

**POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING, KALABURAGI**  
**Choice Based Credit System (CBCS)**  
**Scheme of Teaching and Examination 2021 – 22**  
**(Effective from the academic year 2021 – 22)**

**III Semester**

Sl. No.	Course and Course Code		Course Title	Teaching Department	Teaching Hours/Week			Examination			Credits	
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	SEE Marks	CIE Marks		Total Marks
1	BS	21MA31A	Numerical Analysis & Statistical Methods	Mathematics	03		--	03	50	50	100	3
2	PC	21CC32	Introduction to Ceramic Engineering	CCT Dept	03		-	03	50	50	100	3
3	PC	21CC33	Introduction to Materials Science & Engineering	CCT Dept	03		--	03	50	50	100	3
4	PC	21CC34	Geology	CCT Dept	03		--	03	50	50	100	3
5	HSMS	21KAK35	Samskrutika Kannada	Humanities	02		--	1.5	50	50	100	1
		21KAN35	Balake Kannada									
		<b>OR</b>										
		21HU35	Constitution of India and Professional Ethics					03				
6	Internship	21INT36	Summer Internship – I					--	--	50	50	2
7	AEC	21CCAE36A	Ability Enhancement Course(Data Analysis Using Charts And Graph)	CCT Dept	-	-	02	02	50	50	100	1
8	UHV	21UHV36B	Universal Human Values -I			02		02	50	50	100	1
9	PC	21CCL31	Ceramic raw material testing lab	CCT Dept	--	--	2	03	50	50	100	1
10	PC	21CCL32	Computational lab	CCT Dept	--	-	2	03	50	50	100	1
11	PC	21CCL33	Geology lab	CCT Dept	--	--	2	03	50	50	100	1
<b>Total</b>									<b>500</b>	<b>550</b>	<b>1050</b>	<b>20</b>

Course Title: Introduction to Ceramic Engineering		
Course Code	21CC32	Maximum marks CIE: 50
Number of Lecture Hours/Week	3	Maximum marks SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisite		
<b>Course Objectives</b> To impart knowledge and enable students to understand: <ol style="list-style-type: none"> <li>1. Ceramics with historic perspective</li> <li>2. Natural and synthetic ceramic raw materials</li> <li>3. Manufacture of ceramic bodies</li> <li>4. Manufacture and practical applications of conventional ceramics</li> <li>5. Manufacture, properties and applications of newer ceramics</li> </ol>		
<b>Modules</b>		<b>Teaching Hours</b>
<b>Module I</b> Definition, classification, applications, properties and scope of ceramics, ceramics versus metals and organics, historical perspective on the development of ceramics and ceramic industries. General flow diagram of preparation of ceramic articles with equipments used in making of ceramic articles. Newer ceramics versus traditional ceramics. (8 hours)		08
<b>Module II</b> Structure , classification and properties of Clays ( Kaolin Montmorillonite) and feldspars. Structure, properties and polymorphism of quartz. Brief study of cornish stone, nepheline syenite, talc, steatite, pyrophyllite, sericite pyrophyllite, mica and synthetic raw materials. Calculation of percentage oxide content in clays, felspar and other raw materials (9 hours).		09
<b>Module III</b> Preparation of ceramic powders, mixing, preliminary idea of various shaping methods of ceramic articles; dry and semi dry uniaxial pressing, extrusion, jiggering and jollying, injection molding, slip casting, isostatic pressing, hot pressing, hot isostatic pressing, tape casting, machining methods. Drying of ceramics, biscuit firing and glost firing, action of heat on triaxial body. (9 hours)		08
<b>Module IV</b> Elementary ideas of classification, manufacture , properties and applications of conventional ceramics; Refractories, glass, whitewares and portland cement (8 hours)		09

<b>Module V</b> Newer ceramics: Classification – cermets and abrasives, electro-ceramics, bio-ceramics, space ceramics, super conducting ceramics, automotive ceramics. Common tests conducted on ceramics ;bulk density, apparent porosity, loss on ignition, drying shrinkage etc (8 hours)		08
<b>Question paper pattern:</b>		
<b>Text books:</b> 1. Industrial ceramics - F. Singer and Singer S.S. Publisher Springer ISBN 978902752596 2. Cement data book – Vol.I, II, III – W.H. Duda, Gmbh Germany Cement Engineer's Handbook – Von Ottolabahn, McGraw Hill, N.Y. 3. Industrial Ceramics – Singer and Singer, Springer Netherland publisher edition-1.		
<b>Reference Books:</b> 1. Elements of Ceramics – F.H. Nortan Publisher: Longman Higher Education; 2nd Revised edition edition (1 June 1974 ) ISBN-10:0201053063, ISBN-13:978-0201053067 2. Introduction to ceramics – W.D. Kingery et al, Publishers Wiley and Sons. ISBN-13: 978- 0471478607 2nd edition. 3. What every engineer should know about ceramics? – Solomon Mushikant Publisher Marcel and Dekker New york 1992. 4. Properties of Ceramic Raw Materials– W . Rayon Publishers Elsevier 2003 5. Ceramic whitewares – Rexford Newcomb, Jr., Pitman Pub. Corp., NY 6. Refractories – Manufacture, Properties and Applications – A. Rashid Chesti, Prentice Hall of India Pvt. Ltd. 7. Technology of Portland and blended Cements, Banerjee H.N published by A.H. Wheeler Publishing, Allahabad, Ed. 1980. 8. Abrasives – L. Coes Jr, Springer-Verlag 1971. 9. Modern Glass Practice – Samuel Ray Scholes, Charles H. Greene Publisher: Canners books 1975. 10. Advanced Technical Ceramics – Shigeyuki Somiya, Academic Press Inc., Harcourt Brace Jovanovich Publishers, 1984		
<b>E books and online course materials:</b> 1. <a href="http://shodhganga.inflibnet.ac.in/bitstream/10603/108074/12/12_chapter%204.pdf">http://shodhganga.inflibnet.ac.in/bitstream/10603/108074/12/12_chapter%204.pdf</a> 2. <a href="http://www.scielo.br/pdf/mr/v20s2/1516-1439-mr-1980-5373-MR-2016-0915.pdf">http://www.scielo.br/pdf/mr/v20s2/1516-1439-mr-1980-5373-MR-2016-0915.pdf</a>		
<b>Course outcomes:</b> <b>On completion of the course, the student will have the ability to:</b>		
<b>Course Code</b>	<b>CO #</b>	<b>Course Outcome (CO)</b>
16CC33	<b>CO1</b>	Describe ceramic materials and differentiate from other engineering materials C2
	<b>CO2</b>	Explain characteristics and calculate oxide content of various pure and natural and synthetic ceramic raw materials C3
	<b>CO3</b>	Explain and compare various shaping methods of ceramic articles
	<b>CO4</b>	Construct and explain flow charts for manufacture of conventional ceramics and explain properties applications of conventional ceramics C3
	<b>CO5</b>	Explain applications of various newer ceramics and tests conducted on ceramic and ceramic raw materials

Course Title: <b>Introduction to Material Science and Engineering (IMSE)</b>		
Course Code	21CC33	CIE: 50
Number of Lecture Hours/Week	3	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisite		
<p>Course Objectives: To impart knowledge and to enable students to understand:</p> <ol style="list-style-type: none"> <li>1. Engineering materials classification, bonding and crystal geometry.</li> <li>2. Structure of solids and structure determination, crystal imperfections</li> <li>3. Phase diagrams and diffusion in solids</li> <li>4. Diffusion in solids</li> <li>5. Mechanical behavior of materials.</li> </ol>		
Modules		Teaching Hours
<p><b>Module I</b> Introduction: Classification of engineering materials, Structure of atom, Definition of ionization potential, electron affinity and electro-negativity. (3 hours) Chemical Bonding: Bond energy, bond type and bond length, ionic bonding, covalent bonding, metallic bonding and secondary bonding. Elementary idea about variation of bonding character and properties. (5 hours)</p>		8
<p><b>Module II</b> Crystal geometry : Geometry of crystals, the Bravais lattices, crystal directions and planes, the miller indices. (3) hours) Structure of covalent solids, metals and alloys, and ionic solids, structure of silica and silicates and polymers . XRD, Bragg's law, the powder method for structure determination. (5) hours)</p>		9
<p><b>Module III</b> Phase diagram : Phase rule, single component systems, binary phase diagrams, lever rule, typical phase diagrams for <math>Al_2O_3-Cr_2O_3</math>, magnesia-alumina, copper-zinc, iron-carbon systems. (8h)</p>		8
<p><b>Module IV</b> Crystal imperfections: Point imperfections, line imperfections, edge and screw dislocations, the Burgers vector, line energy of dislocations, types of surface imperfections. (5 hours) Diffusion in solids: Ficks laws of diffusion, solution to Ficks second law and Applications of diffusion kinetics. Temperature dependence of diffusion.(4)</p>		9
<p><b>Module V</b> Mechanical behavior: Atomic model of elastic behavior, the modulus as a parameter in design, (4h) Corrosion and its prevention: Principles of corrosion , high temperature corrosion, passivity, factors influencing corrosion rate, Methods of control and prevention of corrosion, (4h)</p>		8

**Question paper pattern:**

Two questions with sub divisions to be set from each module. Students shall answer one question from each module. Mixing of questions in the module is allowed.

**Text books:**

Materials Science and Engineering – A first course : Raghavan V., 3rd ed., Prentice Hall of India Pvt. Ltd., new Delhi, 1996

**Reference Books:**

1. Elements of Material Science – Van Vlack H.L., 2nd ed., Addison – Wesley Pub. Co., NY, 1964. Additional readings 1.
2. Callister W. D Material Science and Engineering: An Introduction, 7th Edition, 2007, John Wiley and Sons

**E books and online course materials:****Course outcomes:**

**On completion of the course, the student will have the ability to:**

Course Code	CO #	Course Outcome (CO)	Blooms Level
	CO1	Define engineering materials and classify them and explain chemical bonds and classification of bonds and their relation to properties.	3
	CO2	Analyze structure of solid materials and elementary idea of XRD methods for determination of structures	3
	CO3	Make use of phase diagrams to deduct amount of phases and invariant reactions and study various phases in equilibrium binary phase diagrams	3
	CO4	Explain various types of defects and their characteristics and determine enthalpy of formation of defects. Explain Ficks first and second law of diffusion and temperature dependence of diffusion	4
	CO5	Explain corrosion and its prevention and Extend chemical bond theory and structure of solids to determine mechanical properties	4

**SUBJECT: GEOLOGY**

<b>Course Code</b>	<b>21CC34</b>	<b>Maximum Marks Cie:50</b>
<b>Number of Lecturer Hours/Week</b>	<b>3</b>	<b>Maximum Marks See:50</b>
<b>Total Number of Lecturer Hours</b>	<b>42</b>	

<b>MODULES</b>	<b>TEACHING HOURS</b>
<b>MODULE – I (GENERAL GEOLOGY ,CRYSTALLOGRAPHY )</b>	8
<b>GENERAL GEOLOGY:</b> Introduction, Branches of Geology, Internal structures of the Earth. Applications the geological background cement and ceramic field	3
<b>CRYSTALLOGRAPHY:</b> Definition and characteristic features of crystals. Symmetrical characters and six crystallographic systems	5
<b>MODULE – II ( MINERALOGY)</b>	8
<b>MINERALOGY:</b> Definition of mineral, Importance of study of minerals, Different methods of study of minerals. Advantages of study of minerals by physical properties. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of following common rock forming minerals: Feldsper, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of other common economics minerals such as Pyrite, Hematite , Magnetite Chlorite , Galena , Pyrolusite, Graphite, Magnesite, and Bauxite	8
<b>MODULE – III ( PETROLOGY )</b>	8
<b>PETROLOGY:</b> Definition of rock: Geological classification of rocks into igneous, Sedimentary and metamorphic rocks. Dykes and sills, common structures and textures of igneous. Sedimentary and metamorphic rocks. Their distinguishing features, Megascopic and microscopic study of Granite, Dolerite, Basalt, Pegmatite, Laerite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate..	8
<b>MODULE –IV ( STRUCTURAL GEOLOGY AND STRATIGRAPHY )</b>	9
<b>STRUCTURAL GEOLOGY:</b> Out crop, strike and dip study of common geological structures associating with the rocks such as Folds, Faults, Unconformities, and Joints – their important types.	4
<b>STRATIGRAPHY:</b> General principles of Stratigraphy, Standard Geological time scale .Tripartite physiographical divisions of India. Broad outline of the stratigraphy of India	5
<b>MODULE-V (ECONOMIC GEOLOGY AND INDUSTRIAL MINERAL DEPOSITS)</b>	9
Rock forming and ore forming minerals, processes of formation of Economic mineral deposits. Simple classification of mineral deposits. Description, deposits, distribution of the important following mineral deposits of India. Mica, Gold, Clay, Feldspar, Quartz, Zircon Beryl, Kyanite, Megnatite, Dolomite, Limestone, Barite, Bauxite.	9

**Text Books**

1. N. Chennkesavulu,

- Engineering Geology, Mc Milan India Ltd., New Delhi, India, 12th Edition 2009.
2. **Venkat Reddy** ,  
Engineering geology, Vikas Publications, New Delhi, India, 2nd Edition 2011.
  3. **Parbin Singh.**,  
“Engineering and General Geology”, Katson Publishers, 2009.

**Reference Books**

- # **K. V. G. K. Gokhale** ,  
Principles of engineering Geology, BS Publications, New Delhi, India, 3rd Edition ,2012.
- # **F.G. Bell**,  
Fundamental of Engineering geology butterwoths, Publications, New Delhi, 3rd Edition, 1999
- # **David George Price**,  
“Engineering Geology: Principles and Practice”, Springer, 2009.

**COURSE OUTCOMES:**

On completion of the course, the student will have the ability to :

<b>COURSE CODE</b>	<b>CO#</b>	<b>COURSE OUTCOME ( CO )</b>
	CO1	Determine the role of the geology in ceramic field, and various aspects of the earth.
	CO2	Formation, classification and various physical properties of minerals.
	CO3	Formation, classification and various physical properties of rocks.
	CO4	Make use of minerals and rocks in the ceramic field with respect to structural features
	CO5	Know the deposits, distribution and uses of economic mineral deposits.

