MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI

TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES

COURSE NAME : CIVIL ENGINEERING GROUP

COURSE CODE : CC

DURATION OF COURSE : EIGHT SEMESTERS **WITH EFFECT FROM 2013-14**

SEMESTER : SECOND **DURATION : 15 DAYS SESSION**

PATTERN : CORRESPONDANCE - SEMESTER **SCHEME : G**

SR. NO	SUBJECT TITLE		Abbreviation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME										SW (17200)
								PAPER HRS.	TH (1)			PR (4)			OR (8)		TW (9)		
					TH	Test	PR		Max		Min	Max		Min	Max	Min	Max	Min	
1	Communication Skills		CMS	17916	05	01	16	03	100		40	--		--	25#	10	25@	10	50
2	Engineering Mathematics		EMS	17917	09	01	--	03	100		40	--		--	--	--	--	--	
3*	Applied Science	Physics	APH	17918	06	01	20+2*	02	50	100	40	25@	50	20	--	--	--	--	
		Chemistry	ACH	17919	06	01	20+2*	02	50			25@			--	--	--	--	
4	Construction Materials		CMA	17920	05	01	24	03	100		40	--		--	--	--	--	--	
				Total	**31**	**05**	**84**	**--**	**400**		**--**	**50**		**--**	**50**	**--**	**50**	**--**	**50**

Total Contact Hours During resident session Per Week: **120 Hrs.** (15 days* 8 hours per day)

THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.

Total Marks **: 600**

@ Internal Assessment, # External Assessment, No Theory Examination,

Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, ,OR-Oral, TW- Term Work, SW- Sessional Work

- Conduct One class test of 25 marks for each theory subject. Sum of the total test marks of all subjects is to be converted out of 50 marks as sessional work (SW).
- Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms.
- Code number for TH, PR, OR and TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.

✶ Applied Science is divided into two parts- Applied Science (Physics) and Applied Science (Chemistry). Theory examination of both parts as well as practical examination of both parts will be conducted on separate days. Sum of theory marks of both parts shall be considered for passing theory examination of Applied Science. Similarly it is also applicable to practical examination. It is mandatory to appear theory and practical examination of both parts. Remaining absent in any examination of any part will not be declared successful for that examination head.

✶ **Candidate remaining absent in examination of any one part of Applied Science subject i.e. Physics, Chemistry will be declare as Absent in Mark List and has to appear for examination. The marks of the part for which candidate was present will not be processed or carried forward.**

Course Name : All Branches of Diploma in Engineering & Technology

Course Code : CC/EC/MC/XC/GC

Semester : Second

Subject Title : Communication Skills

Subject Code : 17816

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TEST	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
05	01	16	03	100	--	25#	25@	150

NOTE:

- **One tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

Rationale:

In this age of globalization, competition is tough. Hence effective communication skills are important. Communication skills play a vital and decisive role in career development. The subject of Communication Skills introduces basic concepts of communication. It also describes the verbal, non-verbal modes and techniques of oral & written communication.

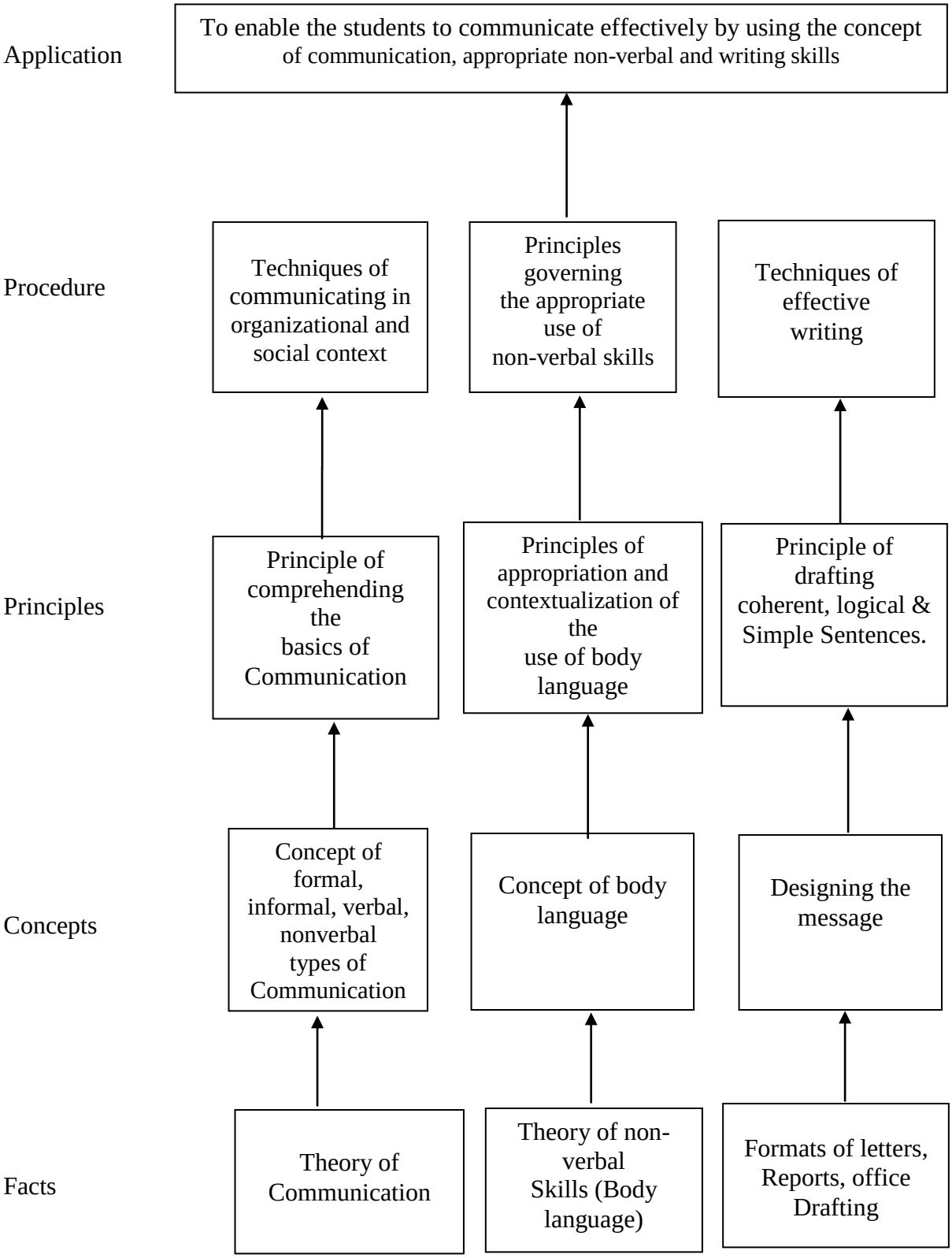
It will guide and direct to develop a good personality and improve communication skills.

