Civil Engineering

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, JNANA SANGAMA, BELGAUM- 590 014

NET'S NAVODAYA INSTITUTE OF TECHNOLOGY RAICHUR - 584103

A

PROJECT REPORT

ON

"TREATMENT OF DOMESTIC WASTEWATER BY USING ARTIFICIALLY CONSTRUCTED WETLAND "

Submitted By

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Under The Guidance Of

Prof. SUMA K.S.

DEPARTMENT OF CIVIL ENGINEERING

2016-2017

PRINCIPAL
Navodaya Institute of Technology (NIT)
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DEPARTMENT OF CIVIL ENGINEERING

CERTIFICATE

This is to certify that **NAGESHWARI(3NA13CV023), NAYANA M.N. (3NA13CV024), SHAILAJA B.T. (3NA13CV037), SUNIL (3NA14CV416)** *of B.E. 8th Semester has successfully completed the project work entitled* ***"TREATMENT OF DOMESTIC WASTEWATER BY USING ARTFICIALLY CONSTRUCTED WETLAND"*** *for the partial fulfillment of Bachelor of Engineering in* ***CIVIL ENGINEERING*** *as prescribed by the Visvesvaraya Technological University, Belgaum, during the academic year 2016-17.*

Project Guide	***Head of the Department***	***Principal***
01/06/2017	09/6/17	
Prof. SUMA K.S.	***Dr. SHIVAREDDY M. S.***	***Dr. SHIVA PRAKASH C.K***

Name of Examiners: **Signature with date**

1. Krishaiah S.K 23/06/17
2. [illegible]

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ABSTRACT

All around the world it is common practice to pump enormous volumes of waste water into rivers, oceans and streams. This has extremely negative effects on the environment, fisheries, animals. Strategies for control of water pollution have focused mainly on implementation of expensive and energy intensive conventional treatment technologies. The limited successes of such strategies can be attributed to the high capital investment requirement, continual replacement and high operation costs. In recent years, constructed wetlands systems have emerged as a low cost high performing waste water treatment technology compared to conventional treatment systems. There is a growing interest to develop and adopt this technology for water pollution control in India as well, that's why we have choosed artificially constructed wetland with cattail plant as vegetation & the results for different retention time are, Hydraulic retention time of 2 days, 4 days and 6 days was maintained, wetland achieved a performance of an average 29.73% of BOD, 84.25% of COD, 57.64% of DO, 48.57% of Turbidity, 35.4% of TDS, reductions for2days retention time. 59.23% of BOD, 84.56% of COD, 72.61% of DO, 77.15% of Turbidity, 37.5% TDS reductions for 4 days retention time and 71.75% of BOD, 87.98% of COD, 79.76% of DO, 87.62% of Turbidity and 44.3% of TDS reductions for 6 days retention time.

KEYWORDS: Constructed wetlands, surface flow constructed wetlands, subsurface flow constructed wetlands.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Water, the most abundant and wonderful natural re- source, is extremely essential for the survival of all living organisms. Rapid industrialization and urbanization over the past decades have generated increasing amounts of wastewater, resulting in environmental deterioration and pressure on reliable water resource.[27]

Untreated sewage is the major sources of pollutants in developing countries. Municipal sewage containing readily biodegradable organic matter, inorganic and organic chemicals, toxic substances and disease causing agents are frequently discharged into aquatic environments (oceans, rivers, lakes, wetlands) without treatment. In rural areas and unplanned high density urban settlements, contamination of surface and groundwater by domestic wastewater occurs through infiltration and surface run-off of poorly placed pit-latrines especially during the rainy-season. The situation is getting worse with rapid urbanization and a continuing lack of proper sanitation in developing areas.[1]

Wastewater is a necessary consequence of human activities on the campus just like it is in any human environment. The city-like situation on university campuses with the attendant volume of wastewater generated is an issue that must be given adequate attention. To achieve best practices in campus planning and to maintain a sanitary environment, the sewer infrastructure plays a very critical role. This is because untreated wastewater poses a threat to human health and environment thus making the protection of the environment of vital importance. This protection is aimed at the improvement of the quality of life, the protection of the ecosystem and the conservation of the natural resources together with the securing of sustained economic development (Xajipakkos et al, 2000). This brings to fore the need for an inclusive sanitation system whose main objective according to Langergraber (2013) is to protect and promote human health by providing a clean environment and breaking the cycle of disease.

