

**Government Polytechnic Kolhapur**  
**Learning and Assessment Scheme for Post S.S.C Diploma Courses**  
**Diploma In Metallurgical Engineering**

**Programme Code** : MT **With Effect From Academic Year** : 2023-24  
**Duration Of Programme** : 6 Semester **Duration** : 16 WEEKS  
**Semester** : First **Scheme** : H

Sr No	Course Title	Abbreviation	Course Type	Level	Course Code	IKS Hrs per sem	Learning Scheme					Credits	Assessment Scheme											
							Actual Contact Hrs./Week			Self Learning (Term Work + Assignment)	Notional Learning Hrs/Week		Paper Duration (hrs.)	Theory			Based on LL & TL				Based on Self Learning		Total Marks	
							CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
																Max	Min	Max	Min	Max	Min	Max		Min
							CL	TL	LL	FA-TH	SA-TH		Max	Min	Max	Min	Max	Min	Max	Min				
1	BASIC MATHEMATICS	HBMT	AEC	1	CCH105	4	4	2	--	2	8	4	3	30	70	100	40	--	--	--	--	25	10	125
2	ENGINEERING PHYSICS	HPHB	DSC	1	CCH102	4	4	--	2	2	8	4	1.5	30*#	70*#	100	40	25	10	25@	10	25	10	175
3	ENGINEERING GRAPHICS	HGRB	DSC	1	CCH106	2	2	--	4	--	6	3	4	30	70	100	40	50	20	--	--	--	--	150
4	APPLIED MECHANICS	HAPM	DSC	1	CCH108	2	4	--	2	2	8	4	3	30	70	100	40	25	10	25@	10	25	10	175
5	METALLURGICAL WORKSHOP PRACTICE-I	HWMT-I	SEC	1	MTH101	2	--	--	4	--	4	2	--	--	--	--	--	25	10	50@	20	--	--	75
6	FUNDAMENTALS OF ICT	HICT	SEC	2	CCH202	--	1	--	2	1	4	2	--	--	--	--	--	25	10	25@	10	25	10	75
7	YOGA AND MEDITATION	HYAM	VEC	2	CCH203	1	--	--	1	1	2	1	--	--	--	--	--	25	10	--	--	25	10	50
<b>Total</b>						17	15	2	15	8	40	20		120	280	400		175		125		125		825

Abbreviations : CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System

Legends : @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

Course Category : Discipline Specific Course Core (DSC) : 3, Discipline Specific Elective (DSE) : 0, Value Education Course (VEC) : 1, Intern./Apprenti./Project./Community (INP) : 0, Ability Enhancement Course (AEC) : 1, Skill Enhancement Course (SEC) : 2, Generic Elective (GE) : 0

**COURSE ID :**

**COURSE NAME** :BASIC MATHEMATICS(CE/ME/ET/IT/EE/MT)  
**COURSE CODE** : CCH105  
**COURSE ABBREVIATION** : HBMT

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	4
	Tutorial Learning	02	
	Laboratory Learning	-	
	SLH-Self Learning	02	
	NLH-Notional Learning	08	

**B: ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Tutorial						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
03	30	70	100	40	--	--	--	--	25	10	125

(Total IKS Hrs for Sem.: 06 Hrs)

**C: ABBREVIATIONS:-**CL-ClassRoomLearning,TL-TutorialLearning,LL-LaboratoryLearning,SLH-SelfLearningHours,NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA -Self LearningAssessment

**Legends:**@InternalAssessment,#ExternalAssessment,\*#OnLine Examination,@\$InternalOnlineExamination( TNR 12 font)

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.\*15Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \*Self learning hours shall not be reflected in the Time Table.  
\*Self learning includes micro project /assignment/other activities. (The list of all assignments are given in tabular format. At least 6 to 8 assignments to be given)

## **D. i) RATIONALE:-**

Mathematics is an important prerequisite for the development and understanding of engineering and technological concepts. For an engineer and technologist, knowledge of mathematics is an effective tool to pursue and master the applications in the engineering and technological fields. Algebra provides the language and abstract symbols of mathematics. The topic Matrices is helpful for finding optimum solution of system of simultaneous equations which are formed in the various branches of engineering using different parameters. Trigonometry is the study of triangles and angles. Contents of this subject will form foundation for further study in mathematics. Statistics can be defined as a type of mathematical analysis which involves the method of collection and analyzing the data and summing of the data in numerical form for a given set of real world observations. Calculus is a branch of mathematics that calculates how matter, particles and heavenly bodies actually move. Derivatives are useful to find maxima & minima of a function, velocity & acceleration are also useful for many engineering problems. Hence the course provides the insight to analyze engineering problems scientifically using logarithms, matrices, trigonometry, straight line, differential calculus and statistics.

### **ii) Competency:**

Apply principles of Basic Mathematics to solve industry based technology problems.

- 1. Cognitive** : To understand the mathematical concepts
- 2. Psychomotor:** Proper handling of scientific calculator
- 3. Affective** : Attitude of accuracy, punctuality, proper reasoning and presentation

## **E. COURSE LEVEL LEARNING OUTCOMES (COS):**

CCH105-1 : To Apply concepts of algebra to solve engineering related problems

CCH105-2 : To Use techniques and methods of statistics to compare multiple sets of data

CCH105-3 : Solve area specific engineering problems under given conditions of straight lines

CCH105-4:- To memorize trigonometric formulae and solve problems based on them.

CCH105-5:- To solve the problems of maxima, minima, radius of curvature and geometrical applications.

**Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps) matrix**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0”

Competency and Cos	Programme Outcomes POs and PSOs								
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1	PSO2
Competency: Use DC machines and transformers.	3	2	1	-	1	-	2		
CCH105-1-CO-1 : To Apply concepts of algebra to solve engineering related problems	3	1	-	-	-	-	1		
CCH105-2-CO-2 : To Use techniques and methods of statistics to compare multiple sets of data	3	1	-	-	1	-	1		
CCH105-3-CO-3 : Solve area specific engineering problems under given conditions of straight lines	3	-	-	-	-	-	1		
CCH105-4-CO-4:- To memorize trigonometric formulae and solve problems based on them.	3	1	1	-	-	-	1		
CCH105-5-CO-5:- To solve the problems of maxima, minima, radius of curvature and geometrical applications.	3	2	1	-	1	-	1		

## F. CONTENT:

### I) Tutorial exercises

Solve any **TEN** the following Tutorial exercises shall be conducted in the Tutorial room in tutorial sessions of batches of about 20- 22 students:

Sr. no	Tutorial experiences	CO
1	Solve Simple problems of Logarithms based on given application	CCH105-1
2	Solve elementary problems on Algebra of Matrices	CCH105-1
3	Solve simultaneous equations using Matrix inversion method	CCH105-1
4	Resolve into Partial Fractions using linear non repeated, repeated and irreducible quadratic factors	CCH105-1
5	Practice problems on equation of straight lines using different forms, Solve problems on perpendicular distance, distance between two parallel lines and angle between two lines	CCH105-3
6	Solve problems on finding range, coefficient of range and mean deviation	CCH105-2
7	Solve problems on Standard deviation, coefficient of variation and comparison of two sets	CCH105-2
8	Solve problems on Allied & Compound angles	CCH105-4
9	Solve problems on Multiple & sub multiple angles	CCH105-4
10	Solve problems on factorization & De- factorization formulae	CCH105-4
11	Solve problems on Inverse Trigonometric Functions	CCH105-4
12	Solve examples on functions & rules of derivatives	CCH105-5
13	Solve examples on Derivative of composite function ,inverse & parametric functions,	CCH105-5
14	Solve examples on Derivative of exponential, implicit and logarithmic functions	CCH105-5
15	Solve examples on Application of Derivatives	CCH105-5

## II)Theory

### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO: CCH105-1 : To Apply concepts of algebra to solve engineering related problems			
Unit 1 Algebra	<p><b>1.1 LOGARITHMS</b>            1.1.1 Concept and laws of logarithm            1.1.2 Simple examples based on laws of Logarithms</p> <p><b>1.2 MATRICES</b>            1.2.1 Definition of a matrix, Types of matrices, Algebra of matrices, Equality of two matrices, Transpose of a matrix,            1.2.3 Adjoint and Inverse of a matrix            1.2.4 Solution of simultaneous equations having 3 unknowns using Matrix inversion method</p> <p><b>1.3 PARTIAL FRACTIONS</b>            1.3.1 Definition of rational, proper and improper fractions            1.3.2 Various cases of Partial fractions and Examples</p> <p>1.4 Algebra of Indian Knowledge System: Solution of simultaneous equations using Vedic Mathematics</p>	12	16
CO: CCH105-2 : To Use techniques and methods of statistics to compare multiple sets of data			
Unit 2 Statistics	<p><b>MEASURES OF DISPERSION</b>            2.1 Range, Coefficient of Range of Discrete and grouped data            2.2 Mean deviation and Standard Deviation about mean for Discrete &amp; Grouped Data (except Assumed mean method and Step deviation method)            2.3 Variance and coefficient of Variance            2.4 Comparison of 2 sets of observations</p>	6	10
CO: CCH105-3 : Solve area specific engineering problems under given conditions of straight lines			
Unit 3 Coordinate Geometry	<p><b>THE STRAIGHT LINE</b>            3.1 Slope, intercepts &amp; various methods of finding slope            3.2 Conditions for two straight lines to be parallel and Perpendicular to each others            3.3 Various forms of straight line            3.4 Perpendicular distance of a point from a line            3.5 Distance between two parallel lines            3.6 Angle between two straight lines            3.7 Geometry in Sulabh sutras in Indian Knowledge System</p>	6	8

**Section –II**

Sr. no.	Topics/Subtopics	Learning Hours	Classroom learning evaluation Marks
CO: CCH105-4:- To memorize trigonometric formulae and solve problems based on them.			
Unit 4 Trigonometry	<p style="text-align: center;"><b><i>TRIGONOMETRY</i></b></p> <p>4.1 Fundamental Identities(Only state,No examples)</p> <p>4.2 Conversion of degree into radian and vice versa of standard angles</p> <p>4.3 Trigonometric ratios of Compound Angles(Without Proof) , Examples</p> <p>4.4 Trigonometric ratios of Allied Angles (Without Proof) , Examples</p> <p>4.5 Trigonometric ratios of Multiple and Submultiple Angles (Without Proof) , Examples</p> <p>4.6 Factorization and De-Factorization Formulae (Without Proof) , Examples</p> <p>4.7 Inverse Trigonometric ratios , Principle values and simple problems</p> <p>4.8 Trigonometry in Indian Knowledge System : The evolution of sine function in India</p> <p>4.9 Trigonometry in Indian Knowledge System : Indian Trigonometry-From ancient beginning to Nilakantha</p> <p>4.10 Trigonometry in Indian Knowledge System : Ancient Indian Astronomy</p> <p>4.11 Trigonometry in Indian Knowledge System: Pythagorean to triples in Sulabhsutras</p>	14	14
CO: CCH105-5:- To solve the problems of maxima, minima, radius of curvature and geometrical applications.			
Unit 5 Differential Calculus	<p>5.1 <b>Functions</b>:Concept of Functions and simple examples</p> <p>5.2 <b>Limits</b>: Concept of Limits without examples</p> <p>5.3 <b>Derivatives</b>:</p> <p>5.3.1 Derivative of sum, difference, product and quotient of two or more functions</p> <p>5.3.2 Derivative of composite functions</p> <p>5.3.3 Derivative of Inverse functions</p> <p>5.3.4 Derivative of Implicit functions</p> <p>5.3.5 Derivative of Parametric functions</p> <p>5.3.6 Derivative of exponential and logarithmic functions</p> <p>5.3.7 Calculus in Indian Knowledge system “ Discovery of Calculus by Indian Astronomers ( Indian Mathematics)</p>	16	16

CO: CCH105-5:- To solve the problems of maxima, minima, radius of curvature and geometrical applications.			
Unit 6 Application of Derivatives	<b><i>APPLICATIONS OF DERIVATIVES</i></b> 6.1 Second Order Derivatives(without examples) 6.2 Equation of Tangent & Normal 6.3 Maxima & Minima(only for algebraic functions) 6.4 Radius of curvature	06	06

\*\* No questions will be asked on IKS related subtopics in any question paper

### **G : List of Microproject /Assignments under SLA**

Sr.No	List of Assignment (under SLA)	Hrs Allotted
1	Collect the Data of Marks obtained by your class in mid semester test. Compute the variance and coefficient of variance of the data	02
2	Prepare a model using the concept of tangent and normal, bending of curves in case of sliding of a vehicle.	02
3	Prepare charts of grouped and ungrouped data.	02
4	Collect statistical data on real world problems and find Mean Deviation & S.D.	02
5	Collect at least 10 examples based on real world applications which will be used to find S.D. /Variance.	02
6	Prepare models to explain different concepts.	02
7	Prepare a model using concept of radius of curvature of bending of railway tracks.	02
8	A window in the form of rectangle surmounted by a semicircular opening . The total perimeter the window to admit maximum light through the whole opening ,prepare a model using concept of Maxima & Minima for the above problem and verify the result.	02
9	Collect applications of radius of curvature on lens design and optics, mirror and reflective surface properties , road and highway design , structural behavior, roller coaster track design & make a video of 5- minutes duration.	02
10	Design a puzzle based on matrices . Create a grid of numbers and operations.	02
11	Develop a math game based on operations of matrices.	02



12	Collect examples based on real world applications of logarithm and prepare a pdf file.	02
13	Measure height of trees/buildings in surrounding locations using trigonometry and prepare presentation.	02
14	Apply trigonometric principles to calculate angles ,distances, dimensions relevant to the chosen area and make a poster presentation.	02
15	Find height of room or distance between two pillars by using concept of straight line.	02

**\*\*Attempt any 10-12 Micro Projects, out of the given list.**

### **H : Specification table for setting question paper for semester end theory examination**

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Algebra	4	6	6	16	CCH105-1
I / 2	Statistics	2	4	4	10	CCH105-2
I / 3	Coordinate Geometry	2	2	4	8	CCH105-3
II / 4	Trigonometry	2	6	6	14	CCH105-4
II / 5	Differential Calculus	2	6	8	16	CCH105-5
II/6	Application of Derivatives	2	2	2	6	CCH105-5
Total Marks					70	

### **I) :-Assessment Criteria**

#### **Formative Assessment of Tutorial:-**

Every Tutorial shall be assessed for 25 marks as per following criteria:

<b>Domain</b>	<b>Particulars</b>	<b>Marks out of 25</b>
Cognitive	Understanding	05
	Application	05
Psychomotor	Solving skill	05
	Remembering formulae & Accuracy	05
Affective	Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

**J) Instructional Methods:**

1. Lectures cum Demonstrations,
2. Classroom practices.
3. Use of projector and soft material for demonstration
4. Use of internate.
5. Whatsapp groups.
6. Use of books

**K) Teaching and Learning resources:**

Chalk board, Books,LCD presentations, Demonstrative kits, Demonstrative charts.

**L) Reference Books:**

S. N.	Name of Book	Author	Publication
1	A Text Book on Engineering Mathematics (First Year Diploma)	G.V.Kumbhojkar	Phadake Prakashan, Kolhapur
2	Basic Mathematics	Patel, Rawal and others	Nirali Prakashan,Pune
3	Basic Mathematics	Sachin S. Shah & Santosh R. Mitkari	Tech-Neo Publications
4	Basic Mathematics	Vitthal B.Shinde & others	Techical Publications
5	Higher Engineering Mathematics	Grewal B.S.	Khanna publication New Delhi,2013 ISBN:8174091955
6	A text book of Engineering Mathematics	Dutta D.	New age publication New Delhi,2006 ISBN:978-81-224-1689-3
7	Studies in the History of Indian Mathematics	C.S.Seshadri	Hindustan Book Agency,New Delhi 110016.ISBN 978-93-80250-06-9
8	Indian Mathematics Engaging with the World from Ancient to Modern Times	George Gheverghese Joseph	World Scientific Publishing Europe Ltd.57 ASBN 978-17-86340-61-0
9	Calculus and Its Applications	Marvin L.Bittinger David J.Ellenbogen Scott A.Surgent	Addison-Wealey 10 <sup>th</sup> Edition ISBN-13:978-0-321-69433-1
10	Mathematics- I	Deepak Singh	Khanna Book Publishing Co. (P) Ltd. ISBN:978-93-91505-42-4
11	Mathematics -II	Garima Singh	Khanna Book Publishing Co. (P) Ltd. ISBN:978-93-91505-52-3
12	Advance Engineering Mathematics	Das H.K.	S Chand publication New Delhi 2008 ISBN:9788121903455
	Sansar ke Mahan	Gunakar Muley	Raj kamal Prakashan ISBN-13.

13	Ganitagya		978-8126703579
14	An Introduction to Statistical learning with applications in R	Gareth James & others	Springer New York Heidelberg Dordrecht London ISBN:978-1-4614-7137-0

### M) Learning Website & Software

- a. [www.nptel.ac.in/courses/106102064/1](http://www.nptel.ac.in/courses/106102064/1)
- b. [www.scilab.org/-SCI Lab](http://www.scilab.org/-SCI%20Lab)
- c. [www.mathworks.com/product/matlab/-MATLAB](http://www.mathworks.com/product/matlab/-MATLAB)
- d. Spreadsheet Applications
- e. <http://ocw.abu.edu.ng/courses/mathematics/>
- f. <https://ocw.mit.edu/>
- g. <https://libguides.cmich.edu/OER/mathematics>
- h. <https://libguides.furman.edu/oer/subject/mathematics>

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**COURSE ID :**  
**COURSE NAME :ENGINEERING PHYSICS (CE/ME/MT)**  
**COURSE CODE :CCH102**  
**COURSE ABBREVIATION :HPHB**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	4
	Tutorial Learning	-	
	Laboratory Learning	02	
	SLH-Self Learning	02	
	NLH-Notional Learning	08	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY			BASED ON LL&TL				BASED ON SLA		TOTAL	
	FA-TH	SA-TH	TOTAL	Practical				MAX	MIN		
				FA -PR	SA-PR	MAX	MIN				
1.5	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	175
	30*#	70*#	100	40	25	10	25@	10	25	10	

**(Total IKS Hrs for Sem.: 04 Hrs)**

**C: ABBREVIATIONS:-**

CL-Classroom Learning, TL-Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA - Summative assessment, IKS - Indian Knowledge System, SLA -Self Learning Assessment  
**Legends:**@Internal Assessment,#ExternalAssessment,\*#OnlineExamination,@\$InternalOnline Examination

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for this semester are (CL+LL+TL+SL) hrs.\*15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \*Self learning hours shall not be reflected in the Time Table.

\*Self learning includes microproject/assignment/other activities.(Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

## **D. i)RATIONALE:-**

Physics is the foundation of engineering and technology. The development of all engineering areas requires good understanding of fundamental principles in physics. Studying physics develops scientific methodology and technical aptitude in the students. Applications of principles of physics in engineering fields create interest and motivate the students.

## **ii)INDUSTRY/EMPLOYEREXPECTEDOUTCOME**

Apply principles of Physics to solve engineering problems as follows:

**Cognitive** : i) Understanding and applying principles and laws of Physics to simple practical problems/ situations. ii) Observing iii) Classifying iv) Interpreting

**Psychomotor** : Handling of instruments, apparatus and tools

**Affective** : Skill of i) working in team ii) curiosity, interest and self-confidence

## **E. COURSELEVELLEARNINGOUTCOMES(COS)**

**CCH102-1** Estimate errors in measurement of physical quantities.

**CCH102-2** Express importance of semiconductors and nanotechnology.

**CCH102-3** Select proper material in engineering industry by analysis of its physical properties.

**CCH102-4** Apply principles of electricity and magnetism to solve engineering problems.

**CCH102-5**Apply principles of optics to solve engineering problems.

**CCH102-6**Apply principles of acoustics and ultrasonics for related engineering applications.

**Course outcomes and programme outcomes/programme specific outcomes (co-po/ps) matrix**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0”

Cos	Programme Outcomes POs and PSOs								
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analyses	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1	PSO2
CCH102-1 Estimate errors in measurement of physical quantities.	3	1	-	1	1	1	1		
CCH102-2 Express importance of semiconductors and nanotechnology	3	-	-	-	1	1	1		
CCH102-3 Select proper material in engineering industry by analysis of its physical properties	3	1	-	1	1	1	1		
CCH102-4 Apply principles of electricity and magnetism to solve engineering problems	3	1	-	1	1	1	1		
CCH102-5 Apply principles of optics to solve engineering problems.	3	1	-	-	1	1	1		
CCH102-6 Apply principles of acoustics and ultrasonics for related engineering applications.	3	-	-	-	1	1	1		

**F. CONTENT:**

**I) Practical exercises**

The following practical exercises shall be conducted in the *Laboratory for Physics developed* by the Institute in practical sessions of batches of about 20- 22 students:

Sr. no	Laboratory experiences	CO
1	To measure internal and external dimensions of hollow cylinder by using Vernier Caliper	CCH102-1
2	To measure the diameter of bob and thickness of plate by using Vernier Caliper	CCH102-1
3	To measure the diameter of bob and thickness of plate by using Micrometer screw gauge	CCH102-1
4	To determine forbidden energy band gap in semiconductors	CCH102-2
5	To determine the viscosity of liquid by Stokes method.	CCH102-3
6	To determine the buoyancy force on a solid immersed in a liquid	CCH102-3
7	To measure unknown resistance of wire by Ohm’s law	CCH102-4

Sr. no	Laboratory experiences	CO
8	To verify series law of resistances	CCH102-4
9	To verify parallel law of resistances	CCH102-4
10	To draw magnetic lines of force for given magnet by using magnetic compass	CCH102-4
11	To verify Snell's law using glass slab	CCH102-5
12	To study variation of $\delta$ with $i$ for a prism by pin method	CCH102-5
13	To determine velocity of sound by resonance tube	CCH102-6
14	To measure distance using ultrasonic meter	CCH102-6
15	To be added by the subject teacher as per requirement	

## II) Theory

### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO: CCH102-1 Estimate errors in measurement in Physical quantities.			
1	<b>UNITS AND MEASUREMENT</b> 1.1 Unit, Physical Quantities : Fundamental and Derived Quantities and their units 1.2 Systems of units : CGS, MKS, FPS and SI 1.3 Errors , Types of errors : Instrumental, Systematic and Random error, Estimation of errors : Absolute, Relative and percentage errors 1.4 Significant figures <b>1.5 Ancient Astronomical Instruments : Chakra, Dhanuryantra, Yasti and Phalaka yantra(IKS learning)</b> 1.6 <b>Simple Numerical problems</b>	<b>10</b>	<b>12</b>
CO: CCH102-2 Express the importance of Semiconductors and nanotechnology.			
2	<b>INTRODUCTION TO SEMICONDUCTORS AND NANOTECHNOLOGY</b> <b>2.1 SEMICONDUCTORS</b> 2.1.1 Conductors, insulators and semiconductors 2.1.2 Energy bands 2.1.3 Intrinsic and extrinsic semiconductors 2.1.4 Minority and majority charge carriers 2.1.5 P and N type semiconductors 2.1.6 Properties of semiconductors 2.1.7 Applications of semiconductors <b>No numericals on above topic</b>	<b>08</b>  (06)	<b>08</b>  (06)

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	<b>2.2 Nanotechnology</b> 2.2.1 Definition of nanoscale, nanometer, nanoparticle 2.2.2 Definition and examples of nanostructured materials 2.2.3 Applications of nanotechnology in electronics, automobile, textile, space, medicine, cosmetics and environment <b>No numericals on above topic</b>	(02)	(02)
CO: CCH102-3Select proper material in engineering industry by analysis of its physical properties.			
3	<b>PROPERTIES OF MATTER</b>  <b>3.1 ELASTICITY</b> 3.1.1 Definitions of elasticity, plasticity, rigidity, deforming force, restoring force 3.1.2 Stress, Strain and their types 3.1.3 Elastic Limit, Statement of Hooke's law 3.1.4 Modulus of elasticity and its types, Relation between Y, K and $\eta$ (No derivation) 3.1.5 Ultimate stress, breaking stress, Working stress, Factor of safety 3.1.6 Applications of elasticity 3.1.7 <b>Simple Numerical problems</b>  <b>3.2 VISCOSITY</b> 3.2.1 Definition and meaning of viscosity, velocity gradient 3.2.2 Newton's law of viscosity, Coefficient of viscosity 3.2.3 Stokes law 3.2.4 Derivation of expression for coefficient of viscosity of liquid by Stokes method 3.2.5 Effect of temperature and adulteration on viscosity of liquids 3.2.6 Applications of viscosity <b>No numericals on above topic</b>	<b>12</b>  (06)          (06)	<b>14</b>  (10)          (04)



## Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO: CCH102-4 Apply principles of electricity and magnetism to solve engineering problems			
4	<p><b>ELECTRICITY AND MAGNETISM</b></p> <p><b>4.1 ELECTRICITY</b>            4.1.1 Concept of charge, Coulomb's inverse square law,            4.1.2 Electric field, Electric field intensity            4.1.3 Electric potential and potential difference            4.1.4 Electric current, Resistance, Ohm's law            4.1.5 Specific resistance            4.1.6 Resistances in series and parallel            4.1.7 <b>Simple Numerical problems</b></p> <p><b>4.2 MAGNETISM</b>            4.2.1 Magnetic field and magnetic field intensity and its units            4.2.2 Magnetic lines of force, magnetic flux  <b>No numericals on above topic</b></p>	<p><b>10</b></p> <p>(06)</p> <p>(04)</p>	<p><b>12</b></p> <p>(08)</p> <p>(04)</p>
CO: CCH102-5 Apply principles of optics to solve engineering problems			
5	<p><b>OPTICS</b></p> <p><b>5.1 PROPERTIES OF LIGHT</b>            5.1.1 Refraction of light            5.1.2 Laws of Refraction of Light, Snell's law            5.1.3 Refraction through glass prism            5.1.4 Dispersion &amp; Dispersive Power (in terms of angles of deviation only)            5.1.5 <b>Simple Numerical problems</b></p> <p><b>5.2 LASER</b>            5.2.1 Introduction of LASER            5.2.2 Properties of laser            5.2.3 Spontaneous and stimulated emission            5.2.4 Population inversion and optical pumping            5.2.5 Applications of LASER  <b>No numericals on above topic</b></p> <p><b>5.3 X-RAYS</b>            5.3.1 Nature and properties of x-rays.            5.3.2 Production of x-rays by Coolidge tube            5.3.3 Applications of x-rays  <b>No numericals on above topic</b></p>	<p><b>14</b></p> <p>(06)</p> <p>(04)</p> <p>(04)</p>	<p><b>18</b></p> <p>(08)</p> <p>(06)</p> <p>(04)</p>

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO: CCH102-6Apply principles of acoustics and ultrasonics for related engineering applications.			
6	<p><b>ACOUSTICS AND ULTRASONICS</b></p> <p><b>6.1 ACOUSTICS</b>  6.1.1 Echo and reverberation of sound  6.1.2 Sabine's formula  6.1.3 Requirements of good acoustics  6.1.4 Acoustical planning of an auditorium  <b>No numericals on above topic</b></p> <p><b>6.2 ULTRASONICS</b>  6.2.1 Limits of audibility  6.2.2 Ultrasonic waves  6.2.3 Ultrasonic transducers : Piezoelectric and Magnetostriction  6.2.4 Applications of ultrasonic waves  <b>No numericals on above topic</b></p>	<b>06</b>	<b>06</b>

**\*\* No questions will be asked on IKS learning subtopics in any question papers.**

### **G : List of Microprojects/Assignments/Other Activities under SLA**

Sr.No.	List of Microprojects (any one of the following under SLA)	Hrs Allotted
1	Prepare chart showing multipliers required for converting units of physical quantities.	02
2	Prepare prototype vernier caliper of desired least count using card sheet.	02
3	Collect information about ancient astronomical instruments like Chakra, Dhanuryantra, Yasti and Phalaka yantra.	02
4	Collect different materials such as metal, plastic, glass etc and prepare models to show their electrical conductivity.	02
5	Collect different sizes of same material (eg. sugar, salt etc) and list the physical/elerical/optical/chemical/mechanical characteristics for each of them.	02
6	Prepare chart showing the three types of modulus of elasticity developed in a material.	02
7	Prepare working model to differentiate liquids on the basis of viscosity.	02
8	Prepare chart/models to demonstrate magnetic lines of force of different types of magnets.	02
9	Prepare chart/models for series and parallel combination of resistances of different values.	02

10	Prepare a model to demonstrate the variation of angle of refraction with respect to angle of incidence.	02
11	Use keychain laser to differentiate laser with ordinary light.	02
12	Prepare a presentation for application of x-rays in different fields.	02
13	Collect information using internet about ancient acoustic architecture. (For CE/ME/MT students)	02
OR		
Sr.No	List of Assignment (any one of the following under SLA)	Hrs Allotted
1	Write fundamental and derived Physical quantities with their SI units	02
2	Enlist the rules used to decide significant figures in measurements.	02
3	Write points to differentiate conductors, semiconductors and insulators on the basis of energy band diagram.	02
4	List applications of semiconductors in Civil, Mechanical, Electrical, Information Technology, Electronics and Telecommunication, Metallurgical Engineering etc.	02
5	Write down the applications of nanotechnology in the field of electronics, cosmetics, textile, environment, medical, space and defense, automobiles.	02
6	Write applications of elasticity.	02
7	Explain free fall of a sphere in a liquid column.	02
8	Write information of electric lines of force and magnetic lines of force.	02
9	Explain conversion of galvanometer into ammeter/voltmeter of desired range.	02
10	Draw ray diagrams showing different phenomena of light (reflection, refraction, dispersion etc).	02
11	Enlist the properties and applications of laser.	02
12	Explain production of X-rays using Coolidge tube.	02
13	Write the information of factors to be considered while planning of an auditorium. (For CE/ME/MT students).	02
AND		
Sr.No	List of Activity (any one of the following under SLA)	Hrs Allotted
	Write importance and significance of calibration of measuring instruments. Collect information of related industries in nearby industrial areas.	02