General Objectives:

Students will be able to:

1. Utilize the skills necessary to be a competent communicator.
2. Select and apply the appropriate methods of communication in various situations.

Learning Structure:



Theory

Name of the Topic	Hours	Marks
Topic 01 - Introduction to Communication: **Specific Objective:** ➢ Describe the process of communication. **Contents:** • Definition of communication • Process of communication • Types of communication -- Formal, Informal, Verbal, Nonverbal, Vertical, Horizontal, Diagonal	**06**	**16**
Topic 02 - Effective communication **Specific Objective:** ➢ Identify the principles and barriers in the communication process **Contents:** ❖ Principles of communication. ❖ Barriers to communication a. **Physical Barrier**: ❖ Environmental (time, noise, distance & surroundings), ❖ Personal (deafness, stammering, ill-health, spastic, bad handwriting) b. **Mechanical** : Machine oriented c. **Psychological:** Day dreaming, prejudice, emotions, blocked mind, generation gap, phobia, status inattentiveness, perception. d. **Language** : Difference in language, technical jargons, pronunciation & allusions.	**08**	**20**
Topic 03 - Non verbal & Graphical communication: **Specific Objectives:** ➢ Effective use of body language & nonverbal codes ➢ View and interpret graphical information precisely. **Contents:** 3.1 Non- verbal codes: [08 Marks] • Proxemics, • Chronemics • Artefacts 3.2 Aspects of body language (Kinesics) [10 Marks] • Facial expression • Eye contact • Vocalics, paralanguage • Gesture • Posture • Dress & appearance	**08**	**28**

• Haptics 3.3 Graphical communication [10 Marks] • Advantages & disadvantages of graphical communication • Tabulation of data & its depiction in the form of bar graphs & pie charts.		
Topic 04 - Listening **Specific Objective:** ➢ Effective use of listening **Contents:** • Introduction to listening • Listening versus hearing • Merits of good listening • Types of listening. • Techniques of effective listening.	**02**	**08**
Topic 05 - Formal Written Communication **Specific Objectives:** ➢ Use different formats of formal written skills. **Contents:** • Office Drafting: Notice , memo & e-mail • Job application with resume. • Business correspondence: Enquiry letter, order letter ,complaint letter, adjustment letter. • Report writing: Accident report, fall in production, investigation report. • Describing objects & giving instructions	**08**	**28**
	32	**100**

Skills to be developed in practical:

Intellectual Skills:

1. Analyzing given situation.
2. Expressing thoughts in proper language.

Motor Skills:

1. Presentation Skills focusing on body language.
2. Interpersonal skills of communication

Journal will consist of following assignments:

01: Draw the diagram of communication cycle for given situation.

State the type and elements of communication involved in it.

02: Graphics:- a) Draw suitable bar-graph using the given data.
b) Draw suitable pie-chart using the given data.

03: Role play: Teacher should form the group of students based on no. of characters in the situation. Students should develop the conversation and act out their roles.

04: Collect five pictures depicting aspects of body language from different sources such as magazines, newspapers, internet etc. State the type and meaning of the pictures.

NOTE: The following assignments should be performed by using Language Software

05 Practice conversations with the help of software.

06 Describe people/personalities with the help of software and present in front of your batch.

07 Prepare and present elocution (three minutes) on any one topic with the help of software.

08 Describe any two objects with the help of software.

Learning Resources:

Sr. No.	Author	Title	Publisher
01	MSBTE, Mumbai.	Text book of Communication Skills.	MSBTE, Mumbai.
02	MSBTE, Mumbai.	CD On Communication Skills	MSBTE
03	Joyeeta Bhattacharya	Communication Skills	Reliable Series
04	Communication Skills	Sanjay Kumar, Pushpa Lata	Oxford University Press

Web Sites for Reference:

Sr. No	Website Address
01	Website: www.mindtools.com/page8.html-99k
02	Website: www.khake.com/page66htm/-72k
03	Website: www.BM Consultant India.Com
04	Website: www.letstak.co.in
05	Website: www.inc.com/guides/growth/23032.html-45k

Course Name : All Branches of Diploma in Engineering and Technology.

Course Code : CC/EC/MC/XC/GC

Semester : Second

Subject Title : Engineering Mathematics

Subject Code : 17917

Teaching and Examination Scheme

Teaching Scheme			Examination Scheme					
TH	TEST	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
09	01	--	03	100	--	--	--	100

NOTE:

- **One tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

Rationale:

This subject is an extension of Basic mathematics of first semester and a bridge to further study of applied mathematics. The knowledge of mathematics is useful in other technical areas.

Differential calculus has applications in different engineering branches. For example concepts such as bending moment, curvature, maxima and minima.

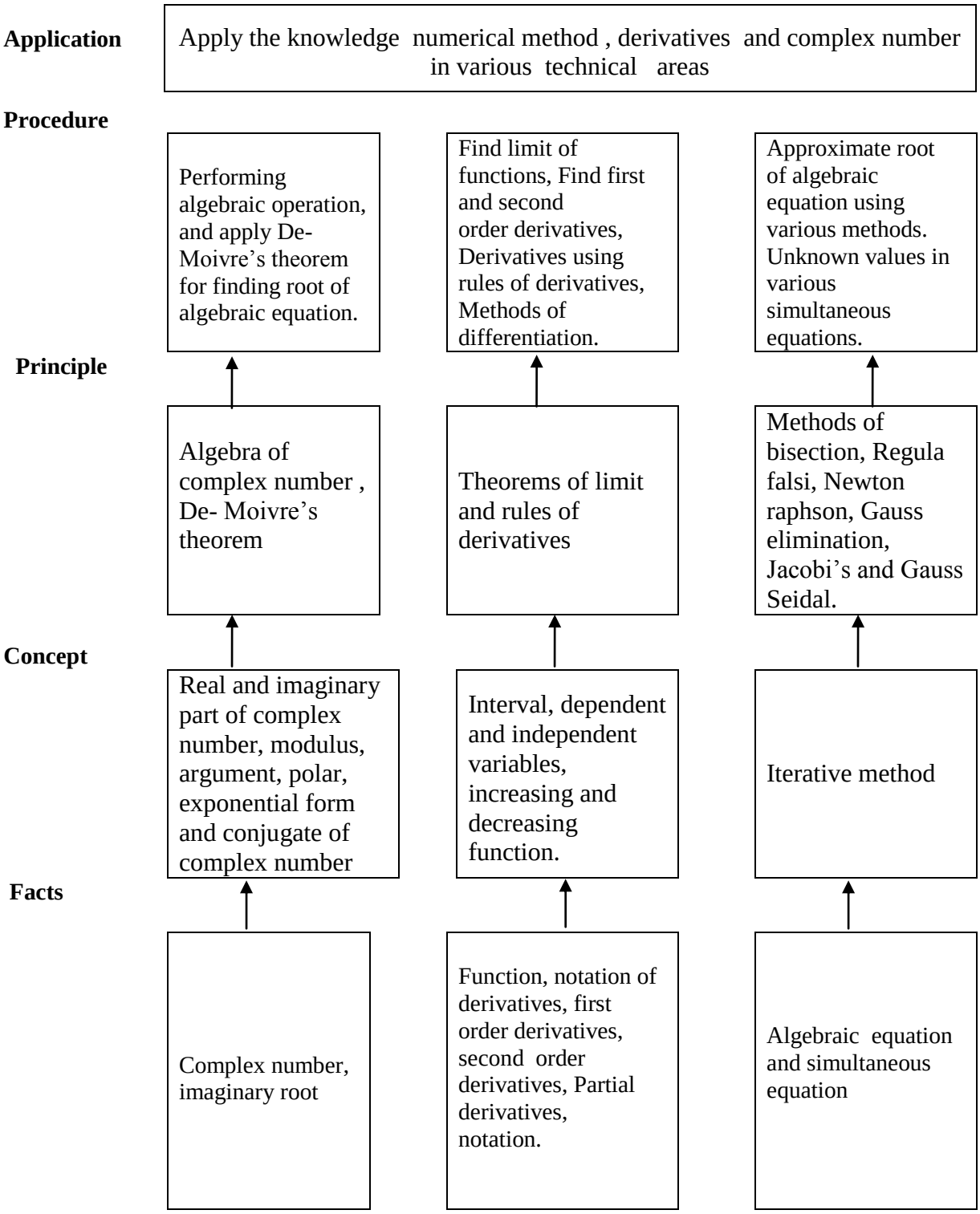
Numerical methods are used in programming as an essential part of computer engineering. For solution of problems in electrical circuits and machine performances complex number is used engineering mathematics lays the foundation to understand technical principles in various fields.

