-	-		
CO-3	2	1	-	-	-	-	-		
CO-4	3	1	-	-	-	-	1		
CO-5	3	2	-	1	-	-	1		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by the respective program coordinator at the institute level. As per the latest NBA guidelines, formulating PSOs is optional.

G) Teaching & Learning Scheme:

Course Code	Course Title	Scheme of Study (Hours/Week)					
		Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
		L	T				
2400105D	Applied Mathematics - D	02	01	-	02	05	04

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem-based learning, etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/ practical performances / problem-based experiences in laboratory, workshop, field, or other locations using different instructional/ Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term Work (includes assignments, seminars, micro-projects, industrial visits, any other student activities, etc.)

SL: Self Learning, MOOCs, Spoken Tutorials, online educational resources, etc.

C: Credits= (1xCIhours) + (0.5xLIhours) + (0.5xNotionalhours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of the teacher to ensure the outcome of learning.

H) Assessment Scheme:

Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
		Theory Assessment (TA)		Term Work & Self-Learning Assessment (TWA)		Lab Assessment (LA)		
		Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2400105D	Applied Mathematics - D	30	70	20	30	-	-	150

Legend:

PTA: Progressive Theory Assessment in the classroom (includes class test, mid-term test, and quiz using online/offline modes)

PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)

TWA: Term work &self-learning Assessment (Includes assessment related to student performance in assignments, seminars, micro-projects, industrial visits, self-learning, any other student activities, etc.

Note:

- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignments, micro-projects, seminars, and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of the respective course. For valid and reliable assessment, the internal faculty should prepare a checklist & rubrics for these activities.

I) Course Curriculum Detailing: This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW), and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to the attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020-related reforms like Green

skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS), and others must be integrated appropriately.

J) Theory Session Outcomes (TSOs) and Units: T2400105D

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 1a. Apply the working rules and standard forms of differentiation to find the derivative of simple functions. *TSO 1b.* Invoke the concept of the Chain rule to find the derivative of simple functions. *TSO 1c.* Apply the concept and rules of derivative to solve the problems related to the velocity and acceleration of a given simple function. *TSO 1d.* Apply the concept and rules of derivative to solve the problems related to the maxima-minima of a given simple function.	**Unit-1.0 Differentiation and its Applications** 1.1 Concept and Definition of Differentiation. 1.2 Working rules, sum, products, division. 1.3 Chain rules. 1.4 Applications: velocity, acceleration, maxima-minima of the given function.	**CO1**
TSO 2a. Apply the concept of compound angle, allied angle, and multiple angles to solve the given simple engineering problems. *TSO 2b.* Apply the concept of Sub-multiple angles to solve the given simple engineering problems. *TSO 2c.* Employ the concept of factorization and de-factorization formulae to solve the given simple engineering problems. *TSO 2d.* Use concepts given in Ancient Indian Mathematics for trigonometry to solve given problems. (IKS).	**Unit-2.0 Trigonometry** 2.1 Trigonometric ratios of compound, allied, multiple, and sub-multiple angles (without proof). 2.2 Factorization and de-factorization formula (without proofs). 2.3 Trigonometry in Indian Knowledge System: The Evolution of Sine Function in India. 2.4 Indian Trigonometry: Basic Indian Trigonometry- Introduction and Terminology (From Ancient Beginnings to Nilakantha) (IKS). 2.5 Trigonometry in Indian Knowledge System: Pythagorean triples in Sulabasutras. (IKS).	**CO2**
TSO 3a. Calculate the angle between the given two straight lines. *TSO 3b.* Formulate an equation of straight lines related to given engineering problems. *TSO 3c.* Identify the perpendicular distance from the given point to the line. *TSO 3d.* Calculate the perpendicular distance between the given two parallel lines. *TSO 3e.* Use the geometry given in Sulabasutras to solve the given problems. (IKS).	**Unit-3.0 Straight line** 3.1 Straight line and slope of a straight line. a. Angle between two lines. b. Condition of parallel and perpendicular lines 3.2 Various forms of straight lines. a. Slope-point form, two-point form b. Slope-intercept form, Intercept-intercept form c. General form d. The perpendicular distance from a point to the line. e. Perpendicular distance between two parallel lines. 3.3 Geometry in Sulabasutras in Indian Knowledge System (construction of the square, circling the square). (Indian Mathematics). (IKS).	**CO3**
TSO 4a. Calculate the area of the given triangle and circle Identify the isomorphic graphs. *TSO 4b.* Determine the area of the given square parallelogram, Rhombus, and Trapezium.	**Unit-4.0 Mensuration** 4.1 Area of regular Closed figures, Area of Triangle, Square Parallelogram, Rhombus, Trapezium, and Circle.	**CO4**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 4c. Compute the surface area of the given Cuboids, spheres, Cones, and Cylinders. *TSO 4d.* Determine the volume of given Cuboids, Sphere, Cone, and Cylinder.	4.2 Volume of Cuboids, Cone, Cylinder, and Sphere.	
TSO 5a. Obtain the range and coefficient of range of the given grouped and ungrouped data. *TSO 5b.* Calculate means and standard deviation of discreet and grouped data related to the given simple engineering problems. *TSO 5c.* Define Common causes and Special causes. *TSO 5d.* Define Upper control limit and Lower control limit. *TSO 5e.* Implement control charting to assess process stability. *TSO 5f.* Determine the appropriate type of chart for a given process.	**Unit-5.0 Statistics** 5.1 Range, coefficient of range of discrete and grouped data. 5.2 Mean deviation and standard deviation from the mean of grouped and ungrouped data, weighted means. 5.3 SPC (Statistical Process Control) and significance. 5.4 Histograms and Charts. 5.5 Common causes and Special causes. 5.6 Control limits (Upper control limit and Lower control limit).	**CO5**

Note: One major TSO may require more than one Theory session/Period.

K) Suggested Tutorial and Outcomes:

Outcomes	S. No.	Tutorial Titles	Relevant COs Number(s)
1.1 Apply differentiation to determine the parameters of the fabric to achieve the desired strength. 1.2 Use the concept of differentiation to calculate the parameters of the fabric to achieve the desired shrinkage. 1.3 Calculate desired thermal conductivity of the fabric that needs to be adjusted, using the concept of differentiation. 1.4 Use differentiation to calculate the parameters of the fabric that need to be adjusted to achieve the desired air permeability. 1.5 Apply differentiation to solve given problems based on the Food Industry.	1.	• Application of differentiation for determining desired strength. • Differentiation and its applications for determining desired shrinkage. • Application of differentiation for determining thermal conductivity. • Differentiation and its applications for determining desired air permeability. • Application of differentiation in the Food industry.	CO1
2.1 Measure the angles of two pieces of fabric and calculate the angle at which the seam needs to be sewn to be perfectly straight. 2.2 Measure the angle of a fabric roll and calculate the angle of the roll. 2.3 Measure the length of the conveyor belt for a given angle of the frame. 2.4 Calculate the circumference of the circle by measuring the radius of a piece of fabric.	2.	• Applications of measuring angles. • Applications of measuring length. • Applications of calculating circumferences.	CO2

Outcomes	S. No.	Tutorial Titles	Relevant COs Number(s)
3.1 Calculate the amount of fabric required to make a garment with specific measurements. 3.2 Calculate the finished length of a fabric after making a certain number of pleats. 3.3 Make a particular style of garment by calculating the total yardage of fabric needed. 3.4 Estimate the number of ems and seams needed to finish a garment. 3.5 Calculate the total yardage of fabric needed to make a particular style of garment.	3.	• Applications of measuring length. • Applications of finding slope. • Applications of computing perpendicular distance.	CO3
4.1 Calculate the area of a fabric piece given the measurements of length and width. 4.2 Calculate the area of a fabric piece given the measurements of length and width. 4.3 Calculate the weight of a cylindrical fabric piece given the measurements of radius, height, and density. 4.4 Calculate the Weight of a cuboid fabric piece given the measurements of length width, height, and density.	4.	• Applications of calculating area. • Applications of calculating weight.	CO4
5.1 Create a frequency distribution table for the number of textile engineering diploma students in a class. 5.2 Create a distribution graph (bar graph) to illustrate the number of textile engineering diploma students in a class. 5.3 Calculate the mean, median, mode, and range of the number of textile engineering diploma students in a class. 5.4 Explain the difference between a population and a sample in the context of textile engineering diploma students in a class. 5.5 Calculate the standard deviation for the number of textile engineering diploma students in a class.	5.	• Applications of frequency distribution. • Applications of mean, median, and mode. • Applications of calculating standard deviation.	CO5

L) Suggested Term Work and Self-Learning: S2400105D Some sample suggested assignments, micro-projects, and other activities are mentioned here for reference.

a. Assignments: Questions/Problems/Numerical/Exercises to be provided by the course teacher in line with the targeted COs.

1. Use differentiation to determine the rate at which dye is absorbed by the textile material.
2. Use Differential calculus to model and optimize the tensile strength of fabric based on the relationship between fabric composition, weave structure, and tensile strength.
3. Apply Trigonometric functions to create patterns like stripes, checks, or circular designs. Explain the relationship between the function parameters and resulting fabric pattern characteristics.

4. Use Library resources to find various applications of trigonometry in designing food processing equipment.
5. Use Library resources to find various applications of straight lines in fabric inspection to detect distortions or irregularities in woven or knitted fabrics.
6. Prepare a handout and a PDF file on the role of straight lines in assembling and decorating food products such as cakes or Sandwiches.
7. Employ mensuration to calculate fabric weight and Fabric Consumption and prepare a file.
8. Use the concept of mensuration for pattern layout optimization and present the findings.
9. Prepare a write-up on the role of statistical process control in identifying and addressing variations in textile production processes.
10. Prepare a presentation on the role of statistics in the nutritional analysis of food products. Discuss the use of statistical techniques to analyze and interpret data related to nutrient content, dietary intake, and health outcomes.

b. Micro Projects:

1. Prepare charts displaying various standard differential formulas.
2. Explore the use of differential calculus to calculate the velocity and acceleration of a particle.
3. Calculate the rate of change of the temperature and plot its graph.
4. Calculate profit and loss concerning business using graphs.
5. Prepare charts showing the area and volume of various geometrical shapes using mensuration.
6. Draw the graph of the Trigonometric ratio on a chart paper and verify using suitable open-source software.
7. Prepare a model showing the area of different geometrical shapes.
8. Prepare a simulated environment to study the 2D-printing under the influence of coordinate geometry.
9. Prepare a chart consisting of the surface area of cuboids, spheres, cones, and cylinders as their real-life application.
10. Download 5-7 videos based on mean deviation for group data and ungrouped data, watch them, and write a report to detail the mathematical steps involved.
11. Make a short video of duration 5-7 minutes for the use of Laplace transform to calculate the response of a system to an input signal.
12. Download 5-7 videos based on the application of Statistical process control to understand the process of manufacturing products and write a report to detail the mathematical steps involved.
13. Make a short video of duration 10-15 minutes on the engineering application of statistical process control especially in production units in the textile industry.

c. Other Activities:

1. Seminar Topics:
    - Sustainable Textile Manufacturing: Challenges and Opportunities
    - Smart Textiles and Wearable Technology
    - Nanotechnology in Textiles: Advancements and Applications
    - Digital Printing Techniques for Textile Design
    - Innovations in Textile Dyeing and Finishing Processes
    - Advances in Textile Testing and Quality Control
    - Eco-Friendly Textile Fibers: Development and Utilization
    - Trends in Textile Fashion Design and Forecasting
    - Textile Supply Chain Management: Optimization and Logistics
    - Surface Modification Techniques for Textile Material

- Textile Engineering for Sustainable Apparel Production
- Future Prospects of 3D Printing in Textile Manufacturing

2. Visits: Visiting the following places would provide students an opportunity to see the application of various branches of mathematics in different fields. This will also help students to comprehend the career opportunities available in the field of mathematics.
    - Visit to a mathematics museum.
    - Visit a mathematics research institute.
    - Visit to a mathematics laboratory.
    - Visit to a Data Science Center.
    - Visit the mathematics department of a college or university.
    - Visit a nearby Textile Industry.
    - Visit to a Space Agency.
    - Visit to a Game Studio.

3. Self-Learning Topics:
    - Applications of differentiation (optimization, rates of change)
    - Statistical inference (confidence intervals, hypothesis testing)
    - Systems of linear equations and their solutions
    - Yarn calculations (count systems, conversions)
    - Fabric calculations (linear density, fabric weight)
    - Statistical analysis of textile data

M) **Suggested Course Evaluation Matrix:** The course teacher has to decide and use the appropriate assessment strategy and its weightage in theory, laboratory, and Term Work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate **CO attainment**.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work & Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	10%	10%	10%	20%	10%	-	-
CO-2	10%	10%	10%	20%	10%	-	-
CO-3	20%	20%	20%	20%	25%	-	-
CO-4	25%	25%	25%	20%	25%	-	-
CO-5	35%	35%	35%	20%	30%	-	-
Total Marks	**30**	**70**	**20**	**20**	**10**	**-**	**-**
			50				

Legend:

*: Other Activities include self-learning, seminars, visits, surveys, product development, software development, etc.