**\*\*One microproject/ assignment/ given activity is to be completed during the semester.**

## H : Specification table for setting question paper for semester end theory examination

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Units and measurements	2	4	6	12	CCH102-1
I / 2	Introduction to Semiconductors and Nanotechnology	2	2	4	08	CCH102-2
I / 3	Properties of matter (Elasticity and Viscosity)	4	2	8	14	CCH102-3
II / 4	Electricity and Magnetism	2	4	6	12	CCH102-4
II / 5	Optics (Properties of light, Laser & X-rays)	6	6	6	18	CCH102-5
II / 6	Acoustics and Ultrasonics	2	2	2	06	CCH102-6
<b>Total Marks</b>					<b>70</b>	

### I :-Assessment Criteria

#### i) Formative Assessment of Practical:-

Every practical assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Presentation ( Observations, calculations & Result table)	05
Psychomotor	Operating Skills	05
	Drawing skills (Neat & complete circuit Diagram / schematic Diagram)	05
Affective	Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

#### ii) Summative Assessment of Practical :

Every practical assignment shall be assessed for 25 marks as per following criteria:

Sr.no	Criteria	Marks allotted
1	Attendance at regular practical	05
2	Preparedness for practical	05
3	Neat & complete Diagram / observation table	05
4	Observations / Calculations / Result / Graph	05
5	Safety / use of proper tools	05
<b>TOTAL</b>		<b>25</b>

**iii) Assessment of SLA :-**

Every Self-learning assignment shall be assessed for 25 marks as per following criteria:

Sr.no	Criteria	Marks allotted
1	Attendance	05
2	Preparedness and workmanship	05
3	Presentation (neat figures/ diagrams/ tables/ graphs etc.)	05
4	Conclusion / Inference	05
5	Oral Based on microproject/ assignment/ activity	05
<b>TOTAL</b>		<b>25</b>

**J) Instructional Methods:**

1. Lectures cum Discussions
2. Regular Home Assignments
3. Laboratory work
4. Use of projector and soft material for demonstration

**K) Teaching and Learning resources:**

1. Chalk board
2. Video clips
3. Slides
4. Item Bank
5. Charts

**L) Reference Books:**

S.N.	Name of Book	Author	Publication
1	Text book of Physics for class XI & XII (Part-I, II)	Narlikar	N.C.E.R.T Delhi
2	Engineering Physics	P.V.Naik.	Pearson Edu. Pvt. Ltd, New Delhi.
3	Concepts in Physics, Vol. I & II.	Narkhede, Pawar, Sutar	Bharti Bhawan Ltd, New Delhi.
4	Principles of Physics.	Walker, Halliday, Resnik	Wiley Publication. , New Delhi.
5	Engineering Physics	B.L. Theraja	S. Chand Publishers – New Delhi
6	Concept of modern physics	Beiser	Tata Mc-Graw Hill
7	Physics for Technicians	E. Zebro Wski	Tata Mc-Graw Hill
8	Engineering Physics	V. Rajendran	Tata McGraw-Hill Publications
9	The Archaic and The Exotic : Studies in the history of Indian astronomical instruments	SteeramulaRajeswara Sarma	Manohar Book Services
10	The Surya Siddhanta	Aryabhata	Baptist Mission Press, Calcutta

## **M) Learning Website & Software**

- 1) <http://www.physicsclassroom.com>
- 2) <http://scienceworld.wolfram.com/physics/>
- 3) <http://physics.about.com/>
- 4) <http://nptel.ac.in/course.php?disciplineId=115>
- 5) <http://nptel.ac.in/course.php?disciplineId=104>
- 6) [www.fearofphysics.com](http://www.fearofphysics.com)
- 7) [www.science.howstuffworks.com](http://www.science.howstuffworks.com)
- 8) [www.iksindia.org](http://www.iksindia.org)

\*\*\*\*\*

**COURSE ID: ME**

**Course Name : ENGINEERING GRAPHICS (CE/ME/MT)**

**Course Code : CCH106**

**Course Abbreviation: HGRB**

**Course Type : DSC**

**A. LEARNING SCHEME:**

**Pre-requisite Course(s): Nil**

**Teaching Scheme:**

Scheme component	Actual Contact Hours / week	Credits
Classroom Learning (CL)	02	3
Tutorial Learning (TL)	-	
Laboratory Learning (LL)	04	
Self-Learning Hours (SLH)	-	
Notional Learning (NLH)	06	

**B. ASSESSMENT SCHEME:**

Theory				Based on LL & TL				Based on Self Learning		Total Marks
				Practical						
FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
30	70	100	40	50	20	-	-	-	-	150

**Total IKS Hrs for Sem: 2 Hrs**

**C. ABBREVIATIONS:** CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning,

SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment,

SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

**Legends:** @ Internal Assessment, # External Assessment, \*# On Line Examination, @\$ Internal Online Examination

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course, then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all 5 assignments here in tabular format)

**D. i) RATIONAL:**

Engineering graphics is the language of engineers. The concepts of graphical language are used in expressing the ideas, conveying the instructions, which are used in carrying out the

jobs on the sites, shop floor etc. This course is useful in developing drafting and sketching skills in the student. It covers the knowledge & application of drawing instruments & also familiarizes the learner about Bureau of Indian Standards related to engineering drawing. The curriculum aims at developing the ability to draw and read various engineering curves, projections and dimensioning styles. The subject mainly focuses on use of drawing instruments, developing imagination and translating ideas into sketches. The course also helps to develop the idea of visualizing the actual object or part on the basis of drawings and blue prints. This preliminary course aims at building a foundation for the further courses related to engineering drawing and other allied courses in coming semesters

## ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry identified outcome through various learning experiences:

- Prepare simple engineering drawing manually using drawing instruments.

## E. COURSE LEVEL LEARNING OUTCOMES (CO'S)

<b>CCH106-1</b> Understand various fundamentals in engineering drawing.
<b>CCH106-2</b> Produce different types of engineering curves.
<b>CCH106-3</b> Produce the projection of point & lines inclined to one reference plane.
<b>CCH106-4</b> Produce the projection of different planes.
<b>CCH106-5</b> Produce orthographic drawing and sectional orthographic drawing from given pictorial view.

### Competency, course outcomes and programme outcomes/programme specific outcomes (CP-CO-PO/PSO) matrix

[ Note: Correlation levels: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"]

Competency and COs	Programme outcome POs and PSO's								
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO3 Design/development of solutions	PO 4 Engineering Tools, Experimentation & testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long learning	PSO1 Work in mfg & service sector	PSO 2 Start entrepreneurial activity
CCH106-1	3	-	-	-	-	-	-	-	-
CCH106-2	3	-	1	-	-	-	-	-	-
CCH106-3	3	-	-	1	1	-	-	-	-
CCH106-4	3	-	1	-	-	-	-	-	-
CCH106-5	3	-	1	1	-	-	-	-	-

## F. CONTENT:

### i) Practical exercises



Practical Exercises and related skills to be developed:

The following practical exercises shall be conducted in the *Drawing Hall for Engineering drawing* in practical sessions of batches of about 20- 22 students:

<b>Sr No</b>	<b>Laboratory Experiment / Practical Titles / Tutorial Titles</b>	<b>Number of hrs.</b>	<b>Relevant COs</b>
1	Draw horizontal, vertical, 30-degree, 45 degrees, 60 & 75- degrees lines using Tee and Set squares/ drafter.	2	CO1
2	Draw different types of lines, dimensioning styles	2	CO1
3	Draw one figure showing dimensioning techniques, two problems on redraw the figures. (Sketch Book)	2	CO1
4	Draw one figure showing dimensioning techniques, two problems on redraw the figures and one problem on Scales. (01 Sheet)	4	CO1
5	Draw any four Engineering Curves (Sketchbook)	2	CO2
6	Draw any four Engineering Curves – (01 Sheet)	4	CO2
7	Draw any four problems on Line parallel to both the principal planes Line parallel to one principal planes & perpendicular to other Principal planes using first angle method of projection. (Sketchbook)	2	CO3 CO5
8	Draw any four problems on Line parallel to one principal plane & inclined to other principal planes using first angle method of projection - (01 Sheet)	4	CO3 CO5
9	Draw any four problems on Plane parallel to one principal plane & perpendicular to another Principal plane, Plane perpendicular to both the principal planes using first angle method of projection. (Sketchbook)	4	CO4 CO5
10	Draw any four problems on Plane inclined to one principal plane and perpendicular to other principal plane using first angle method of projection - (01 Sheet)	4	CO4 CO5
11	Draw two problems on orthographic projections using first angle method of projection having plain surfaces, slanting surfaces and slots etc.	2	CO5
12	Draw two problems on orthographic projections using first angle method of projection having cylindrical surfaces, ribs etc. (Sketchbook)	2	CO5

13	Draw two problems on orthographic projections using first angle method of projection having plain surfaces, slanting surfaces cylindrical surfaces, ribs and slots etc.- (01 Sheet)	2	CO5
14	Draw different types of sections of simple objects (Sketchbook)	2	CO5 CO6
15	Draw two problems on sections of solids having ribs, cylindrical surface etc. (01 Sheet)	4	CO5 CO6
16	Correlate ancient Indian sculptures, Indian temples, Monuments, etc. with Engineering Graphics. (IKS)	2	CO1 CO2 CO3 CO4 CO5 CO6

ii) THEORY

SECTION – I

Sr. No	Topics	Teaching (Hours )	Theory Evaluation Marks
<i>Course Outcome CCH106-1 Understand various fundamentals in engineering drawing</i>			
1.	<b>INTRODUCTION TO ENGINEERING DRAWING</b> 1.1 Drawing Instruments and their uses 1.2 Standard sizes of drawing sheets as per ISO-A series, Layout of sheet. 1.3 Letters and numbers (single stroke vertical) Convention of lines and their applications. 1.4 Scale (reduced, enlarged & full size) Plain scale and Diagonal scale. 1.5 Dimensioning technique as per SP-46 (Latest Edition), Elements of dimensioning, Types and applications of chain, parallel and Co-ordinate dimensioning	04	06

*Course Outcome CCH106-2 Produce different types of engineering curves*

<b>2.</b>	<b>ENGINEERING CURVES</b> 2.1 Conic sections and their applications 2.2 Ellipse by Arc's of circle method & Concentric circles method. 2.3 Parabola by Directrix and focus method & Rectangle method 2.4 Hyperbola by Transverse Axis focus Method & Rectangular hyperbola (Inclined axes). 2.5 Involutés of circle, & pentagon, hexagon 2.6 cycloid, epicycloids, hypocycloid 2.7 Helix & Archimedean spiral.	<b>09</b>	<b>18</b>
<i>Course Outcome CCH106-3 Produce the projection of point &amp; lines inclined to one reference plane</i>			
<b>3.</b>	<b>PROJECTION OF POINT AND LINES</b> 3.1 Projection of points when point is in first quadrant only 3.2 Orientation of Line with respect to principal planes (Both ends of line should be in first quadrant) <ul style="list-style-type: none"> <li>• Line parallel to both the principal planes</li> <li>• Line parallel to one principal planes &amp; perpendicular to other Principal planes</li> <li>• Line parallel to one principal plane &amp; inclined to other principal planes</li> </ul>	<b>05</b>	<b>10</b>

#### SECTION – II

Sr. No	Topics	Teaching (Hours)	Theory evaluation Marks
<i>Course Outcome CCH106-4 Produce the projection of different planes.</i>			
<b>4.</b>	<b>PROJECTION OF PLANES</b> 4.1 Types of Planes - Circular, Square, Triangular, Rectangular, Pentagonal, Hexagonal. 4.2 Orientation of plane with respect to principal planes (Planes in First Quadrant Only) – <ul style="list-style-type: none"> <li>• Plane parallel to one principal planes &amp; perpendicular to another Principal plane</li> <li>• Plane perpendicular to both the principal planes</li> <li>• Plane inclined to one principal plane and perpendicular to other principal plane</li> </ul>	<b>03</b>	<b>10</b>
<i>Course Outcome CCH106-5 Produce orthographic drawing and sectional orthographic drawing from given pictorial view.</i>			
<b>5.</b>	<b>ORTHOGRAPHIC PROJECTIONS</b> 5.1 Introduction to Orthographic Projections -First and Third angle Projection Method, their symbols 5.2 Conversion of Pictorial view into Orthographic Views. (First angle Projection Method Only)	<b>05</b>	<b>14</b>
<i>Course Outcome CCH106-5 Produce orthographic drawing and sectional orthographic drawing from given pictorial view</i>			

<b>6.</b>	<b>SECTIONAL VIEWS</b> 6.1 Types of sections 6.2 Conversion of pictorial view into sectional Orthographic views. (First Angle Projection Method only)	<b>04</b>	<b>12</b>
<b>Total</b>		<b>30</b>	<b>70</b>
1. Summative assessment – Theory paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.			

**\*\* No questions will be asked on IKS learning subtopics in any question papers.**

**G. SUGGESTED MICRO PROJECTS / ASSIGNMENTS/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING) UNDER SLA**  
- NOT APPLICABLE

**H. SPECIFICATION TABLE FOR SETTING QUESTION PAPER FOR SEMESTER END THEORY EXAMINATION**

Topic No.	Name of topic	Distribution of marks (Cognitive level-wise)			Course Outcome	Total Marks
		Remember	Understand	Application		
1	Introduction To Engineering Drawing	00	06	00	CCH106-1	06
2	Engineering curves	00	12	06	CCH106-2	18
3	Projection of Point and Lines	00	10	00	CCH106-3	10
4	Projection of Planes	00	00	10	CCH106-4	10
5	Orthographic Projection	00	00	14	CCH106-5	14
6	Sectional Views.	00	00	12	CCH106-5	12
	<b>Total</b>	00	28	42		<b>70</b>

**I. ASSESSMENT CRITERIA**

**Formative Assessment of Practical: -**

Every assignment shall be assessed for 25 marks as per following criteria:

<b>Domain</b>	<b>Particulars</b>	<b>Marks out of 25</b>
---------------	--------------------	------------------------

Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

#### **J. INSTRUCTIONAL METHODS:**

- i) Lectures cum Demonstrations,
- ii) Class room practices.
- iii) Use of projector and soft material for demonstration

#### **K. TEACHING AND LEARNING RESOURCES:**

Chalk board, Power Point presentations and Demonstrative kits.

#### **L. REFERENCE MATERIAL:**

<b>Sr. No.</b>	<b>Author</b>	<b>Title</b>	<b>Publisher</b>
1.	N. D. Bhatt	Engineering Drawing	Charotar Publishing House 2010
2.	Amar Pathak	Engineering Drawing	Dreamtech Press, 2010
3.	D. Jolhe	Engineering Drawing	Tata McGraw Hill Edu., 2010
4.	M. B. Shah, B. C. Rana	Engineering Drawing	Pearson, 2010
5.	K. Venugopal	Engineering Drawing and Graphics + AutoCAD	New Age Publication, Reprint 2006
6.	IS Code, SP – 46	Engineering Drawing Practice	Bureau of Indian Standards

#### **M. LEARNING WEBSITE & SOFTWARE: -**

1. <http://www.design-technology.info/IndProd/drawings/>
2. <http://graphicalcommunication.skola.edu.mt/syllabus/engineering-drawing/>
3. [http://en.wikipedia.org/wiki/Engineering\\_drawing](http://en.wikipedia.org/wiki/Engineering_drawing)
4. <http://www.engineeringdrawing.org/>
5. [http://www.teachengineering.org/view\\_activity](http://www.teachengineering.org/view_activity)
6. [www.howtoread.co.in/2013/06/how-to-read-ed.html](http://www.howtoread.co.in/2013/06/how-to-read-ed.html)
7. <http://www.slideshare.net/akhilrocker143/edp>
8. <http://www.24framesdigital.com/pstulpule>

\* \* \*

**COURSE ID :**

**COURSE NAME : APPLIED MECHANICS (CE/ME/MT)**

**COURSE CODE : CCH108**

**COURSE ABBREVIATION : HAPM**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	4
	Tutorial Learning	-----	
	Laboratory Learning	02	
	SLH-Self Learning	02	
	NLH-Notional Learning	08	

**B. LEARNING SCHEME**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
03	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	175
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN			
	30	70	100	40	25	10	25@	10	25	10	

(Total IKS hours for sem: 02 hours)

**C: ABBREVIATIONS: -**

CL- Class Room Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA - Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

**Legends:** @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination.

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

## **D.RATIONALE:**

The role of an engineer is to dream a mechanism for the present and the future generation. Understand the concept of existing mechanism thoroughly. An engineer in his initial stages of learning need to understand the basics of components of the machine, then forces in those components, interaction of these forces resulting in an engineering marvel or a mechanism. The contents of this most versatile basic course for engineering curriculum aims at providing fundamental meaning of various engineering principles and concept in engineering applications .The contents also forms basic or primary set for higher level of subject such as strength of material, analysis of structures and design of steel structures and RCC structures. The subject being first and foremost entry level curriculum for the various programs in engineering it acts as gateway for engineering career. With the learning outcomes of the subject, learner can get clues for various fields such as mechanical, civil, metallurgical and varied courses like aerodynamics, space mechanics, marine structures .The subject being interdisciplinary in nature it comes under allied department applied mechanics.

## **Competency identified for the course:**

The MPEC 2020 curriculum design based on MSBTE K curriculum guideline and NEP2020 policy incorporates all salient features such as notional hours and non-national hours of learning. Indian knowledge system through 2 hours in a semester is aimed at exploring ancient traditional technical knowledge prevailing in the country. Subject is given 4 hrs. Of class room learning, 2hrs of practicals (lab learning) and 2 hrs. of self-leaning. All these hrs. Of learnings including IKS learning are aimed at achieving following skills sets.

Cognitive	Psychomotor	Affective domain
<p>Understanding force concepts in various mechanics through FBD for various physical situations</p> <p>Solving for equilibrium condition of various force system and appreciating the mechanism analytically.</p> <p>Understanding the kinematics geometry of motion in rectilinear and circular motion</p> <p>Solving static equilibrium and dynamic equilibrium condition( kinetics) and lifting machines.</p> <p>Formative assessment is employed through two unit test., end semester exam (specification table) (30 marks)and progressive assessment format for lab work is to be followed .(10 marks)</p>	<p>Practicals with hands on experience on force system to verify Lamis theorem ,law of polygon of forces ,parallelogram of forces ,beam reactions on force table or similar set up.</p> <p>Lifting machines are operated to establish law of machine and compute efficiency .</p> <p>By performing motion of bodies with different surfaces in contact , frictional resistance is evaluated .</p> <p>By simulating areas to forces centroid for different laminae is graphically found.</p> <p>progressive assessment format for lab work is to be followed(10marks) .</p>	<p>All practical systematically executed to understand the principles, appreciate the inferences with the set of observations conducting lab learning in a small group where every individual gets ample opportunity, essence of team work is developed, result oriented performance is appreciated and time bound activity is scheduled . the neatness and presentation skills are appreciated in formative progressive assessment format for lab work is to be followed (5marks).</p>

## E. COURSE LEVEL LEARNING OUTCOMES (COs):

**CCH108-1** Understanding mechanisms for the interaction of various forces in their components with types and corresponding effects. With due focus on rigid body concept, principle of superposition resolution and composition of forces.

**CCH108-2** Study of equilibrium for concurrent and non-concurrent force system and finding resultant and equilibrant graphically and analytically.

**CCH108-3** Problems on equilibrium condition involving friction and support reactions in beams graphically and analytically.

**CCH108-4** Knowing simple lifting mechanisms establishing law of machine, evaluating efficiency for set of loads.

**CCH108-5** Studying equations of motion for rectilinear and circular motion, establishing relation between linear and angular motion parameters.

**CCH108-6** Understanding effect of force for executing work, energy principles and conservation of energy concept.



**Competency, course outcomes and programme outcomes/programme specific outcomes  
(CO-PO/PSO matrix)**

[Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0” ]

Competency and COs	Programme Outcomes POs and PSOs								
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1	PSO2
Competency: Applied Mechanics	3	2	2	2	3	1	2		
CCH108-1 Understanding mechanisms for the interaction of various forces in their components with types and corresponding effects. With due focus on rigid body concept, principle of superposition resolution and composition of forces.	3	2	-	2	-	1	2		
CCH108-2 Study of equilibrium for concurrent and non-concurrent force system and finding resultant and equilibrant graphically and analytically.	3	2	1	2	-	1	2		
CCH108-3 Problems on equilibrium condition involving friction and support	3	2	1	2	-	1	2		

Competency and COs	Programme Outcomes POs and PSOs								
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1	PSO2
reactions in beams graphically and analytically.									
CCH108-4 Knowing simple lifting mechanisms establishing law of machine, evaluating efficiency for set of loads.	3	2	1	3	2	1	2		
CCH108-5 Studying equations of motion for rectilinear and circular motion, establishing relation between linear and angular motion parameters.	2	1	1	2	-	1	2		
CCH108-6 Understanding effect of force for executing work, energy principles and conservation of energy concept.	2	2	1	2	-	1	2		

**Note : typical matrix assessment based on previous records—for continuous analysis improvement .**

## **F. CONTENT:**

## I) LABORATORY WORK

Practical Exercise and related skills to be developed

The following exercises shall be conducted as practical work as detailed in laboratory manual for Applied Mechanics developed by the institute in practical sessions of batches of about 20-22 students.

In the list, Expt. No.1 to7 exercises are compulsory and from 8 to 12, any three exercises shall be conducted. in all 10 experiments are mandatory.

Sr no	Title of practical exercise	Course Outcome
1	Verification Law of parallelogram of forces	CCH108-1
2	Verification Law of polygon of forces	CCH108-1
3	Verification of Lamis theorem	CCH108-2
4	Determination of Beam reaction (Graphically and Analytically)	CCH108-2
5	Graphic statics (To find resultant of concurrent and non-concurrent force system)	CCH108-2
6	Determination of centroid (regular and irregular laminas)	CCH108-2
7	Determination of coefficient of friction between different surfaces	CCH108-3
8	Simple lifting machine introduction of basic terms Study of differential axle and wheel	CCH108-4
9	Screw jack Application and finding efficiency and its law	CCH108-4
10	Study of worm and worm wheel	CCH108-4
11	Gear mechanism (Either single or double)	CCH108-4
12	Experiment on simple pendulum to know dynamic characteristics	CCH108-5

## II) THEORY:

### Section I

Sr no	Course content	Lecture hours (class room learning)	Theory Assessment marks
	<b>CO: CCH108-1</b> Understanding mechanisms for the interaction of various forces in their components with types and corresponding effects. With due focus on rigid body concept, principle of superposition resolution and composition of forces.		

1	<b>Force systems and principles</b> 1.1 Rigid body concepts, physical quantities and their units 1.2 Free body diagram for various mechanisms 1.3 Force characteristics, definition, force and force system-principles and laws 1.4 Different type of actions and their representation, with their effect (resultant moment, couple etc.) 1.5 Application on force system – numerical on law of parallelogram of forces, law of polygon of forces	8 hours	12 marks
<b>CO: CCH108-2</b> Study of equilibrium for concurrent and non-concurrent force system and finding resultant and equilibrant graphically and analytically.			
2	<b>Equilibrium of bodies</b> 2.1 Two force system resultant and equilibrium inference 2.2, Lami's theorem for three force system and its application 2.3 Varignon's principle and its application 2.4 Solving graphically and analytically beams with roller and hinge support 2.5 Definition of centroid and centroid for standard areas /sections. Its determination experimentally for irregular areas	12 hours	12 marks
<b>CO: CCH108-3</b> Problems on equilibrium condition involving friction and support reactions in beams graphically and analytically.			
3	<b>Friction on bodies and beam statics</b> 3.1 Laws of dry friction 3.2 Free body diagram to derive expression for $\mu_s$ & $\mu_k$ 3.3 Problems on block and ladder friction 3.4 Reaction in beams carrying point load and udl with hinge and roller support. 3.5 Beam carrying transverse loads and couple	10 hours	10 marks
	<b>Total</b>	<b>30</b>	<b>34</b>

## Section II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<b>CO: CCH108-4</b> Knowing simple lifting mechanisms establishing law of machine, evaluating efficiency for set of loads.			
4	<b>Simple Lifting machines</b> 4.1 Basic definition of terms involved in lifting mechanisms.	12 hours	14 marks

	4.2 Different types of simple lifting machines such as simple gears differential axial and wheel, screw jack 4.3 Inclined plane and evaluating coefficient of static friction		
<b>CO: CCH108-5</b> Studying equations of motion for rectilinear and circular motion, establishing relation between linear and angular motion parameters.			
5	<b>Kinematics and kinetics</b> 5.1 Kinematics and kinetic equations of motion 5.2 D'Alembert's principle for dynamic equilibrium 5.3 Kinetics for circular motion 5.4 Evaluating dynamic characteristics of simple pendulum	10 hours	12 marks
<b>CO: CCH108-6</b> Understanding effect of force for executing work, energy principles and conservation of energy concept			
6	<b>Work, power and energy</b> 6.1 Definition of work done and dot product of force and displacement vectors 6.2 Energy types and law of conservation of energy 6.3 Collision of bodies and problem solving 6.4 Power and its interpretation in different mechanism	8 hours	10 marks
	<b>Total</b>	<b>30</b>	<b>36</b>

## G. List of Assignments/Microprojects under SLA

\*\*assignments/Microproject are to be completed during the semester.

Sr.No	List of Microproject objectives	Format	Assessment criteria
1	Mechanism –free body diagrams, force equations and efficiency	Title:	Objectives: 5 marks
2	Equilibrium of static force systems - Buildings, Dams, Engineering structures case studies	Objectives:	Methodology:10 marks
3	Gear systems –case studies	Study scheme: 2* 15 = 30 hours planning	Presentation /inferences:10 marks
4	Rope drives, weighing machines case studies	Procedure: theory/modeling	
5	Rolling, sliding friction field applications.	Observations:	
6	Machine foundation aspects	Inference:	
7	Vibration analysis of simple motions	Conclusion	
		Bibliography	

8	Motion of bodies, projectile, space mechanics preliminary studies		
9	Energy principles, fly wheel machine concept and applications		

### H: Specification table for setting question paper for semester end theory examination

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Force systems and principles	4	4	4	12	CCH108-1
I / 2	Equilibrium of bodies	4	4	4	12	CCH108-2
I / 3	Friction on bodies and beam statics	4	2	4	10	CCH108-3
II / 4	Simple Lifting machines	4	2	8	14	CCH108-4
II / 5	Kinematics and kinetics	4	4	4	12	CCH108-5
II / 6	Work, power and energy	4	2	4	10	CCH108-6
Total Marks					<b>70</b>	

### I:-Assessment Criteria

#### i) Formative Assessment of Practical: -

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

#### ii) Summative Assessment of Practical:

Every practical assignment shall be assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Attendance at regular practical	05

2	Preparedness for practical	05
3	Neat & complete Diagram.	05
4	Observations & handling of instrument.	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

**iii) Assessment of SLA: -**

Every Self-learning assignment/microproject shall be assessed for 25 marks as per assessment shown in table of criteria G.

**J. Instructional Methods:**

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration

**K. Teaching and Learning resources:**

- |                       |                               |
|-----------------------|-------------------------------|
| 1. Chalk board        | 2. LCD presentations          |
| 3. Demonstrative kits | 4. Demonstrative charts       |
| 5. Question Bank      | 6. Digital learning resources |

**L. REFERENCE BOOKS**

a) Book / journals / IS code

Sr no	Name of Book	Author	Publication
1	Engineering Mechanics	S Timoshenko and young	McGraw- Hill, 1995
2	Vector Mechanics for Engineer	Beer, Johnston	McGraw- Hill, 1995
3	Engineering Mechanics	S S BHAVIKATTI S.S and Rajashekarappa K.G.	New age international publisher
5	Engineering Mechanics	K L KUMAR	Tata McGraw- Hill Publishing company Limited
6	Text book on engineering mechanics	Khurmi R .S.	S. Chand Publications, New Delhi
7	Engineering Mechanics	Singer F.L.	Harper and Row Pub. York.

**M. Learning Website & Software**

- a. [www.nptel.com/iitm/](http://www.nptel.com/iitm/)
- b. [www.howstuffworks.com/](http://www.howstuffworks.com/)
- c. [www.vlab.com](http://www.vlab.com)
- d. [https:// en.wikipedia.org/wiki/applied\\_mechanics](https://en.wikipedia.org/wiki/applied_mechanics)

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**COURSE ID :**  
**COURSE NAME :** Metallurgical Workshop Practice - I  
**COURSE CODE :** MTH101  
**COURSE ABBREVIATION :** HWMT-I

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	--	02
	Tutorial Learning	--	
	Laboratory Learning	04	
	SLH-Self Learning	--	
	NLH-Notional Learning	04	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	75
--	--	--	--	--	25	10	50@	20	--	--	

**(Total IKS Hrs for Sem. : 02 Hrs)**

**C:** Abbreviations: CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH- Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination  
 Note : ( TNR 11 font)

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)



## D. i) RATIONALE:-

This course is mainly deals with Forging, Moulding and Turning operation. These processes are commonly used in Engineering Industry. A technician has to work in such environment with his peers, superiors and subordinates for a major part of his life. Therefore the emphasis on the practical work is needed for the primary experience of working in the team.

## ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry identified outcome through various learning experiences:

1. Demonstrate various forging, moulding and turning operations.

## E. COURSE LEVEL LEARNING OUTCOMES (COS)

MTH101-1 Select different types of tools required for forging, moulding and turning operations.

MTH101-2 Select a precise forging operation for a given job.

MTH101-3 Prepare a job with forging, moulding and turning operations.

MTH101-4 Practicing safety in workshop.

## Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps) matrix

[ Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analyses	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 To prepare the students to play the role of metallurgist in industries	PSO2 To create awareness about safety protocols to be followed in various metallurgical industries	PSO3 Develop sensitivity among the students about the environmental hazards caused due to the pollutants generated in metallurgical industries.
CO-1 Select different types of	3	2	2	2	2	2	3	3	2	2

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 To prepare the students to play the role of metallurgist in industries	PSO2 To create awareness about safety protocols to be followed in various metallurgical industries	PSO3 Develop sensitivity among the students about the environmental hazards caused due to the pollutants generated in metallurgical industries.
tools required for forging, moulding and turning operations										
CO-2 Select a precise forging operation for a given job	3	2	2	2	2	2	3	2	2	2
CO-3 Prepare a job with forging, moulding and turning operations.	3	1	3	2	2	3	3	3	2	2
CO-4 Practicing safety in workshop	3	2	2	1	2	2	2	2	3	3

## F. CONTENT:-

### I) Practical exercises

The following practical exercises shall be conducted in the *workshop* in practical sessions of batches of about 20- 22 students:

Sr. no.	Laboratory experiences	CO
1	<b>Smithy Shop :-</b> Demonstration of different forging tools.	1
2	Demonstration of different forging processes like shaping, fullering, setting down operations etc.	2
3	One job like hook, flat chisel or any hardware item Note - One job of standard size (saleable/marketable article per student)	2,4
4	<b>Moulding Shop :-</b> Illustration of various materials and equipments used in making mould.	1
5	Study of pattern making.	1
6	Demonstration of gating system in casting	3
7	To prepare a sand mold, using the pattern.	3,4
8	<b>Turning Shop :-</b> Demonstration of various tools used in turning shop.	1
9	Demonstration of turning operation using lathe machine.	3
10	Preparation of one simple job involving turning operation.	3,4

## II) Theory - NA

### G : List of Assignments under SLA NA

### H : Specification table for setting question paper for semester end theory examination

NA

### I :-Assessment Criteria

#### i) Formative Assessment of Practical :-

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

#### ii) Summative Assessment of Practical :

At the time of Practical Examination assessed for 50 marks as per following criteria:

<b>Sr. no</b>	<b>Criteria</b>	<b>Marks allotted</b>
1	Knowledge about the course	10
2	Preparedness for practical /Oral	10
3	Neat & complete Diagram/write up	10
4	Observations/Handling of instrument/ Communication/Presentation	10
5	Oral Based on Lab work and completion of task	10
<b>TOTAL</b>		<b>50</b>

**J) Instructional Methods:**

1. Demonstration during practical.
2. Workshop Record Book.

**K) Teaching and Learning resources:**

1. Shop Demonstration.
2. Hands on training on machine.

**L) Reference Books:**

S.N.	Name of Book	Author	Publication
1	Elements of workshop Technology – Volume I & II	S. K. Hajra Chaudhary, Bose, Roy	Media Promoters and Publishers limited
2	Elements of workshop Technology – Volume I & II	B.S. Raghuvanshi	Dhanpat Rai & Co.

**M) Learning Website & Software**

1. <http://nptel.ac.in>
2. You Tube – Forging, Moulding, Turning.

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**COURSE ID: 06**

**Course Name : Fundamentals of ICT (CE/ME/EE/MT/ET/IT)**

**Course Code : CCH202**

**Course Abbreviation : HICT**

**1. TEACHING-LEARNING & ASSESSMENT SCHEME :**

Scheme component	Hours / week	Credits
Theory	1	2
Practical	2	

Course Code	Course Title	Abbr	Course Category /s	Learning Scheme					Credits	Paper Duration	Assessment Scheme										Total Marks
				Actual Contact Hrs./Week			SLH	NLH			Theory			Based on LL & TSL				Based on SL			
				CL	TL	LL					FA-TH	SA-TH	Total	Practical		SLA					
				Max	Max	Max	Min	Max			Min	Max	Min	Max	Min	Max	Min				
CCH202	FUNDAMENTALS OF ICT	ICT	SEC	1	-	2	1	4	2		-	-	-	-	25	10	25@	10	25	10	75

**Total IKS Hrs for Sem. : 0 Hrs**

Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learn Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - India Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.
7. \* Self learning includes micro project / assignment / other activities.

**♦ Candidate remaining absent in practical examination of any one part of Basic Science course i.e. Physics, Chemistry will be declared as Absent in Mark List and has to appear for examination. The mark part for which candidate was present will not be processed or carried forward.**

**2. RATIONALE:**

In any typical business setup in order to carry out routine tasks related to create business documents, perform data analysis and its graphical representations and making electronic slide show presentations, the student need to learn various software as office automation tools like word processing applications, spreadsheets and presentation tools. They also need to use these tools for making their project reports and presentations. The objective of this course is to develop the basic competency in students for using

these office automation tools to accomplish the job. This course also presents an overview of emerging technologies so that students of different discipline can appraise the applications of these technologies in their respective domain.

### 3. COMPETENCY:

**Apply Fundamental knowledge of computer system to work with simple applications.**

**Cognitive:** i) State the basic parts of a computer system and relationships among component. ii) State characteristics and functions of CPU's, motherboard, RAM, Storage devices etc.

**Psychomotor:** i) Use computers for Internet services, Electronics Documentation, Data Analysis and Slide Presentation. ii) Appraise Application of ICT based Emerging Technologies.in different domain.

**Affective: Attitude** of i) Precision ii) Accuracy iii) Safety iv) Punctuality

### 4. COURSE OUTCOMES:

CCH202-1 - Use computer system and its peripherals for given purpose

CCH202-2 - Prepare Business document using Word Processing Tool

CCH202-3 - Analyze Data and represent it graphically using Spreadsheet

CCH202-4 - Prepare professional Slide Show presentations

CCH202-5 - Use different types of Web Browsers and Apps

CCH202-6 - Explain concept and applications of Emerging Technologies

### 5. COURSE OUTCOMES AND PROGRAMME OUTCOMES (CO-PO) MATRIX

1	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
CCH202-1	1	-	-	-	-	-	1		
CCH202-2	-	-	-	3	-	-	1		
CCH202-3	-	2	1	3	-	-	1		
CCH202-4	-	-	-	3	-	-	1		
CCH202-5	1	-	-	3	-	-	3		
CCH202-6	1	-	-	3	-	-	3		

Legends :- High:03, Medium:02,Low:01, No Mapping: -  
 \*PSOs are to be formulated at institute level

### 6. LABORATORY WORK:

**Laboratory experiments and related skills to be developed:**

Sr. No.	Title of Experiment	Skills to be developed	Course outcome
---------	---------------------	------------------------	----------------

1.	a) Work with Computer System, Input/output devices, and peripherals. b) Work with files and folders	1.1 Identify various Input/output devices, connections and peripherals of computer system 1.2 Work with Computer System, Input/output devices, and	CCH202-1
2.	Work with document files: a) Create, edit and save document in Word Processing. b) Text, lines and paragraph level formatting	2.1 Create and manage word document. 2.2 Apply formatting features on text at line, paragraph and page level.	CCH202-2
3.	Work with Images and Shapes in Word Processing.	3.1 Insert and edit images, shapes in a document file	CCH202-2
4.	Work with tables in Word Processing.	4.1 Insert table and apply various table formatting features on it.	CCH202-2
5.	Working with layout and printing a) Document page layout, Themes, and printing. b) Use of mail merge with options.	5.1 Apply page layout features in word processing. 5.2 Print a document by applying various print options 5.3 Use mail merge in word processing	CCH202-2
6.	Create, open and edit Worksheet.	6.1 Enter and format data in a worksheet. 6.2 Insert and delete cells, rows and columns 6.3 Apply alignment feature on cell	CCH202-3
7.	Formulas and functions in Worksheet.	7.1 Create formula and "If" condition on cell data 7.2 Apply various functions and named ranges in worksheet.	CCH202-3
8	Sort, Filter and validate data in Spreadsheet.	8.1 Implement data Sorting, Filtering and Data validation features in a worksheet.	CCH202-3
9	Charts for Visual Presentation in Spreadsheet.	9.1 Create charts using various chart options in spreadsheet.	CCH202-3
10	Worksheet Printing.	10.1 Print the worksheet by applying various print options for worksheet	CCH202-3
11	Make Slide Show Presentation.	11.1 Apply design themes to the given presentation 11.2 Insert pictures text/images/shapes in slide 11.3 Use pictures text/images/shapes editing options.	CCH202-4
12	Use Tables and Charts in Slide	12.1 Add tables and charts in the slides. 12.2 Run slide presentation in different modes 12.3 Print slide presentation as	CCH202-4

		handouts/notes	
13	a) Insert Animation effects to Text and Slides. b) Insert Audio and Video files in presentation	13.1 Apply animation effects to the text and slides 13.2 Add/set audio and video files in the presentation.	CCH202-4
14	a) Internet connection configuration b) Use Internet and Web Services.	14.1 Configure internet connection on a computer system 14.2 Use different web services on internet	CCH202-5
15	Working with Browsers.	15.1 Configure different browser settings 15.2 Use browsers for the given purpose	CCH202-5
16	Prepare Web Forms for Survey.	16.1 Create web forms for survey using different options.	CCH202-6
17	Prepare Web Forms for Quiz	17.1 Create web forms for Quiz using different options	CCH202-6

## 7. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING SKILLS DEVELOPMENT (SELF LEARNING)

### Self Learning

Following are some suggestive self-learning topics: 1) Use ChatGPT/any other AI tool to explore information. 2) Use Calendar to Schedule and edit activities. 3) Use Translate app to translate the given content from one language to another. 4) Use cloud based storage drive to store and share your files.

### Assignment

Prepare journal of practical performed in the laboratory.

### Micro project

The microproject has to be industry application based, internet-based, workshop-based, laboratory-based or based as suggested by Teacher. 1) Perform a survey on various input and output devices available in market and its report. 2) Prepare Time Table, Prepare Notes on Technical Topics, Reports, Biodata with covering letter (S teacher shall assign a document to be prepared by each student) 3) Prepare slides with all Presentation features as: classroom presentation, presentation about department, presentation of Technical Topics. (Subject teacher assign a presentation to be prepared by each student). 4) Student Marksheet, Prepare Pay bills, tax statement, assessment record using spreadsheet. (Teacher shall assign a spreadsheet to be prepared by each student). 5) Survey on different web browsers. 6) Generate resume for different job profile, survey report of any industry ChatGPT/any other AI tool.

## 8. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications
1	a) Computer System with all necessary Peripherals and Internet connectivity. b) Any Office Software c) Any Browser (Any General Purpose Computer available in the Institute)

## 9. CONTENT:



Sr. No.	Topics / Sub-topics	Lectures (Hours)
<b>Course Outcome CCH202-1 - Use computer system and its peripherals for given purpose.</b>		
1	<p><b>Unit - I Introduction to Computer System</b></p> <p>1.1 Basics of Computer System: Overview of Hardware and Software: block diagram of Computer System, Input/Output unit CPU, Control Unit, Arithmetic logic Unit (ALU), Memory Unit</p> <p>1.2 Internal components: processor, motherboards, random access memory (RAM), read-only memory (ROM), video cards, sound cards and internal hard disk drives)</p> <p>1.3 External Devices: Types of input/output devices, types of monitors, keyboards, mouse, printers: Dot matrix, Inkjet and LaserJet, plotter and scanner, external storage devices CD/DVD, Hard disk and pen drive</p> <p>1.4 Application Software: word processing, spreadsheet, database management systems, control software, measuring software, photo-editing software, video-editing software, graphics manipulation software System Software compilers, linkers, device drivers, operating system</p> <p>1.5 Network environments: network interface cards, hubs, switches, routers and modems, concept of LAN, MAN, WAN, WLAN, Wi-Fi and Bluetooth</p> <p>1.6 Working with Operating Systems: Create and manage file and folders, Copy a file, renaming and deleting of files and folders, Searching files and folders, application installation, creating shortcut of application on the desktop.</p>	2
<b>Course Outcome CCH202-2 - Prepare Business document using Word Processing Tool.</b>		
2	<p><b>Word Processing</b></p> <p>2.1 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.</p> <p>2.2 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</p> <p>2.3 Changing the Layout of a Document: Adjust page margins, Change page orientation, Create headers and footers, Set and change indentations, Insert and clear tabs</p> <p>2.4 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</p> <p>2.5 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 page</p> <p>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</p>	3

Sr. No.	Topics / Sub-topics	Lectures (Hours)
<b><i>Course Outcome CCG202-3: Design files of word processors, spreadsheets, presentation software, and database application.</i></b>		
<b>3</b>	<p><b>Spreadsheets</b></p> <p>3.1 Working with Spreadsheets: Overview of workbook and worksheet, Create Worksheet Entering sample data, Save, Copy Worksheet, Delete Worksheet, Close and open Workbook.</p> <p>3.2 Editing Worksheet: Insert and select data, adjust row height and column width, delete, move data, insert rows and columns, Copy and Paste, Find and Replace, Spell Check, Zoom In-Out, Special Symbols, Insert Comments, Add Text Box, Undo Changes, - Freeze</p> <p>3.3 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, Header and Footer, Insert Page Breaks, S</p> <p>3.4 Working with Formula: Creating Formulas, Copying Formulas, Common spreadsheet Functions such as sum, average, min, max, date, In, And, or, mathematical functions such as sqrt, power, applying conditions using IF.</p> <p>3.5 Working with Charts: Introduction to charts, overview of different types of charts, Bar, Pie, Line charts, creating and editing charts. Using chart options: chart title, axis title, legend, data labels, Axes, grid lines, moving chart in a separate sheet.</p> <p>Advanced Operations: Conditional Formatting, Data Filtering, Data Sorting, Using Ranges, Data Validation, Adding Graphics, Printing Worksheets, print area, margins, header, footer and other page setup options.</p>	3
<b><i>Course Outcome CCH202-4 - Prepare professional Slide Show presentations</i></b>		
<b>4</b>	<p><b>Presentation Tool</b></p> <p>4.1 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</p> <p>4.2 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</p> <p>4.3 Working with Tables: Insert a Table in a Slide, Format Tables, and Import Tables from Other Office Applications.</p> <p>Working with Charts: Insert Charts in a Slide, Modify Chart, Import Charts from Other Office Applications.</p>	4
<b><i>Course Outcome CCH202-5 - Use different types of Web Browsers and Apps CCH202-6 - Explain concept and applications of Emerging Technologies</i></b>		
<b>5</b>	<p><b>Basics of Internet and Emerging Technologies</b></p> <p>5.1 World Wide Web: Introduction, Internet, Intranet, Cloud, Web Sites, web pages, URL, web servers, basic settings of web browsers- history, extension, default page, default search engine, creating and retrieving bookmarks, use search engines effectively for</p>	3

<b>Sr. No.</b>	<b>Topics / Sub-topics</b>	<b>Lectures (Hours)</b>
	5.2 Web Services: e-Mail, Chat, Video Conferencing, e-learning, e-shopping, e-Reservation, e-Groups, Social Networking 5.3 Emerging Technologies: IOT, AI and ML, Drone Technologies,3D Printing. Tools: Docs, Drive, forms, quiz, Translate and otherApps	

## 10. ASSESSMENT METHODOLOGIES/TOOLS

### Formative assessment (Assessment for Learning)

- Lab performance, Assignment, Self-learning and Seminar/Presentation

### Summative Assessment (Assessment of Learning)

- Lab. Performance, viva voce

## 11. PROGRESSIVE SKILLS TEST :

### Criteria for Continuous Assessment of Practical work and Progressive skill Test:

<b>Sr. no</b>	<b>Criteria</b>	<b>Marks allotted</b>
1	Attendance at regular practical	05
2	Preparedness for practical	02
3	Neat & complete Diagram.	04
4	Observations & computer handling skill	02
5	Use of toolbar, menu bar and short cut keys.	04
6	Logical thinking and approach	04
7	Oral Based on Lab work and completion of task	04
<b>TOTAL</b>		<b>25</b>

Assessment at semester end practical exam as per **Pro-forma II**.

### Criteria for assessment at semester end practical exam:

<b>Sr . no</b>	<b>Criteria</b>	<b>Marks allotted</b>
1.	Technical ability	10
2.	Communication skill	5
3.	Logical approach	10
<b>TOTAL.</b>		<b>25</b>

## 12.INSTRUCTIONAL STRATEGIES:

### Instructional Methods:

1. Lectures cum Discussions
2. Regular Home Assignments.
3. Laboratory experiences and laboratory interactive sessions

**Teaching and Learning resources:**

1. Chalk board
2. Slides(PPT)
3. Self-learning Online Tutorials

**13. REFERENCE MATERIAL:**

**a) Books / Codes**

Sr.No	Author	Title	Publisher
1	Goel Anita	Computer Fundamentals	Pearson Education, New Delhi, 2014, ISBN-13: 978-8131733097
2	Miller Michael	Computer Basics Absolute Beginner's Guide, Windows 10	QUE Publishing; 8th edition August 2015, ISBN: 978-0789754516
3	Alvaro Felix	Linux: Easy Linux for Beginners	CreatevSpace Independent Publishing Platform- 2016, ISBN-13: 978-1533683731
4	Johnson Steve	Microsoft Office 2010: On Demand	Pearson Education, New Delhi India, 2010. ISBN :9788131770641
5	Schwartz Steve	Microsoft Office 2010 for Windows: Visual Quick Start	Pearson Education, New Delhi India, 2012, ISBN : 9788131766613
6	Leete Gurdy, Finkelstein Ellen, Mary Leete	OpenOffice.org for Dummies	Wiley Publishing, New Delhi, 2003 ISBN : 978-0764542220

**b) Suggested Websites and Portals**

Sr.No	Link / Portal	Description
1	<a href="https://www.microsoft.com/en-in/learning/office-training.aspx">https://www.microsoft.com/en-in/learning/office-training.aspx</a>	Office
2	<a href="http://www.tutorialsforopenoffice.org/">http://www.tutorialsforopenoffice.org/</a>	Open Office
3	<a href="https://s3-ap-southeast-1.amazonaws.com/r4ltue295xy0d/Special_Edition_Using_StarOffice_6_0.pdf">https://s3-ap-southeast-1.amazonaws.com/r4ltue295xy0d/Special_Edition_Using_StarOffice_6_0.pdf</a>	Open Office
4	<a href="https://ashishmodi.weebly.com/uploads/1/8/9/7/18970467/computer_fundamental.pdf">https://ashishmodi.weebly.com/uploads/1/8/9/7/18970467/computer_fundamental.pdf</a>	Computer Fundamental
5	<a href="http://www.tutorialsforopenoffice.org/">http://www.tutorialsforopenoffice.org/</a>	Open Office
6	<a href="https://www.tutorialspoint.com/computer_fundamentals/index.htm">https://www.tutorialspoint.com/computer_fundamentals/index.htm</a>	Computer Fundamental
7	<a href="https://www.tutorialspoint.com/word/">https://www.tutorialspoint.com/word/</a>	Word Processing
8	<a href="https://www.javatpoint.com/ms-word-tutorial">https://www.javatpoint.com/ms-word-tutorial</a>	Word Processing

<b>Sr.No</b>	<b>Link / Portal</b>	<b>Description</b>
9	<a href="https://support.microsoft.com/en-au/office/word-for-windows-training-7bcd85e6-2c3d-4c3c-a2a5-5ed8847">https://support.microsoft.com/en-au/office/word-for-windows-training-7bcd85e6-2c3d-4c3c-a2a5-5ed8847</a>	Word Processing
10	<a href="https://www.javatpoint.com/excel-tutorial">https://www.javatpoint.com/excel-tutorial</a>	Spreadsheet
11	<a href="https://support.microsoft.com/en-au/office/excel-video-training-9bc05390-e94c-46af-a5b3-d7c22f6990bb">https://support.microsoft.com/en-au/office/excel-video-training-9bc05390-e94c-46af-a5b3-d7c22f6990bb</a>	Spreadsheet
12	<a href="https://www.javatpoint.com/powerpoint-tutorial">https://www.javatpoint.com/powerpoint-tutorial</a>	Powerpoint Presentation
13	<a href="https://support.microsoft.com/en-au/office/powerpoint-for-windows-training-40e8c930-cb0b-40d8-82c4-b">https://support.microsoft.com/en-au/office/powerpoint-for-windows-training-40e8c930-cb0b-40d8-82c4-b</a>	Powerpoint Presentation
14	<a href="https://www.geeksforgeeks.org/ms-dos-operating-system/">https://www.geeksforgeeks.org/ms-dos-operating-system/</a>	Operating System
15	<a href="https://www.javatpoint.com/windows">https://www.javatpoint.com/windows</a>	Windows Operating System
16	<a href="https://www.javatpoint.com/what-is-linux">https://www.javatpoint.com/what-is-linux</a>	Linux Operating System
17	<a href="https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT">https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT</a>	IoT
18	<a href="https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/">https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/</a>	IoT
19	<a href="https://www.javatpoint.com/machine-learning">https://www.javatpoint.com/machine-learning</a>	AI & Machine Learning
20	<a href="https://www.skillrary.com/blogs/read/introduction-to-drone-technology">https://www.skillrary.com/blogs/read/introduction-to-drone-technology</a>	Drone Technology
21	<a href="https://www.cnet.com/tech/computing/what-is-3d-printing/">https://www.cnet.com/tech/computing/what-is-3d-printing/</a>	3D Printing
22	<a href="https://support.google.com/a/users/answer/9389764?hl=en">https://support.google.com/a/users/answer/9389764?hl=en</a>	Apps

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**COURSE ID:**  
**COURSE NAME** : **YOGA &MEDITATION.**  
**COURSE CODE** : **CCH203**  
**COURSE ABBREVIATION** : **HYAM**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	00	01
	Tutorial Learning	00	
	Laboratory Learning	01	
	SLH-Self Learning	01	
	NLH-Notional Learning	2	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	50
-NA-	-NA--	--NA-	--NA-	-NA-	25	10	--NA-	--NA-	25	10	

(Total IKS Hrs for Semester: 01Hr)

**C: ABBREVIATIONS:-** CL-Class-Room Learning, TL-Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA -Self Learning Assessment

**Legends:** @Internal Assessment, #External Assessment, \*#OnLine Examination, @\$Internal Online Examination( TNR 12 font)

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for these semester are (CL+LL+TL+SL) hrs.\*15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \*Self learning hours shall not be reflected in the Time Table.

\*Self learning includes micro project/assignment/other activities.(Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

## D. i) RATIONALE

Diploma Graduate needs a sound body and mind to face the challenging situations in career as employee or as an entrepreneur. Yoga and Meditation brings about the holistic development of an individual and equips with necessary balance to handle the challenges. The age of polytechnic student is appropriate to get introduced to yoga practice as this will help them in studies as well as his professional life. Moreover, Yoga inculcates discipline in all walks of the life of student. Pranayama practice regulates breathing practices of the student to improve stamina, resilience. Meditation empowers a student to focus and keep calm to get peace of mind.

World Health Organization (WHO) has also emphasized the role of yoga and meditations stress prevention measure. National Education Policy -2020 highlights importance of yoga and meditation amongst students of all ages. Therefore, this course for Diploma students is designed for the overall wellbeing of the student and aims to empower students to adopt and practice Yoga in daily life.

## ii) INDUSTRY/EMPLOYER EXPECTED OUTCOME

By practicing basic yoga and pranayam in daily life, candidate should have attained the state of sound physique and balance mind to execute daily duties.

## E. COURSE LEVEL LEARNING OUT-COMES (COs)

Students will be able to achieve & demonstrate the following Cos on completion of course based learning-

- CCH110-1 Practice basic Yoga and Pranayam in daily life to maintain physical and mental fitness.
- CCH110-2 Practice meditation regularly for improving concentration and better handling of stress and anxiety.
- CCH110-3 Follow healthy diet and hygienic practices for maintaining good health.

## Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps) matrix

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"

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	
CO1	-	-	-	-	3	-1	-	-		
CO2	-	-	-	-	3	-1	-	-		
CO3	-	-	-	-	3	-1	-	-		

Legends:-High:03,Medium:02,Low:01,No Mapping:-  
\*PSOs are to be formulated at institute level

## F. CONTENT:

## I) Practical exercises

Sr No	Laboratory Experiment/Practical Titles/Tutorial Titles	Learning Of hrs.	Relevant COs
1	Introduction:- 1.1 Introduction to Ashtang Yog 1.2 Presentations on Introduction to Yoga and its History, Omkar chanting, prayer, Padmasan, Siddhasan & Vajrasan Lab Exp: 1. Perform warming up exercises to prepare the body from head to toe for Yoga - i) Neck Movement ii) Shoulder Movement iii) Trunk Movement iv) Knee Movement v) Ankle Movement	03	CCH110-1
2	Lab Exp: 2. After warmup, perform all the postures of Surya Namaskar one by one in a very slow pace, Lab Exp 3. Perform multiple Surya-Namaskar ( Starting with three and gradually increasing it to twelve) in one go. (Experiment 2 to 4 must be followed by shavasana for self relaxation.)	4	CCH110-1, CCH110-2
3	Lab Exp: 4 Perform Sarvangasana, Halasana, Kandharasana (setubandhasana), Uttanpadasana, Pawanmuktasana. Lab Exp: 5 Perform Bhujangasana, Naukasana, Mandukasana. Lab Exp: 6 Perform Shalabhasana, Dhanurasana, Vakrasana, Gomukhasana, Paschimottasana, Ardhamasendrasana Lab Exp: 7 Perform Veerasana, Veer-Bhadrasana, Vrukshasana, Trikonasana. (Follow up experiment 5 to 7 with shavasana for self relaxation)	4	CCH110-2
4	Lab Exp: 8 Perform Deepbreathing, Anulom Vilom Pranayam Kriya Lab Exp: 9 Practice Kapalabhati Pranayam Kriya, Bhastrika Lab Exp: 10 Practice Bhramary Pranayam and Sheetali Pranayam	2	CCH110-3
5	Lab Exp: 11 Perform sitting in Dhyana Mudra and meditating. Start with five minute and slowly increasing to higher durations. Introduction to Vipassana, Anapan & Chakras. (Trainer will explain the benefits of Meditation before practice)	2	CCH110-3

## II) Theory : (Not Applicable )

Section I NA

Section –II NA

\*\* No questions will be asked on IKS learning subtopics in any question papers.



## G : List of Assignments under SLA

Sr. No.	List of Assignment (under SLA)	Hrs Allotted
1	Maintain a diary indicating date-wise practice done by the student with a photograph of self-yogic posture	02
2	Prepare Diet for and nutrition chart self	01
3	Practice at least thrice a week.	02
4	Read books on different methods to maintain health, wellness and to enhance mood	02
5	Watch videos on Yoga Practices.	01
6	Post your selfie with one asana on social media	02
7	Post your selfie with meditation posture on social media FB	02
8	Create your short video clip while performing one or two asanas	02
9	Create your short video performing Sun Salutation (Suyranamaskar)	01
	Total	15hrs

**\*\*Candidate has to complete at least one major assignment from the given during his or her a single semester.**

- Maintain diary indicating date wise practice done by the student with a photograph of self in yogic posture. Prepare Diet for and nutrition chart self

### Assignment:

Prepare Diet for and nutrition chart for your self

### • Self-Learning

- Practice at least thrice a week.
- Read books on different methods to maintain health, wellness and to enhance mood
- Watch videos on Yoga Practices.