General objectives:

Student will be able to

1) Use complex numbers for representing different circuit component in complex form to determine performance of electrical circuit and machines.
2) Apply rules and methods of differential calculus to solve problems.
3) Apply various numerical methods to solve algebraic and simultaneous equations.

Learning Structure:



Content Theory:

Topic	Hours	Marks
Topic 1 - Complex number		
1.1 Complex number ---------- 14 **Specific objectives :** ➢ Find roots of algebraic equations which are not in real. • Definition of complex number, Cartesian, polar and exponential forms of complex number. • Algebra of complex number such as equality, addition, subtraction, multiplication and division. • De- Moivre's theorem with simple examples. • Euler's form of circular functions, hyperbolic functions and relation between circular and hyperbolic functions.	**08**	**14**
Topic 2 - Differential Calculus		
2.1 Function ---------- 14 **Specific objectives :** ➢ Identify the function and find the value of function. • Definition of function, range and domain of function. • Value of function at a point. • Types of functions and examples.	**08**	**58**
2.2 Limits ---------- 20 **Specific objectives :** ➢ To evaluate limit of function. • Concept and definition of limit. • Limits of algebraic, trigonometric, logarithmic and exponential functions with examples.	**08**	
2.3 Derivatives ---------- 24 **Specific objectives :** ➢ Find the derivatives by first principle. ➢ Solve problems using rules and methods of derivatives • Definition of derivatives, notation, derivatives of standard function using first principle. • Rules of differentiation such as, derivatives of sum or difference, product, and quotient with proofs. • Derivative of composite function with proof (Chain rule) • Derivatives of inverse trigonometric functions using substitution • Derivatives of inverse function. • Derivatives of implicit function. • Derivatives of parametric function. • Derivatives of one function w.r.t another function. • Logarithmic differentiation. • Second order differentiation.	**12**	
Topic 3 - Numerical Method		
3.1 Solution of algebraic equation ---------- 14 **Specific objectives :** ➢ Find the approximate root of algebraic equation. • Bisection method • Regula falsi method • Newton Rapshon method	**06**	**28**

3.2 Numerical solution of simultaneous equations ---------- 14 **Specific objectives :** ➢ Solve the system of equations in three unknowns. • Gauss elimination method • Jacobi's method • Gauss Seidal method	**06**	
Total	**48**	**100**

Assignments::

1) Assignments are for students to get enough practice.

List of Assignments:

Sr No.	Topic for Assignments
1	Complex number (Examples based on algebra of complex numbers)
2	Complex number (Examples based on De Moivre's theorem and Euler's formulae)
3	Function
4	Limit (algebraic and trigonometric functions)
5	Limit (logarithmic and exponential functions)
6	Derivatives by first principle
7	Derivatives (Examples based on formulae of standard functions and rules)
8	Derivatives (Examples based on methods of differentiation)
10	Solution of algebraic equations
11	Solution of simultaneous equations

Learning Resources:

1) Books:

Sr. No.	Title	Authors	Publication
1	Mathematics for polytechnic	S. P. Deshpande	Pune Vidyarthi Griha Prakashan, Pune
2	Calculus : Single Variable	Robert T. Smith	Tata McGraw HILL
3	Advanced Engineering mathematics	Dass H. K	S. Chand Publication New Delhi
4	Fundamentals of Mathematical Statistics	S. C. Gupta and Kapoor	S. Chand Publication, New Delhi
5	Higher Engineering Mathematics	B. S .Grewal	Khanna Publication, New Delhi
6	Applied Mathematics	P. N. Wartikar	Pune Vidyarthi Griha Prakashan, Pune

2) Websites: www.khan academy

Course Name : Civil Engineering Group

Course Code : CC/EC/MC/XC/GC

Semester : Second

Subject Title : Applied Science (Physics)

Subject Code : 17918

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TEST	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
06	01	20+2*	02	50	25@	--	--	75

NOTE:

- **One tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**
- **Applied Science is divided into two parts - Applied Science (Physics) and Applied Science (Chemistry). Theory examination of both parts as well as practical examination of both parts will be conducted on separate days. Sum of theory marks of both parts shall be considered for passing theory examination of Applied Science. Similarly it is also applicable to practical examination. It is mandatory to appear theory and practical examination of both parts. Remaining absent in any examination of any part will not be declared successful for that examination head**.

Rationale:

Applied physics is a powerful instrument in engineering & technology. It is an important subject for mechanical engineering group courses

The topics on Rectilinear and Angular motion, kinetics and work power energy will be useful in understanding concepts of motion, velocity, impulse and applications such as recoil of gun, motion of lift, potential, kinetic energy, torque etc.

The topics on projectile and circular motion will be useful in various applications in civil, engineering field.

The topics on non destructive testing will be useful in testing various materials used in the civil, mechanical and automobile engineering field.

The topics on acoustics are useful for the students of civil engineering while designing auditoriums, lecture hall etc. Indoor lighting is necessary in architecture and interior design of a hall.