**: Mentioned under point- (N)

#: Mentioned under point-(O)

Note:

- The percentages given are approximate
- In the case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided among all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to the achievement of each COs.

N) Suggested Specification Table for End Semester Theory Assessment: The specification table represents the reflection of sample representation of assessment of the cognitive domain of the full course.

Unit Title and Number	Total Classroom Instruction (Cl) Hours	Relevant COs Number(s)	Total Marks	ETA (Marks)		
				Remember (R)	Understanding (U)	Application & above (A)
Unit-1.0 Differentiation and its Applications	8	CO1	08	2	4	2
Unit-2.0 Trigonometry	8	CO2	08	2	4	2
Unit-3.0 Straight line	10	CO3	14	4	6	4
Unit-4.0 Mensuration	8	CO4	18	6	6	6
Unit-5.0 Statistics	14	CO5	22	6	8	8
Total	**48**	**-**	**70**	**20**	**28**	**22**

Note: A similar table can also be used to design class/mid-term/ internal question papers for progressive assessment.

O) Suggested AssessmentTable for Laboratory (Practical): (Not Applicable)

P) Suggested Instructional/Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lectures, Tutorial, Case Methods, Group Discussions, Industrial visits, Industrial Training, Field Trips, Portfolios, Learning, Role Play, Live Demonstrations in Classrooms, Labs, Field Information, and Communications Technology (ICT)Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Session, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software:

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/Practical Number
1.	High-end computers	Processor Intel Core i7 with Compilers and Programming Languages, RAM 32GB, DDR3/DDR4, HDD 500 GB, OSWindows10	All
2.	Software	Scientific Calculators, Graphing Calculator, SCILAB, GraphEq^2.13, Microsoft Mathematics, GeoGebra, Math3D	1,2,3,4,5
3.	Printer	High-Speed Duplex Printer	4,5
4.	Scanner	Handheld 3D scanner, Accuracy up to 0.1mm, Resolution up to 0.2 mm, Wireless technology with an in-built touchscreen and battery, Extended field of view for capturing both large and small objects	4,5

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Elementary Engineering Mathematics	B. S. Grewal	Khanna Publishers,15th Edition. ISBN: 978-81-7409-257-1
2.	Engineering Mathematics (Third edition)	Croft, Anthony	Pearson Education, New Delhi, 2014. ISBN 978-81-317-2605-1
3.	Calculus and Its Applications	Marvin L. Bittinger David J. Ellenbogen Scott A. Surgent	Addison-Wesley 10th Edition ISBN-13: 978-0-321-69433-1
4.	Calculus and Analytic Geometry	G. B. Thomas, R. L. Finney	Addison Wesley, 9th Edition, 1995. ISBN 978-8174906168
5.	Advanced Engineering Mathematics	Krezig, Ervin	Wiley Publ., New Delhi,2014, ISBN: 978-0-470-45836-5
6.	Understanding Engineering Mathematics	John Bird	Routledge; First Edition ISBN 978-0415662840
7.	Indian Mathematics Engaging with the World from Ancient to Modern Times	George Gheverghese Joseph	World Scientific Publishing Europe Ltd. 57ISBN 978-17-86340-61-0
8.	A Modern Introduction to Ancient Indian Mathematics	T.S. Bhanumurthy	New Age International Private Limited, 1 January 2008 ISBN- 10. 812242600X, ISBN- 13. 978-8122426007
9.	Mathematics-I	Deepak Singh	Khanna Book Publishing Co. (P) Ltd. ISBN: 978-93-91505-42-4
10.	Mathematics-II	Garima Singh	Khanna Book Publishing Co. (P) Ltd. ISBN: 978-93-91505-52-3
11.	Sansar Ke Mahan Ganitagya	Gunakar Muley	First Edition, Rajkamal Prakashan, ISBN-10. 8126703571, ISBN-13. 978-8126703579.
12.	Consider Dimension and Replace Pi	M.P. Trivedi and P.Y. Trivedi	Notion Press; 1st edition (2018), ISBN: 978-1644291795

(b) Online Educational Resources:

1. https://ocw.mit.edu/
2. https://tutorial.math.lamar.edu/
3. https://www.khanacademy.org/
4. https://www.feynmanlectures.caltech.edu/
5. https://www.wolframalpha.com/
6. https://www.dplot.com/
7. https://www.geogebra.org/
8. https://www.easycalculation.com/
9. https://www.scilab.org/
10. https://www.desmos.com/
11. https://nptel.ac.in/
12. https://swayam.gov.in/
13. https://ndl.iitkgp.ac.in/
14. https://parakh.aicte-india.org/
15. https://ekumbh.aicte-india.org/

16. https://learnengg.com/LE/Index

Note: Teachers are requested to check the Creative Commons license status/ financial implications of the suggested, online educational recourses before use by the students.

(c) Others:

1. Online Mathematics Courses.
2. Mathematics Communities and Forums.
3. Mathematics Journals.
4. Mathematics Podcast.
5. Mathematics Tutorials.
6. Mathematics Quizzes.
7. Mathematics Animation.
8. Mathematics Simulations.
9. Mathematics Games.
10. Mathematics Puzzles.
11. Mathematics Brain Teasers.
12. Mathematics Apps.
13. Mathematics Blog.

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A) Course Code : **2415105(P2415105/S2415105)**

B) Course Title : Engineering Drawing & Graphics
(CE, EE, ELX, ELX (R), MIE, FTS, AE, CHE, TE, CRE)

C) Pre- requisite Course(s) : Knowledge of standard geometries

D) Rationale :

With the emergence of computer-aided drafting and design (CAD) tools the traditional engineering drawing practices has undergone significant change as the emphasis has shifted from drawing board-based engineering practices to Computer aided based drafting and modeling which has the advantages of speed, modification, storage and convenience of drawing complex 2D and 3D entities. Still to develop ability of visualization, understanding of drawing standards and free hand sketching on one side and to take advantage of digital drafting tools on other, this course addresses both the aspects. The course covers the knowledge & application of drawing instruments, familiarizes the learner about Bureau of Indian standards related to engineering drawing, developing the ability to draw and read various engineering curves, projections and dimensioning styles and finally make him able to use computer aided drafting software for developing engineering drawings related to different fields.

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/laboratory/workshop/field/ industry.

After completion of the course, the students will be able to-

- **CO-1** Use drawing instruments, drawing codes, dimensioning, conventions and symbols as per IS SP-46(2003) in engineering drawing.
- **CO-2** Draw geometrical figures, curves and engineering scales.
- **CO-3** Draw the views of objects using principles of orthographic projection.
- **CO-4** Draw isometric views of components directly or from orthographic projections.
- **CO-5** Draw free hand sketches of engineering elements, their orthographic and isometric views.
- **CO-6** Use computer aided drafting software to draw 2D and isometric geometric entities.

F) Suggested Course Articulation Matrix (CAM):

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	**PO-2** Problem Analysis	**PO-3** Design/ Development of Solutions	**PO-4** Engineering Tools	**PO-5** Engineering Practices for Society, Sustainability and Environment	**PO-6** Project Management	**PO-7** Life Long Learning	**PSO-1**	**PSO-2**
CO-1	3	-	-	3	2	1	-		
CO-2	3	-	-	3	-	1	-		
CO-3	3	1	1	3	-	1	2		
CO-4	3	1	1	3	-	1	2		
CO-5	3	-	1	3	-	-	2		
CO-6	3	-	1	3	2	1	3		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

G) Teaching & Learning Scheme:

Course Code	Course Title	Scheme of Study (Hours/Week)					
		Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
		L	T				
2415105	Engineering Drawing & Graphics	-	-	04	02	06	03

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term Work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.

C: Credits= (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

H) Assessment Scheme:

Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
		Theory Assessment (TA)		Term Work& Self-Learning Assessment (TWA)		Lab Assessment (LA)		
		Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2415105	Engineering Drawing & Graphics	-	-	20	30	20	30	100

Legend:

PTA: Progressive Theory Assessment in classroom (includes class test, mid-term test and quiz using online/offline modes)

PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)

TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.

Note:

- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

I) Course Curriculum Detailing: This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW) and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020 related reforms like Green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS) and others must be integrated appropriately.

J) Theory Session Outcomes (TSOs) and Units:

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 1a. Use Drawing Instruments to prepare 2D drawings manually. *TSO 1b.* Use different lines and annotations for a given situation. *TSO 1c.* Draw engineering scale for the given situation. *TSO 1d.* Choose appropriate scale factor for the drawing as per given situation. *TSO 1e.* Dimension the given geometric figure using IS SP-46 standard. *TSO 1f.* Draw the given regular geometric figure with tangents and normal. *TSO 1g.* Draw selected engineering curve.	**Unit-1.0 Basic Elements of Drawing** 1.1 Methods to use different Drawing Instruments and supporting materials. 1.2 Different lines and conventions in engineering drawing. 1.3 Engineering scales and applications: Reduced, enlarged & full size (only Plain scale) 1.4 Dimensioning techniques: types and applications of chain, parallel and coordinate dimensioning as per SP-46. 1.5 Regular Geometrical figures, Tangency constructions. 1.6 Engineering Curves: only Ellipse and Parabola using concentric circle method, rectangular method and Eccentricity method when focus and directrix are given.	**CO1, CO2**
TSO 2a. Explain the different types of projections & their uses. *TSO 2b.* Draw the orthographic projections of different objects *TSO 2c.* Convert pictorial views into orthographic views	**Unit-2.0 Orthographic Projections** 2.1 Concept and applications of Orthographic, Perspective, Isometric and Oblique Projections. 2.2 Orthographic Projection: First and Third angle 2.3 Draw orthographic views of simple 3D entities containing lines, circles and arcs with axis/orientation parallel and/or perpendicular to the projection planes only. Problems should be restricted up to three views Front view/Elevation, Top view/Plan and Side views only using First Angle Method only. 2.4 Conversion of simple pictorial views into orthographic views. (Domain specific illustrative problems to be given by the teacher)	**CO1, CO2, CO3**
TSO 3a. Explain the Isometric Projection, Isometric view and Isometric Scale. *TSO 3b.* Draw isometric dimensioning on the given isometric view. *TSO 3c.* Explain the Methods of constructing isometric drawing *TSO 3d.* Draw Isometric View of the given object containing elements like rectangular, circular, cylindrical shapes and slots on sloping and plane surfaces. *TSO 3e.* Convert the given orthographic views into isometric View/Projection.	**Unit-3.0 Isometric Projection** 3.1 Introduction to isometric projection. 3.2 Isometric scale and Natural Scale. 3.3 Isometric view and isometric projection. 3.4 Illustrative problems limited to Isometric projection of objects containing rectangular, circular, cylindrical shapes and slots on sloping and plane surfaces. 3.5 Conversion of orthographic views into isometric View/projection.	**CO1, CO3, CO4**
TSO 4a. Sketch the given straight line, square, rectangle, circle and arc. *TSO 4b.* Sketch the given simple orthographic and isometric views of the given part.	**Unit-4.0 Free Hand Sketches of Engineering Elements** 4.1 Materials for Sketching. 4.2 General Guidelines for Freehand Sketching.	**CO5**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 4c. Sketch the given domain specific engineering element/component.	4.3 Freehand sketching of straight lines, square, rectangle, circles and arcs. 4.4 Free hand sketches of orthographic views. 4.5 Free hand sketches of isometric views. 4.6 Freehand sketching of domain specific engineering elements/components (e.g. Bolt, Nut, Washer, Stud, Screw, simple machine parts, etc. in case of mechanical, production, automobile, electrical engineering).	
TSO 5a. Use computer aided drafting software for creating the institute Drawing Template. *TSO 5b.* Use computer aided drafting software for creating the given simple 2D entity.	**Unit-5.0 Basic Computer Aided Drafting** 5.1 Basics of AutoCAD or any other drafting software–interface, screen layout, starting commands from menus, command line. 5.2 Coordinate system, Angular measurements, Point specification. 5.3 Drawing aids - Grid, Snap, Ortho, Osnap, Units, Limits, Layers, Linetype. 5.4 Opening and Saving drawing files. 5.5 Creating User Defined Templates. 5.6 Methods of Selecting and deleting Objects. 5.7 Undo and Redo. 5.8 Creating basic drawings objects - lines, arc, circles, ellipses, polyline and polygons.	**CO1, CO2, CO6**
TSO 6a. Use computer aided drafting software for creating orthographic views of the given object. *TSO 6b.* Use computer aided drafting software for creating isometric views of the given object. *TSO 6c.* Print the given drawing (using institute template) on A4/A3 sheet.	**Unit-6.0 Advanced Computer Aided Drafting** 6.1 Modify commands - erase, copy, move, rotate, scale, stretch, 6.2 Array: concept and applications. 6.3 Controlling Drawing display 6.4 Text and Dimensioning 6.5 Layers: concept and application 6.6 Drawing orthographic vies using drafting software with principles mentioned in Unit 2. 6.7 Drawing isometric views using drafting software with principles mentioned in Unit 3. 6.8 Printing and plotting of drawings.	**CO1, CO2, CO3, CO4, CO6**

Note: One major TSO may require more than one Theory session/Period.