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1.2 PROBLEM STATEMENT

Wastewater treatment is a problem that has plagued man ever since he discovered that discharging his wastes into surface waters can lead to many additional environmental problems. Strategies for control of water pollution have focused mainly on implementation of expensive and energy intensive conventional treatment technologies. The limited successes of such strategies can be attributed to the high capital investment re- quirement, continual replacement and high operation costs. In recent years, constructed wetlands systems have emerged as a low-cost high-performing wastewater treatment technology compared to conventional treatment systems. There is a growing interest to develop and adopt this technology for water pollution control in India as well.[27]

1.3 SIGNIFICANCE OF CONSTRUCTED WETLANDS

Various methods are available for wastewater treatment starting from conventional ponds to anaerobic la- goons. Recently advanced technologies including physical, chemical and biological treatments have been developed for the sewage water treatment like, ion ex- change, filtration, coagulation, precipitation, adsorption etc. Among the biological systems, constructed wet- land technology is a new technology and it is a cheaper alternative for waste water treatment as it uses local resources. Aesthetically it is a more landscaped looking wetland site compared to the conventional waste- water treatment plants.

This system promotes sustain- able use of local resources, which is a more environment friendly biological wastewater treatment system. Apart from, compared with conventional treatment systems, this constructed wetland systems having advantages such as: can be established in the same place, where the wastewater is produced; can be maintained by relatively untrained personnel; have relatively low energy requirements; and are low cost systems. Since the publication of first research report on the use of aquatic plants for pollution control, research into constructed wetlands has expanded rapidly, but this novel approach remains a developing technology even today with many of the key processes and their rates and interactions are poorly understood and standardized. [27]

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1.4 Objectives of constructed wetland

- To treat domestic waste water using artificially constructed wetlands
- To test the quality of treated waste by using constructed wetlands for other beneficial use (recycling of treated wastewater)
- To construct the artificial horizontal flow constructed wetland using cattail plants
- To determine output of wetland treatment system to meet BIS standards
- To assess the variation of pollutional parameters

3.1.3 Wastewater

Navodaya college sewage is selected as influent for the wetland; sewage was collected at regular intervals from sewage room. Sewage contains various types of impurities and disease bacteria. Sewage is mainly composed of human fecal material, domestic wastes including wash-water. Wetland facility designed to receive the waste from domestic, commercial and biological processes to remove various contaminants depending on its constituents.

3.1.4 Coarse Aggregate

The media used in subsurface flow constructed wetlands (SSFCW) is fundamental; it is crucial that the gravel or sand be clean, washed and without impurities. When available, volcanic rock is the best medium but other materials such as limestone, river rocks, recycled concrete and recycled crushed glass to desired diameter are also being used. The gravel is the growth medium for microorganisms, works as a sieve and determines hydraulic residence time.

The wetland tank was filled entirely with course aggregate; the aggregate size being 20mm retained and must be free from dust and dirt. About 75% of Total wetland is filled entirely with 20mm size aggregates and in between the aggregates a sand layer of about 5cm is laid. The reason for using the coarse gravel as a filter media is to avoid the clogging problem that usually occurs when only sand is used.