Principle of Photocell and its applications are required in study of solar cells, photovoltaic cells. The study of this subject matter will make the student versatile, innovative, & sound base for engineering studies & research work in technical field.

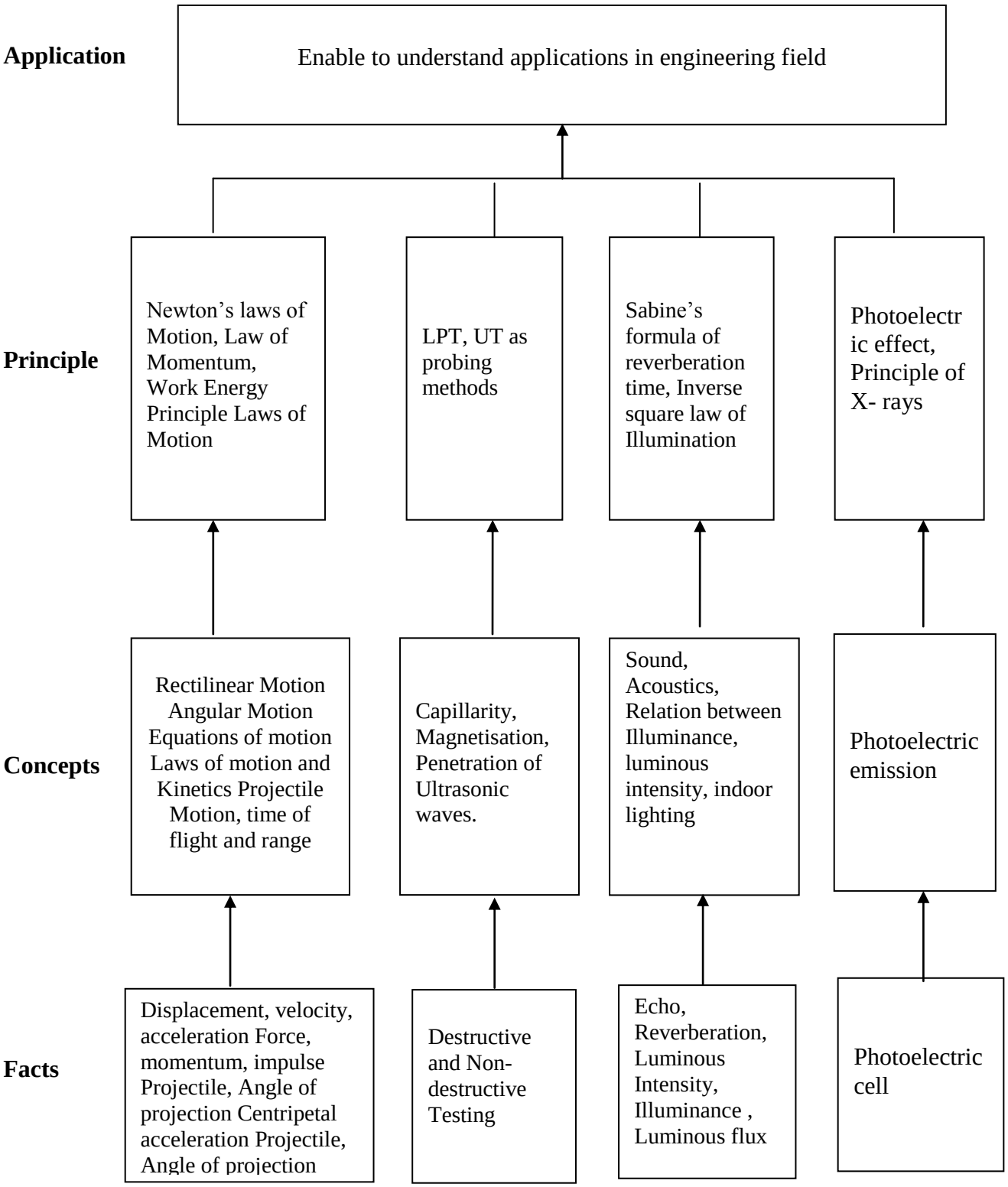
General Objectives.

Students will able to.

1. Understand equations of motion and their applications.
2. Differentiate kinetic and kinematics and **s**olve the problems on kinematics and kinetics.
3. Understand Ultrasound and its applications
4. Use N.D.T. in quality assurance and saving of man power, machining, materials,

5. Use principles of illumination for enhancing work efficiency
6. Analyze variation of sound intensity with respect to distance.
7. Identify different factors affecting acoustical planning of buildings and indoor lighting.
8. Differentiate between Centripetal and Centrifugal force.

Learning Structure:



Applied Physics (Civil Engineering Group) Theory:

Topics and contents	Hours	Marks
Topic 1] Motion **Specific Objectives:** ➢ State equations of motion. ➢ Apply laws of motion to solve problems. ➢ Differentiate between linear and circular motion, ➢ State meaning of centripetal acceleration, centripetal force, **1. 1 Rectilinear and Angular Motion [06 Marks]** • Equations of motion:-V=u+at, $S=ut+1/2at^2$, $V^2=u^2+2as$ (no derivation), distance traveled by particle in n^{nt} second, (only equation), Uniform velocity, uniform acceleration and uniform retardation, equations of motion for motion under gravity. • Definition of angular displacement, angular velocity, angular acceleration, relation between angular velocity and linear velocity, three equations of angular motion (no derivation) angular distance traveled by particle in n^{nt} second (only equation). **1.2 Kinetics and Work Power Energy [06 Marks]** • Definitions of momentum, impulse, impulsive force with formulae, statements of Newton's laws of motion with equations, applications of laws of motion—recoil of gun. • Definition of work, power and energy, equations for potential energy. kinetic energy, work -energy principle. **1.3 Projectile Motion and circular motion [04 Marks]** • Definition of a projectile motion, angle of projection, trajectory, time of flight and range with formulae. • Definition of a circular motion, centripetal acceleration, centripetal force, definition of centrifugal force, and its applications.	**10**	**16**
Topic 2] Nondestructive Testing of materials. **Specific Objectives:** ➢ Describe the method of production of ultrasonic waves ➢ Use NDT methods for quality testing of materials in industry **2.1 Ultrasonic [04 Marks]** • Ultrasonic waves-properties, production of ultrasonic waves by piezoelectric method **2.2 Non –destructive testing methods [06 Marks]** • Destructive and Nondestructive testing, advantages of NDT, limitations of N.D.T., different N.D.T. Methods used in industries, criteria for selection of NDT method, Liquid penetration Testing (LPT): principle, procedure and applications, Ultrasonic testing methods:-principle, procedure and applications.	**06**	**10**
Topic 3] Acoustics and Indoor lighting: **Specific Objectives:** ➢ Find the Conditions for good acoustics ➢ Determine factors affecting acoustical planning of auditorium ➢ Apply Inverse square law of photometry ➢ Find working and applications of Bunsen's photometer **3.1 Acoustics: [06 Marks]** • Echo, reverberation, standard reverberation time, Sabine's formula, conditions for good acoustics, factors affecting acoustical planning of	**08**	**12**