<b>COURSE TITLE: DATA ANALYSIS USING CHARTS AND GRAPH</b>		
Course Code	21CCAE36A	Maximum marks CIE: 50
Number of Lecture Hours/Week	01	Maximum marks SEE: --
Total Number of Lecture Hours	14	SEE Hours: --
Prerequisite: 1. Student should have basic knowledge of excel		
Course Objectives Use Microsoft Excel for data analysis with confidence in an Office environment.		
<b>Modules</b>		<b>Teaching Hours</b>
<b>Module I</b> <b>Introduction to charts and graphs</b> Difference Between Graphs and Charts Graphs vs Charts Info graphics Differences Graphs.		3
<b>Module II</b> <b>Understanding how and when to use the following charts</b> Bar Charts, Line Charts, Pareto Charts, Area Charts Histograms, Pie Charts, Tree Maps, Scatter Plots, Bubble Charts.		3
<b>Module III</b> <b>Understanding how and when to use the following charts</b> Heat Maps, Maps, Bullet Charts, Gantt Charts, Box and Whisker Plots, Waterfall Charts Motion Charts		3
<b>Module IV</b> <b>Creating a Chart:</b> Learn how to create a chart from spreadsheet data. Learn selecting the charts, moving and resizing a chart, delete a chart. Learns option and tools used to change the type of chart for ex: from column to bar chart.		3
<b>Module V</b> <b>Editing the chart:</b> Adding, removing and editing a chart title. Adding data labels to a chart, exact values/numbers or percentages. Changing the chart area background color and also the colors that make up the "bars" in the charts, change the color of text used within the chart.		2



<b>Text books:</b> 11.			
<b>Reference Books:</b> 1.			
<b>E books and online course materials:</b> 1.			
<b>Course outcomes:</b> <b>On completion of the course, the student will have the ability to:</b>			
<b>Course Code</b>	<b>CO #</b>	<b>Course Outcome (CO)</b>	<b>Blooms Level</b>
<b>21CC41</b>	<b>CO1</b>		L4
	<b>CO2</b>		L1, L4
	<b>CO3</b>		L4
	<b>CO4</b>		L4
	<b>CO5</b>		L4

<b>COURSE TITLE: UNIVERSAL HUMAN VALUES-II</b>		
<b>Course Code</b>	<b>21UHV36B</b>	<b>CIE: 50</b>
<b>Number of Lecture Hours/Week</b>	<b>2hrs (Tutorial)</b>	<b>SEE: 50</b>
<b>Total Number of Theory Hours</b>	<b>14 hours</b>	<b>SEE Hours: 03</b>
<p><b>Course Objectives:</b></p> <ol style="list-style-type: none"> <li>To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.</li> <li>To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.</li> <li>To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.</li> </ol>		
<b>Modules</b>		<b>Teaching Hours</b>
<p><b>Module I</b>  <b>Introduction To Value Education:</b> Understanding Value Education, Need Of Value Education, Basic Guidelines For Value Education, The Content Of Value Education, The Process Of Value Education.  <b>Self- Exploration As The Process For Value Education:</b> Starting To Observe Inside, What Is Self-Exploration? What Is Its Purpose? Content Of Self-Exploration, Natural Acceptance, What Is The State Today?, What Is The Way Out? What Do We Need To Do?</p>		<b>3hrs</b>
<p><b>Module II</b>  <b>The Basic Human Aspirations- Continuous Happiness And Prosperity:</b> Continuous Happiness And Prosperity- Our Basic Aspiration, Exploring Happiness And Prosperity, A Look At The Prevailing Notions Of Happiness And Prosperity, Some Possible Questions/ Confusions.  <b>The Program To Fulfill Basic Aspiration:</b> Basic Requirements For Fulfillment Of Human Aspirations, What Is Our State Today?, Why Are We In This State?- Living With Wrong Assumptions, What Is The Solution?- The Need For Right Understanding, Our Program: Understand And Live In Harmony At All Levels Of Living, Our State Today?, Our Natural Acceptance For Harmony At All Levels Of Our Living, Human And Animal Consciousness.</p>		<b>3hrs</b>
<p><b>Module III</b>  <b>Understanding The Harmony At Various Levels:</b> Understanding The Human Being As Co-Existence Of Self(I) And Body, Human Being Is More Than Just The Body, Understanding Myself As Coexistence Of Self And The Body, Understanding The Needs Of The Self And Needs Of The Body, Understanding The Self(I) As A Conscious Entity, The Body As The Material Entity, Exercise On Distinguishing Needs Of The Self(I) And The Body, Exercise On Distinguishing Activities Of The Self(I) And Body, Understanding The Body As An Instrument Of 'I'(I Being The Seer, Doer And Enjoyer).  <b>Harmony In Self(I)- Understanding Myself:</b> Why Should I Study Myself?, Getting To Know The Activities In I Related?, The Activities In I Are Continuous, What Is The Problem Today?, Effects Of The Problem, What Then Is The Solution?, Result Of Realization And Understanding- Living With Definiteness.  <b>Harmony With The Body- Understanding Sanyama And Svashtya:</b> Our Body- A Self-</p>		<b>3hrs</b>

<p>Organised Unit, Harmony Of I With The Body: <i>Sanyama</i> And <i>Svashtya</i>, What Is Our State Today?, What Is The Way Out?, Understanding And Living With <i>Sanyama</i>, Correct Appraisal Of Our Physical Needs.</p>	
<p><b>Module IV</b>  <b>Harmony In The Family- Understanding Values In Human Relationships:</b> Family As The Basic Unit Of Human Interaction, Harmony In The Family, Justice(<i>Nyaya</i>), What Is The State Today?, Values In Human Relationships, Trust (<i>Visvasa</i>), Respect (<i>Sammana</i>), The Basis For Respect, Assumed Bases For Respect Today, The Problem Due To Differentiation, Difference Between Attention And Respect, What Is The Way Out?, Affection (<i>Sneha</i>), Care (<i>Mamata</i>), Guidance(<i>Vatsalya</i>),Reverence(<i>Shraddha</i>),Glory(<i>Gaurava</i>),Gratitude(<i>Kritagyata</i>),Love(<i>Prema</i>), Harmony From Family To World Family: Undivided Society.  <b>Harmony In The Society-From Family Order To World Family Order:</b> Extending Relationship From Family To Society, Identification Of The Comprehensive Human Goal, Where Are We Today?, Programs Needed To Achieve The Comprehensive Human Goal: Five Dimensions Of Human Endeavour, Education-Right Living (<i>Siksha-Sanskara</i>), Health-Self-Regulation (<i>Svasthya-Sanyama</i>), Justice-Preservation (<i>Nyaya-Suraksha</i>), Production-Work (<i>Utpadana-Karya</i>), Exchange-Stotage (<i>Vinimaya-Kosa</i>), What Is Our State Today?, Harmony From Family Order To World Family Order: Universal Human Order.</p>	<p><b>3hrs</b></p>
<p><b>Module V</b>  <b>Harmony In Nature-Understanding The Interconnectedness And Mutual Fulfillment:</b> The Four Orders Of Nature, Inconnectedness And Mutual Fulfillment (<i>Parasparta</i> And <i>Paraspara Purakata</i>), Recyclability And Self-Regulation In Nature, Understanding The Four Orders- Things (<i>Vastu</i>), Activity (<i>Kriya</i>), Innateness (<i>Dharana</i>), Natural Characteristic (<i>Svabhava</i>), Basic Activity, Conformance (<i>Anu-Sangita</i>), Human Beings-Our State Today, What Is The Way Out?.  <b>Harmony In Existence-Understanding Existence As Co-Existence:</b> An Introduction To Space (<i>Sunya</i>), Co-Existence Of Units In Space, Limited And Unlimited, Active And No-Activity, Energised And Energy In Equilibrium, Each Unit Recognizes.... Space Is Reflecting Or Transparent, Self-Organized And Self-Organization Is Available, Existence Is Co-Existence, What Are We Doing Today? Where Do We Want To Be?</p>	<p><b>2hrs</b></p>
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. The Text Book R.R Gaur, R Sangal, G P Bagaria, A Foundation Course In Human Values And Professional Ethics, Excel Books, New Delhi, 2010, ISBN 978-8-174-46781-2.</li> <li>2. The teacher's manual R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi, 2010</li> </ol>	
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.</li> <li>2. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.</li> <li>3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991</li> <li>4. Ivan Illich, 1974, Energy &amp; Equity, The Trinity Press, Worcester, and HarperCollins, USA</li> <li>5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to Growth, Club of Rome's Report, and Universe Books.</li> <li>6. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.</li> </ol>	

7. A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
8. E.F. Schumacher, 1973, small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
9. A.N. Tripathy, 2003, Human Values, New Age International Publishers.

**Course outcomes: On completion of the course, the student will have the ability to:**

Course Code	CO	Course Outcome (CO)
<b>21UHV3X</b>	<b>CO1</b>	The students are able to see that verification on the basis of natural acceptance and experiential validation through living is the only way to verify right or wrong, and referring to any external source like text or instrument or any other person cannot enable them to verify with authenticity; it will only develop assumptions
	<b>CO2</b>	The students are able to see that their practice in living is not in harmony with their natural acceptance most of the time, and all they need to do is to refer to their natural acceptance to remove this disharmony
	<b>CO3</b>	The students are able to see that lack of right understanding leading to lack of relationship is the major cause of problems in their family and not the lack of physical facilities in most of the cases, while they have given higher priority to earning of physical facilities in their life ignoring relationships and not being aware that right understanding is the most important requirement for any human being
	<b>CO4</b>	The students feel confident that they can understand the whole existence; nothing is a mystery in this existence. They are also able to see the interconnectedness in the nature, and point out how different courses of study relate to the different units and levels. Also they are able to make out how these courses can be made appropriate and holistic.
	<b>CO5</b>	The students are able to grasp the right utilization of their knowledge in their streams of Technology/Engineering/ Management to ensure mutually enriching and recyclable productions systems.
	<b>CO6</b>	The students are able to sincerely evaluate the course and share with their friends. They are also able to suggest measures to make the course more effective and relevant. They are also able to make use of their understanding in the course for a happy and prosperous society.

**B. E. III/IV SEM.  
SAMSKRUTHIKA KANNADA**

Subject Code	Subject	Stream	Th- Tut-Pr	Credits
21KAK36/45	SAMSKRUTHIKA KANNADA	Humanities and Social Sciences (H.S.S)	2 - 0 - 0	01

**CIE: 50 SEE: 50 SEE: 1 hours 30 Minutes Total: 28 Hours**

## ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯಪುಸ್ತಕ

(ಕನ್ನಡ ಮಾತೃಭಾಷೆಯ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ)

(ಕನ್ನಡಿಗರಿಗಾಗಿ - for Kannadigas - Common to all branches)

[As per Outcome Based Education (OBE) and Choice Based Credit System (CBCS) scheme]

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

- ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡದ ಜೊತೆಗೆ ಕ್ರಿಯಾತ್ಮಕ ಕನ್ನಡವನ್ನು, ಕನ್ನಡ ಸಾಹಿತ್ಯ, ಸಂಸ್ಕೃತಿ ಮತ್ತು ನಾಡು ನುಡಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.
- ಕನ್ನಡದಲ್ಲಿ ತಾಂತ್ರಿಕ ವಿಜ್ಞಾನಗಳ ವಿಷಯಕ್ಕೆ ಸಂಬಂಧಿಸಿದ ಹಲವಾರು ವಿಷಯಗಳನ್ನು ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.
- ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ, ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗೂ ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.

**ಪರಿವಿಡಿ**

**ಭಾಗ - ಒಂದು ಲೇಖನಗಳು**

**ಕನ್ನಡ ನಾಡು, ನುಡಿ ಮತ್ತು ಸಂಸ್ಕೃತಿಗೆ ಸಂಬಂಧಿಸಿದ ಲೇಖನಗಳು**

೧. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ : ಹಂಪ ನಾಗರಾಜಯ್ಯ
೨. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ : ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ - ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ
೩. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ - ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೊ. ವಿ. ಕೇಶವಮೂರ್ತಿ +

**ಭಾಗ - ಎರಡು**

**ಕಾವ್ಯ ಭಾಗ (ಆಧುನಿಕ ಪೂರ್ವ)**

೪. ವಚನಗಳು : ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ಯಕ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರ ದಾಸಿಮಯ್ಯ, ಆಯ್ಯಕ್ಕಿ ಲಕ್ಕಮ್ಮ.
೫. ಕೀರ್ತನೆಗಳು : ಅದರಿದೇನು ಫಲ ಇದರಿದೇನು ಫಲ - ಪುರಂದರದಾಸ ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೆ - ಕನಕದಾಸ
೬. ತತ್ವಪದಗಳು : ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು - ಶಿಶುನಾಳ ಪರಿಷ್ಕರಣೆ  
ಶಿವಯೋಗಿ - ಬಾಲಲೀಲಾ ಮಹಾಂತ ಶಿವಯೋಗಿ

೭. ಜನಪದ ಗೀತೆ : ಬೀಸುವ ಪದ, ಬಡವರಿಗೆ ಸಾವ ಕೊಡಬೇಡ

ಭಾಗ - ಮೂರು

ಕಾವ್ಯ ಭಾಗ (ಆಧುನಿಕ)

೮. ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗ : ಡಿ.ವಿ.ಜಿ.
೯. ಕುರುಡು ಕಾಂಚಾಣಾ : ದ.ರಾ. ಬೇಂದ್ರೆ
೧೦. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು
೧೧. ಹೆಂಡತಿಯ ಕಾಗದ : ಕೆ.ಎಸ್. ನರಸಿಂಹಸ್ವಾಮಿ
೧೨. ಮಬ್ಬಿನಿಂದ ಮಬ್ಬಿಗೆ : ಜಿ.ಎಸ್. ಶಿವರುದ್ರಪ್ಪ
೧೩. ಆ ಮರ ಈ ಮರ : ಚಂದ್ರಶೇಖರ ಕಂಬಾರ
೧೪. ಚೋಮನ ಮಕ್ಕಳ ಹಾಡು : ಸಿದ್ದಲಿಂಗಯ್ಯ

ಭಾಗ - ನಾಲ್ಕು

ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿ ಪರಿಚಯ, ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ

೧೫. ಡಾ. ಸರ್ ಎಂ ವಿಶ್ವೇಶ್ವರಯ್ಯ - ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ : ಎ ಎನ್ ಮೂರ್ತಿರಾವ್
೧೬. ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ
೧೭. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ

ಭಾಗ - ಐದು

ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ

೧೮. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ
  ೧೯. 'ಕ' ಮತ್ತು 'ಬ' ಬರಹ ತಂತ್ರಾಂಶಗಳು ಮತ್ತು ಕನ್ನಡದ ಟೈಪಿಂಗ್\*
  ೨೦. ಕನ್ನಡ - ಕಂಪ್ಯೂಟರ್ ಶಬ್ದಕೋಶ\*
  ೨೧. ತಾಂತ್ರಿಕ ಪದಕೋಶ : ತಾಂತ್ರಿಕ ಹಾಗೂ ಪಾರಿಭಾಷಿಕ ಕನ್ನಡ ಪದಗಳು\*
- \* (ಅಧ್ಯಾಯ 3, 19, 20 ಮತ್ತು 21 ಇವುಗಳು ವಿಶಾಖಾ ಯದಿಂದ ಪ್ರಕಟಿತ " ಆಡಳಿತ ಕನ್ನಡ "
- ಪುಸ್ತಕದಿಂದ ಆಯ್ದು ಲೇಖನಗಳು - ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೊ. ವಿ. ಕೇಶವಮೂರ್ತಿ.



**POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING, KALABURAGI**  
**Choice Based Credit System (CBCS)**  
**Scheme of Teaching and Examination 2021 – 22**  
**(Effective from the academic year 2021 – 22)**

**IV Semester**

Sl. No.	Course and Course Code		Course Title	Teaching Department	Teaching Hours/Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	SEE Marks	CIE Marks	Total Marks	
1	PC/BS	21CC41	Unit Operations	CCT Dept	03		--	03	50	50	100	3
2	PC	21CC42	Ceramic Processing and fabrication	CCT Dept	03		--	03	50	50	100	3
3	PC	21CC43	Whitewares and heavy clay wares	CCT Dept	03		--	03	50	50	100	3
4	PC	21CC44	Fuels and Furnaces	CCT Dept	03		--	03	50	50	100	3
5	HSMS	21KAK45	Samskrutika Kannada	Humanities	02	--	--	1.5	50	50	100	1
		21KAN45	Balake Kannada					OR				
		21HU45	Constitution of India and Professional Ethics					03				
6	AEC	21CCA46A	Ability Enhancement Course (Life Sciences) (Biology for Ceramics)	CCT Dept	02	-	-	03	50	50	100	2
7	AEC	21CCA46B	Ability Enhancement Courses(Furnaces and equipment Drawing)	CCT Dept	-	-	02	02	50	50	100	1
8	UHV	21UHV46C	Universal Human Values-II			02		02	50	50	100	1
9	PC	21CCL41	Unit Operations Lab	CCT Dept	--	--	2	03	50	50	100	1
10	PC	21CCL42	Ceramic processing lab	CCT Dept	--	-	2	03	50	50	100	1
11	PC	21CCL43	Whitewares lab	CCT Dept	--	--	2	03	50	50	100	1
<b>Total</b>									<b>550</b>	<b>550</b>	<b>1100</b>	<b>20</b>

<b>THEORY COURSE TITLE: Ceramic Processing and Fabrications</b>	
Course Code: 21CC42	CIE: 50
Number of Lectures Hours/Week: 04	SEE: 50
Total Number of Lecture Hours: 52	SEE Hours: 03
<b>Modules</b>	<b>Teaching Hours</b>
<p align="center"><b>Module-I</b></p> <p>Classification of ceramic powder products, Ceramic products by functions, Objectives of ceramic processing, industrial ceramic processing, Common raw materials i.e., crude materials, industrial minerals, beneficiation of kaolin and industrial inorganic chemicals; Alumina by Bayer's process, SiC by Acheson process, sea water magnesia, Titania by chloride or sulphate process.</p>	10
<p align="center"><b>Module-II</b></p> <p>Synthesis of ceramic powders by wet chemical routes such as precipitation, sol-gel techniques, solvent evaporation and extraction, powders from vapor phase reactions and powders from mechanical milling. Raw materials specifications, working principles of spectroscopy techniques, procedure for phase analysis by XRD, microscopy characterization techniques, thermo-chemical and thermo-physical analysis, particle size and shape analysis techniques, powders density measurement and specific surface area measurement</p>	10
<p align="center"><b>Module-III</b></p> <p>Processing additives: Liquids and wetting agents, de-flocculants and coagulants, development of electrical double layer, coagulation and flocculation. Binder compositions; clay binders, molecular binders such as vinyl type and cellulose type. Waxes and glycols, Dissolving and admixing binders, general effect of binders. Granulation; Direct granulation and spray drying. Characteristics of packing of uniform spheres, packing in interstices among coarser particles, packing and continuous size distribution and hindered packing.</p>	11
<p align="center"><b>Module-IV</b></p> <p>Fabrication methods: Rheological behavior of slurries; effective stress and shear resistance in a saturated system and rheological properties of slurries, Slip casting in permeable mould, examples of compositions of casting slurries. Vacuum casting, Pressure casting, thixotropic casting and Tape casting. Plastic-Forming processes; Equipment and material variables in extrusion and examples of composition of extrusion bodies. Pressing; Process variables in dry pressing, processing additives used in industrial pressing powders, powder flow and die filling, compaction behavior, control of compact defects, isostatic compaction and its significance.</p>	11
<p align="center"><b>Module-V</b></p> <p>Drying and Firing; The drying process, drying mechanism, drying shrinkage and defects and modes of drying. Firing systems, Pre-sintering processes, solid-state sintering and liquid-phase sintering, cooling and Hot pressing. <b>Mercury intrusion porosimetry</b> to measure pore size distribution</p>	10
<p><b>Question paper pattern:</b> Question paper shall contain five modules, each module containing two questions. Students shall answer any one question from each module.</p>	



**Text books:**

James S. Reed “Introduction to the Principles of Ceramic Processing” John Wiley & Sons Publication  
New York

**Reference Books:**

M. N. Rehman, “Ceramic Processing and Sintering” 2<sup>nd</sup> Edition, Engineering and Technology; Physical Sciences, CRC Press 2003

**E-books and online course materials:**

1. M. N. Rehman Ceramic Processing and Sintering, Second Edition Marcel Dekker Inc. USA  
[https://www.academia.edu/5600888/Ceramic\\_Processing\\_and\\_Sintering\\_Rahaman\\_PDF](https://www.academia.edu/5600888/Ceramic_Processing_and_Sintering_Rahaman_PDF)

**Course outcomes:**

On completion of the course, the student will have the ability to:

<b>CO #</b>	<b>Course Outcome (CO)</b>
CO1	Classification of ceramic powder products and raw materials
CO2	Synthesis of ceramic fine powders and interpretation of their characteristics
CO3	Identify appropriate additives for batch composition and particle packing efficiency
CO4	Selection of appropriate fabrication method based on its applications
CO5	Analysis of drying and sintering schedules on densified product

<b>THEORY COURSE TITLE: White wares and Heavy clay wares</b>	
Course Code: 21CC43	CIE: 50
Number of Lectures Hours/Week:	SEE: 50
Total Number of Lecture Hours: 42	SEE Hours: 03
<b>Modules</b>	<b>Teaching Hours</b>
<b>Module-I:</b> Definition, Scope and division of field, geological formation, occurrence, raw materials- plastic raw materials , non plastic raw materials, non clay plastic raw materials .mining and treatment of ceramic raw materials. Triaxial composition, crystal structure and Properties of important ceramic raw materials.	9
<b>Module-II:</b> Auxiliary raw materials, Particulate solids and water role in different ceramic raw materials and in bodies. Batch calculation, inter-conversion of batch composition to formula and batch formula to composition. Rheology and types of fluids.	8
<b>Module-III:</b> Important shaping methods like jiggering, jollying, slip casting, tape casting, extrusion, isostatic pressing, hot pressing, soft mud processes, plastic forming. Finishing, drying and firing of wares. Glazes: Definition, types of raw materials, coloring ingredients, decorating methods, compounding and firing of glazes, blending, preparation Of glaze slip, glaze application.	9
<b>Module-IV:</b> Heavy Clay Wares: Definition of raw materials, classification of building materials, their chemical and mineralogical composition, clay preparation and shaping. Manufacture of common building bricks and roofing tiles, hollow bricks, sewer pipe, salt glazing. Microstructure of structural clay products	8
<b>Module-V:</b> Fine ceramics: Characteristics, Manufacture and properties of floor tiles, wall tiles, art ware, dental porcelain, bone china, abrasion resistance, porcelain, chemical stone wares, chemical porcelain, insulators, and metalized ceramics. Testing: Loss on ignition, plasticity, thermal shock, corrosion resistance, abrasion resistance, refraction, optical absorption, and crazing, lead solubility. General Plant Layout of white wares industries.	8
<b>Question paper pattern:</b> Question paper shall contain five modules, each module containing two questions. Students shall answer any one question from each module.	
<b>Text books:</b> 1. Industrial Ceramics – Singer and Singer, Springer Netherland publisher edition-1. 2. Ceramic Raw Materials – Ryan, William Ryan Pregamon Press, 1978. 3. Ceramic batch calculations – A.I. Andrews. 4 Ceramic Glaze Technology – Bull & Taylor, Pregamon press, 1986	
<b>Reference Books:</b> 1. Fine Ceramics – F.H. Norton, Krieger pub. Co (June 1978) 2. Introduction to Ceramics – W.D. Kingery, vol. 18, Wiley press, 1960.. 3. Elements of Ceramics – Norton, Addison-Wesley Longeman publisher, 1974. 4. Introduction to White wares – Jackson Mac laren and sons Lt.publisher, London 1969. 5. Ceramics – P. William Lee, Reinhold publisher, 1961. 6 Ceramic white wares – Rexford Newcomb, Pitman publishing Corporation 1947. 7. Heavy Clay wares – F.H. Clews, ACS publication, Academic Press, Newyork.	

**E-books and online course materials:**

1. [https://www.goodreads.com/book/show/2269166.Whitewares\\_Production\\_Testing\\_And\\_Quality\\_Control](https://www.goodreads.com/book/show/2269166.Whitewares_Production_Testing_And_Quality_Control)
2. [https://books.google.com/books/about/Ceramic\\_Whitewares.html?id=vtWIAAAACAAJ](https://books.google.com/books/about/Ceramic_Whitewares.html?id=vtWIAAAACAAJ)
3. <https://phoenix.overdrive.com/phoenix-33/content/media/290620>
4. <https://www.routledge.com/Ceramic-Processing-Industrial-Practices/Sarkar/p/book/9780367727062>
5. [https://books.google.com/books/about/Elements\\_of\\_Ceramics.html?id=bzvxAIAAAIAAJ](https://books.google.com/books/about/Elements_of_Ceramics.html?id=bzvxAIAAAIAAJ)
6. <http://www.hsbttutor.org.in/CeramicEngineering.html>
7. <https://www.worldcat.org/title/modern-ceramic-engineering-properties-processing-and-use-in-design-fourth-edition/oclc/1034612383>
8. <https://www.skillshare.com/browse/clay>
9. <https://www.skillshare.com/browse/pottery>
10. <https://www.britannica.com/art/whiteware>
11. <https://www.youtube.com/watch?v=PSHQxlbMNpE>
12. <https://www.facebook.com/JohnBrittPottery/videos/free-online-glaze-course-here-are-titles-of-videos-you-may-have-to-search-but-6-/466799357583201/>
13. <https://www.teachinart.com/glazing-made-easy.html>
14. <https://claystation.com/tag/online-glaze-course-pottery-ceramics-glazes-john-britt-johnbrittpottery-throwing-videos/>
15. <http://www.lifeandart.in/online-ceramic-glazing-courses.html>

**Course outcomes:**

On completion of the course, the student will have the ability to:

CO #	Course Outcome (CO)
CO1	<b>Describe occurrence, formation, Structure and properties of ceramic raw materials.</b>
CO2	<b>Explain role of water, rheology, and batch calculations.</b>
CO3	<b>Illustrate shaping methods , glaze preparation and glaze application</b>
CO4	<b>Discuss Characteristics, raw materials, manufacture heavy clay ware products</b>
CO5	<b>Explain manufacture of fine ceramics and testing of white ware products</b>

<b>Course Title: Fuels and Furnaces</b>		
Subject Code	21CC44	CIE: 50
Number of Lecture Hours/Week	3(Theory)	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
<b>Modules</b>		<b>Teaching Hours</b>
Module-1 Fuels and general classification made on fuels, features and characteristics of fuels Solid fuels: Wood and charcoal. Coal and theories behind coal formation, ranking and distribution of coals in India, washing of coal and its importance. High and low temperature coal carbonization. Coke manufacture and its applications. Pulverized coal and its applications, determination of calorific value of solid fuels.		8
Module-2 Liquid fuels: Petroleum, its origin theories and occurrence, production of petroleum, pretreatment of petroleum, refining and distillation of crude petroleum, byproducts of crude petroleum and their applications, cracking of petroleum, purification of petroleum, properties of petroleum products Determination of calorific value of liquid fuels.		8
Module-3 Gaseous fuels: Natural gas, gobar gas, LPG, coal gas, producer gas, water gas, blast furnace gas – Manufacture and their applications. Nuclear fuels: nuclear fuels resources in India, nuclear reactors: basic components of nuclear reactors, classification and types of nuclear reactors		8
Module-4 Furnaces: General classification of furnaces, furnace auxiliaries, Different types of heating elements used in furnaces waste heat recovery from furnace flue gases by using regenerator and recuperators, Control of furnace atmosphere, kilns and furnaces used in ceramic industries: Rotary kilns, Tunnel kiln, Intermittent and Continuous kiln, Glass tank furnaces, muffle furnace, ovens		10
Module-5 Furnaces used in metallurgical industries: Sintering furnace, Blast furnace, L.D. Converter, open hearth furnace Regenerators and recuperates furnaces, Electric furnaces (resistance, induction, arc, and dielectric heating), annealing furnace, soaking pits. Calculations pertaining to furnaces and kilns		8
<b>Question paper pattern:</b> Student has to answer five full questions choosing one question from each module.		
<b>Text books:</b> 1. Glass melting tank furnace – Rudolf Gunthar, Society of Glass Sheffield publisher, 1958. 2. Elements of Fuels, Furnaces and Refractories – O.P. Gupta, Khanna publishers, Delhi 2005. 3. Pyrometry – W.P. Wood & J.M. Cork, McGraw-Hill, 1941. 4. Industrial Furnaces – W. Trinks, John wiley and sons publisher, 2004. 5. Fuels, Furnaces and Refractories – J.D. Gillchrist, Pergamon press, Newyork, 1977. 6. Modern Furnace Technology – H. Etherington, London, Griffin publisher, 1961. 7. Handbook of Glass manufacture – F.V. Tooley, Vol. 2, 3rd ed., Ashlee publishing, Newyork, 1974. 8. Efficient use of fuels – HMSO – Brime and King		