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2415105

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 1.1. Use manual drawing instruments *LSO 1.2.* Draw simple 2D entities using manually drawing instruments.	1.	Geometric Construction: • Draw set of lines with different conditions (two problems). • Draw circle and arcs with different geometric conditions and constraints (two problems). • Draw polygons by general methods (Triangle, square, pentagon, hexagon, heptagon) (Three problems).	CO1, CO2
LSO 2.1. Draw conic sections using manually drawing instruments. *LSO 2.2.* Use different methods of construction of ellipse and parabola.	2.	• Construct ellipse using four center method, arc of circle method and rectangle method. • Construct parabola using rectangular method, and parallelogram method.	CO2
LSO 3.1. Apply concepts of orthographic projection in drawing the given simple object on drawing sheet. *LSO 3.2.* Visualize the three views related to the given object based on its shape and orientation.	3.	Draw Orthographic projections of following using first angle method: • A pentagonal pyramid is placed in first quadrant with its axis parallel to H.P. and V.P • A frustum of a hexagonal is placed in first quadrant with its axis perpendicular to H.P. and parallel to V.P • Different objects having cylindrical surfaces, ribs. (three views of each object, total six problems)	CO3
LSO 4.1. Apply concepts of orthographic projection to draw three views of given domain specific object/ component.	4.	Draw Orthographic projections of domain specific objects (three views of each object) (Two problems).	CO3
LSO 5.1. Use concepts of Isometric projection to draw the given simple object with slant surface.	5.	Draw Isometric view of simple objects having plain and slanting surface by using natural scale. (Three problems)	CO4
LSO 6.1. Visualize the 3D shape of the given object. *LSO 6.2.* Convert the given 2D figures/views into 3Dobject.	6.	Convert the orthographic views of an object to isometric view. (Two problems)	CO3, CO4
LSO 7.1. Draw free hand sketches of the given domain specific object/component	7.	Draw free hand sketches/conventional representation of your domain specific components (Six problems)	CO5
LSO 8.1. Draw 3D free hand sketches from the given isometric shape.	8.	Draw free hand sketch of isometric drawings (prepared in Sr. No. 05) without using any instruments.	CO5
LSO 9.1. Draw 3D free hand sketches of the given real object/component.	9.	Given the 3D model of an object, student will try to imagine the three views and draw them with free hand in the sketch book.	CO5
LSO 10.1. Use computer aided drafting software to create and modify a template. *LSO 10.2.* Insert any picture in the existing AutoCAD drawing	10.	Prepare a template for your institute of A-4 size with title block and institute logo.	CO6

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 10.3. Insert text in the existing AutoCAD drawing			
LSO 11.1. Use computer aided drafting software to create and modify simple 2D entities. *LSO 11.2.* Use computer aided drafting software to create and modify circles and arcs with different geometric conditions and constraints	11.	Computer Aided Drafting: Use the software to draw following simple 2-D entities using Draw commands individually • Draw circle and arcs with different geometric conditions and constraints (two problems). • Draw polygons (Triangle, square, pentagon, hexagon, heptagon) (Three problems).	CO6
LSO 12.1. Use computer aided drafting software to calculate Area, Perimeter, and Centroid of the given 2D entity	12.	Use the software to estimate Area, Perimeter, and Centroid for the given 2D entities like Circle, Pentagon, Trapezium, hexagon and 2D entity with arcs and spline curves using 'Enquiry' and 'List' commands.	CO6
LSO 13.1. Use computer aided drafting software to draw complex 2D entities.	13.	Use the software to draw four domain specific complex 2-D entities assigned by the teacher using Draw, Edit and Modify commands	CO6
LSO 14.1. Use computer aided drafting software to create and modify 2D entities. *LSO 14.2.* Use computer aided drafting software to create and modify the given orthographic views.	14.	Use the software to draw orthographic views of • A pentagonal pyramid is placed in first quadrant with its axis parallel to H.P. and V.P • A frustum of a hexagonal is placed in first quadrant with its axis perpendicular to H.P. and parallel to V.P • Different objects having cylindrical surfaces, ribs. (three views of each object, total six problems)	CO3, CO6
LSO 15.1. Use computer aided drafting software to create and modify the given isometric entities.	15.	Use the software to draw isometric views of three 3D objects containing lines, arcs, circles, holes, ribs and slots	Co4, CO6

L) Suggested Term Work and Self Learning: S2415105 Some sample suggested assignments, micro project and other activities are mentioned here for reference.

a. Assignments:

1. Sketch progressive and parallel dimensioning.
2. Prepare a list of industrial and household components in which conic curves are used and justify the utility of these curves.
3. Write the equations for parabola in different quadrants and observe the effect of changing eccentricity in case of parabola.
4. Exercises on drawing orthographic views of engineering domain specific simple parts.
5. Exercise on drawing isometric views of different objects.
6. Exercises on converting the orthographic views of an object to isometric view.
7. Exercise on missing views.
8. Exercises on creating simple digital drawings, orthographic views and isometric views.
9. Each student should explain at least one problem for construction and method of drawing in sheet/computer to all batch colleagues. Teacher will assign the problem of particular sheet to be explained to each student batch.
10. Each student will assess at least one sheet of other students (May be a group of 5-6 students identified by teacher can be taken) and will note down the mistakes committed by them. Student will also guide the students for correcting the mistakes, if any.

b. Micro Projects:

1. Through experimentation, justify that the eccentricity of an ellipse is 1.
2. Cut a Cardboard/Thermocole cone with various section planes to get circle, ellipse, parabola and hyperbola.
3. Explore the applications of engineering curves in different fields of engineering and prepare a short report.
4. List the shapes and curves you are observing around you in real life with name of place and item. (For Ex. ellipse, parabola, hyperbola, cycloid, epicycloids, hypocycloid, involute, spiral helix).
5. Cut triangular, square, rectangular and circular shaped Cardboard/Thermocole pieces and observe them by placing in different positions with respect to the protection planes.
6. Take a medium sized hexagonal nut and draw its isometric projection.
7. The teacher will assign one set of orthographic projections and ask the student to develop 3D Thermocol models of the same.
8. Prepare an A4 digital drawing template of your institute with title block and institute logo.
9. Each batch will collect 5 components/circuits/items specific to their branch and draw their orthographic views using AutoCAD software.
10. Download 5 videos on shortcuts used in AutoCAD, watch them and write a report to detail out the steps involved, Commands used.

c. Other Activities:

1. Seminar Topics:
   - Standard symbol and conventions used in engineering drawings related to your branch/domain.
   - Commercially available other Computer Aided Drafting Software.
   - Compatibility of AutoCAD drawings compared to Conventional Drawing.

2. Visits: Collect production/construction/circuit drawings from nearby industries/shop/builders and observe the type of orthographic projection, symbol of projection and various views used.

3. Self-Learning Topics:
   - Types of lines and dimensioning in engineering drawing.
   - Different methods of drawing Arcs and Circles in AutoCAD software.

M) **Suggested Course Evaluation Matrix:** The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and Term Work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate CO attainment.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work& Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	-	-	05%	-	-	05%	16%
CO-2	-	-	05%	20%	20%	05%	16%
CO-3	-	-	20%	20%	20%	15%	16%
CO-4	-	-	20%	20%	20%	15%	16%
CO-5	-	-	15%	20%	20%	20%	16%
CO-6	-	-	35%	20%	20%	40%	17%
Total Marks	-	-	**20**	**20**	**10**	**20**	**30**
			50				

Legend:

*: Other Activities include self- learning, seminar, visits, surveys, product development, software development etc.

**: Mentioned under point- (N)

#: Mentioned under point-(O)

Note:

- The percentages given are approximate.
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) Suggested Specification Table for End Semester Theory Assessment: (Not Applicable)

O) Suggested AssessmentTable for Laboratory (Practical):

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
1.	Geometric Construction: • Draw set of lines with different conditions (two problems). • Draw circle and arcs with different geometric conditions and constraints (two problems). • Draw polygons by general methods (Triangle, square, pentagon, hexagon, heptagon) (Three problems).	CO1, CO2	30	60	10
2.	• Construct ellipse using four center method, arc of circle method and rectangle method • Construct parabola using rectangular method, and parallelogram method	CO2	30	60	10
3.	Draw Orthographic projections of following using first angle method: • A pentagonal pyramid is placed in first quadrant with its axis parallel to H.P. and V.P • A frustum of a hexagonal is placed in third quadrant with its axis parallel to H.P. and V.P • Different objects having cylindrical surfaces, ribs. (three views of each object, total six problems)	CO3	30	60	10
4.	Draw Orthographic projections of domain specific objects (three views of each object) (Two problems).	CO3	30	60	10
5.	Draw Isometric view of simple objects having plain and slanting surface by using natural scale. (Three problems)	CO4	30	60	10
6.	Convert the orthographic views of an object to isometric view (Two problems)	CO3, CO4	30	60	10
7.	Draw free hand sketches/conventional representation of your domain specific components (Six problems)	CO5	30	60	10
8.	Draw free hand sketch of all above isometric drawings (prepared in Sr. No. 06) without using any instruments.	CO5	30	60	10
9.	Given the 3D model of an object, student will try to imagine the three views and draw them with free hand in the sketch book.	CO5	40	50	10
10.	Prepare a template for your institute of A-4 size with title block and institute logo.	CO6	40	50	10
11.	Computer Aided Drafting: Use the software to draw following simple 2-D entities using Draw commands individually • Draw circle and arcs with different geometric conditions and constraints (two problems). • Draw polygons (Triangle, square, pentagon, hexagon, heptagon) (Three problems).	CO6	40	50	10

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
12.	Use the software to estimate Area, Perimeter, and Centroid for the given 2D entities like Circle, Pentagon, Trapezium, hexagon and 2D entity with arcs and spline curves using 'Enquiry' and 'List' commands.	CO6	40	50	10
13.	Use the software to draw four domain specific complex 2-D entities assigned by the teacher using Draw, Edit and Modify commands	CO6	40	50	10
14.	Use the software to draw orthographic views of • A pentagonal pyramid is placed in first quadrant with its axis parallel to H.P. and V.P • A frustum of a hexagonal is placed in first quadrant with its axis perpendicular to H.P. and parallel to V.P • Different objects having cylindrical surfaces, ribs. (three views of each object, total six problems)	CO3, CO6	40	50	10
15.	Use the software to draw isometric views of three 3D objects containing lines, arcs, circles, holes, ribs and slots	CO4, CO6	40	50	10

Legend:
PRA*: Process Assessment
PDA**: Product Assessment

Note: This table can be used for both end semester as well as progressive assessment of practical. Rubrics need to be prepared by the course teacher for each experiment/practical to assess the student performance.