auditorium. **3.2 Indoor lighting: [06 Marks]** • Definition of luminous intensity, intensity of illumination with their SI units, inverse square law of photometry, Bunsen's photometer - ray diagram, working and applications, need of indoor lighting, indoor lighting schemes and factors affecting indoor lighting.		
Topic 4]: Modern physics. **Specific objectives:** ➢ Derive Planck Einstein equation ➢ State the concept of photocell ➢ State applications of X - ray **4.1 Photo electricity: [06 Marks]** • Photon (quantum), Plank**'s** hypothesis, energy of photon**,** properties of photons. • Photo electric effect: Circuit diagram, process of photoelectric emission, definitions:-threshold frequency, threshold wavelength, stopping potential, characteristics of photoelectric effect • Work function, Einstein's photoelectric equation, photo resistor (LDR) – symbol, principle, applications, photoelectric cell:-principle, applications. **4.2 X-rays: [06 Marks]** • Origin of X-rays, production of X-rays using Coolidge's X-ray tube, minimum wavelength of X-ray, properties of X-rays, applications of X- rays: engineering, medical and scientific.	**08**	**12**
TOTAL	**32**	**50**

Practical: Skills to be developed:

Intellectual Skills:

- Proper selection of measuring instruments on the basis of range, least count, precision and accuracy required for measurement.
- Verify the principles, laws, using given instruments under different conditions.
- Read and interpret the graph.
- Interpret the results from observations and calculations.
- Use these results for parallel problems.

Motor Skills:

- Proper handling of instruments.
- Measuring physical quantities accurately.
- Observe the phenomenon and to list the observations in proper tabular form.
- Adopt proper procedure while performing the experiment.

List of Experiments:

Sr No	Title of Experiment	To be performed by a group of
1	Determine the radius of spherical surface using spherometer	2 **Students**
2	Find refractive index of prism by using spectrometer	4 to 5 **students**
3	Calculate coefficient of absorption for acoustical materials	2-3 **students**
4	Compare luminous intensities of two luminous bodies by using Bunsen's photometer	4 to5 **students**
5	Verify characteristics of photoelectric cell.	4 to5 **students**
6	Calculate coefficient of linear expansion of a metal rod using Pullinger's apparatus.	2 to 3 **students**
7	Determine velocity of sound by resonance tube.	4 to5 **students**
8	Determine rigidity modulus of given wire using torsional pendulum.	2 to3 **students**
9	Calculate acceleration due to gravity using compound bar pendulum	4 to5 **students**

Learning resources:

1. **Books:**

Sr. No.	Title	Author	Publisher
01	Engineering Physics	by R.K.Gaur and S.L.Gupta	Dhanpat Rai Publication, New Delhi.
02	Fundamental of Physics	Resnick and Hailday	Wisley Toppan Publishers – England
03	Engineering Physics	V. Rajendran	Tata McGraw-Hill Publications
04	Engineering Physics	K. Rajgopal	PHI learning pvt ltd. New Delhi
05	Physics- Std XI, Std XII	-	HSC board/c CBSE Board
06	Conceptual Physics	P.G.Hewitt	Pearson Education, Tenth edition
07	A text book of engineering Physics	M.N. Avadhanulu P.G. Kshirsagar	S.Chand & co. Ltd

2. Websites:

http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html
http://physics.info
http://physics.org
http://about.com
http://classroom.com
http://101science.com

3) Videos:

http://www.youtube.com/watch?v=ZmhuCIL5BqQ: work power energy
http://www.youtube.com/watch?v=8kOSth5QgF4: motion in one dimension, rectilinear motion
http://www.youtube.com/watch?v=SsIaL3L6Jg4: projectile motion
http://www.cmslaser.com

4) CD:

Educational Cd of NCERT
Educational cd of Pearson education India

5) PPT:

PPT www.dboccio.com/Physics%20PowerPoints/Work,%20Energy,
www.khanacademy.com

Course Name : Civil Engineering Group

Course Code : CC/EC/MC/XC/GC

Semester : Second

Subject Title : Applied Science (Chemistry)

Subject Code : 17919

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TEST	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
06	01	20+2*	02	50	25@	--	--	75

NOTE:

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- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**
- **Applied Science is divided into two parts - Applied Science (Physics) and Applied Science (Chemistry). Theory examination of both parts as well as practical examination of both parts will be conducted on separate days. Sum of theory marks of both parts shall be considered for passing theory examination of Applied Science. Similarly it is also applicable to practical examination. It is mandatory to appear theory and practical examination of both parts. Remaining absent in any examination of any part will not be declared successful for that examination head**.

Rationale:

Study of Applied Chemistry is essential to Civil Engineering course. It provides knowledge of chemical properties of materials and selection of appropriate material for specific applications in the field of engineering.

Study of impurities and hardness in water, chemical reactions involved, sewage water and methods for water softening and purification will help the students to make proper use of water.

The study of extraction of iron, heat treatment method to improve mechanical properties of iron without changing its chemical composition, different alloys of iron are also useful in mechanical engineering application. Study of composition and properties of cement and lime useful in their application in construction of structures. The organic coatings like paints are the materials of decoration as well as protection. Their study will help the student to apply correct methods for preserving the machines and structures.

The contents of this subject are designed to enhance student's capabilities in managing the given task and in solving challenging problems in the field of civil engineering. The subject will generate curiosity of carrying out further development in all engineering fields.