**E books and online course materials:** Fuels, furnaces and refractories- James Ducan Gilcris,  
<https://www.askiitians.com/iit-jee-chemistry/physical-chemistry/fuel-cell.aspx>  
<https://en.wikipedia.org/wiki/Fuel>  
<https://en.wikipedia.org/wiki/Furnace>  
<http://www.madehow.com/Volume-7/Furnace.html>

**Course outcomes:**

**On completion of the course, the student will have the ability to:**

Course Code	CO #	Course Outcome (CO)	Blooms Level
	CO1	<b>Interpret about</b> solid fuels and able to <b>outline</b> their applications in process industries.	<b>L2</b>
	CO2	<b>Explain</b> petroleum by- products formation and <b>apply</b> the by -products for different applications.	<b>L2,L3</b>
	CO3	<b>Classify</b> different types of gaseous fuels. Formation and <b>assessment</b> of gaseous fuels applications in process industry. ( L2, L6)	<b>L2, L5</b>
	CO4	<b>Explain</b> and understand about furnaces and their types and furnaces used ceramic industries	<b>L2,L5</b>
	CO5	<b>Learn</b> about different types of furnaces used in metallurgical industries and will be in a position to solve calculation related to heat balance sheet	<b>L2, L5</b>

<b>Course Title: CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS</b>		
Subject Code	21HU45	CIE: 50
Number of Lecture Hours/Week	3(Theory)	SEE: 50
Total Number of Lecture Hours	28	SEE Hours: 03
<b>Modules</b>		<b>Teaching Hours</b>
<b>MODULE – I</b> <b>Introduction and Fundamental Rights:</b> The Constitution of India. Evolution of the Constitution. The Constituent Assembly of India. Sources and Features of the Indian Constitution. Preamble to the Constitution of India. Salient Features of Fundamental Rights and their classification. General exercise of Fundamental Rights and their limitations. RTI (Right to Information Act of 2005 Under Article 19(1)) and The Right of Children to Free and Compulsory Education Act or Right to Education Act (RTE) Under Article 21-A of the Constitution. Special Provisions (Article 370.371 & 371J) for some States		<b>6</b>
<b>MODULE – II</b> <b>Directive Principles of the State Policy and The State Executive:</b> Under Article 36 to 51 of The Constitution and their Relevance. Fundamental Duties Under Article 51A of The Constitution and their Relevance. State Government - The Governor- Appointment, Powers and Functions of the Governor. The Appointment of Chief Minister, his Powers and Functions. The State Council of Ministers and their Functions. The State legislature and The State Council. The High Court of the State, its Powers and Jurisdiction. Appointment and Qualifications of High Court Judges.		<b>6</b>
<b>MODULE – III</b> <b>The Union Executive:</b> Central Government. The President of India, his Election, Powers and Functions. The Vice-President of India, his Election, Powers and Functions. The Supreme Court of India and its Structure. Appointment and Qualification of Supreme Court Judges. Their Powers and Functions. The Structure of Judiciary in India. The Parliament of India. The Prime Minister, his Appointment, Powers and Functions. The Union Council of Ministers their Powers and Responsibilities. Concept of Public Interest Litigation (PIL)		<b>6</b>
<b>MODULE – IV</b> <b>Constitutional Provisions and Emergency Provisions and Election Process :</b> Constitutional for Women, Children, Backward Classes and Scheduled Caste and Scheduled Tribes under different Article of The Constitution. Different types of Emergencies under Article 352, 356 and 360 of the Constitution of India. The Election Commission of India- its Powers and Functions. The State Election Commission		<b>5</b>
<b>MODULE – V</b> <b>Engineering Ethics:</b> Its Aims and Scope, Responsibilities of Engineers, Impediments to their Responsibilities, Honesty, Integrity, Reliability, Risk and Safety Measures, Liabilities of Engineers.		<b>5</b>
<b>Question paper pattern:</b> Solve five full questions selecting atleast one question from each Module		
<b>Text books:</b>		
<ol style="list-style-type: none"> <li>An introduction to the constitution of India and Profession Ethics. By B. R. Venkatesh and Merunandan K. B. Publisher: Idea International Publication Bangalore.</li> <li>The Constitution of India and Professional Ethics. By K. R. Phaneesh. Publisher: Sudha Publication Bangalore.</li> <li>Professional Ethics.By S. Chand. Publisher: S. Chand &amp; Company Ltd. Ram Nagar, New Delhi - 110055.</li> <li>E books and online course materials: Constitution of India and Professional Ethics By: M Raja Ram. Publisher: New Age International (P) Limited, New Delhi.</li> <li>The Constitutional law of India By: J.N. Pandhey. Publisher: Central Law agency, Allahabad.</li> </ol>		

**Course outcomes:**

**On completion of the course, the student will have the ability to:** At the end of the course the students will be able to

Course Code	CO #	Course Outcome (CO)	Blooms Level
	CO1	Explain the evolution and features of constitution, fundamental rights and their classification L 2	L2
	CO2	Describe the directive principles of state policy, fundamental duties and The State Executive L 2	L2,L3
	CO3	Describe about The Union Executive and concept of Public Interest Litigation L 2	L2, L5
	CO4	Explain the Constitutional Provisions for women, children, SC/ST'S, Emergency Provisions and Election Process L 2	L2,L5
	CO5	Identifies the qualities required for an professional engineers to be ethical L 4	L2, L5

**Course Objectives:** To enable the students to obtain the basic knowledge about The Constitution of India and Professional Ethics in the following topics:-

- . Introduction and Fundamental Rights
- . Directive Principles of the State Policy and the State Executive
- . The Union Executive
- . Constitutional Provisions for women, Children & SC/ST 'S, Emergency Provisions and Election Process
- . Engineering Ethics

**COURSE ARTICULATION MATRIX**

CO	COURSE OUTCOME STATEMENT	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	Explain the evolution and features of constitution, fundamental rights and their classification						3	2	3				3
CO 2	Describe the directive principles of state policy, fundamental duties and The State Executive						3	2	3				1
CO 3	Describe about The Union Executive and concept of Public Interest Litigation						3	2	3				1
CO	Explain the						3	2	3				1

<b>4</b>	Constitutional Provisions for women, children, SC/ST'S, Emergency Provisions and Election Process												
<b>CO 5</b>	Identifies the qualities required for an professional engineers to be ethical						2	2	3				3
	<b>Program Articulation Matrix(PAM)</b>						2.8	2	3				1.8



<b>UNIVERSAL HUMAN VALUES-II</b>		
Course Code	21UHV46C	CIE: 50
Number of Lecture Hours/Week	2hrs (Tutorial)	SEE: 50
Total Number of Theory Hours	14 hours	SEE Hours: 03
<b>Course Objectives:</b>		
<ol style="list-style-type: none"> <li>To facilitate the students to understand harmony at all the levels of human living, and live accordingly.</li> <li>To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life.</li> </ol>		
<b>Modules</b>		<b>Teaching Hours</b>
<p style="text-align: center;"><b>Module I</b></p> <p><b>Implications Of The Right Understanding: Providing The Basis For Universal Human Values And Ethical Human Conduct-</b> Value In Different Dimensions Of Humanliving, Universal Values Naturally Emerging From The Right Understanding, Definitiveness Of Ethical Human Conduct, Identification Of <i>Svatva</i> Leading To <i>Svatantrata And Svarajya</i>, Development Of Human Consciousness, Implications Of Value-Based Living.</p>		<b>3hrs</b>
<p style="text-align: center;"><b>Module II</b></p> <p><b>Basis For The Holistic Alternative Towards Universal Human Order:</b> Identification Of Comprehensive Human Goal, Vision For The Holistic Alternative, Basis For Humanistic Education And Humanistic Constitution, Universal Human Order And Its Implications.</p>		<b>3hrs</b>
<p style="text-align: center;"><b>Module III</b></p> <p><b>Professional Ethics In The Light Of Right Understanding:</b> Profession-In The Light Of Comprehensive Human God, Ensuring Competence In Professional Ethics, Issues In Professional Ethics-The Current Scenario, Inherent Contradictions And Dilemmas And Their Resolutions.</p>		<b>3hrs</b>
<p style="text-align: center;"><b>Module IV</b></p> <p><b>Vision For Holistic Technologies, Production Systems And Management Models:</b> The Holistic Criteria For Evaluation, A Critical Appraisal Of The Prevailing Systems, Learning From The Systems In Nature And Traditional Practices, Holistic Technologies And Systems- Typical Case Studies.</p>		<b>3hrs</b>
<p style="text-align: center;"><b>Module V</b></p> <p><b>Journey Towards the Holistic Alternative- The Road Ahead:</b> Appreciating The Need For Self-Exploration, Facilitating The Understanding Of Harmony At Various Levels, Steps For Evaluation At The Individual Level, Steps For Transition At The Level Of Family, Society And Profession, Promoting Mass Awareness And Moving Towards Humanistic Education, Evolving Holistic Models Of Living, Amending Policies, Programs And Social Systems In Tune With Comprehensive Human Goal, Is The Transition Too Difficult?, Concluding Remarks.</p>		<b>2hrs</b>
<b>Text Books:</b>		
<ol style="list-style-type: none"> <li>The Text Book R.R Gaur, R Sangal, G P Bagaria, A Foundation Course In Human Values And Professional Ethics, Excel Books, New Delhi, 2010, ISBN 978-8-174-46781-2.</li> <li>The teacher's manual R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi, 2010</li> </ol>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.</li> <li>PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Purblishers.</li> <li>Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991</li> <li>Ivan Illich, 1974, Energy &amp; Equity, The Trinity Press, Worcester, and HarperCollins, USA</li> <li>Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to Growth, Club of Rome's Report, Universe Books.</li> <li>Subhas Palekar, 2000, How to practce Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.</li> </ol>		

7. A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
8. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
9. A.N. Tripathy, 2003, Human Values, New Age International Publishers.

**Course outcomes: On completion of the course, the student will have the ability to:**

Course Code	CO	Course Outcome (CO)
<b>21UHV4X</b>	<b>CO1</b>	The students are able to visualize the co-relation between lack of human values and the prevailing problems.
	<b>CO2</b>	They are also able to visualize tangible steps and a roadmap for moving in the cherished direction.
	<b>CO3</b>	The students are able to visualize an appropriate utilization of the knowledge in their respective streams to ensure mutually enriching and sustainable systems.
	<b>CO4</b>	The students are able to sincerely evaluate the course and the transformation achieved in this process.
	<b>CO5</b>	They are also able to make use of this understanding for moving towards happy and prosperous life including an ethical conduct of their profession.

<b>Course Title: Ability Enhancement Course (Life Sciences) (Biology for Ceramics)</b>		
Course Code	21CCA46A	CIE: 50
Number of Lecture Hours/Week	2	SEE: 50
Total Number of Lecture Hours	25	SEE Hours: 03
Prerequisite		
<p>Course Objectives:</p> <p>To impart knowledge and enable students to understand:</p> <ol style="list-style-type: none"> <li>1. Bio materials and structure and properties of biological cells.</li> <li>2. Structure of blood and its interaction with implant</li> <li>3. Structure of bone, heart and tooth, and their problems.</li> <li>4. Testing the Cellular viability and Cellular adhesion of bio implants</li> <li>5. Classification and applications of bio Ceramic Materials</li> </ol>		
<b>Modules</b>		<b>Teaching Hours</b>
<p>Module I</p> <p>Property requirement of biomaterials: concept of biocompatibility, some definitions related to biomaterials. General classification of Biomaterials: Bioinert, bioactive, bioresorbable materials. Structure and properties of biological cells and tissues; natural bones structure and properties. Cell material interactions and foreign body response, Assessment of biocompatibility of biomaterials cell signaling process cell migration, cell differentiation cell apoptosis.</p>		5
<p>Module II</p> <p>Hemo compatibility, Structure of Blood as a Tissue, Interaction of a implants with blood elements, Types of bacteria, Bacteria adhesion and bio film formation, Protocol for Bacteria culture formation,</p>		5
<p>Module III</p> <p>Structure, properties and types of bones and Teeth. Bone forming Cells, Cardiovascular system Heart structure and function. Common Cardio problems Stricture.</p>		5
<p>Module IV</p> <p>In vitro Tests (cellular adhesion, cellular viability using MTT test ontogenetic differentiation using ALP assay, Invivo testing.</p>		5
<p>Module V</p> <p>Bioceramics, Categories of ceramic biomaterials, historical perspective of bioceramics, merits of ceramic biomaterials over metals and polymers, desired properties of implantable bioceramics. Bio-inert bio ceramics: alumina, zirconia, calcium aluminates and pyrolytic carbon.</p> <p>Bio-active glasses and glass ceramics, novel bio-medical materials based on glasses,</p>		5
<p><b>Question paper pattern:</b></p> <p>Two questions with sub divisions to be set from each module. Students shall answer one question from each module. Mixing of questions in the module is allowed.</p>		

**Text books:**

1. Human biomaterials application – Donald L. Wise et al.(ISBN 0-089603-337-6 (alk. Paper)

**Reference Books:**

2. Biomaterials Science Ratner, Hoffman, Schoen, Lemons (Elsevier; ISBN 0-12-582461
3. Advanced Biomaterials Fundamentals Processing and Applications Edited By Bikramjit Basu,
4. Dhirendra Katti, Ashok Kumar A JOHN WILEY & SONS INC. PUBLICATION HOBOKEN,
5. NEWJERSY 2009
6. SKINNER'S Science of Dental Materials – Ralph W. Phillips, A PRISM Indian Edition 9th
7. Ed. 1992 PRISM BOOKS PVT LTD Bangalore.
8. Human biomaterials application – Donald L. Wise et al.
9. Biomaterials: Principles and applications – Ed. By Joon B. Park et al., CRC Press
10. Bioceramics: Applications of Ceramic and Glass Materials in Medicine – Ed. James F.
11. Shackelford. An introduction to bioceramics – Ed. Larry L. Hench