P) Suggested Instructional/Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Field Trips, Portfolio Based, Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field Information and Communications Technology (ICT)Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Session, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software:

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/Practical Number
1.	Drawing Table with Drawing Board	Drawing Table with Drawing Board of Full Imperial/ A1 size.	1 to 9
2.	Models and Charts	Normal and cut sectioned Models and Charts of objects for orthographic / isometric projections	1 to 9
3.	Drawing equipments and instruments	Drawing equipments and instruments for class room teaching-large size: • T-square or drafter (Drafting Machine). • Set squires (450 and 300-600) • Protector. • Drawing instrument box (containing set of compasses and dividers). • Drawing sheets, Drawing pencils, Eraser. • Drawing pins / clips	1 to 9
4.	Sample production/construction drawings	From nearby industries, construction companies and developed by senior teachers of the state	All
5.	Interactive board (165 x 130 cm)	Supports dual touch, dual write and intuitive gestures, such as toss, rotate and zoom with multitouch operating systems, such as Windows®	All

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/Practical Number
6.	Computer aided drafting software like AutoCAD	Latest educational licensed network version	9 to 15
7.	CAD workstations	latest configuration Processor Intel Core i7 with Open GL Graphics Card, RAM 32 GB, DDR3/DDR4, HDD 500 GB, Graphics Card NVIDIA OpenGL 4 GB, OS Windows 10	9 to 15
8.	Printer/plotter	A3 size	9 to 15

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Engineering Drawing	N.D. Bhatt	Charotar Publishing House, Anand, Gujrat 2010; ISBN: 978-93- 80358-17-8.
2.	Engineering Drawing	R.K. Dhawan	S. Chand and Company, New Delhi; ISBN: 81-219-1431-0.
3.	Engineering Drawing	P.J. Shah	S. Chand & Company, New Delhi, 2008, ISBN:81-219-2964-4.
4.	Engineering Graphics with AutoCAD	A.K. Sarkar, A.P. Rastogi, D.M. Kulkarni	PHI Learning Private Limited-New Delhi (2010); ISBN: 978-8120337831.
5.	Engineering Drawing and Graphics using AutoCAD	T. Jeyapoovan	Vikas Publishing House Pvt. Ltd, Noida, 2011; ISBN: 978-8125953005.
6.	Engineering Graphics	S. K. Pradhan K.K. Jain	Khanna Book Publishing Company Pvt. Ltd., New Delhi ASIN : B0BM5BMMXT ISBN-10 : 9355381891 ISBN-13 : 978-9355381897

(b) Online Educational Resources:

1. Scales: https://youtu.be/YSEZu3Ch26k
2. Dimensioning: https://youtu.be/_OSY04TnlEM
3. Simple Orthographic Projections: https://youtu.be/DW7dpKdxVrA
4. Orthographic Projections of objects with slant and curved surfaces: https://youtu.be/dCWjBvZBpjM
5. Illustrative Example: https://youtu.be/MR5de9EC940
6. Illustrative Example: https://youtu.be/mahh-WONNHA
7. Isometric Projection of 3D objects: https://youtu.be/0K-5URiyi50
8. Isometric Projection-Object with slant surfaces: https://youtu.be/qSPJOiXKv98
9. Isometric Projection-Object with curved surfaces: https://youtu.be/qSPJOiXKv98
10. Missing lines and missing views: https://nptel.ac.in/courses/105/104/105104148/
11. Launching AutoCAD and Opening drawing: https://youtu.be/aoo-t0-gEfw
12. AutoCAD Main Screen: https://youtu.be/D0YyEiCjwpk
13. Draw and Modify Toolbars: https://youtu.be/T_RN_RBFk7o
14. Illustrative Example-1: https://youtu.be/_Bheo9MzeVk
15. Block creation: https://youtu.be/ZguZZVjxaek

16. Rectangular and Polar array : https://youtu.be/YgYZgbrUJ_M
17. Illustrative Example-2: Array: https://youtu.be/yJf_IsWX4gM
18. Dimensioning: https://youtu.be/sEiRsi14u0U
19. Use of layers: https://youtu.be/fdQqNdDtOI8
20. Illustrative Example 3: Flywheel: https://youtu.be/AU-Vsd2T0DA

Note: Teachers are requested to check the creative commons license status/ financial implications of the suggested, online educational recourses before use by the students.

(c) Others:

1. Bureau of Indian Standards, Engineering Drawing Practice for Schools and Colleges IS: SP-46, BIS, Government of India, Third Reprint, October 1998; ISBN: 81-7061-091-2.
2. AutoCAD e manual

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A) Course Code : 2418107(P2418107/S2418107)

B) Course Title : ICT Tools
(CE, ME, ME (Auto), FTS, CSE, AIML, MIE, CRE, CHE, FPP, TE, CACDDM, GT)

C) Pre- requisite Course(s) :

D) Rationale :

Besides working in technical environment in their profession, diploma pass outs may also get involved in routine office task related to creating business documents, perform data analysis and its graphical representations, making presentations. In order to carry-out these works, the students need to learn various desk-top based and internet-based software tools such as- office automation applications like word processing, spreadsheets and presentation tools. They also need to use these tools for making their project reports and presentations during their graduation programme. The objective of this course is to develop the basic competency in students for using these office automation tools to accomplish the job.

E) Course Outcomes (Cos): After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/ laboratory/ workshop/ field/ industry.

After completion of the course, the students will be able to-

CO-1 Prepare business document using word processing tool.
CO-2 Manipulate data and represent it graphically using spreadsheet.
CO-3 Prepare professional slide-based presentations.
CO-4 Work effectively with Internet and basic web services

F) Suggested Course Articulation Matrix (CAM):

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	**PO-2** Problem Analysis	**PO-3** Design/ Development of Solutions	**PO-4** Engineering Tools	**PO-5** Engineering Practices for Society, Sustainability and Environment	**PO-6** Project Management	**PO-7** Life Long Learning	**PSO-1**	**PSO-2**
CO-1	1	2	2	2	-	2	-		
CO-2	2	2	2	2	-	1	-		
CO-3	1	2	2	2	-	-	-		
CO-4	1	2	2	2	3	1	2		

Legend: High (3), Medium (2), Low (1) and No mapping (-)
***** PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional

G) Teaching & Learning Scheme:

Course Code	Course Title	Scheme of Study (Hours/Week)					
		Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
		L	T				
2418107	ICT Tools	-	-	04	02	06	03

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term Work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.

C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

H) Assessment Scheme:

Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
		Theory Assessment (TA)		Term Work & Self Learning Assessment (TWA)		Lab Assessment (LA)		
		Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2418107	ICT Tools	-	-	20	30	20	30	100

Legend:

PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)

PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)

TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.

Note:

- Separate passing is must for progressive and end semester assessment for both theory and practical.
- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

I) Course Curriculum Detailing: This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW) and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020 related reforms like Green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS) and others must be integrated appropriately.

J) Theory Session Outcomes (TSOs) and Units:

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
–	**Unit-1.0** **Word Processing** **1.0 Word Processing:** Overview of Word processor Basics of Font type, size, colour, Effects like Bold, italic, underline, Subscript and superscript, Case changing options, previewing a document, saving a document, closing a document and exiting application. **1.1 Editing a Document:** Navigate through a document, Scroll through text, Insert and delete text, select text, Undo and redo commands, Use drag and drop to move text, Copy, cut and paste, Use the clipboard, Clear formatting, Format and align text, Formatting Paragraphs, Line and paragraph spacing, using FIND and REPLACE, setting line spacing, add bullet and numbers in lists, add borders and shading, document views, Page settings and margins, Spelling and Grammatical checks **1.2 Changing the Layout of a Document:** Adjust page margins, change page orientation, create headers and footers, Set and change indentations, Insert and clear tabs. **1.3 Inserting Elements to Word Documents**: Insert and delete a page break, Insert page numbers, Insert the date and time, Insert special characters (symbols), Insert a picture from a file, Resize and reposition a picture **1.4 Working with Tables:** Insert a table, convert a table to text, Navigate and select text in a table, resize table cells, Align text in a table, Format a table, Insert and delete columns and rows, Borders and shading, Repeat table headings on subsequent pages, Merge and split cells. **1.5 Working with Columned Layouts and Section Breaks:** a Columns, Section breaks, Creating columns, Newsletter style columns, Changing part of a document layout or formatting, Remove section break, Add columns to remainder of a document, Column widths, Adjust column spacing, Insert manual column breaks.	**CO-1**
–	**Unit-2.0 Spreadsheets** **2.1 Working with Spreadsheets:** Overview of workbook and worksheet, Create Worksheet Entering data, Save, Copy Worksheet, Delete Worksheet, Close and open Workbook. **2.2 Editing Worksheet:** Insert data, adjust row height and column width, delete, move data, insert new rows and columns, Copy and Paste content, Find and Replace, Spell Check, sheet view Zoom In-Out, insert Special Symbols, Insert Comments, Add Text Box, Undo-redo Changes, - Freeze Panes, hiding/unhiding rows and columns. **2.3 Formatting Cells and sheet:** Setting Cell Type, Setting Fonts, Text options, Rotate Cells, Setting Colors, Text Alignments, Merge and Wrap, apply Borders and Shades, Sheet Options, Adjust Margins, Page Orientation, insert Header and Footer, Insert Page Breaks, Set Background. **2.4 Working with Formula:** Creating Formula, absolute and relative cell references, Copying and pasting Formula, Common spreadsheet Functions such as sum, average, min, max, date, In, And, or, mathematical	**CO-2**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
	functions such as sqrt, power, statistical functions, applying conditions using IF. **2.5 Working with Charts:** Introduction to charts, overview of different types of charts, Bar, Pie, Line charts, creating and editing charts. Using different chart options: chart title, axis title, legend, data labels, Axes, grid lines, moving chart in a separate sheet. **2.6 Advanced Operations:** Applying Conditional Formatting, Data Filtering, Data Sorting, Using Ranges, Data Validation, Adding Graphics, Printing Worksheets, print area, margins, header, footer and other page setup options.	
–	**Unit-3.0 Presentation Tool** **3.1 Creating a Presentation:** Outline of an effective presentation, Identify the elements of the User Interface, starting a New Presentation Files, Creating a Basic Presentation, Working with textboxes, Apply Character Formats, Format Paragraphs, View a Presentation, Saving work, creating new Slides, Changing a slide Layout, Applying a theme, Changing Colours, fonts and effects, apply custom Colour and font theme, changing the background, Arrange Slide sequence, **3.2 Inserting Media elements:** Adding and Modifying Graphical Objects to a Presentation - Insert Images into a Presentation, insert audio clips, video/animation, Add Shapes, Add Visual Styles to Text in a Presentation, Edit Graphical Objects on a Slide, Format Graphical Objects on a Slide, Group Graphical Objects on a Slide, apply an Animation Effect to a Graphical Object, Add Transitions, Add Speaker Notes, Print a Presentation. **3.3 Working with Tables:** Insert a Table in a Slide, Format Tables, and Import Tables from Other Office Applications. **3.4 Working with Charts:** Insert Charts in a Slide, modify a Chart, Import Charts from Other Office Applications.	**CO-3**
–	**Unit-4.0 Basics of Internet** **4.1 World Wide Web**: Introduction, Internet, Intranet, URL, web servers, basic settings of web browsers- history, extension, default page, default search engine, privacy and security, creating and retrieving bookmarks, use search engines effectively for searching the content. **4.2 Web Services**: Cloud- software as service (SAS), Google docs, slides, sheets, Form, Web Sites, web pages, e-Mail, Chat, Video Conferencing, e-learning, e-shopping, e-Reservation, e-Groups, Social Networking	**CO-4**

Note: One major TSO may require more than one Theory session/Period.

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2418107

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant Cos Number(s)
LSO 1.1. Perform fundamental word processing operations to create a document	1.	a) Create, edit and save document: apply formatting features on the text – line, paragraph b) Use bullets, numbering, page formatting, header, footer, margin, layout	CO-1
LSO 2.1. Work with images/shapes in a document	2.	Insert and edit images and shapes, resizing, cropping, colour, background, group/ungroup	CO-1
LSO 3.1. Organize data in tabular form in a document	3.	Insert table and apply various table formatting features on it.	CO-1
LSO 4.1. Perform Document proofing operations in a document	4.	Review features such as Spelling, grammar, Thesaurus, translate, language, word count, comments	CO-1
LSO 5.1. Organize and print Document	5.	Apply page layout features i. Print layout, web layout, show ruler, gridline, page zoom, split ii. Themes, page background, paragraph, page setup iii. Create multicolumn page iv. Use different options to print the documents	CO-1
LSO 6.1. Create batch of documents with tailored variable information using mail merge	6.	Use mail merge operation with options.	CO-1
Spreadsheets			
LSO 7.1. Create a worksheet *LSO 7.2.* Format sheet/cell	7.	Create, open and edit worksheet i. Enter data and format it, adjust row height and column width ii. Insert and delete cells, rows and columns. iii. Apply Format cell, wrap text, number format, orientation feature on cell.	CO-2
LSO 8.1. Perform fundamental calculation operations in a worksheet	8.	Insert formulas, absolute and relative cell reference, "IF" conditions, built-in functions and named ranges in worksheet.	CO-2
LSO 9.1. Filter the given data set *LSO 9.2.* Validate data based on criteria *LSO 9.3.* Sort the data in given order	9.	Apply conditional formatting, data Sorting, Data Filter and Data Validation features.	CO-2
LSO 10.1. Create various types of charts to represent data in graphical form	10.	Create different charts, apply various chart options.	CO-2
LSO 11.1. Print worksheet as per given layout	11.	Apply Page setup and print options on worksheet to print the worksheet.	CO-2
Presentation Tools			
LSO 12.1. Create electronic slide show containing text, image, shape, table, charts objects	12.	Create slide presentation i. Apply design themes to the given presentation ii. Add new slides and insert text, pictures/images, shapes iii. Add tables and charts in the slides	CO-3