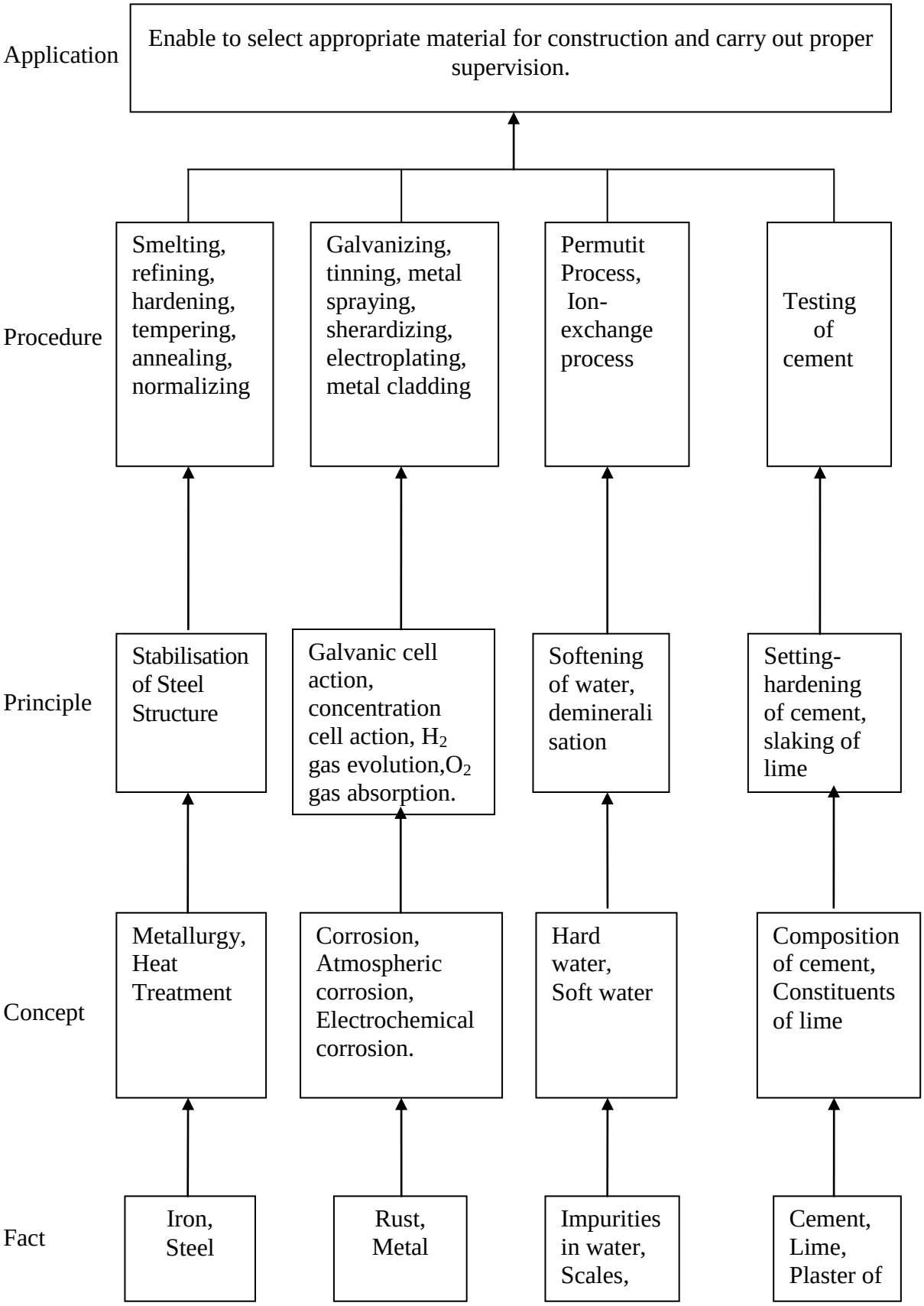
General Objectives:

The student will be able to

1. Know appropriate materials while using in construction.
2. Apply knowledge to enhance operative life span of construction material and structure by various protective methods.
3. Understand setting and hardening processes of cement and lime.
4. Understand appropriate method to protect the machines and structures from corrosion.

5. Know methods of water purification.

Learning Structure:



Theory content:

Topic and Contents	Hours	Marks
Topic:1] Metallurgy: **Specific Objectives:** ➢ Explain the process of extraction of iron from its ore. ➢ Explain different processes of heat treatment. ➢ State effects of alloying elements on properties of steels. **1.1Metallurgy: [6 Marks]** • Definitions of metallurgy, ores of iron. • Extraction of pig iron by smelting in Blast furnace with chemical reactions in different zones, products of blast furnace- composition, properties and applications of pig iron, slag and flue gases. • Properties and applications of commercial forms of iron- pig iron, cast iron, wrought iron. **1.2 Steels: [6 Marks]** • Definition of steel, preparation of steel from pig iron using open hearth process, basic oxygen process. • Classification of plain carbon steel- low carbon, medium carbon, high carbon steels with their properties and applications. • Heat Treatment of steels: Definition and purposes of -hardening, tempering, annealing, normalizing.	**08**	**12**
Topic 2] Corrosion: **Specific Objectives:** ➢ Explain Mechanism of atmospheric corrosion and immersed corrosion. ➢ Describe different methods of protection of metal from corrosion **2.1 Corrosion : [6 Marks]** • Corrosion, Types of corrosion: • Atmospheric Corrosion: Definition, mechanism of oxidation corrosion, types of oxide films and their significance, factors affecting rate of atmospheric corrosion. • Immersed Corrosion: Definition, mechanism of immersed corrosion by galvanic cell action- with evolution of hydrogen gas and absorption of oxygen gas, factors affecting immersed corrosion. **2.2 Protection of metals by: [8 Marks]** • Modification of environment, modification of properties of metal, electrochemical protection by sacrificial anodic protection and impressed current cathodic protection, use of protective coatings. • Application of metallic coatings: By galvanising, tinning, metal spraying, electroplating, metal cladding and cementation- sherardizing, chromising, colourising. • Application of non-metallic coatings: paint-definition, characteristics, constituents of paint and their functions.	**10**	**14**
Topic 3] Water: **Specific Objectives:** ➢ State the causes of hardness of water. ➢ Describe the method for removing hardness from water. **3.1 Hardness of water: [10 Marks]** • Types of impurities in natural water. • Definitions of hard and soft water, causes of hardness, types of	**10**	**18**

hardness, definition and degree of hardness, in ppm and equivalents of $CaCO_3$, estimation of hardness by EDTA method, Numericals. • Adverse effects of hard water in: - Industries: paper industry, textile industry, dyeing industry, sugar industry. - Domestic applications: washing, bathing, cooking, drinking. - Boilers: boiler corrosion, caustic embrittlement, scale and sludge formation. **3.2 Water treatment: [8 Marks]** • For industrial applications: Principle, diagram, working, chemical reactions, regeneration, advantages-Permutit / Zeolite process and Ion exchange process • For domestic applications: Water quality parameters for potable water, treatment of water for domestic application by screening, sedimentation, coagulation, filtration, sterilization. • Chlorination method of sterilization- using chlorine gas, bleaching powder, chloramines. • For sea water: Desalination of sea water by reverse osmosis.		
Topic 4] Cement and Lime: **Specific Objectives:** ➢ Select appropriate materials used in construction. ➢ Understand properties of cement and lime. **4.1 Cement : [4 Marks]** • Portland cement: Definition, chemical composition, average compound composition, functions of constituents. Setting and hardening of Portland cement with chemical reactions, function of gypsum in cement. • Special Cements: Properties and application of water proofing cement, super sulphate cement, plaster of paris. • Mortar and Concrete: Definition, formation, properties and applications. **4.2 Lime** : **[2 Marks]** • Definition, formation, properties and uses of quick lime, slaked lime, hydrated lime. • Classification of lime: Composition, properties and uses of fat lime, lean lime.	**04**	**06**
Total	**32**	**50**

Practicals:

Intellectual Skills:

1. Select proper equipments and instrument
2. Interpret the results.
3. Plan the set up of the experiment.
4. Verify the characteristics of materials.