**E books and online course materials:****Course outcomes:**

**On completion of the course, the student will have the ability to:**

Course Code	CO #	Course Outcome (CO)	Blooms Level
	CO1	Define bio materials and explain structure and properties of biological cells	3
	CO2	Explain structure of blood and its interaction with implant	3
	CO3	Explain structure of bone, heart and tooth, and their problems.	3
	CO4	Test the Cellular viability and Cellular adhesion and Cellular viability	4
	CO5	Explain corrosion and its prevention and Extend chemical bond theory and structure of solids to determine mechanical properties	4

**COURSE TITLE: FURNACES AND EQUIPMENT DRAWING**

Course Code	21CCAE46B	Maximum marks CIE: 50
Number of Lecture Hours/Week	01	Maximum marks SEE: 50
Total Number of Lecture Hours	15	SEE Hours:
Prerequisite: 1. Student should have basic knowledge of excel		
Course Objectives To impart knowledge and enable students to draw 1. Steel making furnaces 2. Glass making furnaces 3. Various types of kilns 4. Rotary kiln and other equipments used in cement industries 5. Unit operation equipments		
<b>Modules</b>		<b>Teaching Hours</b>
<b>Module I</b> Drawing of Electrical Arc furnace, Induction furnace, pyrometers, Blast furnace, open hearth furnace, L.D.convertor, Bessemer Convertor, Laddles, Soaking Pit		3
<b>Module II</b> Pot furnace, Glass Tank Furnace, Regenerators and recuperators.		3
<b>Module III</b> Dryers, Modern Tunnel Kiln, DDKiln Updraft kiln Chamber Kiln Halfmanns Kiln,		3
<b>Module IV</b> Rotary Kiln, Preheater Precalciners Screw Conveyor Bucket Conveyor Stacking and reclaiming equipment Dust Collector air separator coolers		3
<b>Module V</b> Jaw Crusher, Gyratory Crusher, Roller crusher Ball Mill Magnetic Separator Screens Frictional Screw press Counter current Intensive Mixer		3
<b>Text books:</b> 1. Industrial Ceramics – Singer and Singer, Springer Netherland publisher edition-1. 2. Handbook of Glass Manufacture – Vol 1,2, F.V. Tooley, Ogdan Publication 3. McCabe W.L., et. al., “Unit Operations of Chemical Engineering”, 5th ed., McGraw Hill International, Singapore, 2000. 4. Cement data book – Vol.I, II, III – W.H. Duda, Gmbh Germany.		
<b>Reference Books:</b> 1. Glass melting tank furnace – Rudolf Gunthar, Society of Glass Sheffield 2. Publisher, 1958. Elements of Fuels, Furnaces and Refractories – O.P. Gupta, Khanna publishers, Delhi 2005. 3. Fuels, Furnaces and Refractories – J.D. Gillchrist, Pergamon press, Newyork, 1977.		
<b>E books and online course materials:</b> 1.		
<b>Course outcomes:</b> <b>On completion of the course, the student will have the ability to:</b>		

<b>Course Code</b>	<b>CO #</b>	<b>Course Outcome (CO)</b>	<b>Blooms Level</b>
<b>21CCA46B</b>	<b>CO1</b>	Draw steel making furnaces	
	<b>CO2</b>	Draw Glass making furnaces	
	<b>CO3</b>	Draw various types of kilns	
	<b>CO4</b>	Draw rotary kiln and other equipments used in cement industries	
	<b>CO5</b>	Draw Unit operation equipments	

UNIVERSAL HUMAN VALUES-I			
Course Code	22UHV47	Credits:1	CIE: 50
Number of Lecture Hours/Week	2hrs (Tutorial)		SEE: 50
Total Number of Theory Hours	14 hours		SEE Hours: 02
<b>Course Objectives:</b>			
<ol style="list-style-type: none"> <li>To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.</li> <li>To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.</li> <li>To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.</li> </ol>			
<b>Modules</b>			<b>Teaching Hours</b>
<b>Module I</b>			
<b>Introduction To Value Education:</b> Understanding Value Education, Need Of Value Education, Basic Guidelines For Value Education, The Content Of Value Education, The Process Of Value Education. <b>Self- Exploration As The Process For Value Education:</b> Starting To Observe Inside, What Is Self-Exploration? What Is Its Purpose?, Content Of Self-Exploration, Natural Acceptance, What Is The State Today?, What Is The Way Out? What Do We Need To Do?.			3x2hrs
<b>Module II</b>			
<b>The Basic Human Aspirations- Continuous Happiness And Prosperity:</b> Continuous Happiness And Prosperity- Our Basic Aspiration, Exploring Happiness And Prosperity, A Look At The Prevailing Notions Of Happiness And Prosperity, Some Possible Questions/ Confusions. <b>The Program To Fulfill Basic Aspiration:</b> Basic Requirements For Fulfillment Of Human Aspirations, What Is Our State Today?, Why Are We In This State?- Living With Wrong Assumptions, What Is The Solution?- The Need For Right Understanding, Our Program: Understand And Live In Harmony At All Levels Of Living, Our State Today?, Our Natural Acceptance For Harmony At All Levels Of Our Living, Human And Animal Consciousness.			3x2hrs
<b>Module III</b>			
<b>Understanding The Harmony At Various Levels:</b> Understanding The Human Being As Co-Existence Of Self(I) And Body, Human Being Is More Than Just The Body, Understanding Myself As Coexistence Of Self And The Body, Understanding The Needs Of The Self And Needs Of The Body, Understanding The Self(I) As A Conscious Entity, The Body As The Material Entity, Exercise On Distinguishing Needs Of The Self(I) And The Body, Exercise On Distinguishing Activities Of The Self(I) And Body, Understanding The Body As An Instrument Of 'I'(I Being The Seer, Doer And Enjoyer).			3x2hrs
<b>Module IV</b>			
<b>Harmony In Self(I)- Understanding Myself:</b> Why Should I be aware of Myself?, Getting To Know The Activities In I Related?, The Activities In I Are Continuous, What Is The Problem Today?, Effects Of The Problem, What Then Is The Solution?, Result Of Realization And Understanding- Living With Definiteness. <b>Harmony With The Body- Understanding Sanyama And Svashtya:</b> Our Body- A Self-Organised Unit, Harmony Of I With The Body: <i>Sanyama</i> And <i>Svashtya</i> , What Is Our State Today?, What Is The Way Out?, Understanding And Living With Sanyama, Correct Appraisal			3x2hrs

Of Our Physical Needs.		
<b>Module V</b> <b>Harmony In The Family- Understanding Values In Human Relationships:</b> Family As The Basic Unit Of Human Interaction, Harmony In The Family, Justice( <i>Nyaya</i> ), What Is The State Today?, Values In Human Relationships, Trust( <i>Visvasa</i> ),Respect( <i>Sammama</i> ), The Basis For Respect, Assumed Bases For Respect Today, The Problem Due To Differentiation, Difference Between Attention And Respect, What Is The Way Out?, Affection ( <i>Sneha</i> ), Care( <i>Mamata</i> ), Guidance( <i>Vatsalya</i> ),Reverence( <i>Shraddha</i> ),Glory( <i>Gaurava</i> ),Gratitude( <i>Kritagyata</i> ),Love( <i>Prema</i> ), Harmony From Family To World Family: Undivided Society.		<b>3x2hrs</b>
<b>Text Books:</b> <ol style="list-style-type: none"> <li>1. The Text Book R.R Gaur, R Sangal, G P Bagaria, A Foundation Course In Human Values And Professional Ethics, Excel Books, New Delhi, 2010, ISBN 978-8-174-46781-2.</li> <li>2. The teacher’s manual R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi, 2010</li> </ol>		
<b>Reference Books:</b> <ol style="list-style-type: none"> <li>1. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.</li> <li>2. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Purblishers.</li> <li>3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991</li> <li>4. Ivan Illich, 1974, Energy &amp; Equity, The Trinity Press, Worcester, and HarperCollins, USA</li> <li>5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to Growth, Club of Rome’s Report, Universe Books.</li> <li>6. Subhas Palekar, 2000, How to practce Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.</li> <li>7. A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.</li> <li>8. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond &amp; Briggs, Britain.</li> <li>9. A.N. Tripathy, 2003, Human Values, New Age International Publishers.</li> </ol>		
<b>Question paper pattern:</b> <ol style="list-style-type: none"> <li>1. The question paper will have 30% of MCQ questions covering the entire syllabus, students need to answer all the questions.</li> <li>2. 70% of descriptive questions consist of 2 questions from each module of 14 marks each; students need to answer FIVE full questions, selecting ONE full question from each module.</li> </ol>		
<b>Course outcomes:</b> <b>On completion of the course, the student will have the ability to:</b>		
Course Code	CO	Course Outcome (CO)
<b>21UHV36B</b>	<b>CO1</b>	Develop a universal approach to value education by the right understanding of reality (i.e. a worldview of the reality “as it is”) through the process of self-exploration.
	<b>CO2</b>	Develop a Holistic perspective towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence.
	<b>CO3</b>	Proficient to understand the harmony at various levels.
	<b>CO4</b>	Evaluate the need of right understanding to live with the harmony at the level of human being (self and body).
	<b>CO5</b>	Recognize and fulfill the requirement of harmony at the level of family.



**B.E. III/IV SEM.  
BALAKE KANNADA**

Subject Code	Subject	Stream	Th- Tut-Pr	Credits
21KAN36/45	BALAKE KANNADA	Humanities and Social Sciences (H.S.S)	2 - 0 - 0	01

CIE : 50

SEE : 50

SEE : 1 hours 30 Minute

Total : 28 Hours

**ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ  
ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯಪುಸ್ತಕ  
baLake Kannada Text Book for VTU**

(Common to B.Arch, B.Plan and B.E/B.Tech of all branches)

[As per Outcome Based Education (OBE) and Choice Based Credit System (CBCS) scheme]

**Course Learning Objectives:**

The course will enable the non Kannadiga students to understand, speak, read and write Kannada language and communicate (converse) in Kannada language in their daily life with kannada speakers.

**Table of Contents**

Introduction to the Book  
Necessity of learning a local language:  
Tips to learn the language with easy methods.  
Easy learning of a Kannada Language: A few tips  
Hints for correct and polite conversation  
Instructions to Teachers for Listening and Speaking Activities  
Key to Transcription  
Instructions to Teachers

**Part – I Lessons to teach and Learn Kannada Language**

- Lesson – 1** ವೈಯಕ್ತಿಕ, ಸ್ವಾಮ್ಯಸೂಚಕ/ಸಂಬಂಧಿತ ಸಾರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು - Personal Pronouns, Possessive Forms, Interrogative words
- Lesson – 2** ನಾಮಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು - Possessive forms of nouns, dubitive question and Relative nouns
- Lesson – 3** ಗುಣ, ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣಬಣ್ಣ ವಿಶೇಷಣಗಳು, ಸಂಖ್ಯಾವಾಚಕಗಳು  
Qualitative, Quantitative and Colour Adjectives, Numerals
- Lesson – 4** ಕಾರಕ ರೂಪಗಳು ಮತ್ತು ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು – ಸಪ್ತಮಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯ – (ಆ, ಅದು, ಅವು, ಅಲ್ಲಿ) Predictive Forms, Locative Case
- Lesson – 5** ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು – Dative Cases, and Numerals
- Lesson – 6** ಸಂಖ್ಯಾಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು - Ordinal numerals

and Plural markers

Lesson – 7 ನ್ಯೂನ / ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು ಮತ್ತು ವರ್ಣ ಗುಣವಾಚಕಗಳು

Defective / Negative Verbs and Colour Adjectives

Lesson – 8 ಅಪ್ಪಣೆ / ಒಪ್ಪಿಗೆ, ನಿರ್ದೇಶನ, ಪ್ರೋತ್ಸಾಹ ಮತ್ತು ಒತ್ತಾಯ ಆರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು - Permission, Commands, encouraging and Urging words (Imperative words and sentences)

Lesson – 9 ಸಾಮಾನ್ಯ ಸಂಭಾಷಣೆಗಳಲ್ಲಿ ದ್ವಿತೀಯ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ಸಂಭವನೀಯ ಪ್ರಕಾರಗಳು

Accusative Cases and Potential Forms used in General Communication

Lesson – 10 “ಇರು ಮತ್ತು ಇರಲ್ಲ” ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು, ಸಂಭಾವ್ಯಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾ ಪದಗಳು  
Helping Verbs “iru and iralla”, Corresponding Future and Negation Verbs

Lesson – 11 ಹೋಲಿಕೆ (ತರತಮ), ಸಂಬಂಧ ಸೂಚಕ ಮತ್ತು ವಸ್ತು ಸೂಚಕ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಪದಗಳ ಬಳಕೆ  
Comparative, Relationship, Identification and Negation Words

Lesson – 12 ಕಾಲ ಮತ್ತು ಸಮಯದ ಹಾಗೂ ಕ್ರಿಯಾಪದಗಳ ವಿವಿಧ ಪ್ರಕಾರಗಳು  
Different types of forms of Tense, Time and Verbs

Lesson – 13 ದ್, -ತ್, -ತು, -ಇತು, -ಆಗಿ, -ಅಲ್ಲ, -ಗ್, -ಕ್, ಇದೆ, ಕ್ರಿಯಾ ಪ್ರತ್ಯಯಗಳೊಂದಿಗೆ ಭೂತ, ಭವಿಷ್ಯತ್ ಮತ್ತು ವರ್ತಮಾನ ಕಾಲ ವಾಕ್ಯ ರಚನೆ  
Formation of Past, Future and Present Tense Sentences with Verb Forms

Lesson – 14 ಕರ್ನಾಟಕ ರಾಜ್ಯ ಮತ್ತು ರಾಜ್ಯದ ಬಗ್ಗೆ ಕುರಿತಾದ ಇತರ ಮಾಹಿತಿಗಳು  
Karnataka State and General Information about the State