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant Cos Number(s)
LSO 13.1. Run slide presentation in different modes *LSO 13.2.* Print slide presentation	13.	i. Run slide presentation in customize form/modes ii. Print slide presentation as sheet, handouts using various print options	CO-3
LSO 14.1. Apply given animation effects to the text and slides.	14.	Apply different animation effects to the text and slides with given options.	CO-3
LSO 15.1. Add audio and video files in the presentation	15.	Add some sample audio and video files in the presentation and format the same with various options available.	CO-3
Internet Basics			
LSO 16.1. Configure internet and browser setting	16.	a) Configure Internet connection b) Configure browser settings and use browsers	CO-4
LSO 17.1. Use different internet services	17.	a) Use internet for different web services, such as, chat, email, video conferencing, etc.	CO-4
LSO 18.1. Work with Google Doc	18.	Work with Google Doc for creating collaborative documents on cloud	CO-4
LSO 19.1. Work with google sheet	19.	Work with google sheet for creating collaborative spreadsheets on cloud	CO-4
LSO 20.1. Work with google slides	20.	Work with google slides for creating collaborative slide presentation on cloud	CO-4
LSO 21.1. Create google form	21.	a) Create google form for a sample survey b) Through google forms collect user's response, download it in csv format, analyse it and represent data/trend through graphs and present it.	CO-4, CO3

L) Suggested Term Work and Self Learning: S2418107 Some sample suggested assignments, micro project and other activities are mentioned here for reference.

a. Assignments: Questions/Problems/Numerical/Exercises to be provided by the course teacher in line with the targeted COs.

b. Micro Projects:

i. **Word documents**: prepare documents such as Time Table, Application, Notes, Reports. (Subject teacher shall assign a document to be prepared by each student)

ii. **Slide Presentations:** Prepare slides with all Presentation features such as: content presentation, presentation about department, presentation of reports. (Subject teacher shall assign a presentation to be prepared by each student).

iii. **Spreadsheets:** Prepare statements such as Pay bills, tax statement, student's assessment record using spreadsheet- perform statistical analysis, sorting and filtering operations, represent data through various types of charts. (Teacher shall assign a spreadsheet to be prepared by each student).

c. Other Activities: ---

M) Suggested Course Evaluation Matrix: The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and Term work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate CO attainment.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work & Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	-	-	15%	-	-	20%	20%
CO-2	-	-	10%	25%	-	10%	20%
CO-3	-	-	15%	25%	33%	15%	20%
CO-4	-	-	30%	25%	33%	15%	20%
CO-5	-	-	30%	25%	34%	40%	20%
Total Marks	-	-	20	20	10	20	30
			50				

Legend:

*: Other Activities include self- learning, seminar, visits, surveys, product development, software development etc.

**: Mentioned under point- (N)

#: Mentioned under point-(O)

Note:

- The percentages given are approximate.
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) Suggested Specification Table for End Semester Theory Assessment: (Not Applicable)

O) Suggested Assessment Table for Laboratory (Practical):

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
1.	a) Create, edit and save document: apply formatting features on the text - line, paragraph b) Use bullets, numbering, page formatting, header, footer, margin, layout	CO-1	60	30	10
2.	Insert and edit images and shapes, resizing, cropping, colour, background, group/ungroup	CO-1	60	30	10
3.	Insert table and apply various table formatting features on it.	CO-1	60	30	10
4.	Review features such as Spelling, grammar, Thesaurus, translate, language, word count, comments	CO-1	70	20	10
5.	Apply page layout features i. Print layout, web layout, show ruler, gridline, page zoom, split ii. Themes, page background, paragraph, page setup iii. Create multicolumn page iv. Use different options to print the documents	CO-1	60	30	10
6.	Use mail merge operation with options.	CO-1	60	30	10

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
7.	Create, open and edit worksheet i. Enter data and format it, adjust row height and column width ii. Insert and delete cells, rows and columns. iii. Apply Format cell, wrap text, number format, orientation feature on cell.	CO-2	60	30	10
8.	Insert formulas, absolute and relative cell reference, "IF" conditions, built-in functions and named ranges in worksheet.	CO-2	60	30	10
9.	Apply conditional formatting, data Sorting, Data Filter and Data Validation features.	CO-2	60	30	10
10.	Create different charts, apply various chart options.	CO-2	30	60	10
11.	Apply Page setup and print options on worksheet to print the worksheet.	CO-2	30	60	10
12.	Create slide presentation i. Apply design themes to the given presentation ii. Add new slides and insert text, pictures/images, shapes iii. Add tables and charts in the slides	CO-3	40	50	10
13.	i. Run slide presentation in customize form/modes ii. Print slide presentation as sheet, handouts using various print options	CO-3	30	60	10
14.	Apply different animation effects to the text and slides with given options.	CO-3	60	30	10
15.	Add some sample audio and video files in the presentation and format the same with various options available.	CO-3	60	30	10
16.	a) Configure Internet connection b) Configure browser settings and use browsers	CO-4	70	20	10
17.	Use internet for different web services, such as, chat, email, video conferencing, etc.	CO-4	70	20	10
18.	Work with Google Doc for creating collaborative documents on cloud	CO-4	60	30	10
19.	Work with google sheet for creating collaborative spreadsheets on cloud	CO-4	60	30	10
20.	Work with google slides for creating collaborative slide presentation on cloud	CO-4	60	30	10
21.	i. Create google form for a sample survey ii. Through google forms collect user's response, analyze it and represent data/trend through graphs and present it.	CO-4, CO-3	60	30	10

Legend:

PRA*: Process Assessment

PDA**: Product Assessment

Note: This table can be used for both end semester as well as progressive assessment of practical. Rubrics need to be prepared by the course teacher for each experiment/practical to assess the student performance.

P) Suggested Instructional/Implementation Strategies: Different Instructional/ ImplementationStrategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Portfolio Based Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field, Information and Communications Technology (ICT) Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Sessions, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software:

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/Practical Number
1.	Computer system with internet connection	(Any computer system with basic configuration)	All
2.	Office application	Such as- Microsoft Office 365/ Microsoft Office 2019 or latest	All

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Microsoft Office 2019 For Dummies Paperback – 1 January 2018	Wallace Wang	Wiley (1 January 2018), ISBN-10: 8126578556, ISBN-13: 978-8126578559
2.	Office 2019 In Easy Steps	Michael Price	BPB Publications; First edition (1 January 2019), ISBN-10: 938851114X ISBN-13: 978-9388511148
3.	MS OFFICE 2016 ADVANCED LEVEL Basic Computer Concept In Hindi A Complete Book For MS OFFICE 2016 IN Hindi Language	Rakesh Sangwan	ASCENT PRIME PUBLICATION; 2022nd edition (1 January 2021)

(b) Online Educational Resources:

1. Gain essential skills in Office 2019 and 365: (https://edu.gcfglobal.org/en/topics/office/)
2. Microsoft 365 basics video training: (https://support.microsoft.com/en-us/office/microsoft-365-basics-video-training-396b8d9e-e118-42d0-8a0d-87d1f2f055fb)

Note: Teachers are requested to check the creative commons license status/ financial implications of the suggested, online educational recourses before use by the students.

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A) Course Code : **2400008(P2400008/S2400008)**

B) Course Title : Sports, Yoga and Meditation (Common for all Programmes)

C) Pre- requisite Course(s) :

D) Rationale

Sports or Physical Education, Yoga and Meditation is an integral part of a person's overall well-being and is imperative for a healthy mind and body balance. So, it is necessary that every educational institute should lay ample emphasis on including sports, yoga and meditation as a necessary part of education, however, it depends on how it is introduced in the curriculum makes all the difference. Sports, Yoga and Meditation plays a very important role in overall Well-being for a good personality, develops value system, sense of friendliness, feeling of togetherness thereby developing team spirit and mutual cooperation. It also plays a major role in reducing level of stress/anxiety and add to the mental toughness. Looking to the ample benefits there is need to inculcate sports, Yoga and meditation as a day-to-day habit and imparting education related to physical education is more critical than ever before.

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/ laboratory/ workshop/ field/ industry.

After completion of the course, the students will be able to-

CO-1 Select appropriate physical activities to maintain healthy lifestyle.

CO-2 Apply basic principles and practices of Yoga and meditation for overall growth & development.

CO-3 Use fitness and wellness techniques for optimal health and wellbeing.

CO-4 Apply ancient Indian ayurvedic methods and techniques, exercises, yoga and meditation for fitness and wellness.

F) Suggested Course Articulation Matrix (CAM):

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	**PO-2** Problem Analysis	**PO-3** Design/ Develop-met of Solutions	**PO-4** Engineering Tools	**PO-5** Engineering Practices for Society, Sustainability and Environment	**PO-6** Project Managem ent	**PO-7** Life Long Learning	**PSO-1**	**PSO-2**
CO-1	3	3	3	-	1	-	2		
CO-2	3	3	3	-	1	-	2		
CO-3	3	3	3	-	1	-	2		
CO-4	3	2	1	-	1	-	1		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

G) Teaching & Learning Scheme:

Course Code	Course Title	Scheme of Study (Hours/Week)					
		Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
		L	T				
2400008	Sports, Yoga and Meditation	-	-	01	01	02	01

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term Work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.

C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

H) Assessment Scheme:

Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
		Theory Assessment (TA)		Term Work & Self-Learning Assessment (TWA)		Lab Assessment (LA)		
		Progressive Theory Assessment	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2400008	Sports, Yoga and Meditation	-	-	10	-	06	09	25

Legend:

PTA: Progressive Theory Assessment in classroom (includes class test, mid-term test and quiz using online/offline modes)

PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)

TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.

Note:

- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

I) Course Curriculum Detailing: This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW) and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020 related reforms like Green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS) and others must be integrated appropriately.

J) Theory Session Outcomes (TSOs) and Units:

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO.1a Explain ancient history and development of yoga in India *TSO.1b* Compare the ancient Indian games with the modern games. *TSO.1c* Differentiate between given terms used in sports *TSO.1d* Describe the different aspects of Mental Toughness *TSO.1e* Use Imagery Training for sports *TSO.1f* Apply motivation techniques to motivate students in sports. *TSO.1g* Use concentration techniques for playing and exercising. *TSO.1h* Manage Stress, Anxiety and Arousal during sports. *TSO.1i* Select sports and exercise for healing and developing health and mental wellness *TSO.1j* Describe the impact of parents' involvement in their children's sports activities *TSO.1k* Select sports and exercises for physically challenged as per their need.	**Unit-1.0 Sports and Exercises** 1.1 Historical development of physical activities and sports in India, Indian ancient games- Kho-Kho and Kabaddi, Chariot races, riding elephants and horse, swordsmanship, wrestling, boxing, atyapatya, archery, dancing, dands baithak, malkhamb, lezim, lathi etc 1.2 Origin of traditional sports, 3rd century BCE-martial arts and archery, indoor games like Chess and Snakes & Ladders have origins in ancient India, in the form of games of Chaturanga and Gyan Chauper, 1.3 Dholavira, the world's oldest terraced arena 3000 BC 1.4 Definition of play, game, sports, exercise, psychology, sports psychology and exercise psychology, psychology and common sense. 1.5 Mental toughness- mind, Imagery, use of imagery and imagery in sports, types of imagery (visual, kinesthetic, auditory and olfactory) 1.6 Motivation in sport and goalsetting in sports 1.7 Arousal regulation – self-awareness of regulation, anxiety reduction techniques-somatic anxiety reduction techniques, cognitive Anxiety reduction, multimodal anxiety reduction, coping with stress. Arousal -inducing techniques. Arousal and anxiety measurement factors, Arousal and anxiety signs recognition 1.8 Nutrition and rehabilitation, Importance of concentration and attentional focus in sports and training, Impact of health on healing from physical athletic injuries. Impact of exercise to increase mental wellness, Role of coach in sports, parents' involvement in their children's sports activities. 1.9 Adaptation of sports and exercises for physically challenged students in all levels.	**CO1, CO4**
TSO.2a Explain ancient history and development of yoga in India *TSO.2b* Identify the physiology of yoga and meditation. *TSO.2c* Evaluate meditation and yoga as a healing modality. *TSO.2d* Select asanas and pranayama as per need. *TSO.2e* Describe the effect of yoga and meditation on ageing, stress and hypertension. *TSO.2f* Select mediation techniques as per the need. *TSO.2g* Explain Bandha, Mudra and Chakra *TSO.2h* Enumerate the steps of Suryanamaskar. *TSO.2i* Select Yoga and Meditation for physically challenged as per their need.	**Unit-2.0 Yoga and Meditation** 2.1 Origin of yoga, History and development of yoga, Adi yogi, evidences of yoga in pre-Vedic period (2700 B.C.), Vedic Period, Pre-Classical Period, Classical Period- Patanjali's period, Modern Period. 2.2 Yoga practices and the related literature-Vedas (4), Upanishads (108), Smritis, teachings of Buddhism, Jainism, Panini, Epics (2), Puranas (18) 2.3 Importance of Yoga & Mediation, meaning of the term Yoga and Meditation, Fundamentals Principles of Yoga & Fitness training, Eight Limbs of Yoga	**CO2, CO4**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
	2.4 Difference between yoga asana and physical exercises, Difference between yoga and meditation 2.5 Role of Yoga and Meditation in Purificatory Process, in character building, developing concentration, will power and discipline 2.6 Types of Yoga Practices - Asanas, Pranayama, Meditation 2.7 Mindfulness – knowing the mind, training the mind, feeling the mind 2.8 Different Methods of meditation, Physiology of meditation, Mental, physical and emotional benefits of Asanas, Pranayama, Concentration and Meditation 2.9 Bandha, Mudra and Chakra 2.10 Effects of Asanas and pranayama on physiology of human body 2.11 Importance of "Suryanamaskar 2.12 Adaptation of Yoga and meditations for physically challenged students in all levels. 2.13 Yoga Asanas Do's and Don'ts for Beginners	
TSO.3a Explain the ancient Indian ayurvedic methods for fitness and wellness *TSO.3b* Identify the different factors affecting the fitness and wellness in the given situation *TSO.3c* Use different methods to maintain Health and Wellness *TSO.3d* Explain the components of Balance Diet *TSO.3e* Identify the causes of stress and anxiety in the given situation *TSO.3f* Use stress reduction techniques to manage Stress and Anxiety *TSO.3g* Manage Stress, Anxiety and Depression in the given situation *TSO.3h* Select recovery process for energy replenishment after exercise.	**Unit 3.0 Fitness and Wellness** 3.1 Evolution of wellness, 3,000-1,500 BC: Ayurveda –holistic system, Tailored Ayurvedic regimens as per unique constitution of each person (their nutritional, exercise, social interaction and hygiene needs) – with the goal of maintaining a balance that prevents illness. 3.2 Meaning, Importance, Definition and dimensions of Health and Wellness (WHO/Yoga) 3.3 Factors affecting Fitness and Wellness 3.4 Role of Physical Activities and Recreational Games in maintaining physiological and psychological wellbeing. 3.5 Different Methods to Maintain Health, Wellness and to enhance mood 3.6 Nutrition for Health & Wellness, Relationship between Diet and Fitness Components of Balance Diet and its importance – Carbohydrates, Protein, Fat, Vitamins & Minerals, Water, Healthy Lifestyle through Diet and Fitness 3.7 Anxiety, Stress and Aging-Meaning of Anxiety, Stress and Aging, Types and Causes of Stress, 3.8 Stress, anxiety and depression reduction with exercise, yoga and meditation 3.9 Energy Continuum and Recovery Process, Metabolism and exercise, Recovery from exercise, Replenishment of energy stores during recovery process, Removal of excess lactic acid produced during exercise	**CO3, CO4**