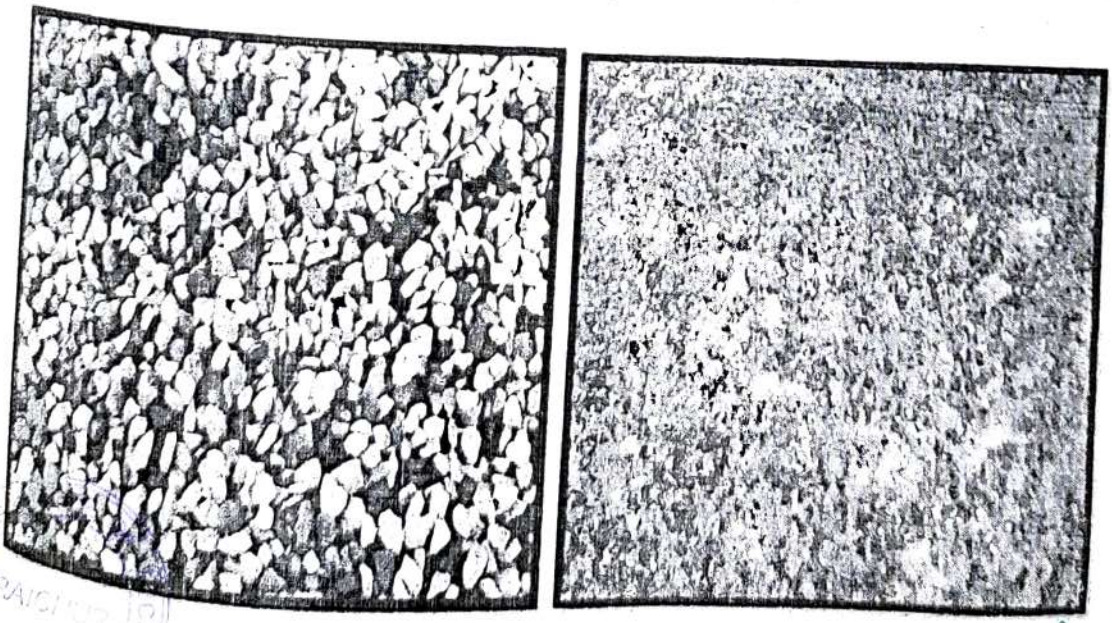

Fig 3.1: Coarse aggregates and medium sand

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5.2 CONCLUSION

Constructed wetlands are a viable alternative for wastewater treatment for reducing the organics and sus- pended solids with low-cost. The design should take into account the type of wastewater and the loading rate, the climatological setting of the designed wetland, the sediment and plant types to be used and the management needed for operation of the wetland.

- Operation and maintenance are the most important aspect of treatment wetlands operation.

- As reported in most of the study, the SFCW system does not establish reliable for treating wastewater with high ammonium concentration. Most operational SFCW demonstrating successful ammonia removal at long HRT, which usually takes more than six days. From the review, intermittent or batch type flow to alternating beds might enhance the oxygen status and therefore, improve the ammonia removal capability. Therefore, the approach should be tested and then demonstrated if promising.

- The use of new technology and specialized media in the SFCW to improved phosphorus removal should be developed and demonstrated since phosphorus removal always shows worse performance in the removal.

- SFCW design can offer high performance levels for various types of wastewater. However, the response to complex organic and inorganic compounds in industrial and domestic wastes needs more investigations.

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CONCRETE AND HIGHWAY MATERIALS LABORATORY

Subject Code	: **10CVL78**	IA Marks	: 25
No. of Practical Hours/Week	: 03	Exam Hours	: 03
Total No. of Practical Hours	: 42	Exam Marks	: 50

PART - A

CEMENT: Normal Consistency, Setting time, Soundness by Autoclave method, Compression strength test and Air permeability test for fineness, Specific gravity of cement.

FRESH CONCRETE: Workability – slump, Compaction factor and Vee Bee tests.

HARDENED CONCRETE: Compression strength and Split tensile tests. Test on flexural strength of RCC beams, Permeability of concrete.

PART - B

SOIL: Density of Soil by Sand replacement method, CBR Text.

AGGREGATES: Crushing, abrasion, impact and Shape tests (Flaky, Elongation, Angularity number) Specific gravity and water absorption.

BITUMINOUS MATERIALS AND MIXES: Specific Gravity, Penetration,Ductility, Softening point, Flash and fire point, Viscosity, proportioning of aggregate mixes by Rothfutch Method, Marshall Stability tests.

REFERENCE BOOK:

1. Relevant IS Codes and IRC Codes.
2. **Highway Material Testing Laboratory Manual** by Khanna S K and Justo, – CEG Nemi Chand & Bros.
3. M. L. Gambhir : Concrete Manual : Dhanpat Rai & sons New – Delhi.

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VIII -SEMESTER

ADVANCED CONCRETE TECHNOLOGY

Subject Code	: **10CV81**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

Importance of Bogue's compounds, Structure of a Hydrated Cement Paste, Volume of hydrated product, porosity of paste and concrete, transition Zone, Elastic Modulus, factors affecting strength and elasticity of concrete, Rheology of concrete in terms of Bingham's parameter.