Lesson – 15 ಕನ್ನಡ ಭಾಷೆ ಮತ್ತು ಸಾಹಿತ್ಯ -  
Kannada Language and Literature

Lesson – 16 ಭಾಷೆ ಕಲಿಯಲು ಏನನ್ನು ಮಾಡಬೇಕು ಮತ್ತು ಮಾಡಬಾರದು  
Do's and Don'ts in Learning a Language

Lesson – 17 PART - II

Kannada Language Script Part – 1

Lesson – 18 PART - III

Kannada Vocabulary List : ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು - Kannada Words in Conversation

P D A College of Engineering  
**B.E. in Respective branch Name Scheme of Teaching and Examinations 2022**  
 Outcome Based Education (OBE) and Choice Based Credit System (CBCS)  
 (Effective from the academic year 2023-24)

**V SEMESTER**

S I. N o	Course and Course Code		Course Title	Teaching (TD)and Question Paper Setting Board(PSB)	Teaching Hours/Week				Exa mina tion			
					Theory Lectur	Tutorial	Practical /Drawin	Self-Study	Duration in hours	CIEMarks	SEEM arks	Total Marks
					L	T	P	S				
1	HSM S/PC	22HU51	Humanities	TD-Respective Dept. PSB- Respective Dept.	3	0	0		03	5 0	50	100
2	IPC C	22CC52	Refractories	TD-Respective Dept. PSB- Respective Dept.	2	2	2		03	5 0	50	100
3	PCC	22CC53	Cement technology-1	TD-Respective Dept. PSB- Respective Dept.	4	0	0		03	5 0	50	100
4	PCC L	22CCL5 4	Cement Lab	TD-Respective Dept. PSB- Respective Dept.	0	0	2		03	5 0	50	100
5	PEC	22CC55X (A,B,C)	Fuels and combustion/ Material technology/Smart materials	TD-Respective Dept. PSB- Respective Dept.	3	0	0		03	5 0	50	100
6	PRO J	22CCM P56	Mini Project	TD-Respective Dept. PSB- Respective Dept.	0	0	4		-	5 0		50
7	AE C	22RMI5 7	Research Methodology and IPR	Any Department	2	2	0		03	5 0	50	100
8	BSC	22ES58	Environmental Studies	TD:CV/Env/Chem PSB:CV	2	0	0		03	5 0	50	100
9	NCM C	22NS59	Mandatory Course	NSS	0	0	2			50		50
		22PH59	Mandatory Course	Sports								
		22YO59	Mandatory Course	Yoga								
<b>Total</b>										<b>4 5 0</b>	<b>35 0</b>	<b>800</b>
<b>Professional Elective Course</b>												
22CC55A	Fuels and combustion			22CC55C	Smart materials							
22CC55B	Material technology			22XX55D								
<b>PCC:</b> ProfessionalCoreCourse, <b>PCCL:</b> ProfessionalCoreCourselaboratory, <b>UHV:</b> UniversalHumanValueCourse, <b>MC:</b> MandatoryCo urse(Non-credit), <b>AEC:</b> Ability												

Course Title: **REFRACTORIES**

Subject Code	22CC52	CIE: 50
Number of Lecture Hours/Week	3 (Theory)	SEE: 50
Total Number of Lecture Hours	42	Hours: 03
		<b>Teaching Hours</b>
<p style="text-align: center;"><b>MODULE -I</b></p> <p>Definition, Classification and properties of refractories, raw materials, scope of refractory industries in India, Review of raw materials for different refractories. Drying shrinkage, processing variables for controlling drying shrinkage, drying in hot floors and other types of dryers. Preparation, properties and applications of Alumino-silicate refractory bricks (fire clay, silliminite, kyanite, andulsite, high heat duty, moderate heat duty, low heat duty refractories)</p>		8
<p style="text-align: center;"><b>MODULE -II</b></p> <p>Silica and semi silica.. Preparation, properties and applications of magnesite, dolomite, chrome and chrome magnesite, insulation bricks.carbon and graphitized refractories, Mag-carbonrefractories, fusion cast refractories. Sialon refractories.</p>		9
<p style="text-align: center;"><b>Module-III</b></p> <p>Heat setting and air setting, bonding mortar, ramming masses castables, gunning material, gunning tar mixes. Testing of Refractories PCE tests, compression, torsional and creep properties. RUL test, reheat shrinkage, spalling resistance, slag resistance, reaction between refractories and glasses, heat transmission, behavior of refractories in different environment, carbon monoxide disintegration. Specification of different kinds of bricks,</p>		8
<p><b>Module-IV</b></p> <p>Phase diagrams related to the manufacture of conventional refractories, two and three component systems for refractory manufacturing. Sintering: Introduction, definition, types of sintering processes, study of driving force, mechanisms. Modes of material transport, topology of solid state sintering, liquid phase sintering and vapor phase sintering, parameters for control of sintering processes.</p>		8
<p style="text-align: center;"><b>Module –V</b></p> <p>Blast furnace, design and installation of blast furnace, carbon lining, modification of hot blast for high temperature. Operation of basic and acidic open hearth furnaces, soaking pits, reheating furnaces, hot metal mixer, ladles, steel melting furnaces by electricity Refractoriness in non-ferrous industries, Refractories in generation of steam, power, nuclear power Refractories used in glass, coke-ovens, cement industries, gas production, etc.</p>		9
<p><b>Question paper pattern:</b> Question paper shall contain FIVE modules, each module containing TWO questions. Students shall answer any ONE full question from each module</p>		
<p><b>Text books:</b> 1. Refractories - Rashid Chesti</p>		
<p><b>Reference Books:</b></p>		

<b>THEORY COURSE TITLE: CEMENT TECHNOLOGY – I</b>	
Course Code: 22CC53	CIE: 50
Number of Lectures Hours/Week:04	SEE: 50
Total Number of Lecture Hours: 42	SEE Hours: 03
<b>Modules</b>	<b>Teaching Hours</b>
<b>Module-I:</b> Origin and development of cement industries, lime and other building materials, different classes of lime and their properties. Cement manufacture - wet, dry, semi-dry processes, classification of cement. Raw materials, their selection and proportioning, calcareous and argillaceous materials, quality requirements, corrective materials and additives, industrial wastes and by products	08 Hours
<b>Module-II:</b> Study of phase diagrams of binary, ternary and phase relations of clinker material. Proportion of different phase constituents and their ultimate effect on the properties of cement. Significance of moduli values of HM, SM, AF, LSF etc. Guide lines for selection of raw materials for different purposes, raw material quality and burnability factors for clinkerization	10 Hours
<b>Module-III:</b> Reactions occurring in cement burning, effect of cooling on cement properties and phases, effect of minor constituents and mineralizers on raw mix burning and cement characteristics. Thermo-chemistry of cement formation, sequence of reactions, reaction products, calculation of potential phase composition and liquid phase temperature	08 Hours
<b>Module-IV:</b> Hydration of portland cement - hydration mechanisms and related theories for C <sub>3</sub> S phase and mechanisms of C <sub>2</sub> S and C <sub>3</sub> A.etc. Setting and hardening of portland cement, set regulations and gypsum, calcium sulphate - water system, false set, alternative set regulators, air setting of portland cement, carbonation, hydration characteristics of different types of portland cements	08 Hours
<b>Module-V:</b> Types of cement and their use: Quick setting cement, rapid hardening cement, low heat cement, blast furnace slag cement, pozzolona and pozzolonic cement, high alumina cement, soral cement, hydrophobic cement, water proof cement, expanding and stressing cement, sulfate resisting cement, super sulphate cement, trief cement. Testing of cement: particle size analysis by different methods, initial and final setting time, density of cement, soundness of cement, strength test etc, ISI Specifications for different types of cement. Gypsum and plaster of Paris, manufacture of plaster of Paris and its uses.	08 Hours
<b>Question paper pattern:</b> Question paper shall contain five modules, each module containing two questions. Students shall answer any one question from each module.	
<b>Text books:</b> 1. Text book of Cement and Concretes - Lee	

2. Advances in Cement technology – S.N. Ghosh, ABI Books Pvt. Ltd., NewDelhi. 3. Cement Engineer’s Handbook – Von Otto Labahn, McGraw Hill. 4. Cement – Banerjee 5. Cement – Chatterjee			
<b>Reference Books:</b>			
1. Cement Chemistry – Harold F W Taylor 2. Cement-data-book by Walter H. Duda			
<b>E-books and online course materials:</b>			
1. Advances in Cement Technology(1st Edition): Critical Reviews and Case Studies on Manufacturing, Quality Control, Optimization and Use 2. Cement Production Technology (1st Edition): Principles and Practice			
<b>Course outcomes:</b>			
On completion of the course, the student will have the ability to:			
<b>CO #</b>	<b>Course Outcome (CO)</b>		
<b>CO1</b>	<b>Classify and compare various types building materials and cement manufacturing processes</b>		
<b>CO2</b>	<b>Analyze thermo-chemical reactions and calculate the potential phase compositions of various types of cement</b>		
<b>CO3</b>	<b>Interpret the reaction occurring in cement manufacturing and explain its effect on cement properties</b>		
<b>CO4</b>	<b>Explain the hydration mechanism of different cement phases</b>		
<b>CO5</b>	<b>Evaluate properties of various types of cements</b>		
1. Refractories – F.H. Norton 2. Refractories - Properties & application – J.H. Chesters. 3. Refractories – M.L. Mishra 4. Refractories Properties & application – Kenneth Shaw 5. Refractories – Nandi			
<b>E books and online course materials:</b>			
<b>Course outcomes:</b>			
<b>On completion of the course, the student will have the abilityto:</b>			
<b>Course Code</b>	<b>CO #</b>	<b>Course Outcome (CO)</b>	<b>Blooms Level</b>
	<b>CO1</b>	Defend and Describe the classification, general preparation, properties, applications and the scope of refractories, drying of refractories and preparation and applications of alumina silicate refractories .	C1 AI
	<b>CO2</b>	Describe the preparation, properties and applications acidic , basic , insulating , carbon based refractories .	C2 A2
	<b>CO3</b>	Describe monolithic refractories and testing of refractories and specification of refractories .	C3 A3
	<b>CO4</b>	Explain phase diagram and sintering of refractories.	C4 A4
	<b>CO5</b>	Describe applications of refractories in various industries..	C5 A5

## PRACTICAL COMPONENT OF IPCC

<b>S. No</b>	<b>Experiments</b>
1	1 Identification of raw materials for refractory making and about drying shrinkage of glass
2	2 Identification of properties of refractories –PCE, RUL, APP Porosity, Bulk Density, sp gravity, thermal conductivity, spalling resistance etc
3	3 Preparation of grog
4	4 Preparation of fireclay refractory
5	5 Preparation of insulating refractory
6	6 Determination of properties of refractories - PCE, RUL, APP Porosity, Bulk Density, sp gravity, thermal conductivity, spalling resistance
7	9 Determination of packing density of coarse, medium and fine refractory particles configuration

## **COURSE TITLE: CEMENT LABORATORY**

Subject Code: <b>22CCL54</b>	Credits : 01
Number of Lecture Hours per Week: 3hrs	CIE Marks: 50
Total Number of Lecture Hours: 42	SEE Marks: 50

### **List of Experiments**

1. Determination of fineness of cement by sieve analysis.
2. Determination of fineness of cement by Blains air permeability method.
3. Study of Vicat apparatus and determination of consistency of cement.
4. Determination of initial setting time of cement.
5. Determination of Final setting time of cement.
6. Determination of Soundness of cement by Le Chatelier's apparatus.
7. Determination of Soundness of cement by autoclave method.
8. Determination of specific gravity and true density of cement by pycnometer method.
9. Determination of specific gravity and true density of cement by pycnometer method.
10. Determination of specific gravity and true density of cement by Le Chatelier's flask.
11. Determination of compressive strength of cement concrete.
12. Determination of heat of hydration of cement.

<b>Course Code</b>	<b>CO #</b>	<b>Course Outcome (CO)</b>
<b>21CCL55</b>	<b>CO1</b>	Determine physical properties of cement
	<b>CO2</b>	Determine setting time and, soundness of cement
	<b>CO3</b>	Perform chemical and technical analysis of cement
	<b>CO4</b>	Determine mechanical properties of cement
	<b>CO5</b>	Determine thermal properties of cement



Course Title: <b>Fuels and Combustion</b>		
Subject Code	22CC551/ 22CC55A	CIE: 50
Number of Lecture Hours/Week	3 (Theory)	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Modules		Teaching Hours
Module-1 Fuels and general classification made on fuels, features and characteristics of fuels Solid fuels: Coal and theories behind coal formation, ranking and distribution of coals in India, Coal cleaning and its importance, Coke manufacture and its applications. Pulverized coal and its uses.		8
Module-2 Liquid fuels: Petroleum, its origin theories and occurrence, production of petroleum, pretreatment of petroleum, refining and distillation of crude petroleum, byproducts of crude petroleum and their applications, cracking of petroleum, purification of petroleum, properties of petroleum products		8
Module-3 Gaseous fuels: Natural gas, gobar gas, LPG, coal gas, producer gas, water gas, blast furnace gas – production, storage and their applications.		8
Module-4 Combustion: Combustion definition, Gross calorific value, net calorific values, factors influencing rate of combustion, Combustion reactions and calculations of Solid fuels and liquid fuels. Determination of calorific value of solid fuels and liquid fuels in laboratory. Determination of theoretical calorific values (Dulong's formula).		
Module-5 Ceramic Green Energy technologies: Principle of photo-catalytic hydrogen production using ceramic semiconductors, Solid electrolytes and Fuel Cells (SOFCs). Effect of Carbon dioxide (CO <sub>2</sub> ) on climate change, need of carbon dioxide capture and storage, Carbon dioxide capture methods. CO <sub>2</sub> emissions in cement Industry, Government policies and initiatives for CO <sub>2</sub> capture.		10
<b>Question paper pattern:</b> Student has to answer five full questions choosing one question from each module.		
<b>Text books:</b> 1. Glass melting tank furnace – Rudolf Gunthar, Society of Glass Sheffield publisher, 1958. 2. Elements of Fuels, Furnaces and Refractories – O.P. Gupta, Khanna publishers, Delhi 2005. 3. Pyrometry – W.P. Wood & J.M. Cork, McGraw-Hill, 1941. 4. Industrial Furnaces – W. Trinks, John wiley and sons publisher, 2004.		