Note: One major TSO may require more than one Theory session/Period.

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2400008

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 1.1. Perform various sports activities for overall growth and development *LSO 1.2.* Select suitable sport activities as per your need.	1.	Track & Field: Running, Jumping, walking and Throwing, Cycling Event to develop Endurance, Speed, Strength, Agility, Flexibility etc	CO1
	2.	Aerobics and Gymnastics to develop Strength, Agility and Flexibility	
	3.	Net/Wall Sports – Volleyball and Basketball to develop Endurance, Speed, Strength, Agility and Flexibility	
	4.	Striking & Fielding sports like Cricket, bowling, Hockey, Football Baseball etc. to develop Endurance, Speed, Strength, Agility, Flexibility and Coordination	
	5.	Racket Game- Tennis, Badminton, Table tennis etc to develop Endurance, Speed, Strength, Agility and Flexibility	
	6.	Outdoor games: Kho-Kho and Kabaddi and cycling develop Endurance, Speed, Strength, Agility and Flexibility	
	7.	Indoor games: Chess and Carrom, Swimming, Boxing, Karate Weightlifting, Power Lifting, Physique Training, Archery, Roller Skating etc to develop concentration.	
	8.	Prepare and organize Adapted Sports for various levels of physically challenged and impairments.	
LSOs 2.1 Perform various yogic techniques for internal purification and development.	9.	Shat Karmas: Tratakam, Jala-Neti, Sutra-Neti, Vamana Dhauti, Danda Dhauti, Agnisara, Nauli	CO2
	10.	Perform following asanas with correct posture: Ardha-Padmasana [virasana], Ardha-Halasana, Pavana-Muktasana, Naukasana, Ardha-shalabhasana, Shalabhasana, Makarasan, Bhujangasana, Dhanurasana	
	11.	Perform following asnas with correct posture: Vakrasana,Chakrasana,Paschimottanasana,Ugrasana,Gomukh asana, Padmasana, Siddhasana, Bhadrasana, Swastikkasana, Vajrasana, Supta-Vajrasana, Yoga-Mudra	
	12.	MUDRAS & SURIYANAMASKAR Brahma-Mudra, Simha-Mudra, Shanmugi Mudra, Viparithakarani-Mudra, Ashwsini-Mudra, Suriyanamaskar	
	13.	BANDHAS: Jalandhara-Bandha, Jihva-Banda, Uddiyana Bandha, Moola-Bandha	
	14.	PRANAYAMAS Nadi-Shuddhi, Nadi-Shodhana, Suryabhadana, Ujjayi, Bhastrika Pranayama, Bhramari Pranayama, Sitkari , Sitali , Kapalabhati	
	15.	MEDITATION -Silent Meditation	
	16.	MEDITATION – Mantra Meditation	
LSO 3.1. Prepare diet chart for optimal health and wellbeing	17.	Prepare a diet chart for the given sport.	CO3
LSO 3.2. Use health monitoring device	18.	Measure heart rate and heart function with health monitoring device	
	19.	Measure blood sugar and blood pressure	
LSO 3.3. Use different equipment's	20.	Use massage therapy equipment, Hot and cold therapy equipment, Ultrasound therapy equipment	
LSO 3.4. Identify your own threshold and identification level for different taste Stimulations	21.	Determine the taste threshold for three different sensations-sweet salty and sour	
LSO 3.5. Check the given sample for conformance to the	22.	Determine the moisture content in the given sample of oil/fat	

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
standard for moisture content.			
LSO 3.6. Purity tests of oils/fats	23.	Determine the impurities in the given sample of oil.	
LSO 3.7. Acidity test in given sample of fat/oil	24.	Determines the acid value and free fatty acids in the given sample of oil/fat.	
LSO 3.8. Check whether any given samples of oils/fats conform to the standard.	25.	Determine the peroxide value in the given sample of fat or oil.	

L) Suggested Term Work/ Activities and Self Learning: S2400008 Some sample suggested assignments, micro project and other activities are mentioned here for reference.

a. Assignments: Questions/Problems/Numerical/Exercises to be provided by the course teacher in line with the targeted COs.

i. Calculate your Body Composition (BMI) and Cardiovascular Assessment
ii. Assessment for Muscular Endurance, Muscular Strength,
iii. Flexibility, Cardio-respiratory Endurance, Body Composition
iv. Rules and Regulations of different indoor and outdoor games.

b. Micro Projects:

i. Identify and synthesize the factors that influence health in various situations (05 situations). Prepare a report with details of situations and solutions to remove the factors.
ii. Visit different sports club, gyms, and schools and identify various measure taken by them for Fitness and wellness of students/ members
iii. Visit different sports club, gyms, and schools and identify various measure taken by them for Fitness and wellness of physically challenged students/ members
iv. Identify which type of stress, anxiety and depression students are facing and steps and solutions to overcome this.

c. Other Activities:

1. Seminar Topics:
- Identify the health-related challenges in current time and able to apply the preventive measures.
- Role of peers, community and media in health and wellbeing in each level
- Knowledge and skills required to preserve community health and well-being
- Effect of yoga and meditation in maintaining fitness.
- Methods to involve physically challenged students /members in all levels in sports, yoga and meditation in community.
- Counselling techniques to counsel players in matters of handling success and failure.

2. Visits: Visit nearby sports complex, Gyms, stadium etc and prepare a report on hygiene maintenance, medical facilities available, facilities available for physically challenged members, facilities available for old aged members, tools and equipment available and training facilities.

3. Self-Learning Topics:
- Anatomy and physiology of human being
- Role of Yoga and Meditation in Purificatory Process, in character building, developing concentration, will power and discipline
- Mindfulness

- Different Methods to Maintain Health, Wellness and to enhance mood
- Diet and Nutrition
- Metabolic adaptations to exercise
- Cardio-respiratory changes

M) Suggested Course Evaluation Matrix: The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and Term Work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate **CO attainment**.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work & Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1, CO-4	-	-	35%	-	-	35%	35%
CO-2, CO-4	-	-	35%	-	-	35%	35%
CO-3, CO-4	-	-	30%	-	-	30%	30%
Total Marks	**-**	**-**	**10**	**-**	**-**	**06**	**09**
			10				

Legend:

*: Other Activities include self- learning, seminar, visits, surveys, product development, software development etc.

**: Mentioned under point- (N)

#: Mentioned under point-(O)

Note:

- The percentages given are approximate.
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) Suggested Specification Table for End Semester Theory Assessment: (Not Applicable)

O) Suggested Assessment Table for Laboratory (Practical):

S. No.	Laboratory Practical Titles	Relevant COs Number (s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
1.	Track & Field: Running, Jumping, walking and Throwing, Cycling Event to develop Endurance, Speed, Strength, Agility, Flexibility etc	CO1	30	60	10
2.	Aerobics and Gymnastics to develop Strength, Agility and Flexibility		30	60	10
3.	Net/Wall Sports – Volleyball and Basketball to develop Endurance, Speed, Strength, Agility and Flexibility		30	60	10
4.	Striking & Fielding sports like Cricket, bowling, Hockey, Football Baseball etc. to develop Endurance, Speed, Strength, Agility, Flexibility and Coordination		30	60	10
5.	Racket Game- Tennis, Badminton, Table tennis etc to develop Endurance, Speed, Strength, Agility and Flexibility		30	60	10
6.	Outdoor games: Kho-Kho and Kabaddi and cycling develop Endurance, Speed, Strength, Agility and Flexibility		30	60	10
7.	Indoor games: Chess and Carrom, Swimming, Boxing, Karate Weightlifting, Power Lifting, Physique Training, Archery, Roller Skating etc to develop concentration.		30	60	10
8.	Prepare and organize Adapted Sports for various levels of physically challenged and impairments.		30	60	10

S. No.	Laboratory Practical Titles	Relevant COs Number (s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
9.	Shat Karmas: Tratakam, Jala-Neti, Sutra-Neti, Vamana Dhauti, Danda Dhauti, Agnisara, Nauli	CO2	40	50	10
10.	Perform following asanas with correct posture: Ardha-Padmasana [virasana], Ardha-Halasana, Pavana-Muktasana, Naukasana, Ardha-shalabhasana, Shalabhasana, Makarasan, Bhujangasana, Dhanurasana		40	50	10
11.	Perform following asnas with correct posture: Vakrasana,Chakrasana,Paschimottanasana,Ugrasana,Gomukhasana , Padmasana, Siddhasana, Bhadrasana, Swastikkasana, Vajrasana, Supta-Vajrasana, Yoga-Mudra		40	50	10
12.	MUDRAS & SURIYANAMASKAR Brahma-Mudra, Simha-Mudra, Shanmugi Mudra, Viparithakarani-Mudra, Ashwsini-Mudra, Suriyanamaskar		40	50	10
13.	BANDHAS Jalandhara-Bandha, Jihva-Banda, Uddiyana Bandha, Moola-Bandha		40	50	10
14.	PRANAYAMAS Nadi-Shuddhi, Nadi-Shodhana, Suryabhadana, Ujjayi, Bhastrika Pranayama, Bhramari Pranayama, Sitkari , Sitali , Kapalabhati		40	50	10
15.	MEDITATION -Silent Meditation		40	50	10
16.	MEDITATION - Mantra Meditation		40	50	10
17.	Prepare a diet chart for the given sport.	CO3	40	50	10
18.	Measure heart rate and heart function with health monitoring device		40	50	10
19.	Measure blood sugar and blood pressure		40	50	10
20.	Use massage therapy equipment, Hot and cold therapy equipment, Ultrasound therapy equipment		40	50	10
21.	Determine the taste threshold for three different sensations- sweet salty and sour		40	50	10
22.	Determine the moisture content in the given sample of oil/fat		40	50	10
23.	Determine the impurities in the given sample of oil.		40	50	10
24.	Determines the acid value and free fatty acids in the given sample of oil/fat.		40	50	10
25.	Determine the peroxide value in the given sample of fat or oil.		40	50	10

Note: -All the above Games can be selected from the list of SGFI/AIU/IOA

Legend:

PRA*: Process Assessment

PDA**: Product Assessment

Note: This table can be used for both end semester as well as progressive assessment of practical. Rubrics need to be prepared by the course teacher for each experiment/practical to assess the student performance.