Motor Skills:

1. Handle various laboratory reagents.
2. Measure chemicals accurately.
3. Observe the completion of reaction.
4. Note down readings.
5. Follow systematic procedure step by step.

List of Experiments:

Sr. No.	Name of the experiment.
1	Determine the percentage of iron in given Steel sample by redox titration.
2	Find the relation between loss in weight of aluminium strip in acidic and alkaline medium and rate of corrosion.
3	Determine electrode potential of various metals to study their tendency towards corrosion.
4	Determine the strength of given hydrochloric acid solution by titrating it against sodium hydroxide solution by using pH meter.
5	Determine thinner content in paint.
6	Determine total hardness (permanent and temporary) of given sample of water by EDTA method.
7	Determine chloride content in given sample of water by Mohr's method.
8	Determine the alkalinity of given sample of water.
9	Determine the percentage of calcium content in cement.

Learning Resources:

1. Reference books:

Sr. No.	Author	Name of the book	Publisher
1	Jain and Jain	Engineering Chemistry	Dhanpat Rai and Sons
2	S. S. Dara	Engineering Chemistry	S. Chand Publication
3	B Sivasankar	Engineering Chemistry	The McGraw Hill Companies
4	R. Sivkumar, N. Sivkumar	Engineering Chemistry	The McGraw Hill Companies
5	K.B. Chandrasekhar, U. N. Das, Sujatha Mishra	Engineering Chemistry	SCITECH
6	B. K. Sharma	Industrial Chemistry	Goel Publication

2. List of web sites, Videos and animations:

en.wikipedia.org/wiki/Hard_water
www.treat-water.com/waters-impurity.pdf
www.mrwa.com/OP-Water%20and%20Impurities.pdf
en.wikipedia.org/wiki/Cement www.scribd.com/.../Setting-and-Hardening-Concrete
www.ustudy.in/node/1383
en.wikipedia.org/wiki/Carbon_steel
www.asminternational.org/content/ASM/StoreFiles/ACF180B.pdf
www.namedorganicreactions.co.uk/Corrosion.pdf
http://www.ausetute.com.au/corrosion.html
http://www.youtube.com/watch?v=8s8rcnxqLIw
http://www.galvanizeit.org/aga/animation/4728?keepThis=true&TB_iframe=true&height=480&width=640 (Galvanizing)
http://www.ehow.com/list_6725219_different-types-metal-cladding.html (Metal Clading)
http://www.sherardizing.com/resources/files/9_Sherardizing_Corrosion.pdf (Sheradizing)

Course Name : Civil Engineering Group

Course Code : CC

Semester : Second

Subject Title : Construction Materials

Subject Code : 17920

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TEST	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
10	01	--	03	100	--	--	--	100

NOTE:

- **One tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

Rationale:

The basic concern of a civil engineer is the design, construction, supervision and maintenance of structures such as building, bridges, canals, water tanks, roads etc. A most important aspect infield practice is to select and use different types of materials. Thus in the field of civil engineering, construction materials play a vital role in the quality and aesthetics of the structure. With the advancement of technology, new materials are invented and incorporated to a greater extent in the field of construction.

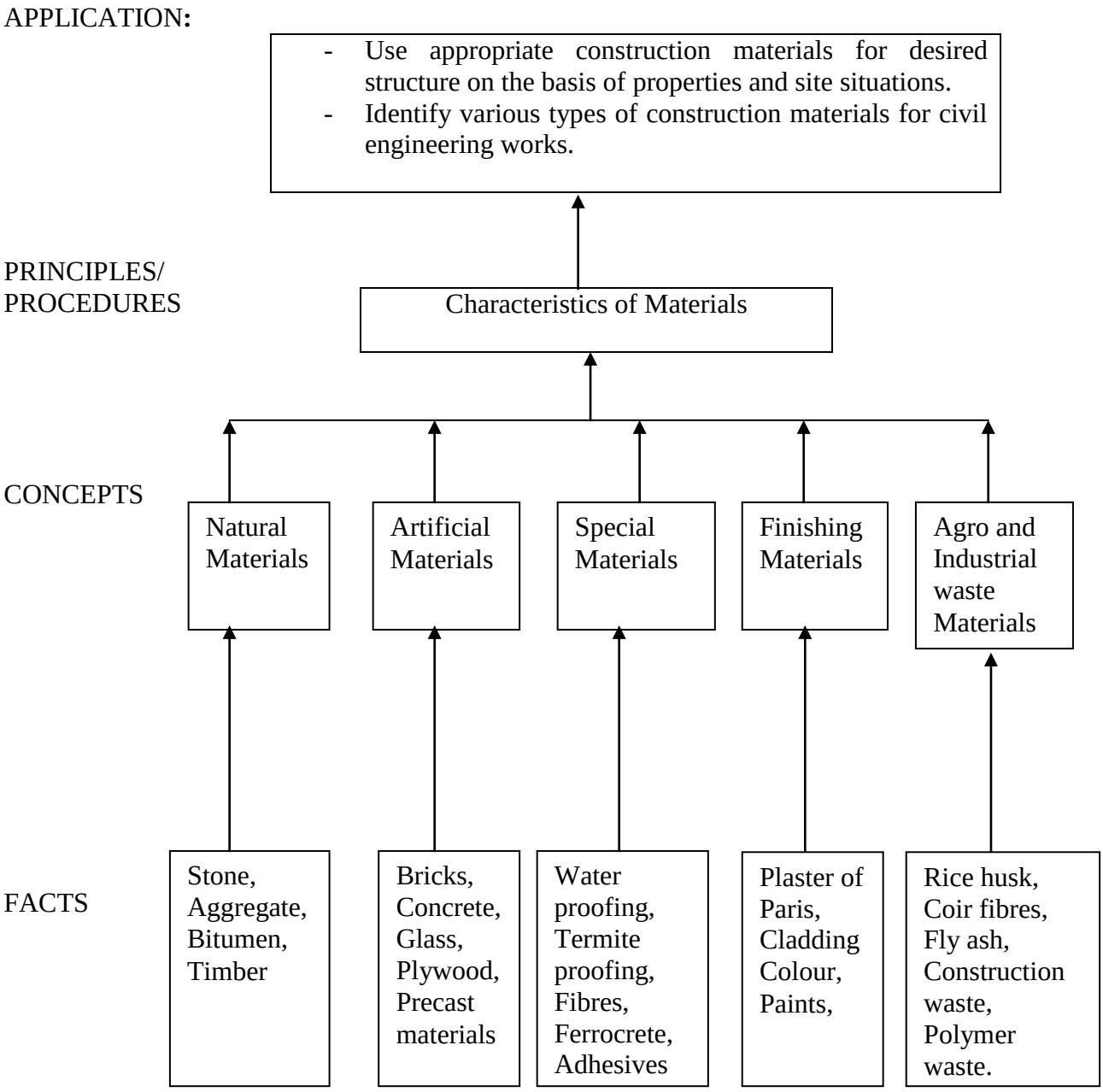
The construction material can be classified as natural, artificial, special, finishing and recycled types. Properties, applications and market study of these, provide the guidance to recommend the use of these materials for various civil engineering structures.