7 Hour

UNIT - 2

CHEMICAL ADMIXTURES- Mechanism of chemical admixture, Plasticizers and super Plasticizers and their effect on concrete property in fresh and hardened state, Marsh cone test for optimum dosage of super plasticizer, retarder, accelerator, Air-entraining admixtures, new generation superplasticiser.

MINERAL ADMIXTURE-Fly ash, Silica fume, GCBS, and their effect on concrete property in fresh state and hardened state.

6 Hours

UNIT - 3

MIX DESIGN - Factors affecting mix design, design of concrete mix by BIS method using IS10262 and current American (ACI)/ British (BS) methods. Provisions in revised IS10262-2004.

6 Hours

UNIT - 4

DURABILITY OF CONCRETE - Introduction, Permeability of concrete, chemical attack, acid attack, efflorescence, Corrosion in concrete. Thermal conductivity, thermal diffusivity, specific heat. Alkali Aggregate Reaction, IS456-2000 requirement for durability.

7 Hours

PART - B

UNIT - 5

RMC concrete - manufacture, transporting, placing, precautions, Methods of concreting- Pumping, under water concreting, shotcrete, High volume fly ash concrete concept, properties, typical mix

Self compacting concrete concept, materials, tests, properties, application and Typical mix.

6 Hours

UNIT - 6

Fiber reinforced concrete - Fibers types and properties, Behavior of FRC in compression, tension including pre-cracking stage and post-cracking stages, behavior in flexure and shear, Ferro cement - materials, techniques of manufacture, properties and application

7 Hours

UNIT - 7

Light weight concrete-materials properties and types. Typical light weight concrete mix High density concrete and high performance concrete-materials, properties and applications, typical mix.

6 Hours

UNIT - 8

Test on Hardened concrete-Effect of end condition of specimen, capping, H/D ratio, rate of loading, moisture condition. Compression, tension and flexure tests. Tests on composition of hardened concrete-cement content, original w/c ratio. NDT tests concepts-Rebound hammer, pulse velocity methods.

7 Hours

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ENVIRONMENTAL ENGINEERING LABORATORY

Subject Code	**10CVL77**	IA Marks	: 25
No. of Practical Hours/Week	: 03	Exam Hours	: 03
Total No. of Practical Hours	: 42	Exam Marks	: 50

1. Determination of Solids in Sewage: Total Solids, Suspended Solids,Dissolved Solids, Volatile Solids, Fixed Solids, Settleable Solids.
2. Electrical conductivity. Determination of Chlorides and Sulphates.
3. Determination of Alkalinity, Acidity and pH.
4. Determination of Calcium, Magnesium and Total Hardness.
5. Determination of Dissolved Oxygen. Determination of BOD.
6. Determination of COD.
7. Determination of percentage of available chlorine in bleaching powder, Residual Chlorine and Chlorine Demand.
8. Jar Test for Optimum Dosage of Alum, Turbidity determination by Nephelometer.
9. Determination of Iron. Phenanthroline method.
10. Determination of Fluorides SPANDS Method.
11. MPN Determination
12. Determination Nitrates by spectrophotometer.
13. Determination of sodium and potassium by flame photometer.

REFERENCES

1. **Manual of Water and Wastewater Analysis** – NEERI Publication.
2. **Standard Methods for Examination of Water and Wastewater** (1995), American Publication – Association, Water P ollution Control Federation, American Water Works Association, Washington DC.
3. **IS Standards :** 2490-1974, 3360-1974, 3307-1974.
4. **Chemistry for Environment Engineering**. Sawyer and Mc Carthy,

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VII SEMESTER
ENVIRONMENTAL ENGINEERING – II

Subject Code	: 10CV71	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Necessity for sanitation, methods of domestic waste water disposal, types of sewerage systems and their suitability.

Dry weather flow, factors affecting dry weather flow, flow variations and their effects on design of sewerage system; computation of design flow, estimation of storm flow, rational method and empirical formulae of design of storm water drain. Time of concentration.

6 Hours

UNIT - 2

DESIGN OF SEWERS: Hydraulic formulae for velocity, effects of flow variations on velocity, self cleansing and non scouring velocities, Design of hydraulic elements for circular sewers flowing full and flowing partially full (No derivations).

MATERIALS OF SEWERS: Sewer materials, shapes of sewers, laying of sewers, joints and testing of sewers, ventilation and cleaning of sewers.