P) Suggested Instructional/Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Field Trips, Portfolio Based, Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field Information and Communications Technology (ICT)Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Session, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software:

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/ Practical Number
1.	High end computers for record keeping	Processor Intel Core i7 with Open GL Graphics Card, RAM 32 GB, DDR3/DDR4, HDD 500 GB, Graphics Card NVIDIA OpenGL 4 GB, OS Windows 10	All
2.	Aerobics and Gymnastic	Basic facilities and equipment's – Balance Beams, Gymnastic Ball, Gymnastic Chalk, Gymnastic, Clubs, Flex Floor Systems, High Bars, Hoops, Horizontal Bars, Leotards, Music, Parallel Bar, Pommel Horses, Ribbons, Rings, Ropes, Sigle Bar Trainer, Spotting Blocks, Streamers, Trampoline, Tumble Track, Uneven Bar, Vault, Vault Spring Board Gymnastic Accessories – Chalk, Grips, Wrist Supports, Mat, Tape, Socks Singlets, Pants Shoes, Shorts Aerobics- Resistance bands, Jump rope, Step bench or box, Abdominal wheel, Exercise mat, Gliding discs, dumbbells, fitness trampolines, hoops	2
3.	Striking & Fielding sports	Complete Cricket Kit, Football Kit, Bowling Kit, Hockey Kit	4
4.	Net/Wall Sports	Complete Volley Ball and basketball kit	3
5.	Racket Game	Complete Tennis Kit, Table Tennis Kit and badminton kit	5
6.	Outdoor games	Complete Kho-Kho and Kabaddi and cycling kit	6
7.	Indoor games	Complete Chess kit, Carrom kit, Swimming kit, Boxing kit, Karate kit, Weightlifting kit, Power Lifting kit, Archery kit and Roller-Skating kit	7
8.	Physique Training	Cardio Machines- Treadmills, Elliptical Trainers, Exercise Bikes, Rowing Machines, Indoor Bikes, Vibration Machines, Steppers Recumbents Dumbbells, Multi-Purpose Bench, power rack, Adjustable Dumbbell Set 2 x 3-10 kg, Exercise mat, resistance band, balance trainer	7
9.	Sports and wellbeing equipment's for physically challenged and impairments.	Fusion Wheel – all-in-one portable wheelchair gym, Pedal exerciser, Deluxe hand exerciser, Greeper sports shoelaces, Active Hands, Ramble Tag Guidance Aid, Cat Tongue Grip Tape **Adaptive Cycling**- Straps, Leg/ Foot Adapters, Prosthetics, Steering Dampener, Handlebar Adapters, HANDCYCLING-Wheelchairs, Bike-On Handcycles, Trikes, Racing Wheelchairs, Trikes, Recumbent Bikes, All-terrain Handcycles, Mono Cycling, Hand Bikes - Off-Road, Cross Country, Racing, Downhill **Archery -** Field Tripod and Quad Mounts (Archery & Gun), In-Line Draw-Loc, Mounts (Archery & Gun), Stands (Gun), Mounts (Archery & Gun) Binoculars and Rests (Gun), Crossbows (Archery), Wheelchair Platform Stabilizing Crutch Poles, Dampeners, Crossbows (Archery), Hands free shooting rest (Gun) Bowling: ramp, roll assist **Fitness**: Anti-Gravity Treadmill, LapMat for Wheelchairs, Strike Assist, Adaptive Treadmill	8
10.	Yoga	Yoga Mats, Yoga Rollers, Yoga Blocks, Aero Yoga Clothing Blankets, cloth Straps, Bolsters, Wheels	9-16
11.	Fitness and wellbeing equipment's	Health monitoring devices for overall healt- Personal health monitor for heart health, Blood sugar monitoring device, Wireless blood pressure device, Smart watch to track heart function, Hot and cold therapy equipment, Massage therapy equipment, Ultrasound therapy equipment	18-20

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/ Practical Number
12.	Taste kit -To test three different sensations- sweet salty and sour	Salt solution (%) -0.5, 0.8, 1.0, 1.2, 1.5, Sugar solution (%) - 0.05, 0.5, 0.7, 1.0, 1.2, Citric acid (%) - 0.02, 0.04, 0.1, 0.5, 1.0 Spoons, Bowls, Beakers, Plain distilled water	21
13.	Test kit to measure peroxide value in the oil	Reagents: Acetic acid-chloroform solution, Saturated potassium iodide solution, Sodium thiosulphate solution- 0.1 N, Starch solution (1%) Apparatus: Pipette 1ml capacity, Conical flask	25
14.	Test kit to measure acid value and free fatty acids in the oil	Sample of oil/fats namely any refined oil or hydrogenated fat. Reagents - ethyl alcohol (95%), phenolphthalein indicator solution, standard aqueous sodium or potassium hydroxide solution (0.1 N or 0.5 N), Pipette (10 ml), Conical flask	24
15.	Test kit to measure impurities in the oil	Sample of Oil/fat, Oven-electric, maintained at 100 ± 1°C., Desiccator, Weighing balance, Filter paper	23
16.	Test kit to measure moisture content in the oil	Sample of oil/fat, Moisture dish-made of porcelain, silica, glass or aluminum, Oven-electric, maintained at 105 ± 1°C., Desiccator Weighing balance	22

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher with ISBN
1.	Practical Applications in Sports Nutrition	Heather Hedrick Fink, Alan E. Mikesky	Jones & Bartlett Learning (2020) ISBN No: 978-1284181340
2.	Massage and Medical Gymnastics,	Lace, M. V.	London: J & A Churchill Ltd. ASIN: B000RY4YB0
3.	ACSM's Guidelines for Exercise Testing and Prescription	Gary Liguori	LWW; (2021) ISBN-13: 978-1975150198
4.	Essentials of Strength Training and Conditioning	Javair Gillett	Human Kinetics, (2021) ISBN-13: 978-1718210868
5.	Practical Applications in Sports Nutrition	Heather Hedrick Fink, Alan E. Mikesky	Jones & Bartlett Learning, (2017) ISBN-13: 978-1284101393
6.	Health Fitness Management	Mike Bates, Mike Spezzano, Guy Danhoff	Human Kinetics, (2019) ISBN-13: 978-1450412230
7.	Yoga for Every Body: A beginner's guide to the practice of yoga postures, breathing exercises and meditation	Luisa Ray, Angus Sutherland	Vital Life Books (2022) ISBN-13: 978-1739737009
8.	Science of Yoga: Understand the Anatomy and Physiology to Perfect Your Practice	Ann Swanson	DK Publisher, (2019) ISBN-13: 978-1465479358
9.	Mudras for Modern Living: 49 inspiring cards to boost your health, enhance your yoga and deepen your meditation Cards	Swami Saradananda	Watkins Publishing (2019) ISBN-13: 978-1786782786
10.	Principles and Methods of Adapted Physical Education & Recreation	Kristi Roth, Laurie Zittel, Jean Pyfer, David Auxter	Jones & Bartlett Learning, (2016) ISBN-13: 978-1284077810
11.	Adapted Physical Education and Sport Sixth Edition	Joseph P. Winnick, David L. Porretta	Human Kinetics, (2016) ISBN-13: 978-1492511533
12.	Counselling Skills in Applied Sport Psychology: Learning How to Counsel	Paul McCarthy, Zoe Moffat	Routledge, (2023) ISBN-13: 978-1032592589
13.	Basic Counselling Skills: A Helper's Manual	Richard Nelson Jones	Sage Publication 2012, New Delhi.

S. No.	Titles	Author(s)	Publisher with ISBN
14.	Advancements in Mental Skills Training (ISSP Key Issues in Sport and Exercise Psychology)	Maurizio Bertollo, Edson Filho, Peter Terry	Routledge, (2020) ISBN-13: 978-0367111588
15.	The Relaxation and Stress Reduction Workbook	Martha Davis, Elizabeth Robbins, Matthew McKay, Eshelman MSW	A New Harbinger Self-Help Workbook (2019)
16.	Patanjalis Yoga Sutras	Swami Vivekananda	Fingerprint Publishing (2023) Prakash Books India Pvt Ltd, New Delhi ISBN-13: 978-9354407017

(b) Online Educational Resources:

1. https://onlinecourses.swayam2.ac.in/aic19_ed28/preview- introduction to Yoga and Applications of Yoga
2. https://onlinecourses.swayam2.ac.in/aic23_ge09/preview- Yoga for Creativity
3. https://onlinecourses.swayam2.ac.in/aic23_ge05/preview- Yoga for concentration
4. https://onlinecourses.swayam2.ac.in/aic23_ge06/preview- yoga for memory development
5. https://onlinecourses.nptel.ac.in/noc21_hs29/preview-Psychology of Stress, Health and Well-being
6. https://onlinecourses.swayam2.ac.in/nce19_sc04/preview- Food Nutrition for Healthy Living - Course – Swayam
7. https://www.classcentral.com/course/swayam-fitness-management-17608- Fitness Management from Swayam
8. https://onlinecourses.swayam2.ac.in/nce19_sc04/preview-Food Nutrition for Healthy Living
9. https://onlinecourses.swayam2.ac.in/cec21_ed02/preview Health Education and Recreation
10. https://onlinecourses.swayam2.ac.in/cec22_ed31/preview Sports Administration and Management

Note: Teachers are requested to check the creative commons license status/ financial implications of the suggested, online educational recourses before use by the students.

(c) Others:

1. https://www.yogajournal.com/yoga-101/philosophy/good-read
2. http://hdl.handle.net/123456789/38171- Yoga Philosophy
3. https://yoga.ayush.gov.in

*****

A) Course Code : **2400108(T2400108)**

B) Course Title : Essence of Indian Knowledge System and Tradition
(Common for all Programmes)

C) Pre- requisite Course(s) :

D) Rationale :

This course will survey the basic structure and operative dimensions of Indian knowledge system. With the new education policy-NEP 2020 focusing on Indian Knowledge Systems (IKS) and Traditions of India. This course introduces the learners to the rich and varied knowledge traditions of India from antiquity to the present. This also helps the learner to know and understand their own systems and traditions which are imperative for any real development and progress. Also, it helps the learner to think independently and originally adopting Indian frameworks and models for solving the problems related to world of work where the student is supposed to perform.

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the accomplishment of following course out comes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/laboratory/workshop/field/ industry.

After completion of the course, the students will be able to-

CO-1 Identify the rich heritage and legacy residing in our Indian Knowledge systems.

CO-2 Correlate the technological & philosophical concepts of IKS with engineering domain specific problems and local problems for finding out possible solutions.

F) Suggested Course Articulation Matrix (CAM):

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	**PO-2** Problem Analysis	**PO-3** Design/ Development of Solutions	**PO-4** Engineering Tools	**PO-5** Engineering Practices for Society, Sustainability and Environment	**PO-6** Project Management	**PO-7** Life Long Learning	**PSO-1**	**PSO-2**
CO-1	2	-	-	-	1	1	1		
CO-2	1	2	2	-	3	1	1		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

G) Teaching & Learning Scheme:

Course Code	Course Title	Scheme of Study (Hours/Week)					
		Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
		L	T				
2400108	Essence of Indian Knowledge System and Tradition	01	-	-	-	01	01

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture(L), Tutorial(T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term Work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.

C: Credits= (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

H) Assessment Scheme:

Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
		Theory Assessment (TA)		Term Work& Self-Learning Assessment (TWA)		Lab Assessment (LA)		
		Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2400108	Essence of Indian Knowledge System and Tradition	25	-	-	-	-	-	25

Legend:

PTA: Progressive Theory Assessment in classroom (includes class test, mid-term test and quiz using online/offline modes)

PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)

TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.

Note:

- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

I) **Course Curriculum Detailing:** This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW) and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020 related reforms like Green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS) and others must be integrated appropriately.

J) Theory Session Outcomes (TSOs) and Units: T2400108

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 1a. Explain the architecture of the Ancient Indian Knowledge Systems. *TSO 1b.* List the salient features of IKS. *TSO 1c.* Comprehend the given IKS model. *TSO 1d.* Identify the role and relevance of the given IKS model in contemporary society.	**Unit-1.0 Introduction to Indian Knowledge Systems** 1.1 Overview of IKS 1.2 Organization of IKS – चतुर्दश-विद्यास्थानं 1.3 Conception and Constitution of Knowledge in Indian Tradition 1.4 The Oral Tradition 1.5 Models and Strategies of IKS	**CO1**
TSO 2a. Enlist the importance of Veda, Vedanga, Visaya, Siksaka. *TSO 2b.* Describe the given IKS domain. *TSO 2c.* Identify elements of mentioned IKS domains that are relevant to Technical Education System. *TSO 2d.* Correlate the elements of mentioned IKS domains with given engineering domain.	**Unit-2.0 Overview of IKS Domains and Relevance in Current Technical Education System.** 2.1 The Vedas as the basis of IKS 2.2 Overview of all the six Vedāṅgas 2.3 Relevance of following IKS domains in present Technical Education System: • Arthashastra (Indian economics and political systems) • Ganita and Jyamiti (Indian Mathematics, Astronomy and Geometry • Rasayana (Indian Chemical Sciences) • Ayurveda (Indian Biological Sciences / Diet & Nutrition) • Jyotish Vidya (Observational astronomy and calendar systems) • Prakriti Vidya (Indian system of Terrestrial/ Material Sciences/ Ecology and Atmospheric Sciences) • Vastu Vidya (Indian system of Aesthetics-Iconography and built-environment /Architecture) • Nyaya Shastra (Indian systems of Social Ethics, Logic and Law) • Shilpa and Natya Shastra (Indian Classical Arts: Performing and Fine Arts) • Sankhya and Yoga Darshna (Indian psychology, Yoga and consciousness studies) • Vrikshayurveda (Plant Science / Sustainable agriculture/food preservation methods)	**CO1, CO2**

Note: One major TSO may require more than one Theory session/Period.