## H: Specification table for setting question paper for semester end theory examination: NA

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA

## I:-Assessment Criteria

### i) Formative Assessment of Practical:-

Every assignment shall be assessed for 25 marks as per the following criteria

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Performance Skills	10
Affective	Discipline and Mind Balance	05
	<b>TOTAL</b>	<b>25</b>

### ii) Summative Assessment of Practical: NA

Every practical assignment shall be assessed for - marks as per following criteria:

Sr.no	Criteria	Marks allotted
NA	NA	NA
NA	NA	NA
NA	NA	NA
NA	NA	NA
NA	NA	NA
	<b>TOTAL</b>	<b>NA</b>

## J) Instructional Methods:

1. Lectures cum Demonstrations
2. Laboratory practices.
3. Use of third party audio visual material for demonstration
4. Demonstration Chart

## K) Teaching and Learning resources:

Presentations, Yoga kits, Demonstrative charts, Actual Practice demonstration

## L) Reference Books:

S.N.	Name of Book	Author	Publication
1	Patanjalis Yoga Sutras	Swami Vivekananda	Fingerprint Publishing (2023) Prakash Books India Pvt Ltd, New Delhi ISBN-13?: 978-9354407017
2	Yoga for Every Body: A beginner's guide to the practice of yoga postures, breathing Exercises and me	Luisa Ray, Angus Sutherland	Vital Life Books (2022) ISBN-13?: 978-1739737009
3	Mudras for Modern Living: 49 inspiring cards to boost your health, enhance your yoga and deepen your mind	Swami Saradananda	Watkins Publishing (2019) ISBN-13?: 978-1786782786

4	The Relaxation and Stress Reduction Workbook	Martha Davis, Elizabeth Robbins, Matt McKay, Eshelman MSW	A New Harbinger Self- Help Workbook (2019)
5	Science of Yoga: Understand the Anatomy and Physiology to Perfect Your Practice	Ann Swanson	ISBN-13: 978-1465479358

## M) Learning Website & Software

- 1 [https://onlinecourses.swayam2.ac.in/aic19\\_ed28/preview](https://onlinecourses.swayam2.ac.in/aic19_ed28/preview)- introduction to Yoga and Applications of Yoga
- 2 <https://onlinecourses.swayam2.ac.in/aic23ge09/preview> - Yoga for Creativity
- 3 [https://onlinecourses.swayam2.ac.in/aic23\\_e05/preview](https://onlinecourses.swayam2.ac.in/aic23_e05/preview)- Yoga for Creativity
- 4 <https://onlinecourses.nptel.ac.in/noc2lhs29/preview>- Psychology of Stress, Health and Well-being
- 5 <https://onlinecourses.swayam2.ac.in/ncel9sc04/preview>- Food Nutrition for Healthy Living Course —Swayam
- 6 [https://onlinecourses.swayam2.ac.in/aic23\\_e06/preview](https://onlinecourses.swayam2.ac.in/aic23_e06/preview)- yoga for memory development

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**Government Polytechnic Kolhapur**  
**Learning and Assessment Scheme for Post S.S.C Diploma Courses**  
**Diploma In Metallurgical Engineering**

**Programme Code** : MT **With Effect From Academic Year** : 2023-24  
**Duration Of Programme** : 6 Semester **Duration** : 16 WEEKS  
**Semester** : Second **Scheme** : H

Sr No	Course Title	Abbreviation	Course Type	Level	Course Code	IKS Hrs per sem	Learning Scheme					Credits	Assessment Scheme										Total Marks	
							Actual Contact Hrs./Week			Self Learning (Term Work + Assignment)	Notional Learning Hrs/Week		Paper Duration (hrs.)	Theory			Based on LL & TL				Based on Self Learning			
							CL	TL	LL					FA-TH	SA-TH	Total		Practical		SLA				
																Max	Min	Max	Min	Max	Min	Max		Min
							1	APPLIED MATHEMATICS	HAMT	AEC	3		CCH301	2	4	2	--	--	6	3	3	30		70
2	ENGINEERING CHEMISTRY	HCHB	DSC	1	CCH104	4	4	--	2	2	8	4	1.5	30*#	70*#	100	40	25	10	25@	10	25	10	175
3	COMMUNICATION SKILLS	HCMS	AEC	2	CCH201	--	4	--	2	2	8	4	3	30	70	100	40	25	10	--	--	25	10	150
4	SOCIAL & LIFE SKILLS	HSLs	VEC	2	CCH204	--	--	--	1	1	2	1	--	--	--	--	--	25	10	--	--	25	10	50
5	ENGINEERING DRAWING	HEDR	AEC	1	CCH110	4	2	--	4	2	8	4	4	30	70	100	40	25	10	25@	10	25	10	175
6	BASIC METALLURGY	HBME	DSE	3	MTH301	2	3	--	1	--	4	2	3	30	70	100	40	25	10	--	--	--	--	125
7	METALLURGICAL WORKSHOP PRACTICE – II	HWMT-II	SEC	1	MTH102	2	--	--	4	--	4	2	--	--	--	--	--	25	10	50@	20	--	--	75
<b>Total</b>						14	17	2	14	7	40	20		150	350	500		150		100		100		850

**Abbreviations** : CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System

**Legends** : @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination

**Note** :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

**Course Category** : Discipline Specific Course Core (DSC) : 2, Discipline Specific Elective (DSE) : 0, Value Education Course (VEC) : 1, Intern./Apprenti./Project./Community (INP) : 0, Ability Enhancement Course (AEC) : 2, Skill Enhancement Course (SEC) : 2, Generic Elective (GE) : 0

**COURSE ID** :  
**COURSE NAME** :APPLIED MATHEMATICS  
**COURSE CODE** : CCH301  
**COURSE ABBREVIATION** : HAMT

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	3
	Tutorial Learning	02	
	Laboratory Learning	-	
	SLH-Self Learning	00	
	NLH-Notional Learning	06	

**B: ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Tutorial						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	100
03	30	70	100	40	--	--	--	--	--	--	

(Total IKS Hrs for Sem.: 02 Hrs)

**C: ABBREVIATIONS:-**CL-ClassRoom Learning, TL-Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA -Self Learning Assessment

**Legends:** @Internal Assessment, #External Assessment, \*#OnLine Examination, @\$Internal Online Examination( TNR 12 font)

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.\*15Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \*Self learning hours shall not be reflected in the Time Table.  
 \*Self learning includes micro project /assignment/other activities. (The list of all assignments are given in tabular format. At least 6 to 8 assignments to be given)

#### **D. i) RATIONALE:-**

Mathematics is an important pre-requisite for the development and understanding of engineering and technological concepts. For an engineer and technologist, knowledge of Mathematics is an effective tool to pursue and to master the applications in the engineering and technological fields. Applied mathematics is designed for its applications in engineering and technology. It includes integration, differential equation,. The connection between applied mathematics and its applications in real life can be understood and appreciated. Integral calculus helps in finding the area . Differential equation is used in finding curve, rectilinear motion. Statistics and probability will help a student to analyze data of large volume in their higher studies. The fundamentals of these topics are directly useful in understanding engineering applications in various fields.

#### **ii) Competency:**

The course should be taught and implemented with the aim to develop the course outcomes (CO's) for the student to acquire the competency needed to apply the mathematical techniques for engineering subjects.

- 1. Cognitive** : Understanding and applying principles of mathematics to engineering problems
- 2. Psychomotor:** To prepare charts displaying the area of irregular shapes using the concept of integration,prepare charts to displaying grouped and ungrouped data .
- 3. Affective** : discipline, consistency, hard work , to concentrate ,accuracy, punctuality, aesthetics

#### **E. COURSE LEVEL LEARNING OUTCOMES (COS)**

CCH301-1 : To solve examples on integration using various techniques

CCH301-2 : To solve Differential equation of first order and first degree by various methods

CCH301-3 : To find approximate solution of algebraic equations and simultaneous equations by various methods.

CCH301-4:- To solve problems on Probability distributions

CCH301-5 :- Solve examples on Laplace Transform

**Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps) matrix**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0”

Competency and Cos	Programme Outcomes POs and PSOs								
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1	PSO2
Competency: Use DC machines and transformers.	3	2	1		1		2		
CCH301-1-CO-1 : To solve examples on integration using various techniques	3	1	-	-	1	-	1		
CCH301-2-CO-2 : To solve Differential equation of first order and first degree by various methods	3	1	-	-	-	-	1		
CCH301-3-CO-3 : To find approximate solution of algebraic equations and simultaneous equations by various methods.	2	3	1	1	-	-	1		
CCH301-4-CO-4:- To solve problems on Probability distributions	2	1	1	1	1	1	1		
CCH301-5-CO-5:- Solve examples on Laplace Transform	2	1	-	-	-	-	1		

## F. CONTENT:

### I) Tutorial exercises

Any **TEN** of the following Tutorial exercises shall be conducted in the Tutorial room in tutorial sessions of batches of about 20- 22 students:

Sr. no	Tutorial experiences	CO
1	Solve simple problems of Integration by substitution.	CCH301-1
2	Solve integration using by parts.	CCH301-1
3	Solve examples on Definite Integral based on given methods.	CCH301-1
4	Solve problems on properties of definite integral.	CCH301-1
5	Solve given problems for finding the area under the curve and area between two curves . (Only for civil and mechanical engg. group)	CCH301-1
6	Solve examples on mean value and root mean square value.(only for Computer, Electrical and Electronics engg. group)	CCH301-1
7	Solve first order first degree differential equation using variable separable method.	CCH301-2
8	Solve first order first degree differential equation using exact differential equation and linear differential equation.	CCH301-2
9	Solve engineering application problems using differential equation.	CCH301-2
10	Solve problems on Bisection method, Regula falsi and Newton-Raphson method.	CCH301-3
11	Solve problems on Jacobi's method and Gauss Seidel method.	CCH301-3
12	Use Bakshali iterative methods for finding approximate value of square root.(IKS)	CCH301-3
13	Solve engineering problems using Binomial Distribution, Poisson Distribution and Normal Distribution.	CCH301-4
14	Solve problems on Laplace transform and properties of Laplace transform.	CCH301-5
15	Solve problems on Inverse Laplace transform and properties of Inverse Laplace transform.	CCH301-5



## II)Theory

### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO: CCH301-1 : To solve examples on integration using various techniques.			
<b>Unit 1 Indefinite Integration</b>	<b>Indefinite Integration</b> 1.1 Definition, Standard formulae 1.2 Rules of Integration (without proof), Examples 1.3 Integration by substitution 1.4 Integration by parts 1.5 Integration by partial fractions (only linear non repeated factors at denominator of proper fraction)	14	16
CO: CCH301-1 : To solve examples on integration using various techniques			
<b>Unit 2 Definite Integration</b>	<b>Definite Integration</b> 2.1 Definition, Examples 2.2 Properties of Definite Integration ( without proof), Examples based on properties	8	8
CO: CCH301-2 : To solve Differential equation of first order and first degree by various methods			
<b>Unit 3 Differential equation</b>	<b>Differential equation</b> 4.1 Definition of differential equation 4.2 Order & degree of Differential equations 4.3 Methods of solving Differential equations of first order & first degree of following types: 4.3.1 Variable separable form 4.3.2 Exact Differential equations 4.3.3 Linear Differential Equations	8	10

### Section –II

Sr. no.	Topics/Subtopics	Learning Hours	Classroom learning evaluation Marks
CO: CCH301-3 :- To find approximate solution of algebraic equations and simultaneous equations by various methods.			
<b>Unit 4 Numerical Methods</b>	<b>Numerical Methods</b> 4.1 Numerical solution of Algebraic Equations 4.1.1 Bisection Method 4.1.2 Regula- Falsi Method 4.1.3 Newton –Raphson method.	10	14

	4.2 Numerical solution to simultaneous equations 4.2.1 Jacobi's Method 4.2.2 Gauss-Seidel method <b>Bakhshali iterative method for finding approximate square root.(IKS)</b>		
CO: CCH301-4:- To solve problems on Probability distributions			
<b>Unit 5</b> Probability Distribution	<b>Probability Distribution</b> 5.1 Binomial distribution 5.2 Poisson's distribution 5.3 Normal distribution	8	8
CO: CCH301-5:- Solve examples on Laplace Transform .			
<b>Unit 6</b> Laplace Transform	<b>Laplace Transform</b> 6.1 Definition , Linearity property 6.2 Laplace Transforms of Standard functions (without proof) and examples 6.3 First shifting property and examples 6.4 Examples on Multiplication by $t^n$ 6.5 Inverse Laplace Transform, Definition 6.6 Standard formulae(without proof) and examples 6.7 Inverse L.T.by using First shifting property 6.8 Inverse L.T. by using Partial fraction method	12	14

**\*\* No questions will be asked on IKS related subtopics in any question paper**

### **G : Specification table for setting question paper for semester end theory examination**

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Indefinite Integration	4	6	6	16	CCH301-1
I / 2	Definite Integration	-	4	4	8	CCH301-1
I / 3	Differential equation	2	4	4	10	CCH301-2
II /4	Numerical Methods	2	4	8	14	CCH301-3
II /5	Probability Distribution	-	4	4	8	CCH301-4
II/6	Laplace Transform	2	6	6	14	CCH301-5
<b>Total Marks</b>					<b>70</b>	

### **H :-Assessment Criteria**

- i) **Formative Assessment (Assessment for Learning)**
  - Tests
- ii) **Summative Assessment (Assessment of Learning)**
  - End term exam

### I) Instructional Methods:

1. Lectures cum Demonstrations
2. Classroom practices
3. Use of projector and soft material for demonstration
4. Use of softwares such as Geogebra

### J) Teaching and Learning resources:

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts.

### K) Reference Books:

S.N.	Name of Book	Author	Publication
1	Higher Engineering Mathematics	Grewal B.S.	Khanna publication New Delhi,2013 ISBN:8174091955
2	A textbook of Engineering Mathematics	Dutta.D.	New age publication New Delhi,2006 ISBN:978-81-224-1689-3
3	Advance Engineering Mathematics	Kreysizg,Ervin	Wiley publication New Delhi,2016 ISBN:978-81-265-5423-2
4	Advance Engineering Mathematics	Das H.K.	S Chand publication New Delhi,2008 ISBN:978-81-219-0345-5
5	Introductory Methods of Numerical Analysis	S.S.Sastry	PHI Learning Private Limited,New Delhi.ISBN:978-81-203-4592-8
6	Studies in the History of Indian Mathematics	C.S.Seshadri	Hindustan Book Agency (India) P 19 Green Park Extension New Delhi.ISBN 978-93-80250-06-9
7	Calculus & Its Applications	Marvin L.Bittinger David J.Ellenbogen Scott A. Surgent	Addison-Wesley 10 <sup>th</sup> Edition ISBN-13:978-0-321-69433-1
8	An Introduction to Statistical Learning with Application in R	Gareth James,Hastie Robert & Tibshirani	Springer New York Heidelberg Dordrecht London ISBN:978-1-4614-7138-7(eBook)

### L) Learning Website & Software

- a) <http://nptel.ac.in/courses/106102064/1>
- b) <https://www.woframalpha.com/>
- c) <http://www.sosmath.com/>
- d) <http://mathworld.wolfram.com>
- e) <https://www.brilliant.org/>
- f) <https://ocw.mit.edu/index.htm>

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**COURSE ID :**  
**COURSE NAME :** ENGINEERING CHEMISTRY  
**COURSE CODE :** CCH 104  
**COURSE ABBREVIATION :** HCHB

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	4
	Tutorial Learning	00	
	Laboratory Learning	02	
	SLH-Self Learning	02	
	NLH- Notional Learning	08	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
	FA-TH	SA-TH	TOTAL		Practical		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	175
1.5	30 *#	70*#	100	40	25	10	25 @	10	25	10	

**(Total IKS Hrs for Sem. : 04 Hrs)**

**C: ABBREVIATIONS:-** CL- Class Room Learning , TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH- Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

**Legends:** @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination . ( TNR 12 font)

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

## **D. i) RATIONALE:-**

Basic science such as Chemistry is the fundamental of Engineering & technology. It is most essential to learn the basic science to understand the fundamental concepts in Engineering & technology. Engineering chemistry deals with the study of structure, composition & properties of the materials, which form the core of the fundamental science. Many processes are based on principle of Chemistry in various industries. Topics such as Water, Electrochemistry, Corrosion, & protection of metals from corrosion are some of the direct applications of chemistry in engineering. Hence, the knowledge of chemistry is essential to the aspiring engineers of all branches in their field. Engineering materials like Steel, Rubber, Plastic, Thermocole, Glass wool, Paints, Lubricants are the backbone of various industries, machines, equipment & processes.

## **ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME**

Apply principles of advanced chemistry to solve engineering problems.

**Cognitive:** Understanding concepts of chemistry for applications in the area of engineering.

### **Psychomotor:**

- i) Sketching and labeling the diagrams for extraction of copper
- ii) Experimentally analyzing the water samples for preparing portable water by different methods.
- iii) Preparing chart of showing percentage, composition, properties and industrial applications of solders.
- iv) Handling & use of glassware & chemicals.

**Affective:** i) Accuracy ii) Safety iii) Punctuality iv. Attitude.

## **E. COURSE LEVEL LEARNING OUTCOMES (COS)**

**CCH104-1** Apply the basic knowledge of atom, molecules and compounds in Engineering Chemistry.

**CCH104-2** Apply the concepts of Electrochemistry to interpret the reasons of corrosion with its remedies.

**CCH104-3** Select the relevant catalyst, alloys, insulators, adhesives, composite materials, plastic and rubber for different applications in the field of engineering.

**CCH104-4** Use of water in Domestic purpose, Industrial purpose and its relevant treatment to solve industrial problems.

**CCH104-5** Explain the method of Extraction of Iron.

**CCH104-6** Choose appropriate with relevant method of lubrication to solve industrial problem and applications of Paint and Varnish.

### **Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/pso) matrix**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"

Competency and Cos	Programme Outcomes POs and PSOs								
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1	PSO2
CCH104-1 CO-1 Apply the basic knowledge of atom, molecules and compounds in Engineering Chemistry.	3.0	2.0	-	1.0	3.0	1.0	3.0		
CCH104 - 2 CO-2 Apply the concepts of Electrochemistry to interpret the reasons of corrosion with its remedies.	3.0	2.0	-	1.0	2.0	1.0	3.0	-	-
CCH104 -3 CO-3 Select the relevant catalyst, alloys, insulators, adhesives, composite materials, plastic and rubber for different applications in the field of engineering.	3.0	1.0	-	-	2.0	1.0	3.0	-	-
CCH104 – 4 CO-4 Use of water in Domestic purpose, Industrial purpose and its relevant treatment to solve industrial problems.	3.0	2.0	-	1.0	3.0	1.0	3.0	-	-
CCH104-5 CO-5 Explain the method of Extraction of Iron.	3.0	1.0	-	-	2.0	1.0	3.0	-	-
CCH10- 6CO-6 Choose appropriate with relevant method of lubrication to solve industrial problem and applications of Paint and Varnish.	3.0	2.0	-	1.0	2.0	1.0	3.0	-	-

## F. CONTENT:

### I) Practical exercises

The following practical exercises shall be conducted in the *Laboratory for Engineering Chemistry developed* by the Institute in practical sessions of batches of about 20- 22 students:

Sr. no	Laboratory experiences	CO
1	Introduction to Chemistry laboratory	CCH104-1
2	Volumetric analysis of solution.	CCH104-1
3	Preparation of 1 N, 0.5 N & 0.1 N Solutions of different chemicals like NaOH, HCl, Oxalic acid, FeSO <sub>4</sub> , etc.	CCH104-1
4	Titration of strong acid and strong bases ( HCl X NaOH)	CCH104-1
5	Double titration of strong acid, strong base & weak acid (HCl X NaOH X H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .H <sub>2</sub> O)	CCH103-1
6	Titration of weak base , strong acid & strong base (Na <sub>2</sub> CO <sub>3</sub> X H <sub>2</sub> SO <sub>4</sub> X KOH)	CCH103-1
7	Estimation of chloride content in water by Mohr' s method	CCH103-4
8	Determination of amount of Ca and Mg ions present in given sample of water by E.D.T.A method	CCH103-4
9	Estimation of viscosity of oils/solutions by Ostwald's method	CCH103-6
10	Estimation of Ca in limestone.	CCH103-5
11	Titration of KMnO <sub>4</sub> & FeSO <sub>4</sub> (Redox titration)	CCH103-5
12	Estimation of % of Fe in given sample of steel.	CCH103-3
13	Determination of alkalinity of water.	CCH103-4
14	Determination of Electrochemical equivalent (ECE) by copper volt meter.	CCH104-2
15	To estimate volumetrically the percentage of copper in a given sample of Brass.	CCH104- 5
16	To demonstrate the different types of Solders.	CCH104-3

### II) Theory

#### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO - CCH104-1 Apply the basic knowledge of atom, molecules and compounds in Engineering Chemistry.			
1	<b>ATOMIC STRUCTURE AND CHEMICAL BONDING</b> 1.1 Philosophy of atom by Acharya Kanad. 1.2 Atom, Fundamental particles, Nature of atom. 1.3 Atomic Number, Mass Number, Isotopes and isobars. 1.4 Bohr's theory of atom.	<b>07</b>	<b>08</b>

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	1.5 Statement of Aufbau's principle, Hund's rule of maximum multiplicity, Pauli's exclusion principle. 1.6 Lewis and Langmuir's concept of stable electronic configuration. 1.7 Electrovalency and Co-valency. 1.8 Formation Of electrovalent compounds- NaCl, CaCl <sub>2</sub> . 1.9 Formation of Covalent compounds- H <sub>2</sub> O, CO <sub>2</sub>		
CO - CCH104-2 Apply the concepts of Electrochemistry to interpret the reasons of corrosion with its remedies.			
2	<b>ELECTROCHEMISTRY AND CORROSION.</b> 2.1 Definitions- Cathode, Anode, Conductor, Electrolyte, Electrode, Ionisation, Electrolysis. 2.2 Arrhenius Theory Of Ionisation. 2.3 Degree of Ionisation & Factors affecting degree of ionisation. 2.4 Statement of Faraday's first and second law of electrolysis. 2.5 Relation between CE and ECE. 2.6 Electrolysis of molten NaCl. 2.7 Electrolysis of CuSO <sub>4</sub> solution by using Cu-Electrodes. 2.8 Industrial applications of electrolysis. 2.8.1 Electroplating. 2.8.2 Electro refining of Cu. 2.9 Definition & types of corrosion. 2.10 Dry or Atmospheric corrosion , Oxide Film Formation & its types, Factors affecting atmospheric corrosion. 2.11 Wet or electrochemical corrosion 2.12 Factors influencing immersed corrosion 2.13 Methods of protection of metal from corrosion - Hot dipping (Galvanizing & Tinning) ,Metal spraying, Metal cladding, Cementation or sherardizing.	10	10
CO - CCH104-3 Select the relevant catalyst, alloys, insulators, adhesives, composite materials, plastic and rubber for different applications in the field of engineering.			
3	<b>CHEMISTRY OF ENGINEERING MATERIALS AND CATALYSIS.</b>  <b>3.1 INSULATORS</b> 3.1.1 Definition & Characteristics of insulator. 3.1.2 Preparation, properties & uses of Glass wool, Thermocole.  <b>3.2 COMPOSITE MATERIALS</b> 3.2.1 Definition.	13	16



Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	3.2.2 Classification, Properties & Application of composite materials.  <b>3.3 PLASTICS</b> 3.3.1 Definition of Polymer, Polymerization. 3.3.2 Types of polymerization – Addition & Condensation polymerization. 3.3.3 Classification of plastic - Thermosoftening & Thermosetting plastic. 3.3.4 Engineering properties & applications of plastic.  <b>3.4 RUBBER</b> 3.4.1 Elastomer 3.4.2 Drawbacks of Natural rubber. 3.4.3 Vulcanization of rubber. 3.4.4 Engineering properties & uses of rubber.  <b>3.5 ADHESIVES</b> 3.5.1 Definition of adhesives. 3.5.2 Characteristics of good adhesive. 3.5.3 Properties of adhesive.  <b>3.6 CATALYSIS</b> 3.6.1 Definition. 3.6.2 Types of Catalyst with example. - Positive catalyst - Negative catalyst 3.6.3 Types of Catalysis. - Homogeneous catalysis. - Heterogeneous catalysis 3.6.4 Catalytic Promoters. 3.6.4 Catalytic Inhibitors 3.6.5 Autocatalysis.		

### Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO - CCH104-4 Use of water in Domestic purpose, Industrial purpose and its relevant treatment to solve industrial problems.			
4	<b>WATER</b> 4.1 Impurities in natural water. 4.2 Hard water & Soft water. 4.3 Hardness of water- Temporary & Permanent.	<b>09</b>	<b>12</b>

	<p>4.4 Reactions of hard water with soap.</p> <p>4.5 Disadvantages of hard water for domestic &amp; Industrial purpose - Textile Industry, Sugar Industry, Paper Industry Dying Industry.</p> <p>4.6 Sterilization of water - Chlorination -by Cl<sub>2</sub>, bleaching powder, Chloramines with chemical reactions.</p> <p>4.7 Ion Exchange method to remove total hardness of Water.</p>		
CO - CCH104-5 Explain the method of Extraction of Iron.			
5	<p><b>METALLURGY AND ALLOYS</b></p> <p>5.1 Occurrence of metals, Definition of minerals, Ore, Flux, Gangue &amp; Slag.</p> <p>5.2 Flow chart of metallurgical processes.</p> <p>5.3 Concentration of ores - Physical methods - 1. Gravity separation method 2. Electromagnetic separation method 3. Froth floatation method Chemical methods - 1. Calcination 2. Roasting</p> <p>5.4 Ores of Iron.</p> <p>5.5 Extraction of Iron from its ore - Blast furnace - Construction, working, reactions &amp; Products.</p> <p>5.6 Definition of alloys.</p> <p>5.7 Classification &amp; purposes of making of alloys.</p> <p>5.8 Composition, properties &amp; engineering application of - <b>Non-ferrous alloys</b> - Duralumin, Monal metal &amp; Woods metal. <b>Ferrous alloys</b> - Heat resisting steel, magnetic steel, Stainless steel.</p>	12	14
CO - CCH104-6 Choose appropriate with relevant method of lubrication to solve industrial problem and applications of Paint and Varnish.			
6	<p><b>LUBRICANTS, PAINT AND VARNISH</b></p> <p>6.1.1 Definition, Classification &amp; Functions of lubricants.</p> <p>6.1.2 Characteristics of lubricants - Viscosity, Viscosity index, Oiliness, Volatility, Cloud point &amp; Pour point, Flash &amp; Fire point, Acid value.</p> <p>6.2 Oil paint - Definition &amp; characteristics of oil paint.</p> <p>6.3 Purpose of using oil paint.</p> <p>6.4 Ingredients of oil paint with suitable example</p>	09	10

	& its functions - Drying oil (Vehicle), Drier, Pigment, Thinner, Filler (Extenders), Plasticizer. 6.5 Varnish - Definition, types, constituents, Properties & applications. 6.6 Distinction between paint & varnish.		
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\*\* No questions will be asked on IKS learning subtopics in any question papers.

### G : List of Assignments under SLA

Sr.No	List of Assignment (under SLA) (Any one of the following)	Hrs Allotted
1	Prepare distinguish chart for Isotopes & Isobars, Electrovalent & Covalent bond	02
2	Prepare Charts of Bohr's Theory, Lewis & Langmuir's theory.	02
3	Faraday's First & Second law statements & formula.	02
4	Electroplating & Electrorefining with diagram	02
5	Note on corrosion due to Oxygen & its types	02
6	With neat labelled diagram explain the process of 1. Galvanizing, 2. Tinning, 3. Metal spraying, 4. Metal Cladding, 5. Sherardizing	02
7	Properties of Plastics, rubber, insulator, composite materials & adhesives.	02
8	Uses/Applications of Plastics, rubber, insulator, composite materials & adhesives.	02
9	Draw diagram of Ion Exchange method	02
10	Note on Impurities present in Natural Water.	02
11	Disadvantages of hard water in Domestic purposes	02
12	Disadvantages of hard water in Industrial purposes	02
13	Flow chart of Metallurgical processes	02
14	With neat labelled diagram explain 1. Gravity separation method. 2. Electromagnetic separation method. 3. Froth floatation method.	02
15	Explain ingredients present in Paints	02

\*\* From the above any two assignments to be completed by the students.

### H : Specification table for setting question paper for semester end theory examination

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Atomic Structure and Chemical Bonding	4	2	2	08	CCH104-1
I / 2	Electrochemistry & Corrosion	4	4	2	10	CCH104-2

I / 3	Chemistry of Engineering materials & catalysis	6	6	4	16	CCH104-3
II / 4	Water	4	4	4	12	CCH104-4
II / 5	Metallurgy & Alloys	6	4	4	14	CCH104-5
II / 6	Lubricants, Paints & Varnish	4	4	2	10	CCH104-6
Total Marks					70	

## I :-Assessment Criteria

### i) Formative Assessment of Practical / Self learning assessment :-

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

### ii) Summative Assessment of Practical :-

Every practical assignment shall be assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Attendance at regular practical	05
2	Preparedness for practical	05
3	Neat & complete Diagram.	05
4	Observations & handling of instrument.	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

## J) Instructional Methods:

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration
4. Charts
5. Simulation videos

## K) Teaching and Learning resources:-

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts.

## L) Reference Books:

Sr.	Author	Title	Publisher
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No.			
1.	Jain & Jain	Engineering chemistry	Dhanpatrai publishing co.
2.	S. C. Rangawala	Engineering materials	Engineering publication
3.	Jain & Agarwal	Metallurgical Analysis	Agarwal publications
4.	O. P. Khanna	Material science & technology	Khanna publication on 2006
5.	Rollason	Metallurgy for Engineers	ASM publication
6.	J. C. Kuriacose	Chemistry in Engineering & Vol. 1 & 11	-
7.	P. C. Jain	Chemistry of Engineering Materials	-
8.	S. S. Dara	A text of Engineering Chemistry	-
9.	R.Gopalan, D.Venkappa	Engineering Chemistry	Vikas Publishing House.

### M) Learning Website & Software

- a. [www.substech.com](http://www.substech.com)
- b. [www.kentchemistry.com](http://www.kentchemistry.com)
- c. [www.chemcollective.org](http://www.chemcollective.org)
- d. [www.wqa.org](http://www.wqa.org)
- e. [www.chemistryteaching.com](http://www.chemistryteaching.com)
- f. [www.ancient-origins.net/hisotry-famous-people/indian-sage-acharya-kanad-001399](http://www.ancient-origins.net/hisotry-famous-people/indian-sage-acharya-kanad-001399)

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**COURSE ID** :  
**COURSE NAME** : COMMUNICATION SKILLS  
**COURSE CODE** : CCH201  
**COURSE ABBREVIATION** : HCMS

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	4
	Tutorial Learning	00	
	Laboratory Learning	02	
	SLH-Self Learning	02	
	NLH-Notional Learning	08	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	150
03	30	70	100	40	25	10	-	-	25	10	

(Total IKS Hrs for Sem. : 00 Hrs)

**C: ABBREVIATIONS:-** CL- Class Room Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment  
**Legends:** @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination.

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

## D. i) RATIONALE:-

Communication, being an integral part of every human activity, plays a fundamental role in education, science and technology. The communication skills are essential for engineering professionals to carryout routine tasks at workplace. These skills are also required for professional activities like dialogue, persuasion and negotiation. Considering the age group and socio-economical background of the students of the Institute, this course has been designed with a skill-oriented content with some necessary theoretical foundation. Thus, this course has been designed to enhance the skills to communicate effectively and skillfully at workplace.

## ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry identified outcome through various learning experiences:

1. “Communicate in written and oral form of English effectively at workplace.”

## E. COURSE LEVEL LEARNING OUTCOMES (COs)

CCH201-1 Use Contextual words in English appropriately.

CCH201-2 Comprehend the concept of communication and identify communication barriers.

CCH201-3 Prepare and participate in dialogue, conversation, elocution and debate.

CCH201-4 Make effective use of body language & graphical communication.

CCH201-5 Write letters, reports, e-mails and technical description in correct language.

CCH201-6 Prepare and present effective media aided presentation.

## COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX:

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0”

	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineerin g Tools, Experiment ation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Manage ment	PO 7 Life- long Learnin g	PSO1	PSO2
<b>Competency:</b> Communicate in written and oral form of English effectively at workplace.	2	-	-	-	-	1	2		
CCH201-1 Use Contextual words in English appropriately.	1	1	-	-	-	2	1		
CCH201-2 Comprehend the concept of communication and identify communication barriers	2	1	-	-	-	2	2		
CCH201-3 Prepare and participate in dialogue, conversation, elocution and debate.	2	1	-	-	-	2	1		

CCH201-4 Make effective use of body language & graphical communication.	2	-	-	-	-	2	2		
CCH201-5 Write letters, reports, e-mails and technical description in correct language.	2	-	-	-	-	2	1		
CCH201-6 Prepare and present effective media aided presentation.	1	1	-	-	-	1	1		

## F. CONTENT:

### D) Practical Exercises

The following practical exercises shall be conducted in the Laboratory for *Communication Skills* developed by the Institute in practical sessions of batches of about 20- 22 students:

Sr No.	Title of Practical Exercise	Course Outcome
1.	Vocabulary Building: Affixation	CCH201-1
2.	Vocabulary Building: Homophones	CCH201-1
3.	Vocabulary Building: Synonyms-Antonyms and Collocations	CCH201-1
4.	Communication Cycle and Communication Barriers	CCH201-2
5.	Oral Communication: Transcription	CCH201-3
6.	Oral Communication: Prepared Speech	CCH201-3
7.	Oral Communication: Conversation	CCH201-3
8.	Oral Communication: Group Discussion	CCH201-3
9.	Oral Communication: Group Debate	CCH201-3
10.	Non-verbal Communication: Graphic Communication	CCH201-4
11.	Non-verbal Communication: Body Language	CCH201-4
12.	Written Communication: Writing formal Letters	CCH201-5
13.	Written Communication: Writing Reports	CCH201-5
14.	Written Communication: Drafting of E-mail	CCH201-5
15.	Written Communication: Technical Writing	CCH201-5
16.	Presentation Aids	CCH201-6



## II) Theory

### Section I

Sr. No.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO: CCH201-1 Use Contextual words in English appropriately.			
1	<b>Vocabulary Building</b> 1.1 Affixation: Prefix and Suffix, Definition and Examples, List of common Prefixes and Suffixes 1.2 Synonyms and antonyms: Vocabulary Expansion, Context and Usage 1.3 Homophones: Identifying Homophones, Meaning and Contest, Vocabulary Expansion 1.4 Collocation: Definition and Identification, Types of Collocations	8	08
CO: CCH201-2 Comprehend the concept of communication and identify communication barriers.			
2	<b>Introduction to Communication</b> 2.1 Definition and Importance of Communication 2.2 Model of Communication 2.3 Principles of Effective Communication 2.4 Types of Communication: Formal, Informal, Oral, Written, Verbal, Non-Verbal, Horizontal, Upward, Downward and Diagonal Communication 2.5 Barriers to communication: Physical, Mechanical, Psychological and Language Barriers	14	16
CO: CCH201-3: Prepare and participate in dialogue, conversation, elocution and debate.			
3	<b>Oral Communication</b> 3.1 Characteristics of Oral Communication. 3.2 Phonetics: IPA, Vowels(12), Consonants(24) and Diphthongs (12) 3.3 Tone, Pronunciation and Accents. 3.4 Spoken English: Prepared and Extempore speeches 3.5 Role Play: Conversation and Dialogue 3.6 Group Discussion and Debate	8	10

## Section II

Sr. No.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO: CCH201-4: Make effective use of body language & graphical communication.			
4	Non-verbal Communication 4.1 Importance of Non-Verbal Communication. 4.2 Aspects of Body Language: Facial Expressions, Eye Contact, Vocalics, Gestures, Posture, Dress, Appearance and Personal Grooming and Haptics. 4.3 Non-Verbal Codes: Proxemics, chroemics, artefacts 4.4 Graphical Communication: 4.4.1 Advantages and Disadvantages of Graphical Communication. 4.4.2 Tabulation of Data and its depiction in the form of Bar Graphs and Pie Charts	08	12
CO: CCH201-5 Write letters, reports, e-mails and technical description in correct language.			
5	Written Communication 5.1 Characteristics of Written Communication. 5.2 Letter Writing: Application with Resume, Enquiry Letter, Order Letter and Complaint Letter 5.3 Writing Reports: Accident, Fall in Production Reports and Micro Project 5.4 Email Writing 5.5 Technical Writing: Object Description, Picture Description, Diary Writing 5.6 Paragraph Writing: Narrative, Descriptive and Technical	16	20
CO: CCH201-6 Prepare and present effective media aided presentation.			
6	Media-Aided Presentations 6.1 Media aids for Presentation: Strengths and Precautions 6.2 Planning, Preparing and Making a Presentation 6.3 Use of Presentation Media	06	04

\*\* No questions will be asked on IKS learning subtopics in any question papers.

## G : List of Assignments/Activities/Micro-project under SLA

\*\*A learner should complete at least on major activity mentioned in the above list under the guidance of subject teacher.

Sr. No	List of Assignment (under SLA)	Hrs Allotted
1	Report different types of episodes and anecdotes	02
2	Seminar preparation and Presentation	04
3	Make a pod cost episode based on Indian freedom fighters.	02
4	Present summary of the editorial column of English news paper	02
5	Write review of on any one: short story, novel, film	02
6	Prepare a booklet on Indian scientist/ eminent persons	04
7	Prepare blog, vlogs and pod cast	04
8	Prepare questionnaire for interview on any one: industry personnel, social worker, entrepreneur and conduct interview.	02
9	Prepare charts/tables of vowels, diphthongs, consonant, organs of speech, vocabulary in English	02
10	Prepare charts/tables of types of communication, barrier in communication, aspects of body language	02
11	Prepare a micro project on a given topic.	04

## H: Specification Table for Setting Question Paper for Semester End Theory Examination

Section/ Topic No.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Vocabulary Building	02	02	04	08	CCH201-1
I / 2	Introduction to Communication	04	06	06	16	CCH201-2
I / 3	Oral Communication	04	02	04	10	CCH201-3
II / 4	Non-verbal Communication	04	02	06	12	CCH201-4
II / 5	Written Communication	04	04	12	20	CCH201-5
II / 6	Media-aided Presentations	-	02	02	04	CCH201-6
Total Marks					70	

## I:-Assessment Criteria

### i) Formative Assessment of Practical:-

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

**ii) Summative Assessment of Practical:**

Every practical assignment shall be assessed for 25 marks as per following criteria:

Sr. No.	Criteria	Marks allotted
1	Attendance at regular practical	NA
2	Preparedness for practical	NA
3	Neat & complete Diagram.	NA
4	Observations & handling of instrument.	NA
5	Oral Based on Lab work and completion of task	NA
<b>TOTAL</b>		

**J) Instructional Methods:**

1. Lecture cum Demonstration,
2. Class room practices.
3. Use of projector and soft material for demonstration

**K) Teaching and Learning Resources:**

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts.

**L) Reference Books:**

S.N.	Name of Book	Author	Publication
1	Communication Skills	Sanjay Kumar and Pushp Lata	Oxford University Press
2	Personality Development and Soft Skills	Brun K. Mitra	Oxford University Press
3	Effective Communication Skills	M Ashraf Rizvi	Tata McGraw-Hill
4	Human Communication	Burgoon Michael	SAGE Publication Inc.
5	101 Ways to Better Communication	Elizabeth Hiemey	Pustak Mahal
6	Technical Writing and Professional Communication	Thomas Huckin and Leslie	McGraw-Hill College Division

**M) Learning Website & Software**

- a. [www.nptel.com/iitm/](http://www.nptel.com/iitm/)
- b. <https://www.britishcouncil.in/english/learn-online>
- c. <https://www.vocabulary.com>
- d. [www.newagegolden.com](http://www.newagegolden.com)
- e. <https://www.internationalphoneticassociation.org>

**COURSE ID** :  
**COURSE NAME** : **SOCIAL AND LIFE SKILLS**  
**COURSE CODE** : **CCH204**  
**COURSE ABBREVIATION** : **HSLs**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	00	01
	Tutorial Learning	00	
	Laboratory Learning	01	
	SLH-Self Learning	01	
	NLH-Notional Learning	02	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	50
00	00	00	00	00	25	10	-	-	25	10	

**(Total IKS Hrs for Sem. : 00 Hrs)**

**C: ABBREVIATIONS:-** CL- Class Room Learning , TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment **Legends:** @ Internal Assessment, # External Assessment, \*# Online Examination, @\$ Internal Online Examination.

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

#### **D. i) RATIONALE:-**

Life skills can be defined as abilities that enable an individual to deal effectively with the demands and challenges of life. Social skills are a subset of life skills that are needed for successful, healthy relationships to easily adapt when moving from one social situation to the next. They help regulate our emotions effectively and develop enduring, supportive relationships, we're happier and healthier. This is why developing life skills and eventually social skills is key not only to being successful in life, it's key for our health and well-being. Thus, Teaching of Social and life skills provide students with essentials of knowing, understanding attitudes, values, morals, social skills and better equip them to handle stress and build their self-efficacy, self-esteem and self-confidence.

Note: The course offers four different alternatives (modules) for achieving above outcomes. Students must complete any one module from the following given options.

- A) MODULE-I : Unnat Maharashtra Abhiyan (UMA)
- B) MODULE-II : National Service Scheme (NSS)
- C) MODULE-III : Universal Human Values
- D) MODULE-IV: Value Education (Unati Foundation)
- E) MODULE-V : Financial Literacy (NABARD)

The institute can choose to offer any one MODULE to the groups of the students by taking into consideration the resources required and resources available in the institute. Different group of students may be offered different MODULE based on their choices.

#### **ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME**

Exhibit psychosocial competencies, workplace ethics, resilience, positive attitude, integrity and self- confidence.

#### **E. COURSE LEVEL LEARNING OUTCOMES (COs)**

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CCH204-1 - Develop ability to adapt to new challenges.
- CCH204-2 - Manage emotions effectively.
- CCH204-3 - Follow workplace ethics and practices.
- CCH204-4 - Manage time effectively.
- CCH204-5 - Increased self-confidence to handle stress.

#### **COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX:**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"

	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineerin g Tools, Experiment ation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Manage ment	PO 7 Life- long Learnin g	PSO1	PSO2
<b>Competency:</b> Exhibit psychosocial competencies, workplace ethics, resilience, positive attitude, integrity and self-confidence.									
CCH204-1 Develop ability to adapt to new challenges.						1	2		
CCH204-2 Manage emotions effectively.						1	2		
CCH204-3 Follow workplace ethics and practices.						1	2		
CCH204-4 Manage time effectively.						2	2		
CCH204-5 Increased self-confidence to handle stress.						2	2		

## F. CONTENT:

I) **Practical Exercises:**  
Not Applicable

II) **Theory**

Sr. No.	Theory Learning Outcomes (TLOs) Aligned to COs.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
	TLO 1.1 Explain developmental needs and connection of various stakeholders TLO 1.2 Enlist the local problems TLO 1.3 Design a methodology for fieldwork	<b>Unit - I MODULE I : Activities Under Unnat Maharashtra Abhiyan (UMA)</b> 1.1 Introduction to Societal Needs and respective stakeholders : Regional societal issues that need engineering intervention 1.2 Multidisciplinary approach-linkages of academia, society and technology 1.3 Stakeholders' involvement 1.4 Introduction to Important secondary data sets	Implementation Methodology: Considering the nature of the course designed, following points shall be considered while implementing the course.  i) Regroup in the batches of 5-6 students for conducting the fieldwork

	<p>TLO 1.4 Select the attributes of engineering and social system for measurement, quantification, and documentation</p> <p>TLO 1.5 Measure &amp; quantify the quantities / systems parameters</p> <p>TLO 1.6 Write a report using information collected. Study the data collected from fieldwork and conclude the observations.</p>	<p>available such as census, district economic surveys, cropping pattern, rainfall data, road network data etc</p> <p>1.5 Problem Outline and stakeholders : Importance of activity and connection with Mapping of system components and stakeholders (engineering / societal)</p> <p>1.6 Key attributes of measurement</p> <p>1.7 Various instruments used for data collection - survey templates, simple measuring equipments</p> <p>1.8 Format for measurement of identified attributes/ survey form and piloting of the same</p> <p>1.9 Fieldwork : Measurement and quantifications of local systems such as agriculture produce, rainfall, Road network, production in local industries, Produce /service which moves from A to B</p> <p>1.10 Analysis and Report writing Report writing containing-</p> <ol style="list-style-type: none"> <li>1. Introduction of the topic</li> <li>2. Data collected in various formats such as table, pie chart, bar graph etc</li> </ol> <p>Observations of field visits and data collected.</p>	<p>from the bigger group.</p> <p>ii) Assign a few batches of the students for this course to all the faculty members.</p> <p>iii) A group of course teachers will visit local governance bodies such as Municipal Corporations, Village Panchayats, Zilla Parishads, Panchayat Samitis to assess the small technological / engineering needs in their area of work.</p> <p>iv) The group of course teachers will carry out initial field visits to evaluate the various possibilities of field visits / various scenarios wherein students can conduct field work to measure / quantify the parameters / attributes.</p> <p>v) The course will be implemented in eight sessions and fieldwork.</p> <ol style="list-style-type: none"> <li>a) Session I - Introduction to development paradigm, fieldwork and case study as pedagogy</li> <li>b) Session II - VII - Society, stakeholders and value creation, measurements, rudimentary analysis and reporting</li> <li>c) Session VIII - Final closure session feedback and assessment</li> <li>d) Field work -       <ol style="list-style-type: none"> <li>1. Pilot Visit - Pilot of survey instrument</li> <li>Survey Visit 1 - Data gathering / Information Collection</li> <li>3. Survey Visit 2 - Data gathering</li> </ol> </li> </ol>
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			Summary Visit - Closure after analysis
<b>2</b>	<p>TLO 2.1 Adoption of Village or Slum</p> <p>TLO 2.2 Survey and Problem Identification</p> <p>TLO 2.3 Conduct Project / Programs in the selected village / slum</p> <p>TLO 2.4 Undertake Special Camping Programme</p>	<p><b>Unit - II MODULE II : National Service Scheme (NSS)</b></p> <p>2.1 Contacting Village/Area Leaders</p> <p>2.2 Primary socio economic survey of few villages in the vicinity of the institute.</p> <p>2.3 Selection of the village for adoption - conduct of activities</p> <p>2.4 Comprehensive Socio Economic Survey of the Village/Area</p> <p>2.5 Identification of Problem(s)</p> <p>2.6 Dissemination of information about the latest developments in agriculture, watershed management, wastelands development, non-conventional energy, low cost housing, sanitation, nutrition and personal hygiene, schemes for skill development, income generation, government schemes, legal aid, consumer protection and allied fields.</p> <p>A liaison between government and other development agencies for the implementation of various development schemes in the selected village / slum.</p>	<p>(i) The teachers should visit the village / slum before adopting it for NSS activities.</p> <p>(ii) The selected area should be compact.</p> <p>(iii) The community people should be receptive to the ideas of improving their living standard. They should also be ready to coordinate and involve in the projects undertaken by the NSS for their upliftment</p> <p>(iv) The areas where political conflicts are likely to arise should be avoided by the NSS units.</p> <p>The area should be easily accessible to the NSS volunteers to undertake frequent visits to slums;</p>
<b>3</b>	<p>TLO 3.1 Love and Compassion (Prem and Karuna)</p> <p>TLO 3.2 Truth (Satya)</p> <p>TLO 3.3 Non-Violence (Ahimsa)</p> <p>TLO 3.4 Righteousness (Dharma)</p> <p>TLO 3.5 Peace (Shanti)</p> <p>TLO 3.6 Service (Seva)</p> <p>TLO 3.7 Renunciation (Sacrifice) Tyaga</p> <p>TLO 3.8 Gender Equality and Sensitivity</p>	<p><b>Unit - III MODULE-III : Universal Human Values</b></p> <p>3.1 Love and Compassion (Prem and Karuna): Introduction, Practicing Love and Compassion (Prem and Karuna)</p> <p>3.2 Truth (Satya) : Introduction, Practicing Truth (Satya)</p> <p>3.3 Non-Violence (Ahimsa) : Introduction, Practicing Non-Violence (Ahimsa)</p> <p>3.4 Righteousness (Dharma) : Introduction, Practicing Righteousness (Dharma)</p> <p>3.5 Peace (Shanti) : Introduction, Practicing Peace (Shanti)</p> <p>3.6 Service (Seva) : Introduction, Practicing Service (Seva)</p> <p>3.7 Renunciation (Sacrifice) Tyaga : Introduction, Practicing Renunciation (Sacrifice) Tyaga</p> <p>Gender Equality and Sensitivity: Introduction, Practicing Gender Equality and Sensitivity</p>	<p>i) Lectures</p> <p>ii) Demonstration</p> <p>iii) Case Study</p> <p>iv) Role Play</p> <p>v) Observations</p> <p>vi) Portfolio Writing</p> <p>vii) Simulation</p> <p>viii) Motivational talks by Practitioners</p> <p>Site/Industry Visit</p>
<b>4</b>	<p>TLO 4.1 Punctuality</p> <p>TLO 4.2 Cleanliness, Hygiene and Orderliness</p> <p>TLO 4.3</p>	<p><b>Unit - IV MODULE-IV: Value Education (Unnati Foundation)</b></p> <p>4.1 Punctuality, Icebreaker and Simple Greeting, Understanding &amp; Managing Emotions, Introducing Self, The power of a Positive Attitude, Talking about one's Family, Talking about one's Family, Making a Positive</p>	<p>i) Video Demonstrations</p> <p>ii) Flipped Classroom</p> <p>iii) Case Study</p> <p>iv) Role Play</p> <p>v) Collaborative learning</p> <p>vi) Chalk-Board</p>

	<p>Responsibility  TLO 4.4 Gratitude and Appreciations  TLO 4.5 Determination &amp; Persistence  TLO 4.6 Respect  TLO 4.7 Team Spirit  TLO 4.8 Caring &amp; Sharing  TLO 4.9 Honesty  TLO 4.10 Forgive and Forget</p>	<p>Impression, Give word list for a Word based  4.2 Cleanliness , Hygiene and Orderliness , Likes and Dislikes, Developing Confidence in Self and Others, Strengths and Weaknesses, Listening Skills , Greeting gestures, Gender Equality and Sensitivity  4.3 Responsibility, OCSEM- Visual Comprehension and Word Based Learning, Goal Setting – Make it happen, Follow, Like &amp; Share Unnati Social Media - Facebook / Instagram/ Twitter Introducing Others, Time Management, Talking about the daily routine, Money Management  4.4 Gratitude and Appreciation , Asking Simple Questions &amp; Asking for the price , Stress Management, Student Referral process , Comprehending &amp; Paraphrasing Information, A Plate of Rice and Dignity of Labour, Topics for Public Speaking, Placement Process , OCSEM-E-Newspaper, Critical Thinking to overcome challenges  4.5 Determination and Persistence, Guiding and Giving Directions, Language Etiquette &amp; Mannerism, . Unnati Philosophy , b. Unnati Branding - Follow, Like &amp; Share Unnati Social Media - Facebook / Instagram/ Twitter, Simple instructions to follow procedures, Assertiveness, Give topics for Debate, Describing a person/Objects, Refusal Skills, Word List for Word based Learning  4.6 Respect, Comparing , OCSEM - Public Speaking, Student referral process, Attending a phone call, Being a Good Team Player , Placement Process, At a Restaurant, Workplace ethics  4.7 Team Spirit, Inviting someone, OCSEM - Picture Reading &amp; Word, a. Unnati Philosophy &amp; b. Unnati Branding - Follow, Like &amp; Share Unnati Social Media - Facebook / Instagram/ Twitter, Apologizing, Apologizing, Dealing effectively with Criticism, Introduce Importance of Self Learning and up skilling  Caring and Sharing , Handling Customer queries, Flexibility &amp; Adaptability, Student referral process, Writing a Resume, OCSEM-Public Speaking, Placement Process, Meditation/ Affirmation &amp; OCSEM-Debate, Introduce Certif-ID, how to create Certif-ID Project ,  4.9 Honesty, Email etiquette &amp; Official Email communication, Alcohol &amp; Substance use &amp; abuse, Describing a known place , Leadership Skills, Describing an event, OSCEM-Picture Reading &amp; Visual Comprehension</p>	
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		Forgive and Forget, Facing and Interview, OSCEM-Public Speaking , Attending a telephonic/Video interview & Mock Interview , Affirmation , Pat-a-Back & Closure (Valediction , Unnati Branding, Student Testimonials), Meditation/ Affirmation & Sponsor connect (Speak to UNXT HO)	
<b>5</b>	TLO 5.1 Literacy About Savings and Investments TLO 5.2 Literacy About Financial Planning TLO 5.3 Literacy About Transactions TLO 5.4 Literacy About Income, expenditure and budgeting TLO 5.5 Literacy About Inflation TLO 5.6 Literacy About Loans TLO 5.7 Literacy About the Importance of Insurance TLO 5.8 Literacy About the Dos and Don'ts in finances	<b>Unit - V MODULE-V : Financial Literacy</b> 5.1 Introduction - Life Goals and financial goals 5.2 Savings and Investments - Three pillars of investments, Popular asset classes, Government schemes, Mutual Funds, Securities markets (Shares and bonds), Gold, Real Estate, Do's and Don'ts of investments 5.3 Retirement planning 5.4 Cashless transactions 5.5 Income, expenditure and budgeting – Concepts and Importance 5.6 Inflation- Concept, effect on financial planning of an individual 5.7 Loans – Types, Management of loans, Tax benefits 5.8 Insurance – Types, Advantages, selection Dos and Don'ts in Financial planning and Transactions	i) Online/Offline Mode of Instructions ii) Video Demonstrations iii) Presentations iv) Case Study v) Chalk-Board Collaborative learning

\*\* No questions will be asked on IKS learning subtopics in any question papers.

## **G : List of Assignments/Activities/Micro-project under SLA**

### **Suggestive list of activities during Regular as well as Special Camping (NSS Activities)**

Following list is only an illustrative list of the type of activities that can be undertaken. Under the programme. It would be open to each NSS Unit to undertake one of these programmes or any other activity which may seem desirable to them according to local needs. The NSS Unit should aim at the integrated development of the area selected for its operation which could be a village or a slum. It has also to be ensured that at least a part of the programme does involve manual work.

(a) Environment Enrichment and Conservation:

The activities under this sub-theme would inter-alia, include:

- (i) plantation of trees, their preservation and upkeep
- (ii) Construction & maintenance of village streets, drains
- (iii) Cleaning of village ponds and wells;
- (iv) Popularization and construction of Gobar Gas Plants, use of non-conventional energy;
- (v) Disposal of garbage & composting;
- (vi) Prevention of soil erosion and work for soil conservation,
- (vii) Watershed management and wasteland development
- (viii) Preservation and upkeep of monuments, and creation of consciousness about the preservation of cultural heritage among the community.

(b) Health, Family Welfare and Nutrition Programme:

- (i) Programme of mass immunization;
- (ii) Working with people in nutrition programmes with the help of Home Science and medical college students;
- (iii) Provision of safe and clean drinking water;
- (iv) Integrated child development programmes;
- (v) Health education, AIDS Awareness and preliminary health care.
- (vi) Population education and family welfare programme;
- (vii) Lifestyle education centres and counselling centres.

© Programmes aimed at creating an awareness for improvement of the status of women:

- (i) programmes of educating people and making them aware of women's rights both constitutional and legal;
- (ii) creating consciousness among women that they too contributed to economic and social well-being of the community;
- (iii) creating awareness among women that there is no occupation or vocation which is not open to them provided they acquire the requisite skills; and
- (iv) imparting training to women in sewing, embroidery, knitting and other skills wherever possible.

(d) Social Service Programmes:

- (i) work in hospitals, for example, serving as ward visitors to cheer the patients, help the patients, arranging occupational or hobby activities for long term patients; guidance service for out-door-patients including guiding visitors about hospital's procedures, letter writing and reading for the patients admitted in the hospital; follow up of patients discharged from the hospital by making home visits and places of work, assistance in running dispensaries etc.
- (ii) work with the organisations of child welfare;
- (iii) work in institutions meant for physically and mentally handicapped;
- (iv) organising blood donation, eye pledge programmes;
- (v) work in Cheshire homes, orphanages, homes for the aged etc.;
- (vi) work in welfare organisations of women;
- (vii) prevention of slums through social education and community action;

(e) Production Oriented Programmes:

- (i) working with people and explaining and teaching improved agricultural practices;

- (ii) rodent control land pest control practices;
- (iii) weed control;
- (iv) soil-testing, soil health care and soil conservation;
- (v) assistance in repair of agriculture machinery;
- (vi) work for the promotion and strengthening of cooperative societies in villages;
- (vii) assistance and guidance in poultry farming, animal husbandry, care of animal health etc.;
- (viii) popularisation of small savings and assistance in procuring bank loans

(f) Relief & Rehabilitation work during Natural Calamities:

- (i) assisting the authorities in distribution of rations, medicine, clothes etc.;
- (ii) assisting the health authorities in inoculation and immunisation, supply of medicine etc.;
- (iii) working with the local people in reconstruction of their huts, cleaning of wells, building roads etc.;
- (iv) assisting and working with local authorities in relief and rescue operation;
- (v) collection of clothes and other materials, and sending the same to the affected areas;

(g) Education and Receptions: Activities in this field could include:

- (i) adult education (short-duration programmes);
- (ii) pre-school education programmes;
- (iii) programmes of continuing education of school drop outs, remedial coaching of students from weaker sections;
- (iv) work in crèches;
- (v) participatory cultural and recreation programmes for the community including the use of mass media for instruction and recreation, programmes of community singing, dancing etc.;
- (vi) organisation of youth clubs, rural and indigenous sports in collaboration with Nehru Yuva Kendras;
- (vii) programmes including discussions on eradications of social evils like communalism, castism, regionalism, untouchability, drug abuse etc.;
- (viii) non- formal education for rural youth and
- (ix) Legal-literacy, consumer awareness.

## **H: Specification Table for Setting Question Paper for Semester End Theory**

**Examination:** Not Applicable

### **I:-Assessment Criteria**

#### **i) Formative Assessment of Practical:-**

Formative assessment (Assessment for Learning) report and presentation of fieldwork activities, self-learning (Assignment)

#### **ii) Summative Assessment of Practical:**

(Assessment of Learning)

**J) Instructional Methods:**

1. Group Discussion, Flipped Classroom
2. Demonstration, Case Study, Role Play, Collaborative Learning, Cooperative Learning
3. Field Visit, Survey
4. Use of projector and soft material for Demonstration (ppt, audio ,video etc)

**K) Teaching and Learning Resources:**

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts.

**L) Reference Books:**

S.N.	Name of Book	Author	Publication
1	Compendium of Training Materials for the Capacity Building of the Faculty and Students of Engineering Colleges on 'IMPROVING THE PERFORMANCE OF RURAL WATER SUPPLY AND SANITATION SECTOR IN MAHARASHTRA' Districts Economic survey reports	IRAP, Hyderabad, CTARA, IIT Bombay and UNICEF, Mumbai	UNICEF
2	Central Public Health and Environmental Engineering Organisation	Manual on Water Supply and Treatment	Ministry of Urban Development, New Delhi
3	Specifications And Standards Committee	Indian Standards (IS) Codes and Indian Roads Congress (IRC) Codes	Bureau of Indian Standards and The Indian Road Congress
4	Prepared by each district administration	Districts Economic survey reports	Govt. of Maharashtra
5	Local college students,UMA staffs	Sample Case Studies on UMA website	IITB-UMA team

**M) Learning Website & Software**

- a. <https://gr.maharashtra.gov.in/Site/Upload/Government%20Resolutions/English/201601131501523808.pdf> (Government Resolution of

Government of Maharashtra regarding Unnat Maharashtra Abhiyan)

- b. <https://gr.maharashtra.gov.in/Site/Upload/Government%20Resolutions/English/201606151454073708.pdf> (Government Resolution of Government of Maharashtra regarding Unnat Maharashtra Abhiyan Guidelines)
- c. <https://censusindia.gov.in/census.website/> (A Website of Census of India)
- d. <https://gsda.maharashtra.gov.in/english/> (A Website of Groundwater Survey and Development Agency, GoM)
- e. <https://mrsac.gov.in/MRSAC/map/map> (A Website where district-wise mapsshowcasing)

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**COURSE ID: ME****Course Name : ENGINEERING DRAWING (ME/MT)****Course Code : CCH110****Course Abbreviation: HEDR****Course Type : AEC****A. LEARNING SCHEME:****Pre-requisite Course(s): Nil**

Scheme component	Actual Contact Hours / week	Credits
Classroom Learning (CL)	02	4
Tutorial Learning (TL)	-	
Laboratory Learning (LL)	04	
Self-Learning Hours (SLH)	02	
Notional Learning (NLH)	08	

**B. ASSESSMENT SCHEME:**

Theory				Based on LL & TL				Based on Self Learning		Total Marks
				Practical						
FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
30	70	100	40	25	10	25@	10	25	10	175

**(Total IKS Hrs for Sem: 4 Hrs)**

**C. ABBREVIATIONS:** CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

**Legends:** @ Internal Assessment, # External Assessment, \*# On Line Examination, @\$ Internal Online Examination

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course, then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all 5 assignments here in tabular format)



## D. i) RATIONALE:

Engineering drawing is the graphical language of Engineers. This is a graphical tool used by the Designers, Planners, Supervisors and Technicians to express their thoughts, ideas and concepts. It offers students an insight into the methods of dealing with engineering drawing problems. This course aims at developing the ability to read and draw Isometric view of a solid, also intends to develop the ability to visualize and draw curves of development of lateral surfaces of various solids. The main focus of the course is in developing imagination, drafting and sketching skills of students, also aims at building a foundation for further course in machine drawing and other allied subjects.

## ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry identified outcome through various learning experiences:

- 1) Use different drawing instruments for solving broad based engineering problems.
- 2) Improved drafting skills, imagination and planning of drawings.

## E. COURSE LEVEL LEARNING OUTCOMES (CO'S)

**CCH110-1** Draw projections of given solids for various orientations.

**CCH110-2** Draw isometric views of given component or from orthographic projections.

**CCH110-3** Interpret the views & complete the missing view.

**CCH110-4** Draw development of lateral surfaces of various solids.

**CCH110-5** Draw proportionate free hand sketches.

### Competency, course outcomes and programme outcomes/programme specific outcomes (CP-CO-PO/PSO) matrix

[ Note: Correlation levels: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"]

Competency and Cos	Programme outcome POs and PSO's								
	PO 1 Basic and discipline specific knowledge	PO 2 Problem analysis	PO 3 Design/ development of solutions	PO 4 Engineering tools, experimentation & testing	PO 5 Engineering practices for society, sustainability and environment	PO 6 project management	PO 7 Life-long learning	PSO 1 Work in Mfg & service sector	Ps 2 Start entrepreneurial activity
<b>Competency</b>									
CCH110-1	3	-	-	-	-	-	1	2	
CCH110-2	3	-	1	1	-	-	1	2	1
CCH110-3	3	-	-	-	-	-	1	1	
CCH110-4	3	-	1	1	-	-	1	2	1
CCH110-5	3	-	-	-	-	-	1	2	

## F. CONTENT:

### i) Practical exercises

The following practical exercises shall be conducted in the *Drawing Hall for Engineering drawing* in practical sessions of batches of about 20- 22 students:

Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	Draw any two problems on projection of solids with axis perpendicular to one of the principal projection planes.	04	CO1
2	Draw any two problems on projection of solids with axis inclined to one of the principal planes and parallel to the other. (Sketchbook)	04	CO1
3	Draw any two problems on projection of solids with axis parallel to both principal planes. (Sketchbook)	04	CO1
4	*Draw any four problems on projection of solids with axis inclined to one of the principal planes and parallel to the other. <b>(01 sheet)</b>	04	CO1
5	Draw two problems on Isometric view of simple objects having plain and slanting surfaces by using natural scale. (Sketchbook)	04	CO2
6	Draw two problems on Isometric Projection of objects having cylindrical surfaces and slots on slanting surfaces by using isometric scale. (Sketchbook)	04	CO2
7	*Draw one problem on Isometric Projection of objects having cylindrical surfaces and slots on slanting surfaces by using isometric scale, and one problem of isometric view by using natural scale <b>(01 sheet)</b>	04	CO2
8	Problem Based Learning: Given the orthographic views of at least three objects with few missing lines, the student will try to imagine the corresponding objects, complete the views and draw these views (sketch book).	04	CO3
9	Draw two problems on Missing view having plain and slanting surfaces, cylindrical surfaces and slots on slanting surfaces (Sketchbook)	04	CO3
10	Draw two problems on Missing view having cylindrical surfaces and slots on slanting surfaces <b>(01 sheet)</b>	04	CO3
11	Draw two problems on developments of lateral surfaces of cube, prisms.	04	CO4
12	Draw two problems on development of lateral surfaces of cylinder, pyramids.	04	CO4
13	*Draw four problems on developments of lateral surfaces of solids. <b>(01 sheet)</b>	04	CO4
14	*Draw freehand Sketches of 12 different standard components <b>(1 Sheet)</b>	04	CO5
15	Prepare a report on the use of various solid geometrical shapes employed in ancient Indian constructions (IKS).	04	CO1 CO2 CO3 CO4 CO5

ii) THEORY

SECTION – I

Sr. No	Topics/ Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<i>Course Outcome CCH110-1 Draw projections of given solids for various orientations.</i>			
1.	<b>Projection of Solids</b> Projection of Solids like Cube, Prisms, Pyramids, Cone, Cylinders and Tetrahedron. 1.1. Axis of Solids perpendicular to one reference plane and Parallel to another Reference Plane) 1.2. Axis of Solids inclined to one reference plane and Parallel to another Reference Plane) **various solid geometrical shapes employed in ancient Indian constructions (IKS).	08	16
<i>Course Outcome CCH110-2 Draw isometric views of given component or from orthographic projections.</i>			
2.	<b>Isometric Projection</b> 2.1. Isometric Axes 2.2. Isometric scale 2.3. Isometric view and Isometric Projection 2.4. Conversion of Orthographic Views into Isometric View/Projection (Including rectangular, cylindrical objects, representation of slots on sloping as well as plane surfaces)	08	18

SECTION – II

Sr. No	Topics/ Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<i>Course Outcome CCH110-3 Interpret the views &amp; complete the missing view.</i>			
3.	<b>Missing View</b> 3.1 Interpretation of the given two orthographic views and draw missing view from the given two Orthographic views. (First Angle Projection Method only)	06	14
<i>Course Outcome CCH110-4 Draw development of lateral surfaces of various solids.</i>			
4.	<b>Developments of Surfaces</b> 4.1 Methods of Development 4.2 Developments of Lateral surfaces of right solids Prism, Cylinder, Pyramid and Cone.	06	12
<i>Course Outcome CCH110-5 Draw proportionate free hand sketches.</i>			
5.	<b>Free Hand Sketches</b> 5.1 Profiles of Screw Threads (V (BSW, Sellers), Square, ACME, Buttress, Knuckle Thread) Conventional representation of threads. 5.2 Free hand sketches of nuts and bolts, Washer, Locking arrangement of nuts, Foundation bolts (Eye, Rag, Lewis), Riveted Joints.	02	10
<b>Total</b>		<b>30</b>	<b>70</b>

Summative assessment – Theory paper should be such that total marks of questions on each topic are one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.

**\*\* No questions will be asked on IKS learning subtopics in any question papers.**

### G. SUGGESTED MICRO PROJECTS / ASSIGNMENTS/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING) UNDER SLA

**\*Complete all assignments mentioned below or any one microproject or activity given by subject teacher.**

#### List of Assignments

Sr. No.	List of Assignment (under SLA)
1	Projection of solids. One problem for each type of solids.
2	Isometric Projection. Two problems on Conversion of orthographic views into isometric View/projection.
3	Missing View. Two problems on drawing missing view from the given two Orthographic views.
4	Development of lateral surfaces of solids. One problem for each type of solids.
5	Free Hand Sketches. Draw freehand Sketches of 8 different standard components.

**Note: Assignments are aimed at enhancing the imagination and drawing skills of students. Separate books are recommended for assignments.**

#### Suggested List of Microprojects

1. Collect industrial part/job and draw its Orthographic Views.
2. Prepare Wooden models of various solids.
3. Draw Development of various given solids by collecting component, job/sample from nearby workshops/industries.
4. Prepare a model of sheet metal from given development.
5. Prepare isometric drawing from any industrial drawing.

#### Suggested Activity for Students

Each student will assess at least one sheet of other students (May be a group of 4 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. Similar other activities can also be considered.

### H. Specification table for setting question paper for semester end theory examination

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I/1	Projection of Solids	0	0	16	<b>16</b>	CO1
I/2	Isometric Projection	0	0	18	<b>18</b>	CO2
II/3	Missing View	0	14	0	<b>14</b>	CO3
II/4	Developments of Surfaces	0	0	12	<b>12</b>	CO4
II/5	Free Hand Sketches	0	10	0	<b>10</b>	CO5
<b>TOTAL</b>			<b>22</b>	<b>48</b>	<b>70</b>	

### I. Assessment Criteria

**i) Formative Assessment of Practical: -**

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

**ii) Summative Assessment of Practical:**

Every practical assignment shall be assessed for 25 marks as per following criteria:

Sr.no	Criteria	Marks allotted
1	Understanding	05
2	Preparedness for practical	05
3	Neat & complete Drawing	05
4	Drawing / drafting skills	05
5	Drawing / drafting skills	05
<b>TOTAL</b>		<b>25</b>

**iii) Assessment of SLA: -**

Every Self-learning assignment shall be assessed for 25 marks as per following criteria:

Sr.no	Criteria	Marks allotted
1	Attendance	05
2	Preparedness for Practical	05
3	Presentation (neat figures/ drawing etc.)	05
4	Drawing / drafting skills	05
5	Understanding	05
<b>TOTAL</b>		<b>25</b>

**J. Instructional Methods:**

- i) Lectures cum Demonstrations,
- ii) Class room practices.
- iii) Use of projector and soft material for demonstration

**K. Teaching and Learning resources:**

Chalk board, Power Point presentations and Demonstrative kits.

**L. Reference Books:**

Sr. No.	Name of Book	Author	Publication
1.	Engineering Drawing	N. D. Bhatt	Charotar Publishing House 2010

2.	Engineering Drawing	Dhawan, R. K.	S. Chand and Company New Delhi
3.	Engineering Drawing	D. A. Jolhe	Tata McGraw Hill Edu., 2010
4.	Engineering Drawing	M. B. Shah, B. C. Rana	Pearson, 2010
5.	Engineering Drawing	Agrawal Basant, Agrawal C.M.	McGraw Hill Education, New Delhi
6.	Engineering Drawing Practice	IS Code, SP – 46	Bureau of Indian Standards

**M. Learning Website & Software: -**

1. <http://www.design-technology.info/IndProd/drawings/>
2. <http://graphicalcommunication.skola.edu.mt/syllabus/engineering-drawing/>
3. [http://en.wikipedia.org/wiki/Engineering\\_drawing](http://en.wikipedia.org/wiki/Engineering_drawing)
4. <http://www.engineeringdrawing.org/>
5. [http://www.teachengineering.org/view\\_activity](http://www.teachengineering.org/view_activity)
6. [www.howtoread.co.in/2013/06/how-to-read-ed.html](http://www.howtoread.co.in/2013/06/how-to-read-ed.html)
7. <http://www.slideshare.net/akhilrocker143/edp>
8. <http://www.24framesdigital.com/pstulpule>

\* \* \*

**COURSE ID :**  
**COURSE NAME : BASIC METALLURGY**  
**COURSE CODE : MTH301**  
**COURSE ABBREVIATION : HBME**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	03	02
	Tutorial Learning	--	
	Laboratory Learning	01	
	SLH-Self Learning	--	
	NLH-Notional Learning	04	

**B. ASSESSMENT SCHEME :**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
03	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	125
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN			
	30	70	100	40	25	10	--	--	--	--	

**(Total IKS Hrs for Sem. : 02 Hrs)**

**C:** Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA - Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment  
 Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination  
 Note : ( TNR 11 font)

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

**D. i) RATIONALE**

Basic metallurgy mainly deals with topics required for understanding metallurgical courses. This course is a collection of widely different basic topics such as atomic structure, fuels, plastic deformation, refractories, furnace technology, conceptual understanding of structure of solid materials and their properties.

## ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry identified outcome through various learning experiences:

1. Recommend appropriate fuel for given furnace.
2. Select suitable refractories for particular furnace.

## E. COURSE LEVEL LEARNING OUTCOMES (COS)

1. Familiar with material structure and properties.
2. Compare cold working and hot working.
3. Select particular fuel for given application.
4. Understand appropriate use of refractory.
5. Understand working of various temperature measuring devices.

### Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps0) matrix

[ Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analyses	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 To prepare the students to play the role of metallurgist in industries	PSO2 To create awareness about safety protocols to be followed in various metallurgical industries	PSO3 Develop sensitivity among the students about the environmental hazards caused due to the pollutants generated in metallurgical industries
CO-1 : Familiar with material structure and properties.	3	2	2	1	2	1	1	1	1	2
CO-2 : Compare cold working and hot working.	3	1	1	2	2	--	1	2	1	1



Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 To prepare the students to play the role of metallurgist in industries	PSO2 To create awareness about safety protocols to be followed in various metallurgical industries	PSO3 Develop sensitivity among the students about the environmental hazards caused due to the pollutants generated in metallurgical industries
CO-3 : Select particular fuel for given application.	3	2	1	2	2	1	2	3	3	3
CO-4 : Understand appropriate use of refractory.	3	3	2	2	2	1	2	3	1	1
CO-5 : Understand working of various temperature measuring devices.	3	2	1	1	1	1	1	3	1	1

## F. CONTENT:-

### I) Practical exercises

The following practical exercises shall be conducted in the *Laboratory* in practical sessions of batches of about 20- 22 students:

Sr. no	Laboratory experiences	CO
1	Crystal structures and planes – F.C.C., B.C.C., H.C.P. structures to be studied with the help of models, sketching structures and planes.	1
2	Proximate analysis of coal and coke: Determination of moisture content, volatile matter and ash content of coal and coke.	3
3	Calorific value of fuel: Determination of calorific value of coal and coke by using bomb calorimeter.	3
4	Study of burners.	3

Sr. no	Laboratory experiences	CO
5	Properties of refractories: Determination of cold crushing strength and porosity of different refractories.	4

## II) Theory

### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO1: Familiar with material structure and properties			
1	<p><b>Introduction &amp; Nature of Solids :</b></p> <p>1.1 Importance of metallurgy, branches of metallurgy and scope under Indian condition.</p> <p>1.2 States of matter, types of structures, atomic structure of metals, number of atoms per unit cell, determination of atomic packing factor and density of metal, allotropy, miller indices for planes and directions.</p> <p>1.3 Imperfections in the crystals: Point, line and surface.</p> <p>1.4 Polymorphism</p> <p>1.5 Draw planes and directions for crystal structure (IKS learning).</p>	07	12
CO2: Compare cold working and hot working			
2	<p><b>Plastic Deformation:</b></p> <p>2.1 Grain structure, hot working, cold working, annealing, recrystallisation, recovery and grain growth.</p> <p>2.2 Structures of silicates, carbon, glasses</p> <p>2.3 Polymeric structure. Ceramics and their comparison with metals (Strength to weight ratio).</p> <p>2.4 Stress-Strain curve</p> <p>2.5 Draw stress-strain curve for mild steel. (IKS learning).</p>	06	09
CO3: Select particular fuel for given application.			
3	<p><b>Solid Fuels:</b></p> <p>3.1 Classifications of fuels, solid fuels classification, properties, advantages, limitation and application, Occurrence/origin of coal with reference to Indian conditions.</p> <p>3.2 Classifications of coal, peat, lignite, bituminous anthracite carbonization of coal-process, products and there uses, properties and uses of Metallurgical coke, bi-</p>	10	14

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	products of coke. Use of pulverized and briquetted coal or coke. 3.3 Proximate analysis of coal and coke. 3.4 Selection criteria of fuel for particular application. Combustion Mechanism of coke. 3.5 Applications of solid fuels (IKS learning).		

### Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO3: Select particular fuel for given application			
4	<b>Liquid, Gaseous Fuels and burners:</b> 4.1 Important properties and uses of various liquid fuels, resources of petroleum , classification of crude oil properties, refining of petroleum, products and uses petrol, diesel, kerosene and furnace oil. 4.2 Manufacture of gaseous fuels. Gaseous fuels composition. Properties and uses of Natural gas. Blast furnace gas, coke oven gas and liquefied petroleum gases, producer gas and LPG. 4.3 Study of types of flames, Burners required for combustion of liquid and gaseous fuels and their working principles, regenerators & recuperators. 4.4 Applications of liquid and gaseous fuels (IKS learning).	08	12
CO4: Understand appropriate use of refractory.			
5	<b>Refractory Materials:</b> 5.1 Classification of refractory, general properties such as refractoriness, porosity, chemical inertness, strength at elevated temperature. 5.2 Testing of refractories : PCE test. 5.3 Properties and Application of acidic refractories such as fireclay, silica, alumina etc. 5.4 Properties and Application of basic refractories such as magnesite, chromite. 5.5 Properties and application of neutral refractories such as carbon and special refractories like insulation materials, , zirconia, cer-wool 5.6 Application of refractory materials (IKS learning).	07	12
CO5: Understand working of various temperature measuring device.			

6	<b>Furnace Technology:</b> 6.1 Basic types of furnaces. 6.2 Refractories used in furnaces, different fuels used in furnaces. 6.3 Types of furnaces – Shaft, reverberatory, coke fired furnace. 6.4 Temperature measuring devices : Thermocouple – Seebeck effect, Thomson effect, Peltier effect. requirements of thermocouple, types of thermocouple, Pyrometers – resistance pyrometer, disappearing filament optical pyrometer, total radiation pyrometer. 6.4 Applications of Thermocouples and Pyrometers in Metallurgical Industries (IKS learning).	07	11
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No questions will be asked on IKS learning subtopics in any question papers.

### **G : List of Assignments under SLA – Not Applicable**

### **H : Specification table for setting question paper for semester end theory examination**

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	<b>Introduction &amp; Nature of Solids</b>	6	4	2	12	<b>MTH301-1</b>
I / 2	<b>Plastic Deformation</b>	3	3	3	09	<b>MTH301-2</b>
I / 3	<b>Solid Fuels</b>	4	4	6	14	<b>MTH301-3</b>
II / 4	<b>Liquid, Gaseous Fuels and burners</b>	4	4	4	12	<b>MTH301-3</b>
II / 5	<b>Refractory Materials</b>	2	6	4	12	<b>MTH301-4</b>
II / 6	<b>Furnace Technology</b>	3	4	4	11	<b>MTH301-5</b>
Total Marks					70	

### **I :-Assessment Criteria**

#### **i) Formative Assessment of Practical :-**

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05

<b>TOTAL</b>	<b>25</b>
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**ii) Summative Assessment of Practical : Not Applicable**

At the time of Practical Examination assessed for 25 marks as per following criteria:

<b>Sr. no</b>	<b>Criteria</b>	<b>Marks allotted</b>
1	Knowledge about the course	05
2	Preparedness for practical /Oral	05
3	Neat & complete Diagram/write up	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

**J) Instructional Methods:**

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration.

**K) Teaching and Learning resources:**

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts.

**L) Reference Books:**

S.N.	Name of Book	Author	Publication
1	Material Science and Metallurgy for Engineer	Dr. V.D. Kodgire	Everest Publishing House
2	Elements of Metallurgy	D. Swarup	Rastogi Publication, Meerut. ISBN-10: 8171338135 ISBN-13: 788171338139
3	Fuels & Refractories	Gilchrist J.D.	Perganson. ISBN-10:0080204295 ISBN13:9780080204291
4	Elements of Fuels, Refractories	O.P.Gupta	Oxford Press. ISBN-10:8174090886 ISBN13:9788174090881

**M) Learning Website & Software**

1. <http://nptel.ac.in/courses/112107144/10>
2. Youtube – crystal structure, solid fuels, liquid fuels, gaseous fuels, refractory materials.

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**COURSE ID :**  
**COURSE NAME :** Metallurgical Workshop Practice - II  
**COURSE CODE :** MTH102  
**COURSE ABBREVIATION :** HWMT-II

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	--	02
	Tutorial Learning	--	
	Laboratory Learning	04	
	SLH-Self Learning	--	
	NLH-Notional Learning	04	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	75
--	--	--	--	--	25	10	50@	20	--	--	

**(Total IKS Hrs for Sem. : 02 Hrs)**

**C:** Abbreviations: CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH- Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination  
 Note : ( TNR 11 font)

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

## **D. i) RATIONALE:-**

This course is mainly deals with Metal Joining Processes, Sheet Metal Forming Processes, and Fitting work. These processes are commonly used in Engineering Industry. A technician has to work in such environment with his peers, superiors and subordinates for a major part of his life. Therefore the emphasis on the practical work is needed for the primary experience of working in the team. Such working upgrades the mental and manual abilities / skills of using efficiently the basic tools in most of the industries. The students are required to supervise, maintain equipments, where he needs the knowledge of basic workshop skills such as welding, sheet metal and fitting processes.

## **ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME**

The aim of this course is to help the student to attain the following industry identified outcome through various learning experiences:

1. Demonstrate various welding processes, sheet metal forming processes and fitting work.

## **E. COURSE LEVEL LEARNING OUTCOMES (COS)**

MTH102-1 Select different types of welding, sheet metal forming and fitting tools for particular application.

MTH102-2 Prepare a job with welding, sheet metal forming and fitting process.

MTH102-3 Select a precise welding method for a given job.

MTH102-4 Practicing safety in workshop.

## **Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/pso) matrix**

[ Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analyses	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 To prepare the students to play the role of metallurgist in industries	PSO2 To create awareness about safety protocols to be followed in various metallurgical industries	PSO3 Develop sensitivity among the students about the environmental hazards caused due to the pollutants generated in metallurgical industries.
CO-1 Select different types of welding, sheet metal forming and fitting tools for particular application	3	2	2	2	2	2	3	3	1	2
CO-2 Prepare a job with welding, sheet metal forming and fitting process	3	1	3	3	1	2	3	2	2	2
CO-3 Select a precise welding method for a given job	3	2	2	2	2	2	3	3	1	2
CO-4 Practicing safety in workshop	3	2	2	1	2	2	2	2	3	3

## F. CONTENT:-

### I) Practical exercises

The following practical exercises shall be conducted in the *workshop* in practical sessions of batches of about 20- 22 students:



Sr. no.	Laboratory experiences	CO
	<b>Welding Shop -</b>	
1	Demonstration of various welding tools, joints of metals, type of welding machines.	1
2	Demonstration of arc welding techniques.	3
3	How to use current setting, earthing connection etc. and any one job involving Butt, Lap joint from the following pieces of work - Window frame, Grill, Sanitary window frame, Supporting frame, Stool frame, Bench frame etc. measure dimensions.	2
4	Safety precautions during welding.	4
	<b>Sheet Metal Shop -</b>	
5	Demonstration of different sheet metal tools and machines.	1
6	Demonstration of sheet metal operations like marking, sheet cutting, hemming, bending, edging, end curling, lancing, riveting etc.	2
7	One job involving sheet metal operations from Dustbin, Letter Box, Tray, Bucket etc.	2,4
	<b>Fitting Shop -</b>	
8	Demonstration of different fitting tools, drilling and power tools.	1
9	Demonstration of different operations like marking, filing, cutting, drilling, tapping etc.	2
10	One simple fitting job (Male Female assembly type involving practice of filing, drilling, cutting, tapping etc.)	2,4

## II) Theory - NA

### G : List of Assignments under SLA

NA

### H : Specification table for setting question paper for semester end theory examination

NA

### I :-Assessment Criteria

#### i) Formative Assessment of Practical :-

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05

Affective	Attendance/Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

**ii) Summative Assessment of Practical :**

At the time of Practical Examination assessed for 50 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Knowledge about the course	10
2	Preparedness for practical /Oral	10
3	Neat & complete Diagram/write up	10
4	Observations/Handling of instrument/ Communication/Presentation	10
5	Oral Based on Lab work and completion of task	10
<b>TOTAL</b>		<b>50</b>

**J) Instructional Methods:**

1. Demonstration during Practicals.
2. Workshop Record Book.

**K) Teaching and Learning resources:**

1. Shop Demonstration,
2. Hands on training on machine.

**L) Reference Books:**

S.N.	Name of Book	Author	Publication
1	Elements of workshop Technology – Volume I & II	S. K. Hajra Chaudhary, Bose, Roy	Media Promoters and Publishers limited
2	Elements of workshop Technology – Volume I & II	B.S. Raghuvanshi	Dhanpat Rai & Co.

**M) Learning Website & Software**

1. <http://nptel.ac.in>
2. You Tube – Welding, Sheet Metal, Fitting.

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**Government Polytechnic Kolhapur**  
**Learning and Assessment Scheme for Post S.S.C Diploma Courses**  
**Diploma In Metallurgical Engineering**

**Programme Code** : MT **With Effect From Academic Year** : 2023-24

**Duration Of Programme** : 6 Semester **Duration** : 16 WEEKS

**Semester** : Third **Scheme** : H

Sr No	Course Title	Abbreviation	Course Type	Level	Course Code	IKS Hrs per sem	Learning Scheme					Credits	Paper Duration (hrs.)	Assessment Scheme										Total Marks
							Actual Contact Hrs./Week			Self Learning (Term Work + Assignment)	Notional Learning Hrs/Week			Theory			Based on LL & TL				Based on Self Learning			
							CL	TL	LL					FA-TH	SA-TH	Total		Practical		SLA				
																Max	Min	Max	Min	Max	Min			
							Max	Min	Max	Min	Max			Min	Max	Min	Max	Min						
1	Metallurgical Thermodynamics	HMTH	DSC	3	MTH302	2	3	1	--	--	4	2	3	30	70	100	40	--	--	--	--	--	--	100
2	Metallurgical Analysis	HMA	DSC	3	MTH303	2	3	--	2	1	6	3	3	30	70	100	40	25	10	--	--	25	10	150
3	Foundry Technology - I	HFT-I	DSC	3	MTH304	2	3	--	2	1	6	3	3	30	70	100	40	--	--	25	10	25	10	150
4	Physical Metallurgy-I	HPHM-I	DSC	3	MTH305	2	3	--	2	1	6	3	3	30	70	100	40	--	--	25	10	25	10	150
5	Iron Making	HIM	DSC	3	MTH306	2	4	--	--	--	4	2	3	30	70	100	40	--	--	--	--	--	--	100
6	Mechanical Engineering	HME	DSC	3	MTH307	--	3	--	2	1	6	3	3	30	70	100	40	--	--	--	--	25	10	125
7	Auto CAD & 3-D Modelling	HATM	DSC	3	MTH308	--	1	--	4	1	6	3	--	--	--	--	--	--	--	50	20	25	10	75
8	Essence of Indian Constitution	HEIC	VEC	2	CCH205	4	1	--	--	1	2	1	--	--	--	--	--	--	--	--	--	50	20	50
<b>Total</b>							21	1	12	6	40	20				600		25		100		175		900

Abbreviations : CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System

Legends : @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination

- Note :
1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
  2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
  3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
  4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
  5. 1 credit is equivalent to 30 Notional hrs.
  6. \* Self learning hours shall not be reflected in the Time Table.

Course Category : Discipline Specific Course Core (DSC) : 7, Discipline Specific Elective (DSE) : 0, Value Education Course (VEC) : 1, Intern./Apprenti./Project./Community (INP) : 0, Ability Enhancement Course (AEC) : 0, Skill Enhancement Course (SEC) : 0, Generic Elective (GE) : 0

**COURSE ID :**  
**COURSE NAME** : Metallurgical Thermodynamics  
**COURSE CODE** : MTH 302  
**COURSE ABBREVIATION** : EMTH

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	03	02
	Tutorial Learning	01	
	Laboratory Learning	--	
	SLH-Self Learning	--	
	NLH- Notional Learning	04	

**B. ASSESSMENT SCHEME :**

PAPER DURATION IN HRS	THEORY				BASED ON LL & TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
03	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	100
	30	70	100	40	--	--	--	--	--	--	

**(Total IKS Hrs for Sem. : 02 Hrs)**

**C. Abbreviations:**

CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH- Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination Note : ( TNR 11 font)

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

## D. i) RATIONALE

The enormous metallurgical industries require enormous energy. The energy sources are limited. Therefore it is necessary to understand the principles underlying energy requirements in these industries so that minimum energy input may be achieved. The thermodynamics laws and their applications contribute towards this understanding. Basic terms such as energy, system, path and state properties, extensive and intensive properties, etc, are required to understand these thermodynamics laws and therefore covered in the present course.

### ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

Understand the fundamental principles underlying the metallurgical processes with reference to the temperature, pressure and energies.

## E. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to:

1. Use fundamentals and terms to understand thermodynamic principles
2. Use first law of thermodynamics and Hess's law to understand thermodynamic reactions
3. Use second law of thermodynamics to understand thermodynamic reactions
4. Use third law of thermodynamics, Roul't's law, Henry's law and sievert's law to understand thermodynamic reactions
5. Use Ellingham Diagram to predict the conditions under which an ore will be reduced to its metal.

### Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps) matrix

[ Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analyses	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 The role of metallurgist in industries	PSO2 To create awareness about safety protocols	PSO3 Develop sensitivity about the environmental hazards
CO1 - Use fundamentals and terms to understand thermodynamic principles	3	3	2	3	2	3	2	3	3	2
CO2 - Use first law of thermodynamics and Hess's law .	3	3	2	3	2	3	2	2	3	3

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 The role of metallurgist in industries	PSO2 To create awareness about safety protocols	PSO3 Develop sensitivity about the environmental hazards
CO3 - Use second law of thermodynamics	3	3	2	3	2	2	2	2	3	3
CO4 - Use third law of thermodynamics, Roul't's law, Henry's law and sievert's law.	3	3	2	3	2	2	2	2	2	2
CO5 - Use Ellingham Diagram.	3	3	2	2	2	2	2	3	3	2

## F. CONTENT:-

### I) Practical exercises – not applicable

Sr. No.	Topic / Subtopic	Hours	Marks
<b>Section I</b>			
CO1 - Use fundamentals and terms to understand thermodynamic principles			
1	<b>INTRODUCTION: SCOPE, CONCEPTS AND TERMS OF THERMODYNAMICS.</b> 1.1 Definition of thermodynamics, scope of metallurgical thermodynamics. 1.2 Energy- concepts , properties, forms, and sources of energy. 1.3 Thermodynamic system and its classification. State of systems 1.4 Extensive and intensive properties, equation of state. 1.5 Thermodynamic processes: isobaric, isothermal, isochoric, adiabatic and polytropic. Path and state functions, standard state Thermodynamic equilibrium, reversible and irreversible processes	10	16
CO2 - Use first law of thermodynamics and Hess's law to understand thermodynamic reactions			
2	<b>FIRST LAW OF THERMODYNAMICS</b> 2.1 Statements and formulation of first law of thermodynamics. 2.2 Internal energy as a state property. 2.3 Heat capacity: specific heat at constant volume and constant pressure, relation between Cp and Cv. 2.4 Enthalpy : definition and mathematical expression Thermo -chemistry: exothermic and endothermic reactions. 2.5 Hess's law – statement and significance. calculation based on Hess's law	10	16

<b>Section II</b>			
CO3 - Use second law of thermodynamics to understand thermodynamic reactions			
<b>3</b>	<b>SECOND LAW OF THERMODYNAMICS</b> 3.1 Statement and mathematical expression of second law of thermodynamics. 3.2 Concept of entropy, entropy change associated with thermodynamic processes. Calculation of entropy of the reaction. Significance of entropy. 3.3 Combine statement of first and second law, Concept of Free energy, Expression of Helmholtz free energy and Gibbs free energy. 3.4 Change in free energy as criteria for deciding nature of process. Fugacity and activity	<b>10</b>	<b>14</b>
CO4 - Use third law of thermodynamics, Rault's law, Henry's law and Sievert's law to understand thermodynamic reactions			
<b>4</b>	<b>THIRD LAW OF THERMODYNAMICS</b> 4.1 Statement of law and its significance. 4.2 Zeroth law of thermodynamics and its significance Phase rule Free energy-temperature relation and relative stability of phases. 4.3 Equilibrium constant for chemical reactions. 4.4 Ideal solution- activity coefficient, Rault's law and Henry's law, Sievert's law and its significance	<b>10</b>	<b>14</b>
CO5 - Use Ellingham Diagram to predict the conditions under which an ore will be reduced to its metal.			
<b>5</b>	<b>ELLINGHAM DIAGRAMS</b> 5.1 General form of Ellingham diagram. 5.2 Oxide and sulphides Ellingham diagrams. 5.3 Characteristics of Ellingham diagrams 5.4 Significance of diagrams- reduction and dissociation of oxides. 5.5 Intersecting lines on Ellingham diagrams.	<b>05</b>	<b>10</b>

No questions will be asked on IKS learning subtopics in any question papers.