6 Hours

UNIT - 3

SEWER APPURTENANCES: Catch basins, manholes, flushing tanks, oil and grease traps, Drainage traps. Basic principles of house drainage. Typical layout plan showing house drainage connections, maintenance of house drainage.

6 Hours

UNIT - 4

WASTE WATER CHARACTERIZATION: Sampling, significance, techniques and frequency. Physical, Chemical and Biological characteristics, Aerobic and Anaerobic activity, CNS cycles. BOD and COD. Their significance & problems

06 Hours

PART – B

UNIT - 5

DISPOSAL OF EFFLUENTS : Disposal of Effluents by dilution, self-purification phenomenon. Oxygen sag curve, Zones of purification, Sewage farming, sewage sickness, Effluent Disposal standards for land, surface water

& ocean. Numerical Problems on Disposal of Effluents. Streeter Phelps equation.

6 Hours

UNIT - 6

TREATMENT OF WASTE WATER: Flow diagram of municipal waste water treatment plant. Preliminary & Primary treatment : Screening, grit chambers, skimming tanks, primary sedimentation tanks – Design criteria & Design examples.

6 Hours

UNIT - 7

SECONDARY TREATMENT: Suspended growth and fixed film bioprocess. Trickling filter – theory and operation , types and designs. Activated sludge process- Principle and flow diagram, Modifications of ASP, F/M ratio. Design of ASP.

8 Hours

UNIT - 8

Anaerobic Sludge digestion, Sludge digestion tanks, Design of Sludge drying beds. Low cost waste treatment method. Septic tank, Oxidation Pond and Oxidation ditches – Design. Reuse and recycle of wa ste water.

8 Hours

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VI SEMESTER

ENVIRONMENTAL ENGINEERING-I

Subject Code	: 10CV61	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

Part - A

Unit - 1

INTRODUCTION: Human activities and environmental pollution. Water for various beneficial uses and quality requirement. Need for protected water supply.

2 Hours

DEMAND OF WATER: Types of water demands- domestic demand in detail, institutional and commercial, public uses, fire demand. Per capita consumption –factors affecting per capita demand, population forecasting, different methods with merits &demerits- variations in demand of water. Fire demand – estimation by Kuichling's formula, Freeman formula & national board of fire underwriters formula, peak factors, design periods & factors governing the design periods

6 Hours

Unit - 2

SOURCES: Surface and subsurface sources – suitability with regard to quality and quantity.

3 Hours COLLECTION AND CONVEYANCE OF WATER: Intake structures – different types of intakes; factor of selection and location of intakes. Pumps- Necessity, types – power of pumps; factors for the selection of a pump. Pipes – Design of the economical diameter for the rising main; Nomograms – use; Pipe appurtenances.

6 Hours

Unit - 3

QUALITY OF WATER: Objectives of water quality management. wholesomeness & palatability, water borne diseases. Water quality parameters – Physical, chemical and Microbiological. Sampling of water for examination. Water quality analysis (IS: 3025 and IS: 1622) using analytical and instrumental techniques. Drinking water standards BIS & WHO guidelines. Health significance of Fluoride, Nitrates and heavy metals like Mercury, Cadmium, Arsenic etc. and toxic / trace organics.

6 Hours

Unit - 4

WATER TREATMENT: Objectives – Treatment flow-chart. Aeration-Principles, types of Aerators.

2 Hours

SEDIMENTATION: Theory, settling tanks, types, design. Coagulant aided sedimentation, jar test, chemical feeding, flash mixing, and clari-flocculator.

4 Hours

Part - B

Unit - 5

FILTRATION: Mechanism – theory of filtration, types of filters, slow sand, rapid sand and pressure filters including construction, operation, cleaning and their design – excluding under drainage system – back washing of filters. Operational problems in filters.

6 Hours

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GEOTECHNICAL ENGINEERING – I

Subject Code	: 10CV54	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT- 1

INTRODUCTION: History of soil mechanics, Definition, origin and formation of soil. Phase Diagram, Voids ratio, Porosity, Percentage Air Voids, Air content, Degree of saturation, Water content, Specific Gravity of soil solids and soil mass, Densities and Unit weights - Bulk, Dry, Saturated & Submerged and their inter relationships.