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: (Not Applicable)

L) Suggested Term Work and Self Learning: Some sample suggested assignments, micro project and other activities are mentioned here for reference.

a. Assignments: Questions/Problems/Numerical/Exercises to be provided by the course teacher in line with the targeted COs.

b. Micro Projects:

1. Write a report on any IKS domain highlighting the correlation with one domain specific engineering course.

c. Other Activities:

1. Seminar Topics: discuss any one IKS domain in details a highlighting the eminent works in the area.
2. Visits:
   - Visit any nearby ancient temple and corelate the geomatical, Shilpa and Vaastu on IKS dimensions specified in each domain.
3. Self-Learning Topics:
   - Sustainable practices adopted in ancient India that can be applied for current engineering situations.

M) Suggested Course Evaluation Matrix: The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and Term Work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate CO attainment.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work & Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	-	-	-	-	-	-	-
CO-2	100%	-	-	-	-	-	-
Total Marks	25	-	-	-	-	-	-
			-				

Legend:

*: Other Activities include self- learning, seminar, visits, surveys, product development, software development etc.

**: Mentioned under point- (N)

#: Mentioned under point-(O)

Note:

- The percentages given are approximate.
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) Suggested Specification Table for End Semester Theory Assessment: (Not Applicable)

O) Suggested AssessmentTable for Laboratory (Practical): (Not Applicable)

P) Suggested Instructional/Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Field Trips, Portfolio Based, Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field Information and Communications Technology (ICT)Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Session, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software: (Not Applicable)

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Introduction to Indian Knowledge System: Concepts and Applications	Archak, K.B. (2012).	Kaveri Books, New Delhi
2.	Introduction to Indian Knowledge System: Concepts and Applications	Mahadevan, B. Bhat, Vinayak Rajat Nagendra Pavana R.N.	PHI, ISBN: 9789391818203
3.	Glimpse into Kautilya's Arthashastra	Ramachandrudu P. (2010)	Sanskrit Academy, Hyderabad
4.	"Introduction" in Studies in Epics and Purāṇas, (Eds.)	KM Munshi and N Chandrashekara Aiyer	Bhartiya Vidya Bhavan

(b) Online Educational Resources:

1. http://bhavana.org.in
2. www.academia.edu/23254393/Science_in_Ancient_India_-_an_educational_module
3. www.academia.edu/23305766/Technology_in_Ancient_India_-_Michel_Danino
4. www.hamsi.org.nz/http://insaindia.res.in/journals/ijhs.php
5. www.niscair.res.in/sciencecommunication/ResearchJournals/rejour/ijtk/ijtk0.asp
6. www-history.mcs.st-andrews.ac.uk/Indexes/Indians.html

Note: Teachers are requested to check the creative commons license status/ financial implications of the suggested, online educational recourses before use by the students.

(c) Others:

1. Swami Harshananda. "A bird's eye view of vedas". R K Math. Bangalore.,http:// rkmathbangalore. org/Books/ABirdsEyeViewOfTheVedas.pdf.
2. Sanskrit Prosody, https://en.wikipedia.org/wiki/Sanskrit_prosody.
3. Vartak, P.V. (1995). "Veda and Jyotish," Part II, Chapter 2, in Issues in Veda and Astrology, H Pandya (Ed.), pp 65 – 73.
4. Sundaram, A.V. (1995). "Astrology: Its usefulness and Limitations in ModernTimes", Part II, Chapter 9, in Issues in Veda and Astrology, H Pandya (Ed.), pp 129 – 135.
5. Archak, K.B. (2012), "The Vedāṅga Literature", Chapter VIII in Essentials of Vedic Literature, Kaveri Books, New Delhi, pp 330 – 391.
6. Vasant Lad (1996), "Ayurveda: A Brief Introduction and Guide", (whole article).

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A) Course Code : **2428109(T2428109/S2428109)**

B) Course Title : Business Communication (TE)

C) Pre- requisite Course(s) :

D) Rationale :

Communication in business is important to convey clear, strong messages to colleagues, superiors, and subordinates. It is also important for personal branding. Internal communication builds rapport among employees and managers and encourages teamwork and collaboration. Good communicators are vital to one's reputation and prevent misunderstandings and conflicts. This course will help students to develop business communication skills essential for placement interviews and for their own future prospects, as well as for growth of specific organization where they are working.

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor, and Affective) in the classroom/laboratory/workshop/field/ industry.

After completion of the course, the students will be able to-

CO-1 Communicate orally in public and in meetings.

CO-2 Apply business communication fundamentals in written communication.

CO-3 Integrate body language with oral communication for effectiveness.

F) Suggested Course Articulation Matrix (CAM):

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	**PO-2** Problem Analysis	**PO-3** Design / Development of Solutions	**PO-4** Engineering Tools	**PO-5** Engineering Practices for Society, Sustainability and Environment	**PO-6** Project Management	**PO-7** Life Long Learning	**PSO-1**	**PSO-2**
CO-1	3	-	3	2	2	-	2		
CO-2	3	2	-	2	-	2	2		
CO-3	3	3	-	2	3	-	-		

Legend: High (3), Medium (2), Low (1), and No mapping (-)

***** PSOs will be developed by the respective programme coordinator at the institute level. As per the latest NBA guidelines, formulating PSOs is optional.

G) Teaching & Learning Scheme:

Course Title	Scheme of Study (Hours/Week)				
	Classroom Instruction (CI)		Notional Hours (TW/ Activities+ SL)	Total Hours (CI+TW/ Activities)	Total Credits (C)
	L	T			
Business Communication	01	-	02	03	02

Legend:

CI: Classroom Instruction (Includes different instructional / implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem-based learning, etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments / practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional / Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term Work (includes assignments, seminars, micro-projects, industrial visits, any other student activities, etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources, etc.

C: Credits= (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of the teacher to ensure the outcome of learning.

H) Assessment scheme:

Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
		Theory Assessment (TA)		Term Work& Self-Learning Assessment (TWA)		Lab Assessment (LA)		
		Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2428109	Business communication	25	-	25	-	-	-	50

I) Course Curriculum Detailing: This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW), and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020-related reforms like Green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS), and others must be integrated appropriately.

j) Theory Session Outcomes (TSOs) and Units: T2428109

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 1a. Speak confidently before the public. *TSO 1b.* Use business presentation skill fundamentals. *TSO 1c.* Communicate through telephone, email & online with etiquette. *TSO 1d.* Participate effectively in group discussions. *TSO 1e.* Demonstrate confidence and self-esteem while presenting.	**Unit-1. Oral Communication** 1.1 Public speaking 1.2 Business presentation delivery 1.3 Telephone, Email, and online etiquette 1.4 Group discussion 1.5 Handling difficult conversations. 1.6 Building self-esteem and self-confidence.	**CO1**
TSO 2a. Draft business letters for different purposes. *TSO 2b.* Prepare reports of different business processes, activities, and events. *TSO 2c.* Write essays on different topics. *TSO 2d.* Use social media and emails for synergistic advantage.	**Unit-2. Written Communication** 2.1 Letter Writing 2.2 Report writing 2.3 Content writing 2.4 Essay writing 2.5 Emails and social media	**CO2**
TSO 3a. Use appropriate pleasing facial expressions for effective communication. *TSO 3b.* Use proper gestures for meaningful communication. *TSO 3c.* Adopt relevant body posture for conveying the correct message. *TSO 3d.* Conform to rules of proxemics and haptics in business conversations.	**Unit-3. Body Language** 3.1 Facial expressions 3.2 Gestures 3.3 Postures 3.4 Proxemics and haptics	**CO3**

Note: One major TSO may require more than one Theory session/Period.

k) Suggested Term Work/ Activities and Self-Learning: S2428109 Some sample suggested assignments, micro-projects, and other activities are mentioned here for reference.

a) Assignments: Questions/Problems/Numerical/Exercises to be provided by the course teacher in line with the targeted COs.

1. Develop a vocabulary list of hundred words
2. Prepare a list of common mistakes in oral communication. Memorize and use them in appropriate situations.

Prepare a list of commonly committed mistakes while writing letters/reports.

3. List fifty phrases and idioms commonly used.
4. Choose twenty quotes given by different celebrities.

b) Micro Projects:

1. Write letters to employers, industry, Municipal Corporations, government, and social organizations for a specific cause.
2. Write emails to media, and employers.
3. Prepare reports of events and write emails to the press for publishing in the newspaper.
4. Prepare quarterly technical reports of output of specific sections of the the industry/organizations.

c) Other Activities:

1. Organise team communication in the workplace following workplace etiquettes.
2. Organize street plays on different social and national themes. Video shoot the event and upload on social media.
3. Deliver speeches on national and regional events mandated by state, record the same and upload on social media.
4. Write an article and send it for publication in newspapers and magazines.
5. Host standup comedy shows and upload them on social media.

i. **Seminar Topics:**

- Public speaking
- Business etiquette
- Body Language

ii. **Visits:**

1. Attend programmes of management/industry association, business expo, conclave, etc.,

Self-Learning Topics:

a. Team building,
b. Business presentation
c. Body Language

L) Suggested Instructional/Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Field Trips, Portfolio Based, Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field Information, and Communications Technology (ICT)Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Session, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

M) List of Major Laboratory Equipment, Tools and Software:

S. No.	Name of Equipment, Tools and Software	Broad Specifications
1.	Mobile phones	Sound and Video recording functions. Social Media
2.	Ear phones	Compatible with mobile phones
3	Headphones	Compatible with laptop/desk top
4.	Blue tooth	Compatible with mobile phones.
5.	Computer	Compatible to record presentations and addresses.
6.	Podium	For presentations on stage.
7.	Public address system	For public meetings.
8.	Full Glass Mirrors	For monitoring Body Language

N) Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Excellence in Business Communication	John V, Thill & Courtland Bovee	Published on January 6, 2016, by Pearson ISBN 9780134319056 (ISBN10: 0134319052) English
2.	Business Communication	Dr. Nishith Rajaram Dubey, Anupam Singh	Publisher : Indra Publishing House, 2023 ISBN- 978-93-93577-69-6
3.	Business Communication	R.C. Bhatia	Ane Publishers Pvt Ltd Daryaganj, Delhi
4.	Communication Skills in English, AICTE Prescribed Textbook	Anjana Tiwari	Publisher: Khanna Publishing ISBN: 9789391505493
5.	Advanced writing skills	D.S. Paul	ISBN - 13 978-8172455385 Publisher Goodwill Publishing House (April 2019)
6.	Everyone Communicates, Few Connect: What the Most Effective People Do Differently	John C. Maxwell	Published March 30, 2010 by Thomas Nelson ISBN 9780785214250 (ISBN10: 0785214259) Language: English

(b) Online Educational Resources:

1. Business communication: https://www.onlinemanipal.com/blogs/what-is-business-
2. Business communication: https://www.taxmann.com/post/blog/communication-meaning-types-and-importance-in-business/
3. Business communication: https://getuplearn.com/blog/business-communication/
4. Public speaking: https://www.wikihow.com/Speak-Confidently-in-Public
5. Content writing: https://www.youtube.com/watch?v=IJNHhZtSGQE
6. Content writing: https://www.youtube.com/watch?v=9FWidHzCO9w
7. Proxemics and haptics: communicationtheory.org/haptic-communication/
8. Report writing: https://edu.gcfglobal.org/en/business-communication/how-to-write-a-powerful-business-report/1/
9. Emails and social media: https://elasticemail.com/blog/marketing_tips/email-marketing-social-media-strategy

10. Business presentation Delivery: https://ecampusontario.pressbooks.pub/essentialcomm/chapter/methods-of-presentation-delivery/
11. Email, telephone and online etiquette: https://openoregon.pressbooks.pub/technicalwriting/chapter/1-3-netiquette/
12. Self-esteem and Self-confidence: https://www.youtube.com/watch?v=PT50nCvzZgE&list=RDCMUCB5_1RZCa-sl3lLovabg2Gw&start_radio=1&rv=PT50nCvzZgE&t=31

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