### **G. List of Assignment Under SLA – Not Applicable**

### **H. Specification table for setting question paper for semester end theory examination**

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
1.	Introduction	6	6	4	16	1
2.	First law of thermodynamic	6	6	4	16	2
3.	Second law of thermod.	4	6	4	14	3
4.	Third law of thermod.	4	6	4	14	4
5.	Ellingham diagrams	2	4	4	10	5
<b>Total</b>		<b>22</b>	<b>28</b>	<b>20</b>	<b>70</b>	
Total Marks					70	

## **I. Assessment Criteria : Not Applicable**

## **J. Instructional Methods:**

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration.

## **K. Teaching and Learning resources:**

Chalk board, LCD presentations, Demonstrative charts.

## **L. Reference Books:**

<b>S.N.</b>	<b>Title</b>	<b>Author, Publisher, Edition and Year Of publication</b>
1.	Metallurgical thermodynamics	R.H. Tupkary, Tu publishers Nagpur, first edition, 1995
2.	Problems in metallurgical thermodynamics and kinetics	G. S. Upadhyaya, Publisher Pergamon, first edition

## **M. Learning Website & Software**

1. <https://www.nist.gov/thermodynamics>
2. <https://www.grc.nasa.gov/www/k-12/airplane/thermo.html>

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COURSE ID :  
**COURSE NAME** : METALLURGICAL ANALYSIS  
**COURSE CODE** : MTH303  
**COURSE ABBREVIATION** : HMA

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	03	03
	Tutorial Learning	--	
	Laboratory Learning	02	
	SLH-Self Learning	01	
	NLH- Notional Learning	06	

**B. ASSESSMENT SCHEME :**

PAPER DURATION IN HRS	THEORY				BASED ON LL & TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
03	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	150
	30	70	100	40	25	10	--	--	25	10	

**(Total IKS Hrs for Sem. : 02 Hrs)**

**C. Abbreviations:**

CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH- Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal

Online Examination Note : ( TNR 11 font)

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

### D. i) RATIONALE

The chemical analysis of metals and alloys determine their mechanical and physical properties. Application of chemical analysis technique to develop new alloys. In medium and large scale industries, instrumental techniques are common. In many small-scale industries, wet chemical analysis methods are commonly used. Thus a Metallurgical Engineer needs to be conversant with various techniques used for chemical analysis of metals and alloys.

### ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

Handling various instruments, apparatus for chemical analysis of metals and alloys.

### E. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to:

1. Use fundamentals of chemical analysis.
2. Practice gravimetric analysis for chemical analysis.
3. Practice volumetric analysis for chemical analysis.
4. Use various instrumental methods of chemical analysis.

### Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps) matrix

[ Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analyses	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 The role of metallurgist in industries	PSO2 To create awareness about safety protocols	PSO3 Develop sensitivity about the environmental hazards
CO-1 : Use fundamentals of chemical analysis	3	2	1	1	2	--	3	3	3	2
CO-2 : Practice gravimetric analysis for chemical analysis.	3	2	1	1	2	--	3	3	3	2
CO-3 : Practice volumetric analysis for chemical analysis.	3	2	1	1	2	--	3	3	3	2
CO-4 : Use various instrumental methods of chemical analysis	3	2	1	1	2	--	3	3	2	1

## F. CONTENT:-

### I) Practical exercises –

The following practical exercises shall be conducted in the *Laboratory* in practical sessions of batches of about 20- 22 students:

Sr. no	Laboratory experiences	CO
1	Introduction of the equipments used in the metallurgical analysis laboratory	1
2	Preparation of standard and dilute solution	1
3	Determination of silicon in steel by using gravimetric analysis method	2
4	Determination of phosphorous in steel by using gravimetric analysis method	2
5	Determination of manganese in steel by volumetric analysis method	3
6	Determination of carbon in steel by using strohlein apparatus	3
7	Study of atomic emission spectrometer	4

### II) Theory

#### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO1: Use fundamentals of chemical analysis.			
1	<b>Introduction :</b> 1.1 Sampling methods of metals & alloys, 1.2 Equipments used in chemical laboratory, 1.3 Preparation of standard and dilute solution, 1.4 Comparison between Qualitative & Quantitative analysis, 1.5 Accuracy, precision, error, presentation of analysis, observation & computation. IKS – History of chemical analysis.	10	14
CO2: Practice gravimetric analysis for chemical analysis.			
2	<b>Gravimetric analysis :</b> 2.1 Chemical balances & their precision, 2.2 Solubility product, 2.3 Requirement of precipitated form, 2.4 Condition of Precipitation and Masking, 2.5 Filtration, Drying & Igniting of Precipitate, 2.6 Weighing & requirement of weigh form, 2.7 Determination of weight % of element from precipitate, 2.8 Merits & Demerits of methods,	12	20

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	2.9 Simple examples on Gravimetric analysis.		

**Section –II**

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO3 : Practice volumetric analysis for chemical analysis.			
3	<b>Volumetric Analysis :</b> 3.1 Analysis, Titration, 3.2 Standardization of solutions, 3.3 Use of Indicators & their properties, 3.4 Requirement of volumetric reaction, 3.5 Acid & alkalis, examples, 3.6 Titration of oxidizing & reducing solutions, 3.7 Advantages & Disadvantages of these method. 3.8 Colorimetry	12	20
CO4 : Use various instrumental methods for chemical analysis.			
4	<b>Instrumental Methods :</b> 4.1 Determination of carbon & sulphur by combustion method, 4.2 Study of strohlein apparatus for determination of C in steel 4.2 Electro-gravimetric analysis, 4.3 Photo-electric calorimeter/Spectrometer, 4.4 Principle of spectroscopic analysis, 4.5 Introduction to Emission & atomic absorption spectrometer, 4.6 Advantage of these methods.	11	16

\*\* No questions will be asked on IKS learning subtopics in any question papers.

**G. List of Assignments under SLA –**

Sr.No.	List of Assignments under SLA	Hrs. Alloted
1	Apply coning and quartering as a sampling method	2
2	Practice use of various equipments in chemical laboratory	2
3	Use steps of gravimetric analysis for any alloy.	2
4	Use steps of volumetric analysis for any alloy.	2
5	Compare volumetric analysis with gravimetric analysis.	2

6	Practice various instrumental methods for chemical analysis of different alloys.	3
7	Determine % carbon in steel by strohlein apparatus	2

### H. Specification table for setting question paper for semester end theory examination

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Introduction	6	6	2	14	1
I / 2	Gravimetric analysis	6	10	4	20	2
II / 3	Volumetric analysis	4	10	6	20	3
II / 4	Instrumental Methods	4	8	4	16	4
Total Marks					70	

### I. Assessment Criteria

#### i) Formative Assessment of Practical :-

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

#### ii) Summative Assessment of Practical : Not Applicable

At the time of Practical Examination assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Knowledge about the course	05
2	Preparedness for practical /Oral	05
3	Neat & complete Diagram/write up	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

### J. Instructional Methods:

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration.

**K. Teaching and Learning resources:**

Chalk board, LCD presentations, Demonstrative charts.

**L. Reference Books:**

S.N.	Name of Book	Author	Publication
1	Quantitative Analysis	V. Alexeyev	MIR Publishers
2	Text Book Of Metallurgical Analysis	B.C. Agarwal & S.P. Jain	Khanna Publisher, N. Delhi

**M. Learning Website & Software**

[https://en.wikipedia.org/wiki/Analytical\\_chemistry](https://en.wikipedia.org/wiki/Analytical_chemistry)

[https://en.wikipedia.org/wiki/Wet\\_chemistry](https://en.wikipedia.org/wiki/Wet_chemistry)

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**COURSE ID :**  
**COURSE NAME :** FOUNDRY TECHNOLOGY - I  
**COURSE CODE :** MTH 304  
**COURSE ABBREVIATION :** HFT- I

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	3	3
	Tutorial Learning	--	
	Laboratory Learning	2	
	SLH-Self Learning	1	
	NLH- Notional Learning	6	

**B. ASSESSMENT SCHEME:**

PAPER DURATION IN HRS	THEORY				BASED ON LL & TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
03	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	150
	30	70	100	40	--	--	25	10	25	10	

**(Total IKS Hrs for Sem. : 02 Hrs)**

**C. Abbreviations:**

CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH- Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination Note : ( TNR 11 font)

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

**D. i) RATIONALE**

To enable Metallurgy engineer to understand the concept of manufacturing processes with reference to Metal industry. This course deals with the fundamentals of foundry processes. It covers the tooling, details of the manufacturing steps as well as various standard types used to suit the requirement of casting.

**ii)INDUSTRY / EMPLOYER EXPECTED OUTCOME**

Familiarize with the entire manufacturing process of casting.

**E. COURSE LEVEL LEARNING OUTCOMES(COS)**

1. Understand the sections in foundry cores, molding, melting.
2. Use various pattern, and pattern allowances
3. Prepare mold and, identify types of cores.
4. Use other molding and casting processes.
5. Use of miscellaneous molding processes.
6. Use of various types fettling tools.

**Competency, course outcomes and programme outcomes /programme specific outcomes(cp-co-po) matrix:**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

Competency and Cos	Programme Outcomes POs and PSOs									PSO3 Develop sensitivity about the environmental hazards
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design/ Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 The role of metallurgist in industries	PSO2 To create awareness about safety protocols	
CO1-Understand the sections in foundry	3	3	2	2	2	2	2	3	3	2
CO2-Use various Pattern, and pattern allowances	3	3	2	3	2	3	2	2	3	3
CO3-Prepare the mold and identify types of cores	3	3	2	3	2	2	2	2	3	3
CO4-Select and use various sand moulding processes	3	3	2	2	3	2	2	2	2	2



Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design/ Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 The role of metallurgist in industries	PSO2 To create awareness about safety protocols	PSO3 Develop sensitivity about the environmental hazards
CO5-Select and use various permanent moulding processes	3	3	2	2	2	2	2	3	3	2
CO6-Use various types of fettling tools	3	3	2	2	3	2	2	2	3	3

## F. CONTENT

### I) Practical exercises –

The following practical exercises shall be conducted in the *Laboratory* in practical sessions of batches of about 20- 22 students:

Sr. no	Laboratory experiences	CO
1	Study of various patterns, match plates etc.	2
2	Determination of various green sand properties	3
3	Producing Green sand mold.	3
4	Prepare Shell mold and core	4
6	Casting aluminum in gravity die casting and centrifugal die casting	5
7	Separation of casting from mould and cleaning of casting	6

### II) Theory -

#### Section I

Sr. no	Topics/ Subtopics	Learning (Hours)	Classroom learning Evaluation (Marks)
<i>Course Outcome MTH 304-1 Understand the sections in foundry cores, molding, melting</i>			
1.	<b>Introduction:</b> What is Foundry Types of foundries Different Section in Foundry Foundry Layout Importance of foundry technology Casting v/s other manufacturing process	04	4

Sr. no	Topics/ Subtopics	Learning (Hours)	Classroom learning Evaluation (Marks)
	Advantages & limitations of foundry process <b>*IKS</b> References of the castings found in excavation of ancient sites. Manufacturing of canons during middle Ages.		
<i>Course Outcome MTH 304-2- Use of Various Pattern, and pattern allowances</i>			
2.	<p><b>Pattern making:</b></p> <p>I. Pattern material: Function of pattern, Material for pattern and core boxes such as metal, wood, wax, plaster, plastic, thermocol etc.</p> <p>II. Types of patterns: Loose, match plate, one piece (solid) pattern, split pattern, skeleton, segmental pattern, Sweep pattern, Comparison of various patterns</p> <p>III. Pattern design and construction Pattern allowances, pattern joints, parting line selection, loose pieces, colour codes for pattern.</p> <p><b>Core Making:</b> Function of core, types of core boxes, Types of Core Print, calculation of core print support</p>	08	14
<i>Course Outcome MTH 304-3- prepare the mold and, identify types of cores</i>			
3	<p><b>Sand Molding Processes:</b> Requirements of moulding sand, types of sands.</p> <p>I. Green Sand Moulding</p> <ol style="list-style-type: none"> <li>a. Ingredients of moulding sands</li> <li>b. Testing of Molding sand.</li> <li>c. Advantages and disadvantages of green sand moulding</li> <li>d. Venting</li> <li>e. Dry sand Moulding</li> </ol> <p>II. Core Making Characteristics of core sand, Types of cores,</p> <p>III. Additives in moulding and core making sands</p>	08	14

### Section II

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
<i>Course Outcome MTH 304-4-Select and use various sand moulding processes</i>			

4	<b>Other sand molding and Core Making processes:</b> CO <sub>2</sub> -Sodium Silicate process Shell sand process Cold box process (Principle/ ingredients, pattern and equipment, casting size/alloy range, application, advantages, limitations)	07	10
<i>Course Outcome MTH 304-5-Select and use various permanent moulding processes</i>			
5.	<b>Permanent Mold Casting</b> I.Die Casting- Gravity, High pressure- Hot chamber, Cold Chamber, Low pressure II.Centrifugal Casting-Types, advantages and disadvantages III.Continuous casting (Principle/equipment's, casting size alloy range, application, and limitations.)	07	10
<i>Course Outcome MTH 304-5- Use of miscellaneous molding processes.</i>			
6	<b>Miscellaneous Molding Process:</b> Plaster molding, ceramic molding, slush casting, Floor molding, Investment Casting	06	10
<i>Course Outcome MTH 304-6 Use of various types fettling tools</i>			
9	<b>Finishing operations.</b> Fettling, cleaning, finishing, Shotblasting, tumbling, sand blasting, grinding, chipping, cutting.	05	08
Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.			

No questions will be asked on IKS learning subtopics in any question papers.

### G. List of Assignments under SLA

1. Visit to any small foundry near you and find out the layout of the foundry.
2. Prepare a thermocoal pattern by providing all the allowances.
3. Prepare simple green sand mould by using any pattern available to your and make a video.
4. Operate a shell making machine and explain its advantages.
5. Produce an aluminum casting by using centrifugal mould.
6. Visit any industrial area nearby you and make a survey of the waste sand dumping site.
7. Find out the safety issues in the fettling shop of the foundry.
8. Make list of the casting defects observed due the moulding parameters.

### H. Specification table for setting question paper for semester end theory examination

**Specification Table for setting question paper for semester end theory paper**

Sr no	Topic	Distribution of Marks			Course Outcome	
		Remember	Understand	Application		
1	Introduction	04	-	-	04	1
2	Pattern Making	06	04	04	14	2
3	Sand Molding	06	04	04	14	3
4	Other sand molding processes	04	04	02	10	4
5	Metal Mold Casting	04	04	02	10	5
6	Miscellaneous Molding Process	04	04	02	10	5
7	Finishing operations	-	04	04	08	6
	<b>Total</b>	28	24	18	70	

**I. Assessment Criteria**

**ii) Summative Assessment of Practical:**

At the time of Practical Examination assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Knowledge about the course	05
2	Preparedness for practical /Oral	05
3	Neat & complete Diagram/write up	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

**J. Instructional Methods:**

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration.

**K. Teaching and Learning Resources :**

Chalk board, LCD presentation, Self-Learning Online Tutorials.

**L. Text-Books:**

Author	Title	Publisher
P.L.Jain	Principles of Foundry Technology	Mcgraw Hill Education(India)

T. V. Ramana Rao	Metal Casting Principle and Practice	New Age International (P) Ltd, Publishers.
Richard W. Heine, Carl R Loper, Philip C Rosenthal	Principle of Metal Casting	Tata MacGraw Hill Publishing Comp.

**Reference Books:**

<b>Author</b>	<b>Title</b>	<b>Publisher</b>
-	Metal hand book no-6	American Soc. Of Metals

**M. Learning Website & Software**

1. <https://nkn.gov.in/en/services-1t-en/community-services-1t-en/e-foundry-1t-en>
2. <https://www.indianfoundry.org/>
3. <https://www.afsinc.org/>

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**COURSE ID :**  
**COURSE NAME :** PHYSICAL METALLURGY - I  
**COURSE CODE :** MTH305  
**COURSE ABBREVIATION :** HPHM-I

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	03	03
	Tutorial Learning	--	
	Laboratory Learning	02	
SLH-Self Learning	01		
NLH-Notional Learning	06		

**B. ASSESSMENT SCHEME :**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
	FA-TH	SA-TH	TOTAL		Practical				MAX	MIN	
03	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	150
	30	70	100	40	--	--	25	10	25	10	

**(Total IKS Hrs for Sem. : 02 Hrs)**

**C. Abbreviations:**

CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination  
 Note : ( TNR 11 font)

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities.

## D. i) RATIONALE

This course deals with solidification of metals and alloys. Various types of equilibrium diagrams and their relationship between microstructure and properties of metals and alloys are studied in course. It also includes detail study of Iron-Iron Carbide Equilibrium Diagram which is very much important for study of various types of steels and cast iron. It also deals with metallography concept. The study of these concepts of physical metallurgy will develop skills in students to identify and interpret microstructures, grades and properties of steel, cast iron and non ferrous metals. Also the emphasis is laid on the properties and application of common metals and alloys.

## ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

Identify and interpret microstructures and properties of steel and cast iron.

## E. COURSE LEVEL LEARNING OUTCOMES (COS)

1. Understand the concept of solidification.
2. Plot various binary equilibrium diagrams and calculate amount of phases using Lever Rule.
3. Draw Iron Carbon Equilibrium Diagram.
4. Select the cast iron for particular application.
5. Prepare specimen for micro examination and operate Metallurgical Microscope for microscopic examination.
6. Select appropriate non-ferrous alloys for given applications.

## Competency, course outcomes and programme outcomes/programme specific outcomes

### (cp-co-po/ps) matrix

[ Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 The role of metallurgist in industries	PSO2 To create awareness about safety protocols	PSO3 Develop sensitivity about the environmental hazards
CO-1 : Understand the concept of solidification.	3	1	2	1	--	--	2	1	1	1
CO-2 : Plot various binary equilibrium diagrams and calculate amount of phases using Lever Rule.	3	--	--	1	--	1	1	2	--	--
CO-3 : Draw Iron Carbon Equilibrium	3	--	--	--	--	--	1	1	--	--

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 The role of metallurgist in industries	PSO2 To create awareness about safety protocols	PSO3 Develop sensitivity about the environmental hazards
Diagram.										
CO-4 : Select the cast iron for particular application.	3	--	1	1	2	2	2	3	1	1
CO-5 : Prepare specimen for micro examination and operate Metallurgical Microscope for microscopic examination	3	--	1	3	1	1	2	3	2	1
CO-6 : Select appropriate non-ferrous alloys for given applications.	3	1	2	2	3	2	2	3	1	1

## F. CONTENT:-

### I) Practical exercises

The following practical exercises shall be conducted in the *Laboratory* in practical sessions of batches of about 20- 22 students:

Sr. no	Laboratory experiences	CO
1	Draw Iron-Iron Carbide Equilibrium Diagram	2,3
2	Draw metallurgical microscope and explain its working.	5
3	Prepare micro-specimen for metallographic observation.	5
4	Prepare mounting specimen for microscopic examination.	5
5	Prepare etching reagent and use that on polished sample for microscopic examination.	5
6	Draw microstructures of various steels by microscopic observation.	5
7	Draw microstructures of various cast iron by microscopic observation.	4,5



Sr. no	Laboratory experiences	CO
8	Draw microstructures of various non-ferrous metals and alloys by microscopic observation.	6

## II) Theory

### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO1: Understand the concept of solidification			
1	<b>Solidification of Metals :</b> 1.1 Concept of solidification - Transformation of liquid in to solid. 1.2 Nucleation and growth, dendrite formation. 1.3 Grain and grain boundaries. 1.4 Cooling curves for pure metals and binary alloys. 1.5 Solid solutions - Substitutional solid solution, Interstitial solid solution. 1.6 Hume- Rothery's rules for formation of solid solution.	06	10
CO2: Plot various binary equilibrium diagrams and calculate amount of phases using Lever Rule			
2	<b>Equilibrium Diagram :</b> 2.1 Definition of phase. 2.2 Gibbs's phase rule and its application 2.3 Polymorphism 2.4 Equilibrium diagrams: Various reactions - eutectoid, eutectic and peritectic reactions. 2.5 Lever Rule: Its derivation and application to equilibrium diagram 2.6 Identification of microstructural changes with respect to equilibrium diagram.	06	08
CO3: Draw Iron Carbon Equilibrium Diagram			
3	<b>Iron Carbon Equilibrium Diagram</b> 3.1 Neat sketch of Iron Carbon Equilibrium Diagram. 3.2 Allotropic transformation of iron. 3.3 Reactions in Iron-Carbon Equilibrium Diagram. 3.4 Critical temperatures in Iron- carbon diagram. 3.5 Classifications of plain carbon steel with reference to iron carbon diagram. 3.6 Solidification and changes in microstructure with reference to Iron-Iron Carbide Equilibrium Diagram. 3.7 Microstructure and properties of plain carbon steel.	10	16

## Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO4 : Select the cast iron for particular application			
4	<p><b>Cast Iron</b></p> <p>4.1 Cast iron: Definition, classification of cast iron, graphitization in cast iron, morphology of graphite.</p> <p>4.2 Malleable Cast Iron: Production – Malleablizing heat treatment, microstructure, properties and applications.</p> <p>4.2 Gray Cast Iron: Production, forms of graphite- A, B, C, D &amp; E, flake size of graphite, ASTM size, relationship between microstructure &amp; mechanical properties, composition, microstructure, properties and applications of gray cast iron.</p> <p>4.3 Nodular Cast Iron: Production, Composition, microstructure, properties and applications of nodular cast iron.</p> <p>4.4 Types of cast iron: Composition, microstructure, properties and applications of - White CI, chilled CI, high duty CI (Meehanite), alloy CI.</p>	06	10
CO5 : Prepare specimen for micro examination and operate Metallurgical Microscope for microscopic examination			
5	<p><b>Microscopic Examination :</b></p> <p>5.1 Microscopy, specimen preparation, mounting of specimen, mechanical and electrolytic polishing, etching reagents and etching techniques, principle and working of optical metallurgical microscope.</p> <p>5.2 ASTM grain size number and method for measurement of grain size.</p>	05	08
CO6 : Select appropriate non-ferrous alloys for given applications			
6	<p><b>Metallurgy Of Nonferrous Alloys</b></p> <p>6.1 <b>Brasses</b>- Cu-Zn equilibrium diagram, Composition, mechanical properties and application of commonly used industrial brasses – cap copper, gilding metals, cartridge brass, admiralty brass, muntz metal, naval brass, leaded brass, high tensile brasses, brazing brass, Defects - orange peel, season cracking, dezincification.</p> <p>6.2 <b>Bronzes</b>: Cu-Sn equilibrium diagram, mechanical properties and application of commonly used industrial bronzes, composition and properties of gun metal and phosphor bronze.</p> <p>6.3 <b>Al alloys</b>: Properties, Al-Si alloy - equilibrium diagram, modification, compositions, LM series, Al-Cu alloy system, Duralumin.</p> <p>6.4 <b>Bearing metals</b>: Classification of bearing metals,</p>	12	18

	requirements of good bearing metal, composition, microstructure, mechanical properties and applications of lead base and tin base bearing metals, effects of copper addition on the properties of bearing metals.		
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No questions will be asked on IKS learning subtopics in any question papers.

### G. List of Assignments under SLA –

Sr.No.	List of Assignments under SLA	Hrs. Alloted
1	Explain concept of solidification of metal	3
2	Use lever rule to any equilibrium diagram	3
3	Prepare malleable cast iron	2
4	Prepare nodular cast iron	2
5	Draw changes in microstructure with % of carbon and temperature in Iron-Iron Carbide Equilibrium Diagram.	3
6	Draw microstructure of various bearing metals.	2

### H. Specification table for setting question paper for semester end theory examination

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Solidification of Metals	4	6	--	10	1
I / 2	Equilibrium Diagram	2	3	3	08	2
I / 3	Iron Carbon Equilibrium Diagram	4	8	4	16	3
II / 4	Cast Iron	2	4	4	10	4
II / 5	Microscopic Examination	2	2	4	08	5
II / 6	Metallurgy Of Nonferrous Alloys	6	6	6	18	6
Total Marks					70	

### I. Assessment Criteria

#### i) Formative Assessment of Practical :-

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05

Affective	Attendance/Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

**ii) Summative Assessment of Practical :**

At the time of Practical Examination assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Knowledge about the course	05
2	Preparedness for practical /Oral	05
3	Neat & complete Diagram/write up	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

**J. Instructional Methods:**

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration.
4. Laboratory experiences and laboratory interactive sessions.
5. Regular home assignment.

**K. Teaching and Learning resources:**

Chalk board, LCD presentations, Demonstrative charts.

**L. Reference Books:**

S.N.	Name of Book	Author	Publication
1	Material Science and Metallurgy for Engineer	Dr. V.D. Kodgire	Everest Publishing House
2	Introduction to Physical Metallurgy	Sidney H. Avner	Tata McGraw-Hill

**M. Learning Website & Software**

1. <https://nptel.ac.in/courses/113105023>
2. [https://www.vssut.ac.in/lecture\\_notes/MME%20201%20\\_%20INTRODUCTION%20TO%20PHYSICAL%20METALLURGY.pdf](https://www.vssut.ac.in/lecture_notes/MME%20201%20_%20INTRODUCTION%20TO%20PHYSICAL%20METALLURGY.pdf)
3. <https://archive.nptel.ac.in/courses/113/105/113105024/>

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**COURSE ID :**  
**COURSE NAME :** IRON MAKING  
**COURSE CODE :** MTH306  
**COURSE ABBREVIATION :** HIM

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	02
	Tutorial Learning	--	
	Laboratory Learning	--	
SLH-Self Learning	--		
NLH-Notional Learning	04		

**B. ASSESSMENT SCHEME :**

PAPER DURATION IN HRS	THEORY				BASED ON LL & TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
03	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	100
	30	70	100	40	--	--	--	--	--	--	

**(Total IKS Hrs for Sem. : 02 Hrs)**

**C. Abbreviations:**

CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination  
 Note : ( TNR 11 font)

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

### D. i) RATIONALE

The extraction of ferrous metals from their ores is the stepping-stone in understanding the metallurgical courses. This course deals with the important extraction techniques involved in Ferrous Metallurgy. Emphasis is given on study of blast furnace, pig iron production and sponge iron production.

### ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

Understand the working of blast furnace and chemical reactions occur in blast furnace.

### E. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to:

1. Study the development of iron making.
2. Notify the roles of charging materials and importance of agglomeration.
3. Draw neat sketch of blast furnace.
4. Understand the working and various reactions of Blast Furnace.
5. Suggest the suitable remedies for varies irregularities in Blast Furnace and modern practices in Blast Furnace.
6. Explain production of sponge iron.

### Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps) matrix

[ Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analyses	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 The role of metallurgist in industries	PSO2 To create awareness about safety protocols	PSO3 Develop sensitivity about the environmental hazards
CO-1 : 1. Study the development of iron making	3	1	1	2	3	1	2	1	1	3
CO-2 : Notify the roles of charging materials and importance of agglomeration	3	--	2	2	1	1	1	2	1	--
CO-3 : Draw neat sketch of blast furnace.	3	--	--	--	--	1	--	1	--	--
CO-4 : Understand the working and various reactions of Blast Furnace.	3	--	--	--	2	1	1	1	1	2

CO-5 : Suggest the suitable remedies for varies irregularities in Blast Furnace and modern practices in Blast Furnace.	3	3	3	2	2	2	2	3	3	2
CO-6 : Explain production of sponge iron.	3	2	2	2	1	1	1	2	1	1

## F. CONTENT:-

### I) Practical exercises – Not Application

### II) Theory

#### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO1: Study the development of iron making			
1	<b>Introduction:</b> 1.1 Ancient Iron Making Processes. 1.2 Development in Iron Making. 1.3 Modern Iron Making. 1.4 Alternative methods of Iron Production. 1.5 Introduction to Integrated Steel Plant. 1.6 Major Steel Plants in India. IKS – Ancient Iron Making in India.	6	8
CO2: Notify the roles of charging materials and importance of agglomeration			
2	<b>Burden Preparation for Blast Furnace:</b> 2.1 <b>Iron Ores</b> - Types. 2.2 <b>Fuel</b> : Coke- Properties, functions. 2.3 <b>Fluxes</b> – Types, functions. 2.4 <b>Beneficiation of Iron ore</b> - Purpose, methods of beneficiation. 2.5 <b>Agglomeration</b> – Purpose, classification. a. <b>Sintering</b> - Principle, process : Dwight-Lloyed sintering machine, advantages. b. <b>Pelletisation</b> - Principle, process : disc pelletiser, drum pelletiser, advantages. 2.6 Burden qualities.	10	12

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	2.7 <b>Burden Distribution</b> - Introduction		
CO3: Draw neat sketch of blast furnace			
3	<b>Blast Furnace Construction :</b> 3.1 Constructional details and functions of Blast Furnace parts : a. Stack b. Bosh c. Hearth d. Bustle pipe e. Tuyers 3.2 Refractories used in Blast furnace. 3.3 Burden charging systems. 3.4 <b>Gas Cleaning System</b> - Functions a. Dust catcher – Working b. Scrubbers - Working c. Electrostatic Precipitator – Working. 3.5 <b>Hot blast stove</b> - Construction, refractories used, working.	14	14

### Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO4: Understand the working and various reactions of Blast Furnace			
4	<b>Blast Furnace Operation :</b> 4.1 Working principle of blast furnace. 4.2 Operations of blast furnace. 4.3 Chemical reactions at different zones in Blast Furnace, temperature profile in Blast Furnace. 4.4 Blast Furnace products— Composition of pig iron, slag and gases. 4.5 Behavior of S, P, Zn and alkali metals. 4.6 Average quantity of charge required per ton of pig iron production.	10	12
CO5: Suggest the suitable remedies for varies irregularities in Blast Furnace and modern practices in Blast Furnace.			
	<b>Irregularities &amp; Modern Trends in Blast Furnace</b> 5.1 Irregularities in Blast Furnace operation and their remedies a. Hanging, b. Scaffolding,		



5	c. Chilled Hearth, d. Pillaring, e. Breakout, f. Channeling. 5.2 Modern trends in Blast Furnace practice : a. High top pressure, b. Oxygen Enrichment of blast, c. Humidification of blast, d. Higher blast temperature.	10	12
<b>CO6: Explain the alternative route of iron production</b>			
6	<b>Sponge Iron Production</b> 6.1 Necessity of alternative route of iron production 6.2 Sponge Iron – Definition, contents. 6.3 Physical chemistry of Sponge Iron processes. 6.4 Sponge Iron making processes– a. HyL Process, b. Midrex Process, c. Rotary Kiln Process. 6.5 Sponge Iron Making in India 6.6 Uses of Sponge Iron. IKS – Other alternative route of iron production.	10	12

\*\* No questions will be asked on IKS learning subtopics in any question papers.

### G. List of Assignments under SLA – Not Applicable

### H. Specification table for setting question paper for semester end theory examination

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Introduction	3	3	2	08	1
I / 2	Burden Preparation for Blast Furnace	4	4	4	12	2
I / 3	Blast Furnace Construction	6	6	2	14	3
II / 4	Blast Furnace Operation	4	6	2	12	4
II / 5	Irregularities & Modern Trends in Blast Furnace	4	6	2	12	5
II / 6	Sponge Iron Production	4	4	4	12	6
Total Marks					70	

### I. Assessment Criteria

i) **Formative Assessment of Practical :- Not Application**

ii) **Summative Assessment of Practical : Not Applicable**

**J. Instructional Methods:**

1. Lectures cum Demonstrations,
2. Class room practices,
3. Use of projector and soft material for demonstration.

**K. Teaching and Learning resources:**

Chalk board, LCD presentations, Demonstrative charts.

**L. Reference Books:**

S.N.	Name of Book	Author	Publication
1	An Introduction to Modern Iron Making	Dr. R.H. Tupkary, V.R. Tupkary.	Khanna Publication, 4 <sup>th</sup> Edition, 2016
2	An Introduction to Modern Steel Making	Dr. R.H. Tupkary, V.R. Tupkary.	Khanna Publication, 7 <sup>th</sup> Edition, 2017
3	General Metallurgy	Boris Kuznestsov,	Mir Publishers, Moscow, 2 <sup>nd</sup> Edition, 1979

**M. Learning Website & Software**

1. <https://nptel.ac.in/courses/113/108/113108079/>
2. <https://www.youtube.com/watch?v=ysLqUDa5GEA>
3. <https://www.youtube.com/watch?v=hBqhGHfzQFQ>

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**COURSE ID** :  
**COURSE NAME** : **Mechanical Engineering**  
**COURSE CODE** : **MTH 307**  
**COURSE ABBREVIATION** : **HME**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	03	03
	Tutorial Learning	--	
	Laboratory Learning	02	
	SLH-Self Learning	01	
	NLH- Notional Learning	06	

**B. ASSESSMENT SCHEME :**

PAPER DURATION IN HRS	THEORY				BASED ON LL & TL				BASED ON SLA		TOTAL
	FA-TH	SA-TH	TOTAL		Practical				MAX	MIN	
03	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	125
	30	70	100	40	--	--	--	--	25	10	

**(Total IKS Hrs for Sem. : 00 Hrs)**

**C. Abbreviations:**

CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH- Notional Learning Hours, FA - Formative Assessment, SA - Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment  
 Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination Note : ( TNR 11 font)

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given.

### D. i) RATIONALE

Metallurgy Engineers often come across various engg. Components for selection of materials and manufacturing processes .They are required to know basic principles of working of different machines and equipments. They are also required to look after the maintenance of the machines. He should know the reading of pattern drawings, various symbols and assembly and details. The basic knowledge of I.C.Engines, Heat Transfer and Fluid mechanics is essential. The understanding of Industrial hydraulics and pneumatics is essential for Industrial automation.

### ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

Understand the working of Engines, pumps & compressors and its maintenance. The working of hydraulics and pneumatics systems.

### E. COURSE LEVEL LEARNING OUTCOMES (COS)

The students will be able:

1. To understand working principles of heat transfer, types of section and orthographic view
2. To know the basic knowledge about the I.C. Engines.
3. To know basic knowledge of 3d printing and robotics
4. To know the basics of power transmission devices
5. To understand the working principal of compressor and pumps etc.
6. To understand the properties of fluids and to get introduction to Industrial Hydraulics Conduct all the tests and calculate the values of different properties.

### Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps) matrix

[ Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0”

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Play the role of metallurgist in industries	PSO2 Awareness about safety protocols	PSO3 Develop sensitivity among the students about the environmental hazards
CO1 - To understand working principles of heat transfer, Types of section and orthographic view	2	1	2	3	1	1	1	2	2	3

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Play the role of metallurgist in industries	PSO2 Awareness about safety protocols	PSO3 Develop sensitivity among the students about the environmental hazards
CO2 - To know the basic knowledge about the I.C. Engines.	2	1	2	1	1	1	3	2	2	2
CO3 - To know basic knowledge of 3d printing and robotics	2	1	2	1	1	1	2	1	2	1
CO4 - To know the basics of power transmission devices	1	2	1	2	1	1	2	2	1	1
<b>CO5 - To understand the working principal of compressor and pumps etc.</b>	2	1	2	2	1	2	1	3	2	1
CO6 - To understand the properties of fluids. To get introduction to Industrial Hydraulics Conduct all the tests and calculate the values of different properties.	1	2	1	3	1	2	1	1	2	1

## F. CONTENT:

### I) Practical exercises –

The following practical exercises shall be conducted in the *Laboratory* in practical sessions of batches of about 20- 22 students:

Sr.No.	Laboratory experiences	course outcome
1	Advanced Sectional Orthographic View	CO1
2	Types Of Section	CO1
3	I.C. Engine	CO2
4	Heat Transfer	CO1
5	3d printing & Robotics	CO3
6	Power transmission devices	CO4
7	Pumps and Compressors	CO5
8	Introduction to Industrial Hydraulics and Pneumatics	CO6

## II) Theory

### Section I

Sr. No.	Topics Subtopics	Teaching (Hours)	Marks
CO1 : To understand working principles of heat transfer, Types of section and orthographic view			
1	<b>Advance Sectional Orthographic view</b> Crankshaft, Engine body, camshaft, flanged coupling, pump body.	06	08
CO1 : To understand working principles of heat transfer, Types of section and orthographic view			
2	<b>Types Of Sections</b> Conventional, revolved, removed, partial, offset, flywheel, pulley, gear.	02	04
CO2 : To know the basic knowledge about the I.C. Engines			
3	<b>I.C. Engines</b> Classification, Different parts, Materials used, Working principle of two stroke, four stroke, Petrol, Diesel engines and difference between them.	06	10
CO1 : To understand working principles of heat transfer, Types of section and orthographic view			
4	<b>Heat Transfer</b> Modes of heat transfer, Calculations of heat transfer for given condition, Conduction, Convection and Radiation, Insulation, Types of insulation, Applications related to Metallurgy, Concept of Black body. (Simple Numericals)	08	12

### Section –II

Sr. No.	Topics Subtopics	Teaching (Hours)	Marks
CO3 : To know basic knowledge of 3d printing and robotics			
5	<b>3D Printing &amp; Robotics</b> Introduction, explain history of 3d printing, Recognize what a 3d printer looks like Describe where 3d printing are used in society, Explain benefits of using 3d printer to make products Explain basic concept of how a 3d printer works ( operations ) <b>Robotics</b> Introduction to robotics Designing, construction, operation Applications of robots	04	08

CO4 : To know the basics of power transmission devices			
6	<b>Power Transmission Device</b> Rope drive, Pulley Belt Transmission & types, Chain drive, Gear drive, Advantages, Disadvantages & applications.	<b>04</b>	<b>10</b>
CO 5 : To understand the working principal of compressor and pumps etc.			
7	<b>Pumps and Compressors</b> Classification, Construction and Working, applications.	<b>05</b>	<b>06</b>
CO6 : To understand the properties of fluids. To get introduction to Industrial Hydraulics Conduct all the tests and calculate the values of different properties.			
8	<b>Introduction to Industrial Hydraulics and Pneumatics.</b> Basic components of hydraulic & pneumatic system. Control elements for pressure, flow and direction. Hydraulic power pack, FRL unit, Meter in and Meter out circuits, Sensors, Actuators, Applications.	<b>10</b>	<b>12</b>

No questions will be asked on IKS learning subtopics in any question papers

### G. List of Assignments under SLA

Sr.no	List of assignments	Hours allotted
1	<b>Advance Sectional Orthographic view – sheet 1</b> Sectional view – sheet 2	03
2	Demonstration of I.C. Engine.	02
3	Calculation of heat transfer	02
4	Demonstration of Pumps – Centrifugal & Reciprocating	03
5	Working of 3d printing and robotics	02
6	Components of hydraulic & pneumatic system. Control elements for pressure, flow and direction.	03

### H. Specification table for setting question paper for semester end theory examination

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Advance Sectional Orthographic view	04	04	--	08	CO1
I / 2	Types Of Sections	02	02	--	04	CO1
I / 3	I.C. Engines	04	04	02	10	CO2
I / 4	Heat Transfer	04	04	04	12	CO1
II / 5	3D Printing & Robotics	04	02	02	08	CO3
II / 6	Power Transmission Device	02	04	04	10	CO4
II / 7	Pumps and Compressors	02	02	02	06	CO5
II / 8	Introduction to Industrial Hydraulics and Pneumatics.	04	04	04	12	CO6

	Total Marks	70	
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## I. Assessment Criteria

### i) Formative Assessment of Practical :-

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

### ii) Summative Assessment of Practical :

At the time of Practical Examination assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Knowledge about the course	05
2	Preparedness for practical /Oral	05
3	Neat & complete Diagram/write up	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

## J. Instructional Methods:

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration.

## K. Teaching and Learning resources:

Chalk-board, Demonstrative charts, Industrial Visits, Experimental work, Models.

## L. Reference Books:

Sr No	Name of Book	Author	Publisher
1	Hydraulic Machinery	Khurmi	S.Chand Co Ltd.,New Delhi
2	Heat Engine Patel Karmachandani	Patel Karmachanda	Ahcarya Publication



3	Hydraulic Machinery	Jagdish Lal	Metropolitan Publishers
4	Heat Transfer	S.P.Sukhatme	Tata Mc Graw Hill
5	Industrial Hydraulics and Pneumatics	Pipenger	Tata Mc Graw Hill

### **M. Learning Website & Software**

1. <https://www.britannica.com/technology/internal-combustion-engine>
2. <https://levelupengines.com/ic-engine/>
3. <https://www.explainthatstuff.com/pumpcompressor.html>
4. <https://sciencenotes.org/heat-transfer-conduction-convection-radiation/>
5. <https://www.powermotiontech.com/technologies/other-technologies/article/21884114/chapter-5-pneumatic-and-hydraulic-systems>
6. **ULTIMAKER CURA SOFTWARE**

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**COURSE ID :**  
**COURSE NAME : Auto CAD & 3-D Modelling**  
**COURSE CODE : MTH 308**  
**COURSE ABBREVIATION : HATM**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	01	03
	Tutorial Learning	--	
	Laboratory Learning	04	
	SLH-Self Learning	01	
	NLH- Notional Learning	06	

**B. ASSESSMENT SCHEME :**

PAPER DURATION IN HRS	THEORY				BASED ON LL & TL				BASED ON SLA		TOTAL
	FA-TH	SA-TH	TOTAL		Practical		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
--	--	--	--	--	--	--	50	20	25	10	75

**(Total IKS Hrs for Sem. : Nil )**

**C. Abbreviations:**

CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH- Notional Learning Hours, FA - Formative Assessment, SA - Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination Note : ( TNR 11 font)

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

## D. i) RATIONALE

Technically Auto CAD AND 3D modelling refers to objects that are constructed on 3 planes (X,Y,Z). The process of creating 2 7 3 dimensional (3D) computer graphics can be divided into 3 basic phases - 3D modeling, 3D animation & 3D rendering. 3D models means solid model is usually originated on the computer by engineer using some kind of solid modeling softwares.

Today 2 D & 3D models are used in wide variety of engineering fields. Three dimensional computer graphics are widely used for product design, assembly design etc. As a diploma engineer he should have the knowledge of solid modeling software to visualize the machine components & assembly like cars, machine tools and earth movers etc.

Use modelling software to understand representation of any 2 & 3 dimensional object and to visualize the machine components, assembly in software.

## ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

Understand the basics of software and reading of drawing accordingly

## E. COURSE LEVEL LEARNING OUTCOMES (COS)

CO 1 - Drawing 2D model using toolbar.

CO 2 -Creating objects – 2 D.

CO 3 - Apply *editing commands* dimensions, tolerances and generate tolerances.

CO 4 - Drawing Templates.

CO 5 - Use and apply 3D Solid model input format

### Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps) matrix

[ Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0” ]

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analyses	PO 3 Design/Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Play the role of metallurgist in industries	PSO2 Awareness about safety protocols	PSO3 Develop sensitivity about the environmental hazards
CO1 - Drawing 2D model using toolbar.	2	-	1	1	1	1	1	1	1	1
CO2 - Creating objects – 2 D	1	1	3	1	1	-	2	1	1	-
CO3 - Apply editing Commands dimensions tolerances and generate tolerances.	1	1	2	1	1	2	1	1	-	-
CO4 - Drawing Templates	3	2	1	1	2	1	1	1	-	-
CO5 - Use and apply 3D Solid model input format	1	2	1	2	1	1	1	1	-	2

## F. CONTENT:-

### I) Practical exercises –

The following practical exercises shall be conducted in the *Laboratory* in practical sessions of batches of about 20- 22 students:

Sr. No.	Laboratory experiences	Course outcome
1	Creation 2 D sketches using drawing commands	CO1
2	Creation of at least 2 models	CO2
3	Creation of at least 3 Objects	CO2
4	Using editing commands and dimensioning system	CO3
5	Generation of orthographic projections front view, top view, side view, isometric view.	CO4
6	Creating templates – mirror , hatching, rotate	CO4
7	Creation 3 D sketches using drawing commands	CO5

### II) Theory

Sr. no	Topics Subtopics	Teaching (Hours)	Marks
CO1 : Draw 2D model using toolbar.			
1	<b>Introduction to Auto CAD</b> Getting Started with AutoCAD, Basic Drawing & Editing Commands - Lines Circles Rectangles , Projects - Creating a Simple Drawing - Creating Simple Drawings Using Object Snap Tracking to extrapolate a projected top view Using Modify tools to arrange an office layout	10	08
CO2 : Create objects			
2	<b>Drawing of objects</b> Advanced Object Types Polylines Arcs Polygons Ellipses Drawing Precision in AutoCAD Polar and Ortho Tracking Entering Coordinates and Angles Object Snaps and Tracking	12	10
CO3 - Apply editing commands			
3	<b>Editing commands</b> Making Changes in Your Drawing Move Copy Rotate Mirror Scale Using the reference option with the Scale Tool Advanced Editing Commands Trim and Extend Fillet and Chamfer Polyline Edit and Spline Offset and Explode Dimensioning Using Dimensioning Tools Dimensioning in a Layout Tab vs. the Model Tab Using Dimension Styles Editing Dimensions	10	14
CO4 : Drawing Templates			

<b>4</b>	<b>Drawing Templates</b> Using Template Files (.dwt) to Make New Drawing Exploring what Settings and Elements are saved with Templates. Text The Multiline Text Tool The Single Line Text Tool Editing Text	14	08
<b>CO5 : Use and apply 3D Solid model input format</b>			
<b>5</b>	<b>Introduction To 3d Drawings</b> Types Of 3d Models The Convention To Autocad 3d Coordinate Systems In Autocad 3d Viewing A 3d Model Creating Wireframe Models Creating Surface Models Modelling Solid Objects Editing 3d Objects Generating Drawing Views Of Solid Models Animations For 3d Objects	14	10
<b>Total</b>		<b>60</b>	<b>50</b>

No questions will be asked on IKS learning subtopics in any question papers.

### G. List of Assignments under SLA

Sr .no	List of assignments	Hours allotted
1	Introduction to AutoCad	02
2	Drawing And Editing Commands	02
3	Drawing templates with steps	01
4	Dimensioning systems and its commands	03
5	Drawing templates with steps	04
6	Introduction to 3d	03

### H. Specification table for setting question paper for semester end theory examination - Not Applicable

### I. Assessment Criteria

#### i) Formative Assessment of Practical :-

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

## ii) Summative Assessment of Practical :

At the time of Practical Examination assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Knowledge about the course	05
2	Preparedness for practical /Oral	05
3	Neat & complete Diagram/write up	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

## J. Instructional Methods:

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration.
4. Computer lab

## K. Teaching and Learning resources:

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts. Multimedia projection facility shall be used during lecture sessions along with computer facility e.g. laptop, computer, LCD projector to teach this Course for effective learning.

## L. Reference Books:

Sr. No.	Author	Title	Publisher / Edition
1	Sham Tickoo	CATIA V5R17 for Designers	Softcover, Cadcim Technologies
2	Sham Tickoo	Pro/Engineer Wildfire for Designers	Softcover, Cadcim Technologies
3	Sham Tickoo	SolidWorks For Designers Release 2006	Softcover, Cadcim Technologies
4	Sham Tickoo	Autodesk Inventor for Designers: Release 10	Softcover, Cadcim Technologies
5	Sham Tickoo, Deepak Maini	NX 4 for Designers	Softcover, Cadcim Technologies
6	Sham Tickoo, Deepak Maini	Solid Edge V19 for Designers	Softcover, Cadcim Technologies
7	--	Various advance 3d modelling software manuals	--

## M. Learning Website & Software

1. <http://catiatutor.com/>
2. [http://www.cadenv.com/Tutorials/catia\\_tutorials/Catia.htm](http://www.cadenv.com/Tutorials/catia_tutorials/Catia.htm)
3. <http://www.frotime.com/>
4. <http://www.proetutorials.com/>
5. <http://www.solidworks.com/sw/resources/solidworks-tutorials.htm>
6. [http://www.solidengineering.co.nz/solidworks\\_free\\_tutorials.htm](http://www.solidengineering.co.nz/solidworks_free_tutorials.htm)
7. [www.solidedgetutorials.com/](http://www.solidedgetutorials.com/)
8. <http://appsci.queensu.ca/courses/APSC161/SETutorials.php>
9. [http://homepages.cae.wisc.edu/~me232/ug\\_tutorials/ug\\_tutorials.htm](http://homepages.cae.wisc.edu/~me232/ug_tutorials/ug_tutorials.htm)
10. <http://www.jqoc.com/soft/Unigraphics-Tutorial/>
11. Auto cad software – latest version

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**Programme** :- ALL  
**Semester** : THIRD  
**Course Title** : ESSENCE OF INDIAN CONSTITUTION  
**Course Code** :- CCH205

### I. RATIONALE

This course will focus on the basic structure and operative dimensions of Indian Constitution. It will explore various aspects of the Indian political and legal system from a historical perspective highlighting the various events that led to the making of the Indian Constitution. The Constitution of India is the supreme law of India. The document lays down the framework demarcating the fundamental political code, structure, procedures, powers, and sets out fundamental rights, directive principles, and the duties of citizens. The course on constitution of India highlights key features of Indian Constitution that makes the students a responsible citizen. In this online course, we shall make an effort to understand the history of our constitution, the Constituent Assembly, the drafting of the constitution, the preamble of the constitution that defines the destination that we want to reach through our constitution, the fundamental right constitution guarantees through the great rights revolution, the relationship between fundamental rights and fundamental duties, the futurist goals of the constitution as incorporated in directive principles and the relationship between fundamental rights and directive principles.

### II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry /employer expected outcome – Abide by the Constitution in their personal and professional life.

### III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

### IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme										
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory			Based on LL & TL				Based on SL		Total Marks
				CL	TL	LL					Total	Practical		SLA						
												FA-TH	SA-TH	Max	Min	Max	Min	Max	Min	
CCH205	ESSENCE OF INDIAN CONSTITUTION	EIC	VEC	1	-	-	1	2	1	-	-	-	-	-	-	-	-	50	20	50

**Total IKS Hrs for Sem. : 4 Hrs**

Abbreviations: CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination  
 Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.
7. \* Self learning includes micro project / assignment / other activities.

CO1 - List salient features and characteristics of the constitution of India.



- CO2 - Follow fundamental rights and duties as responsible citizen and engineer of the country.  
 CO3 - Analyze major constitutional amendments in the constitution.  
 CO4 - Follow procedure to cast vote using voter-id.  
 CO5-List the roles and responsibilities of State Election Commission towards peoples in the state.  
 CO-6 List Judiciary provisions for the peoples in general

## V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

<b>SECTION-I</b>		
<b>Sr. No.</b>	<b>Topics / Sub-topics</b>	<b>Lectures (Hours)</b>
<b>1</b>	<b>CCH 205. 1.</b> The Constitution:- 1.1 Introduction. 1.2 The History of making of the Indian Constitution. 1.3 Basic structure and its interpretation. 1.4 Fundamental Rights and Duties and their interpretation	<b>2</b>
<b>2</b>	<b>CCH 205. 2.</b> Union Government 2.1 Structure of the Indian Union. 2.2 President –Role and power. 2.3 Prime minister and council of ministers. 2.4 Lok Sabha and Rajya Sabha. 2.5 Union Territories and their limitations.	<b>3</b>
<b>3</b>	<b>CCH 205.3</b> State Government. 3.1 Governor –Role and power. 3.2 Chief Minister and council of ministers. 3.3 State secretariat. 3.4 Administrative Regions of Maharashtra.	<b>3</b>
<b>SECTION -II</b>		
<b>4</b>	<b>CCH 205.4</b> Local Administration:-Their roles and responsibilities 4.1 District Administration. 4.2 Municipal Corporation. 4.3 Zilla Panchayat 4.4 Taluka (Tahasil) Administration .	<b>2</b>
<b>5</b>	<b>CCH 205. 5.</b> Election Commission. 5.1 Role and functioning. 5.2 Chief Election Commissioner –Appointment. 5.3 State Election Commission. 5.4 Elections and duties of government /Non government servants – introduction	<b>2</b>
<b>6</b>	<b>CCH 205. 6.</b> Introduction to Judiciary Provisions :- 1.1 Introduction 1.2 Different courts. 1.3 Government legal advisor-provisions. <b>1.4</b> Limitations of courts and co-ordination with Home department.	<b>3</b>

## VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES : N.A.

## VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

- 1.Outline the procedure to submit application for Voter-id

2. Assignments are to be provided by the course teacher in line with the targeted COs.
3. Prepare an essay on Constitution of India .
4. Prepare a comparative chart of Unique features of Indian Constitution of India and Constitution of USA  
 [Assignments are to be provided by the course teacher in line with the targeted COs. A1. Prepare an essay on .Constitution of India . A2 Prepare a comparative chart of Unique features of Indian Constitution of India and Constitution of USA A3. Self-learning topics: Parts of the constitution and a brief discussion of each part Right to education and girl enrollment in schools. GER of Girls and Boys. Right to equality. Social Democracy. Women Representation in Parliament and State Assemblies.]

**Micro project :-** Organize a workshop-cum discussions for spreading awareness regarding Fundamental Rights of the citizen of the country

1. Prepare elaborations where directive principle of State policy has prevailed over Fundamental rights with relevant Supreme Court Judgements.
2. Organize a debate on 42nd, 97th and 103rd Constitutional Amendment Acts of Constitution of India.

### **Seminar**

- 1 Differences in the ideals of Social democracy and Political democracy.
- 2 Democracy and Women's Political Participation in India.
- 3 Khap Panchayat - an unconstitutional institution infringing upon Constitutional ethos.
- 4 Situations where directive principles prevail over fundamental rights.

### **Group discussions on current print articles.**

- Art 356 and its working in Post-Independent India.
- Women's Resrvation in Panchayat leading to Pati Panchayats - Problems and Solutions.
- Adoption of Article 365 in India.
- Need of Amendments in the constitution.
- Is India moving towards a Unitary State Model ?

### **Activity**

Arrange Mock Parliament debates.

Prepare collage/posters on current constitutional issues.

- i. National (Art 352) & State Emergencies (Art 356) declared in India.
- ii. Seven fundamental rights.
- iii. Land Reforms and its effectiveness - Case study of West-Bengal and Kerala.

**VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED : NOT APPLICABLE**

**IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)**

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Constitution and Preamble	CO1	4	-	-	-	-
2	II	Fundamental Rights and Directive Principles	CO2	4	-	-	-	-
3	III	Governance and Amendments	CO3	4	-	-	-	-
4	IV	Electoral Literacy and Voter's Education	CO4	3	-	-	-	-
<b>Grand Total</b>				<b>15</b>				

**X. ASSESSMENT METHODOLOGIES/TOOLS**

**Formative assessment (Assessment for Learning): Suggested Proformas are to be used for ASSESSMENT.**

Assignment, Self-learning and Terms work Seminar/Presentation

**Summative Assessment (Assessment of Learning):- Suggested Proformas are to be used for ASSESSMENT**

**XI. SUGGESTED COS - POS MATRIX FORM**

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	PSO-3
CO1	1	-	-	-	2	-	-			
CO2	1	-	-	-	2	-	-			
CO3	1	2	-	-	2	-	1			
CO4	-	-	-	1	-	-	-			

Legends :- High:03, Medium:02,Low:01, No Mapping: -  
 \*PSOs are to be formulated at institute level

**XII. SUGGESTED LEARNING MATERIALS / BOOKS**

Sr.No	Author	Title	Publisher with ISBN Number
1	P.M.Bakshi	The Constitution of India	Universal Law Publishing, New Delhi 15th edition, 2018, ISBN: 9386515105 (Check the new edition)
2	D.D.Basu	Introduction to Indian Constitution	Lexis Nexis Publisher, New Delhi, 2015, ISBN:935143446X
3	B. K. Sharma	Introduction to Constitution of India	PHI, New Delhi, 6th edition, 2011, ISBN:8120344197
4	MORE READS :	Oxford Short Introductions - The Indian Constitution by Madhav Khosla. The Indian Constitution: Cornerstone of a Nation by Granville Austin. Working a Democratic Constitution: A History by Garnville Austin Founding Mothers of the Indian Republic: Gender Politics of the Framing of the Constitution by Achyut Chetan. Our Parliament by Subhash C. Kashyap. Our Political System by Subhash C. Kashyap. Our Constitution by Subhash C. Kashyap. Indian Constitutional Law by Rumi Pal.	Extra Read
5	B.L. Fadia	The Constitution of India	Sahitya Bhawan, Agra, 2017, ISBN:8193413768

**XIII. LEARNING WEBSITES & PORTALS**

Sr.No	Link / Portal	Description
1	<a href="http://www.legislative.gov.in/constitution-of-india">http://www.legislative.gov.in/constitution-of-india</a>	Constitution overview
2	<a href="https://en.wikipedia.org/wiki/Constitution_of_India">https://en.wikipedia.org/wiki/Constitution_of_India</a>	Parts of constitution
3	<a href="https://www.india.gov.in/my-government/constitution-india">https://www.india.gov.in/my-government/constitution-india</a>	Constitution overview
4	<a href="https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/">https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/</a>	Fundamental rights and duties
5	<a href="https://main.sci.gov.in/constitution">https://main.sci.gov.in/constitution</a>	Directive principles
6	<a href="https://legallaffairs.gov.in/sites/default/files/chapter%203.pdf">https://legallaffairs.gov.in/sites/default/files/chapter%203.pdf</a>	Parts of constitution
7	<a href="https://www.concourt.am/armenian/legal_resources/world_constitutions/constit/india/india-e.htm">https://www.concourt.am/armenian/legal_resources/world_constitutions/constit/india/india-e.htm</a>	Parts of constitution
8	<a href="https://constitutionnet.org/vl/item/basic-structure-indian-constitution">https://constitutionnet.org/vl/item/basic-structure-indian-constitution</a>	Parts of constitution