General Objectives:

Student will be able to:

1. Know various construction materials required for Civil Engineering construction.
2. Understand the properties/characteristics of various construction materials.
3. Know the applications of various construction materials in Civil Engineering Construction.

Learning Structure:



Theory:

Topic and Contents	Hours	Marks
Topic – 1 Over view of Civil Engineering **Specific Objectives:** ➢ State criteria for selection of construction materials. ➢ Classify various construction materials. **Contents:** • Role of Civil Engineering in human life - Building Construction, Transportation Engineering, Environmental Engineering, Irrigation Engineering, Construction Management. (applications only) • Criteria for Selection of construction materials on the basis of carrying prescribed load, serviceability, Aesthetically pleasing, economical, environmental friendly. • Broad classification of materials – Natural, Artificial, Special, Finishing and Recycled construction materials.	**04**	**08**
Topic- 2. Natural Construction Materials **Specific Objectives:** ➢ Classify various Natural construction materials ➢ State various properties of Natural construction materials ➢ List applications of Natural construction materials **Contents :** **2.1 ----------(12)** • Stone – Physical Classification of rocks; Requirements of good building stone, characteristics of stone, Quarrying and dressing of stone. • Timber – Timber as construction material, structure of timber, properties of good timber, seasoning of timber, defects in timber. **2.2 ----------(12)** • Bituminous materials and mixtures: Terminology, different types of asphalt, bitumen, tar used in Civil Engineering works, their properties and uses • Lime – Manufacture of lime, classification, field slaking of lime and properties of lime • Soil –terminology- sand, silt, clay and their suitability in construction work.	**10**	**24**
Topic - 3 Artificial Construction Materials **Specific Objectives:** ➢ List various artificial construction materials. ➢ State functions of various components of cement Plant. ➢ Describe applications of artificial construction materials. **Contents :** **3.1 ----------(10)** • Bricks – Brick earth and its constituents. Conventional bricks and Standard bricks. Characteristics of good brick, Classification of burnt clay bricks and their suitability, special bricks. Manufacturing	**14**	**30**

of burnt clay bricks. Common Field tests on Bricks- shape and size, colour, sound, hardness test, finger scratch test, water absorption test • Tiles –flooring and roofing tiles. Characteristic of good tiles, different types of tiles depending upon material used, sizes of tiles, uses of tiles, wall cladding **3.2 ----------(10)** • Materials for making concrete-: Cement – definition, Manufacturing of cement, types of cements – ordinary Portland, white cement colour cement and their suitability. Different brand name of cement, common pickings available in markets, common field tests on cement- lumps visible, colour, hand feeling , water float test Aggregate – Definition, types of aggregate - coarse aggregate, fine aggregates (size). Artificial sand – properties and advantages, suitability • Pre cast concrete products – concrete blocks- hollow, solid concrete blocks, pavement blocks, balustrades, their properties and uses. **3.3 ----------(10)** • Plywood, particle board and veneers their properties and uses. • Glass – properties- thickness and weight, thermal conductivity, light and heat translation, durability sound insulation, types of glass- soda lime glass, lead glass and borosilicate glass. Glass used for cladding.		
Topic - 4 Special Construction Materials **Specific Objectives:** ➢ List various Special construction materials ➢ State various properties of Special construction materials ➢ State applications of Special construction materials **Contents** **4.1 ----------(10)** • Water proofing and damp proofing materials – Brand names, packings available properties and uses. • Termite proofing materials -need ,names and uses • Thermal insulating materials- properties, names and situations where used • Sound insulating materials- properties, names and situations where used **4.2 ----------(10)** • Fibres – Types –Jute, Coir, Steel Fibres, Carbon Fibres, Glass Fibres, Plastic Fibres, Asbestos Fibres properties and uses • Miscellaneous materials – artificial timber, ferrocrete, adhesives, epoxy and Geosynthetic materials, ceramic materials -properties and uses.	**08**	**20**
Topic - 5. Finishing Materials **Specific Objectives:** ➢ List various finishing materials ➢ State various properties of finishing materials ➢ State applications of finishing materials **Contents**	**06**	**08**

• Plastering Materials – Mortars: Lime Mortar, Cement Mortar, Special Mortars – Properties, proportion, situations where used • Plaster of Paris – Constituents, properties and uses POP finishing boards, sizes, purpose. • Paints, Distempers and Varnishes – types, properties and uses. • Cladding materials – properties, names of different cladding materials and uses. • Linoleum- properties, sizes, use, method of fixings to floor		
Topic -6 Building materials from Agro and Industrial wastes **Specific Objectives:** ➢ List various Agro and Industrial wastes used in construction ➢ State various properties of Agro and Industrial wastes as a construction materials ➢ State applications of Agro and Industrial wastes as a construction materials **Contents** • properties and uses of -: Rice husk, Bagasse, coir fibres, straw, coconut and Areca nut tree trunks, coconut leaf, Fly ash, Blast furnace slag, Granite and marble polishing waste, construction waste, Sawdust, Plastic, Polymer, rubber waste.	**06**	**10**
Total	**48**	**100**

Note: Two field visits shall be arrange to show various recent buildings materials, student shall observe those materials, see sizes, packing, market rates, special characteristics and submit two three pages report.

Learning Resources

1. Books

Sr. No.	Title	Author	Publisher
1	Civil Engineering Materials	Shan Somayaji	Pearson
2	Building construction illustrated	Francis D.K. Ching	Wiley India
3	Olin's Construction Principles, materials and methods	H Leslie Simmons	Wiley India
4	Elements of civil Engineering	Anurag Kandya	Charotar
5	Building materials Technology	L Reed Brantley	Tata McGraw – Hill
6	Engineering Materials	Sharma	PHI Publication
7	Civil Engineering Materials	NITTTR Chandigarh	NITTTR Chandigarh
8	Construction Materials	D. N. Ghose	Tata McGraw – Hill
9	Building Materials	S. K. Duggal	New International

2. Materials museum- Collect the samples and display for the followings-

Stone, aggregate of different sizes, timber, lime, bitumen, Bricks, tiles, precast concrete products, Water proofing, Termite proofing, Thermal insulating, plaster of Paris, paints, distemper, and varnishes.

Also display of various leaflets of recent building materials.