6 Hours

UNIT - 2

INDEX PROPERTIES OF SOIL AND THEIR DETERMINATION:
Index Properties of soil- Water content , Specific Gravity, Particle size distribution, Relative Density, Consistency limits and indices, in-situ density, Activity of Clay, Laboratory methods of determination of index properties of soil: Water content (Oven Drying method & Rapid Moisture method), Specific gravity of soil solids (Pycnometer and density bottle method), Particle size distribution (Sieve analysis and Hydrometer analysis only), Liquid Limit- (Casagrande and Cone penetration methods), Plastic limit and shrinkage limit.

7 Hours

UNIT - 3

CLASSIFICATION OF SOILS: Purpose of soil classification, Particle size classification – MIT classification and IS classifi cation, Textural classification. IS classification - Plasticity chart and its importance, Field identification of soils.

CLAY MINERALOGY AND SOIL STUCTURE: Single grained, honey combed, flocculent and dispersed structures, Valence bonds, Soil-Water system, Electrical diffuse double layer, adsorbed water, base-exchange capacity, Isomorphous substitution. Common clay minerals in soil and their structures- Kaolinite, Illite and Montmorillonite.

8 Hours

UNIT - 4

FLOW OF WATER THROUGH SOILS: Darcy's law- assumption and validity, coefficient of permeability and its determination (laboratory and field), factors affecting permeability, permeability of stratified soils, Seepage

velocity, Superficial velocity and coefficient of percolation, quick sand phenomena, Capillary Phenomena.

6 Hours

PART - B

UNIT - 5

SHEAR STRENGTH OF SOIL: Concept of shear strength, Mohr-coulomb theory, conventional and modified failure envelops, Effective stress concept-total stress, effective stress and Neutral stress, Concept of pore pressure, Total and effective shear strength parameters, factors affecting shear strength of soils, Sensitivity and Thixotropy of clay.

7 Hours

UNIT - 6

COMPACTION OF SOIL: Definition, Principle of compaction, Standard and Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control – compactive effort & method, lift thickness and number of passes, Proctor's needle, Compacting equipment.

6 Hours

UNIT - 7

CONSOLIDATION OF SOIL: Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory-assumption and limitations (no derivation), Normally consolidated, under

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CONCRETE TECHNOLOGY (COMMON TO CV/TR/CTM)

Sub Code	:	**10 CV 42**	**IA Marks**	:	**25**
Hrs/ Week	:	**04**	**Exam Hours**	:	**03**
Total Hrs.	:	**52**	**Exam Marks**	:	**100**

PART – A

Unit- 1 19

ement, Chemical composition, hydration of cement, Types of cement, manufacture of OPC by wet and dry, process (flow charts only) Testing of cement - Field testing, Fineness by sieve test and Blaine's air permeability test, Normal consistency, testing time, soundness, Compression strength of cement and grades of cement, Quality of mixing water. –7 Hours

Unit-2

Fine aggregate - grading, analysis, Specify gravity, bulking, moisture content, deleterious materials. Coarse aggregate – Importanc e of size, shape and texture.Grading of aggregates - Sieve analysis, specific gravity, Flakiness and elongation index, crushing, impact and abrasion tests. - 6 Hours

Unit-3

Workability - factors affecting workability, Measurement of workability - slump, flow tests, Compaction factor and vee-bee consistometer tests, Segregation and bleeding, Process of manufactures of concrete : Batching, Mixing, Transporting, Placing, Compaction, Curing. -7 Hours

Unit-4

Chemical admixtures - plasticizers, accelerators, retarders and air entraining agents, Mineral admixtures - Fly ash, Silica fumes and rice husk ash.

-6 Hours

Part-B

Unit-5

Factors affecting strength, w/c ratio, gel/space ratio, maturity concept, Effect of aggregate properties, relation between compressive strength, and tensile strength, bond strength, modulus of rupture, Accelerated curing, aggregate - cement bond strength, Testing of hardened concrete - compressive strength, split tensile strength, Flexural strength, factors influencing strength test results. - 6Hours

Unit-6

Elasticity - Relation between modulus of elasticity and Strength, factors affecting modulus of elasticity, Poisson , Ratio, Shrinkage - plastic shrinkage and drying shrinkage, Factors affecting shrinkage, Creep - Measurement of creep, factors affecting creep, effect of creep, - 7 Hours

Unit-7

Durability - definition, significance, permeability, Sulphate attack, Chloride attack, carbonation, freezing and thawing, Factors contributing to cracks in concrete - plastic shrinkage, settlement cracks, construction joints, Thermal expansion, transition zone, structural design deficiencies, - 6 Hours

Unit-8

Concept of Concrete Mix design, variables in proportioning , exposure conditions, Procedure of mix design as per IS 10262-1982, Numerical examples of Mix Design - 7 Hours

TEXT BOOKS:

1. "Concrete Technology" - Theory and Practice, M.S.Shetty, S.Chand and Company, New Delhi, 2002.