5. **Fuels, Furnaces and Refractories – J.D. Gillchrist, Pergamon press, Newyork, 1977.**  
 6. **Modern Furnace Technology – H. Etherington, London, Griffin publisher, 1961.**  
 7. **Handbook of Glass manufacture – F.V. Tooley, Vol. 2, 3rd ed., Ashlee publishing, Newyork, 1974.**  
 8. **Efficient use of fuels – HMSO – Brime and King**

**E books and online course materials:** Fuels, furnaces and Refractories- James Ducan Gilcrist,  
<https://www.askiitians.com/iit-jee-chemistry/physical-chemistry/fuel-cell.aspx>  
<https://en.wikipedia.org/wiki/Fuel>  
<https://en.wikipedia.org/wiki/Furnace>  
<http://www.madehow.com/Volume-7/Furnace.html>

**Course outcomes:**

**On completion of the course, the student will have the ability to:**

Course Code	CO #	Course Outcome (CO)	Blooms Level
	CO1	<b>Categorize coals and</b> able to <b>outline</b> their processes to use them in process and metallurgical industries.	<b>L2</b>
	CO2	<b>Explain</b> petroleum products formation and <b>apply</b> various petroleum products for different energy applications.	<b>L2,L3</b>
	CO3	<b>Classify</b> different types of gaseous fuels. Formation and <b>assessment</b> of gaseous fuels applications in process industry.	<b>L2, L5</b>
	CO4	<b>Summarize</b> combustion process, calculate calorific values of solid and liquid fuels and outline determination of calorific values of solid and liquid fuels.	<b>L2,L5</b>
	CO5	Summarize green technologies, explain principle of hydrogen production, working of SOFC and Outline need for CO <sub>2</sub> capture and Government initiatives for reduction of CO <sub>2</sub> emissions.	<b>L2, L5</b>

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**VI SEMESTER**

Sl. No	Course and Course Code		Course Title	Teaching Department (ID) and Question Paper Setting	Teaching Hours/Week				Examination				Credits
					Theory	Tutorial	Practical	Self-Study	Duration in hours	CIEMarks	SEE Marks	Total Marks	
					L	T	P	S					
1	HSM S/PC	22CC61	Cement-II	Respective Dept.	2	2	2		03	50	50	100	4
2	PCC	22CC62	Glass technology-I	Respective Dept.	3	2	0		03	50	50	100	4
3	PEC	22CC63(A,B, C)	Iron and steel making Instrumental methods of analysis Biomaterials	Respective Dept.	3	0	0		03	50	50	100	3
4	OEC	22CCOE641	Non Destructive Testing	Respective Dept.	3	0	0		03	50	50	100	3
5	PRO J	22CC65	Project Phase-I	Respective Dept	0	0	4		03	50	-	50	2
6	PCC L	22CCL66	Glass Lab	Respective Dept.	0	0	2		03	50	50	100	1
7	AEC /SDC	22CCAE671	Indian knowledge system	Respective Dept.	If the course is offered as a Theory				02 03	50	50	100	1
					0	2	0						
					If a course is offered as a practical								
					0	0	2						
8	NC MC	22NS68		NSS									
		22PE68		Sports	0	0	2		50	-	50	0	
		22YO68		Yoga						-			
<b>Total</b>									<b>400</b>	<b>300</b>	<b>700</b>	<b>18</b>	

<b>COURSE TITLE: CEMENT TECHNOLOGY – II</b>	
Course Code: 22CC61	CIE: 50
Number of Lectures Hours/Week: 04	SEE: 50
Total Number of Lecture Hours: 52	SEE Hours: 03
<b>Modules</b>	<b>Teaching Hours</b>
<b>Module-I:</b> Crushing of raw materials, open and closed-circuit crushing, construction and working features of different types of crushers, drying-grinding, energy consumption, laws of size reduction and its applications, types of air separators.	10 Hours
<b>Module-II:</b> Prehomogenization, blending and homogenizing of raw mixes in wet and dry processes, clinkerization, rotary kiln design and constructional features, types of Refractories applied installation of Refractories, recent advances in cement manufacture.	10 Hours
<b>Module-III:</b> Principle of operation of pre-heaters and their structural features, the preheater by pass system, principle of precalcination, advantages of pre calcination, different types of pre-calcinator systems and their applications.	08 Hours
<b>Module-IV:</b> Kiln burning - types of burners used for gas, oil and coal, improved burners for coal firing, firing systems for coal, control of primary and secondary air flow rate and temperature, control of flame shapes and length, excess and false air and their effect on fuel consumption, hard and soft burning, process parameters affecting kiln performance and clinker quality, burning techniques, instruments for control of kiln operation	12 Hours
<b>Module-V:</b> Clinker coolers: need for clinker cooling, various types of coolers, effect of cooling on characteristics of clinker, Grinding of cement: equipment used, grinding aids, coating of grinding media, effect of chemical and potential compounds on Grindability, control of fineness, external and internal water cooling of cement grinding media. Varieties of dust, dust collector systems, material handling equipments. storage practice in cement plant	12 Hours
<b>Question paper pattern:</b> Question paper shall contain five modules, each module containing two questions. Students shall answer any one question from each module.	
<b>Text books:</b> 1. Cement data book – Vol.I, II, III – W.H. Duda, Gmbh Germany. 2. The rotary cement kiln – K.E. Perry, J.J. Wadell, Chemical Public. Co., N.Y. 1972 3. Process technology of cement manufacture – Bauverlag, Gmbh Germany. 4. Cement Engineer’s Handbook – Von Ottolabahn, McGraw Hill, N.Y. 5. Cement – Perry	
<b>Reference Books:</b>	
E-books and online course materials	
Course outcomes: On completion of the course, the student will have the ability to:	
CO #	Course Outcome (CO)
CO1	Explain working of crushers and air separators
CO2	Describe blending and homogenizing methods
CO3	Explain working of burners, coolers, material handling equipments
CO4	Determine process parameters affecting kiln performance
CO5	Recognize burning techniques and instrumentation

<b>COURSE TITLE: GLASS TECHNOLOGY-I(Integrated)</b>	
Course Code : 22CC62	CIE: 50
Number of Lectures Hours/Week:04	SEE: 50
Total Number of Lecture Hours: 52	SEE Hours: 03
<b>Modules</b>	<b>Teaching Hours</b>
<b>Module-I</b> Origin of glass, definition of glass, fundamental concepts of glass, glassy and crystalline states, glass formation, glass making oxides, principal glass making batch materials, minor ingredients and their functions, general glass manufacture, Zachariassen rules on structure of glass, devitrification of glass.	12
<b>Module-II</b> Cullet, factors influencing choice of batch materials, batch material handling and preparation - Raw materials specifications, receiving and storage, shipment, unloading the raw materials, conveying to storage, storage of raw materials in silos, general storage problems, bin segregation, handling and storage of cullet, collecting, weighing, mixing, conveying the batch to furnace, furnace charging, Chemical composition of different types of glasses, calculation of batch. From glass composition vice versa, calculation of empirical formula of glass.	10
<b>Module-III</b> Pot furnaces, tank furnaces - Day tank, continuous furnaces, bridge wall tank furnace, unit melters etc, furnace instrumentation, convection currents, mechanism of melting, physical and chemical reactions occurring during melting, fining, heat conditioning and Homogenization	10
<b>Module-IV</b> Electric melting of glass, Fore hearth, the gob feeder, rings and boots, blow pipe, marvelling and blocking, puffing, off hand working, etc., finishing operations. Glass forming machines – hollow wares, bulbs, bottles, flat glasses.	10
<b>Module-V</b> Tubing, pressed ware, heat absorbing glasses, amber glass, optical glass, fiberglass, optical glass fibre, sintered glass, vycor glass, processing, properties and applications of glass ceramics	10
<b>Question paper pattern:</b> Question paper shall contain five modules, each module containing two questions. Students shall answer any one question from each module.	
<b>Text books:</b> 1. Modern Glass Practice – S.R. Scholes 2. Hand book of Glass Manufacture – F.V. Tooley	
<b>Reference Books:</b> 1. Glass Engineering Hand Book- E.B Shand 2. Technical Glasses – M.B. Volf 3. Glass: A Handbook for students and Technicians – Dickson et.al. 4. Properties of glass – G. W. Moorey 5. Chemistry of Glass – Amul Paul	

6. Glass Research Methods – R.K Day
7. Glass Technology – Charan
8. Glass Science – Robert H. Doremus, John Wiley & Sons.

**E-books and online course materials:**

1. [http://www.digitalbookindex.com/\\_search/search010artglassa.asp](http://www.digitalbookindex.com/_search/search010artglassa.asp)
2. [https://books.google.com/books/about/The\\_Handbook\\_of\\_Glass\\_Manufacture.html?id=ZvweAQAAIAAJ](https://books.google.com/books/about/The_Handbook_of_Glass_Manufacture.html?id=ZvweAQAAIAAJ)
3. [https://www.researchgate.net/publication/236517898\\_e-book](https://www.researchgate.net/publication/236517898_e-book)
4. <https://sites.google.com/celup.42web.io/bonbooko12/pdfepub-download-introduction-to-glass-science-and-technology-by-j-e-shelby-book-in-english>
5. <https://freevideolectures.com/course/4452/npTEL-glass-processing-technology>
6. <https://ocw.mit.edu/courses/materials-science-and-engineering/3-071-amorphous-materials-fall-2015/>
7. <https://www.classcentral.com/course/swayam-glass-processing-technology-14099>
8. [https://onlinecourses.nptel.ac.in/noc20\\_ce46/preview](https://onlinecourses.nptel.ac.in/noc20_ce46/preview)
9. <http://www.icglass.org/home/education/>
10. <https://www.naukri.com/learning/glass-manufacturing-plant-certification>

**Course outcomes:**

On completion of the course, the student will have the ability to:

CO #	Course Outcome (CO)
CO1	Describe glassy state , glass making batch materials ,structure of glass
CO2	Illustrate glass batch material handling and glass batch calculations
CO3	Assess glass making furnaces and glass making reactions
CO4	Outline glass making machines and glass manufacture
CO5	Generalize types of glasses and their applications applications

**PRACTICAL COMPONENT OF IPCC**

S. No	Experiments
1	Identification of raw materials for glass making with formula
2	2Calculation of percentage composition from raw materials
3	3 Identification of various processes of glass manufacture
4	Calculation of weight of raw materials from chemical composition of soda lime silicate glasses
5	Calculation of weight of raw materials from chemical composition of soda lime silicate glasses
6	preparation of soda lime silicate glass
7	Calculation of weight of raw materials from chemical composition of borosilicate glass
8	preparation of borosilicate glass
9	Calculation of weight of raw materials from chemical composition of lead alkali silicate glass
10	Calculation of weight of raw materials from barium borate glass
11	Preparation of barium borate glass
12	Calculations of weight of raw materials from chemical composition of glass ceramics
13	preparation of glass ceramics
14	Procedure for preparation of sheet glass ,float glass , plate glasses
15	procedure for preparation of fiber glass and optical glasses
16	Determination of $T_g$ and $T_G$ and $T_L$

<b>THEORY COURSE TITLE:</b> Industrial Elective (Iron and Steel Making Technology)	
Course Code: 22CC631	CIE: 50
Number of Lectures Hours/Week: 03	SEE: 50
Total Number of Lecture Hours: 42	SEE Hours: 03
<b>Modules</b>	<b>Teaching Hours</b>
<p><b>Module-I:</b> History and Evolution of Iron and Steel Making, Scope of Iron and steel industry in India and World. Classification of Iron and steels, Phase diagram of Iron and Iron Carbide Phase Diagram Structure and properties of Iron and steel, Types of Iron and Steel making List of major steel and iron industries in India <b>Raw Materials for Iron and Steel making I: Coke</b> Availability of Coking Coal, Types and Chemical Characteristics of Coals, Proximate Analysis Ultimate Analysis Petrographic, Selection of Coals for Coke making Assessment of Coke Quality. Processes Used for Coke making Conventional By-product Coke Ovens Non-recovery Ovens Pre-carbonisation Techniques Pre-heating of Coal Briquette Blending of Coal, Selective Alternative Coking Methods</p>	09
<p><b>Module-II</b>  <b>Raw Materials II: Iron Ore and Agglomerates</b> Iron Ore Reserves of India, Beneficiation of Iron Ore The Sinter making Process, Bedding and Blending Granulation, Sintering Feed Preparation and Product Handling, Fundamentals of Sintering of Iron Ores, Sinter Productivity Structure of Sinter Influence of Sinter Chemistry Pelletisation Physical and Chemical Characterization of Lump Ore/Sinter/Pellets Thermal Analysis Metallurgical Tests Compression and Tumbler Strength, Reduction Behavior Reducibility Reduction under Load Softening–Melting Test Recycling of Materials in the Blast Furnace Blast Furnace Technology ,Blast Furnace Reactions and Process in a Nutshell ,General Constructional Features of the Furnace, Different Regions within a Blast Furnace ,Size of Blast Furnace , ,Charging of Solid Materials from the Top ,Blast Furnace Plant and Accessories, Hot Blast Stoves ,calculations relating to blast furnace technology.</p>	08
<p><b>Module-III</b> Alternative iron making processes : sponge iron ,Smelting reduction BOF Operation, BOF Shop Layout and Individual Converter Components ,BOF Vessel Design, The Lance, Gas Cleaning System, Engineering Features of BOF Shops ,Refining Major Inputs for BOF Steelmaking ;-Hot Metal Coolants Flux Materials Oxygen Pre-treatment of Hot Metal Prior to Steelmaking Objectives of Pre-treatment Removal of Silicon Desulphurisation Dephosphorisation Reagents Used for Pre-treatment Soda-ash Mixture of Soda-ash and Sodium Sulphate Mill Scale, Sinter Fines, etc. Calcium Carbide and Magnesium Granules General Comments on Pre-treatment</p>	09
<p><b>Module-IV:</b>  Alternate steel making methods Electric Steelmaking Electric Arc Furnace (EAF) Electric Induction Furnaces Ladle Stirring <b>Secondary Steelmaking</b> Inert Gas Purging (IGP) Deoxidation of Liquid Steel. Thermodynamics of Deoxidation of Molten Steel Kinetics of Deoxidation of Molten Steel The Ladle Furnace (LF) Problem of Slag Carryover The CAS-OB Process Degassing and Decarburisation of Liquid Vacuum Degassing Processes Manufacture of Ultra-Low Carbon (ULC) Steel by RH-OB Process Desulphurisation in Secondary Steelmaking Injection Metallurgy (IM) Clean Steel Technology Inclusion Modification Temperature Changes during Secondary Steelmaking  <b>Stainless Steelmaking</b>  Introduction Melting and Refining of Stainless Steels for Scrap and Ferroalloy-</p>	08

Based Processes Melting The AOD Converter Process Thermodynamics of Reactions in the AOD Process Other Processes for Stainless Steel making Direct Stainless Steelmak		
<b>Module-V: Casting of liquid steel;</b> -Ingot Casting of Steel, Classification of Steel Ingots Ingot Defects and Their Remedies Continuous Casting of Steel; Comparison of Continuous Casting with Ingot Casting,, <b>construction ,working and design of tundish</b> .Continuous casting defects and their remedies. Near-Net Shape Casting;- Thin Slab Casting Strip Casting, Beam Blank Casting. Refractories for lining of various furnaces and heat treatment equipments used in iron and steel making		08
<b>Question paper pattern:</b> Question paper shall contain five modules, each module containing two questions. Students shall answer any one question from each module.		
<b>Text books:</b> 1. A first course in iron and steel making, Dipak Mazumdar, Orient Blackswan Pvt. Ltd., (2015) 2. Iron making and steelmaking: Theory and Practice, Ghosh Ahindra, Chatterjee Amit, Phi Learning Private Limited, (2001)		
<b>Reference Books:</b> 1. Extractive Metallurgy 2: Metallurgical Reaction Processes, Alain Vignes (ISTE Ltd.,) 2. Extractive Metallurgy 3: Processing Operations and Routes, Alain Vignes (ISTE Ltd.,) 3. An introduction to modern steel making, R. H. Tupkary, Khanna Publishers (2000) 4. An introduction to modern iron making, R. H. Tupkary, Khanna Publishers (2004)		
<b>E-books and online course materials:</b>		
<b>Course outcomes:</b> On completion of the course, the student will have the ability to:		
<b>CO #</b>	<b>Course Outcome (CO)</b>	
<b>CO1</b>	<b>Summarize the history, evolution and scope of Iron and Steel Industries.</b>	
<b>CO2</b>	<b>Describe working, operation construction design aspects and calculations connecting to Blast furnace and raw materials used in blast furnace</b>	
<b>CO3</b>	<b>Describe working, operation construction design aspects and calculations connecting to Basic oxygen furnace steel making and sponge iron making</b>	
<b>CO4</b>	<b>Describe working, operation construction design aspects and calculations connecting to Electric arc furnace and secondary steel making</b>	
<b>CO5</b>	<b>Summarize methods of casting of steels and Suggest refractories for lining of various furnaces used in Iron and steel Industries</b>	



<b>COURSE TITLE: Non Destructive Testing</b>	
22CC641OE	CIE: 50
Number of Lectures Hours/Week:03	SEE: 50
Total Number of Lecture Hours: 42	SEE Hours: 03
<b>Modules</b>	<b>Teaching Hours</b>
Module 1 Introduction to NDT: Selection of NDT methods. Visual inspection, leak testing, Liquid penetration inspection- advantages and limitations.	8
Module 2 Magnetic particle inspection: Methods of generating magnetic field, types of magnetic particles and suspension liquids, steps in inspection, applications and limitations of the test. Eddy current inspection: principle of operation, process variables , inspection coils- applications and limitations the test	8
Module 3 Ultrasonic inspection: Basic equipment, characteristics of ultrasonic waves, variables during ultrasonic inspections. Inspection methods, normal incident pulse echo, angle beam pulse echo and transmission type. Method of display- A, B and C scan mode. Transducer elements, couplets, search units, contact type and immersion types inspection methods, inspection of products like casting, extrusions, rolled product, weld set- applications and limitations of the test	10
Module 4 Radiography inspection: Principles, radiation sources. X-Rays and their generation, gamma rays and their generation. Radio graphic films. X-ray filters image intensifiers. Industrial radiography. Image quality indicators, radiography sensitivity- applications and limitations of the test. Neutron radiography: working methodology its application and limitations. Thermal NDT: principle, inspection methods, applications and limitations of the test	8
Module 5 Optical Holography: Basics of Holography, recording and reconstruction-info metric techniques of inspection, procedures of inspection, typical applications. Acoustical Holography: working principle, applications and limitations. Microwave NDT: Working principle, applications and limitations.	8
<b>Question paper pattern:</b> Question paper shall contain five modules, each module containing two questions. Students shall answer any one question from each module.	
<b>Text books:</b> 1. Non-Destructive Testing Techniques- by Ravi Prakash, firstrevised edition, new age international publications. 2. Basics of Non-Destructive testing- by Lari and Kumar, S.K. Kataria & Sonspublication. Non-Destructive Test and Evaluation of Materials- by J. Prasad and C.G.K.Nair,2nd edition, McGraw Higher Ed publication.	
<b>Reference Books:</b>	
<b>E-books and online course materials:</b>	

**Course outcomes:**

On completion of the course, the student will have the ability to:

<b>CO #</b>	<b>Course Outcome (CO)</b>
<b>CO1</b>	Find the basic differences between NDT and destructive testing and liquid penetrant NDT methods.
<b>CO2</b>	Illustrate magnetic particle and leak testing and handle the both tests.
<b>CO3</b>	Utilize Ultrasonic testing tools and outline their advantages and limitations
<b>CO4</b>	Examine the components for defects using X-ray, Gamma ray and by Neutron radiographic non destructive testing tools and outline their advantages and limitations
<b>CO5</b>	Explain the Optical Holographic, Acoustic holographic and microwave NDT methods and assess their applications and limitations

Course Title: Glass laboratory			
Course Code	22CCL66		CIE: 50
Number of Lecture Hours/Week	6 hrs/week		SEE: 50
Total Number of Lecture Hours	54		SEE Hours: 03
Prerequisite			
Course Objectives: To impart knowledge and enable students to understand			
<ol style="list-style-type: none"> <li>1) Glass preparation.</li> <li>2) Glass ceramic preparation.</li> <li>3) Special glass preparation.</li> <li>4) Properties of glasses.</li> <li>5) Decoration of glass.</li> <li>6) Identification of defects.</li> </ol>			
<ol style="list-style-type: none"> <li>1 preparation of glass from glass formers (26)</li> <li>2 preparation of soda lime silicate glass(1)</li> <li>3 Determination of density of soda lime silicate glass by Archimedes principle(2)</li> <li>4 preparation of borosilicate glass(3)</li> <li>5 Determination of density borosilicate glass by archemedes principle (4)</li> <li>6 preparation of phosphate glass(5)</li> <li>7 Preparation of lead alkali silicate glass(6)</li> <li>8 Determination of density of lead alkali silicate glass(8)</li> <li>9 Decoration of glass etching (7)</li> <li>10 Identification of glass defects by visual inspection(10)</li> <li>11 preparation of glass ceramics (9)</li> <li>12 Determination of MOR of glass ceramics (25)</li> <li>13 preparation of photosensitive glass(15)</li> <li>14 preparation of photo chromic glass(14)</li> <li>15 Determination of chemical durability of glass (11)</li> <li>16 Determination of glass transition temperature and softening point of glass by DTA/TGA(22)</li> <li>17 Preparation of barium borate glass .(12)</li> <li>18 Detection of strain in glass (20)</li> <li>19 Determination of density of glassby sink and float method(23)</li> <li>20 Determination of mechanical properties of glass(19)</li> <li>21 Technical analysis of glass (12)</li> <li>22 Determination of viscosity of glass(18)</li> <li>23 Technical analysis of glass (25)</li> <li>24 preparation of of foam glass (16)</li> <li>25 Preparation of vycor glass (96%) silica glass (17)</li> <li>26 preparation of nanoglass (24)</li> <li>27 Decoration of glass by sand blasting.(27)</li> </ol>			
<b>Course outcomes:</b>			
<b>On completion of the course, the student will have the ability to:</b>			
Course code	CO #	Course Outcome (CO)	Blooms Level
	CO1	CO1 Prepare glasses, special glasses and glass Ceramics	C3,P3

	<b>CO2</b>	Codetermine physical properties of glass.	<b>C4,P3</b>
	<b>CO3</b>	<b>Determine mechanical properties of glass</b>	<b>C4 p3</b>
	<b>CO4</b>	Perform decoration of glass	<b>P4</b>
	<b>CO5</b>	Identify glass defects	<b>C1,p4</b>

<b>Semester: VI</b>						
<b>INDIANKNOWLEDGESYSTEMS</b>						
<b>(Theory)</b>						
<b>(Common to All UG Programs)</b>						
<b>Course Code</b>	<b>:</b>	<b>22IKSAE67</b>		<b>CIE</b>	<b>:</b>	<b>50Marks</b>
<b>Credits :L:T:P</b>	<b>:</b>	<b>1:0:0</b>		<b>SEE</b>	<b>:</b>	<b>50Marks</b>
<b>Total Hours</b>	<b>:</b>	<b>15L</b>		<b>SEE Duration</b>	<b>:</b>	<b>02Hours</b>
<b>Course Learning Objectives:</b> The students will be able to						
<b>1</b>	To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.					
<b>2</b>	To make the students understand the traditional knowledge and analyze it and apply it To their day-to-day life.					

<b>Modules</b>	
<b>Module-I</b>	<b>05Hrs</b>
<b>Introduction to Indian Knowledge Systems(IKS):</b> Overview, Vedic Corpus, Philosophy, Character scope and importance, traditional knowledge vis-à-vis indigenous knowledge, Traditional knowledge vs. western knowledge.	
<b>Module-II</b>	<b>05Hrs</b>
<b>Traditional Knowledge in Humanities and Sciences:</b> Linguistics, Number and Measurements - Mathematics, Chemistry, Physics, Art, Astronomy, Astrology, Crafts and Trade in India and Engineering and Technology.	
<b>Module-III</b>	<b>05Hrs</b>
<b>Traditional Knowledge in Professional domain:</b> Town planning and architecture-Construction, Health, wellness and Psychology-Medicine, Agriculture, Governance and public administration, United Nations Sustainable development goals.	

<b>Course Outcomes: After completing the course, the students will be able to</b>	
<b>CO1:</b>	Provide an overview of the concept of the Indian Knowledge System and its importance.
<b>CO2:</b>	Appreciate the need and importance of protecting traditional knowledge.
<b>CO3:</b>	Recognize the relevance of Traditional knowledge in different domains.
<b>CO4:</b>	Establish the significance of Indian Knowledge systems in the contemporary world.

<b>Reference Books</b>	
<b>1</b>	<b>Introduction to Indian Knowledge System-concepts and applications</b> , B Mahadevan, VinayakRajatBhat,NagendraPavanaRN,2022,PHILearningPrivateLtd,ISBN-978-93-91818-21-0
	<b>Traditional Knowledge System in India</b> , AmitJha,2009,AtlanticPublishersandDistributors (P)Ltd.,ISBN-13:978-8126912230,
<b>2</b>	<b>Knowledge Traditions and Practices of India</b> , KapilKapoor, AvadeshKumarSingh,Vol.1, 2005,DKPrintWorld(P)Ltd.,ISBN81-246-0334,
<b>Suggested WebLinks:</b>	
<b>1.</b>	<a href="https://www.youtube.com/watch?v=LZP1StpYEPM">https://www.youtube.com/watch?v=LZP1StpYEPM</a>
<b>2.</b>	<a href="http://nptel.ac.in/courses/121106003/">http://nptel.ac.in/courses/121106003/</a>
<b>3.</b>	<a href="http://www.iitkgp.ac.in/department/KS;jsessionid=C5042785F727F6EB46CBF432D7683B63">http://www.iitkgp.ac.in/department/KS;jsessionid=C5042785F727F6EB46CBF432D7683B63</a> (Centre of Excellence for Indian Knowledge System, IIT Kharagpur)
<b>4.</b>	<a href="https://www.wipo.int/pressroom/en/briefs/tk_ip.html">https://www.wipo.int/pressroom/en/briefs/tk_ip.html</a>
<b>5.</b>	<a href="https://unctad.org/system/files/official-document/ditcted10_en.pdf">https://unctad.org/system/files/official-document/ditcted10_en.pdf</a>
<b>6.</b>	<a href="http://nbaindia.org/uploaded/docs/traditionalknowledge_190707.pdf">http://nbaindia.org/uploaded/docs/traditionalknowledge_190707.pdf</a>
<b>7.</b>	<a href="https://unfoundation.org/what-we-do/issues/sustainable-development-goals/?gclid=EAIAIQobChMImp-Jtb_p8gIVTeN3Ch27LAmPEAAAYASAAEgIm1vD_BwE">https://unfoundation.org/what-we-do/issues/sustainable-development-goals/?gclid=EAIAIQobChMImp-Jtb_p8gIVTeN3Ch27LAmPEAAAYASAAEgIm1vD_BwE</a>

<b>ASSESSMENT AND EVALUATION PATTERN</b>		
<b>WEIGHTAGE</b>	<b>50%(CIE)</b>	<b>50%(SEE)</b>
<b>QUIZZES</b>		
Quiz-I	Each quiz is evaluated for 05 marks adding upto <b>10 Marks.</b>	*****
Quiz-II		
<b>THEORY COURSE-</b> (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test-I	Each test will be conducted for 25 Marks adding upto 50 marks. Final test marks will be reduced To <b>20 Marks</b>	*****
Test-II		
<b>EXPERIENTIALLEARNING</b>	<b>20</b>	<b>*****</b>
Case Study-based Teaching-Learning	--	*****
Sector wise study & consolidation (viz., Engg. Semiconductor Design, Healthcare & Pharmaceutical, FMCG, Automobile, Aerospace and IT/ ITeS)	--	
Video based seminar(4-5minutes per student)	--	
<b>Maximum Marks for the Theory</b>	<b>---</b>	
<b>Practical</b>	<b>--</b>	<b>--</b>
<b>Total Marks for the Course</b>	<b>50</b>	<b>50</b>