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BASIC MATERIAL TESTING LAB
(COMMON TO CV/TR)

Sub Code	:	**10 CVL 37**	**IA Marks**	:	**25**
Hrs/ Week	:	**03**	**Exam Hours**	:	**03**
Total Hrs.	:	**42**	**Exam Marks**	:	**50**

1. Tension test on Mild steel and HYSD bars.
2. Compression test of Mild Steel, Cast iron and Wood.
3. Torsion test on Mild Steel circular sections
4. Bending Test on Wood Under two point loading
5. Shear Test on Mild steel.
6. Impact test on Mild Steel (Charpy & Izod)
7. Hardness tests on ferrous and non-ferrous metals – Brinell's, Rockwell and Vicker's
8. Test on Bricks and Tiles
9. Tests on Fine aggregates – Moisture content, Specif ic gravity, Bulk density, Sieve analysis and Bulking
10. Tests on Coarse aggregates – Absorption, Moisture c ontent, specific gravity, Bulk density and Sieve analysis
11. Demonstration of Strain gauges and Strain indicators

NOTE: All tests to be carried out as per relevant BIS Codes

REFERENCE BOOKS:

1. **Testing of Engineering Materials**, Davis, Troxell and Hawk, International Student Edition – McGraw Hill Book Co . New Delhi.
2. **Mechanical Testing of Materials",** Fenner, George Newnes Ltd. London.
3. **"Experimental Strength of Materials"** , Holes K A, English Universities Press Ltd. London.
4. **"Testing of Metallic Materials"** , Suryanarayana A K, Prentice Hall of India Pvt. Ltd. New Delhi.
5. **Relevant IS Codes**
6. **"Material Testing Laboratory Manual"** , Kukreja C B- Kishore K. Ravi Chawla Standard Publishers & Distributors 1996.
7. **Concrete Manual,** M.L.Gambhir –Dhanpat Rai & Sons- New Delhi.

Scheme of Examination:

Group Experiments: Tension, Compression Torsion and Bending Tests Individual Experiments: Remaining tests

Two questions are to be set – one from group experi ments and the other as individual experiment.

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GEOTECHNICAL ENGINEERING – II

Subject Code	: 10CV64	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

SUBSURFACE EXPLORATION: Importance of exploration program, Methods of exploration: Boring, Seismic refraction method of grophysical exploration, Types of samples - undisturbed, disturbed and representative samples, Samplers, sample disturbance, area ratio, Recovery ratio, clearance, Stabilisation of boreholes - Typical bore log. Number and depth of borings for various civil engineering structures, soil exploration report.

DRAINAGE AND DEWATERING: Determination of ground water level by Hvorselev's method, Control of ground water during excavation: Dewatering - Ditches and sumps, well point system, Vacuum method, Electro- Osmosis method.

8 Hours

UNIT - 2

STRESSES IN SOILS: Boussinesq's and Westergaard's theories for concentrated, circular and rectangular loads. Comparison of Boussinesq's and westergaard's analysis. Pressure distribution diagrams, Contact pressure, Newmark's chart.

6 Hours

UNIT - 3

FLOWNETS: Laplace equation (no derivation) assumptions and limitations only, characteristics and uses of flownets, Methods of drawing flownets for Dams and sheet piles. Estimating quantity of seepage and Exit gradient. Determination of phreatic line in earth dams with and without filter. Piping and protective filter.

5 Hours

UNIT - 4

LATERAL EARTH PRESSURE: Active and Passive earth pressures, Earth pressure at rest. Rankine's and Coulomb's Earth pressure theories--assumptions and limitations, Graphical solutions for active earth pressure (cohesionless soil only) – Culmann's and Rebhann's methods, Lateral earth pressure in cohesive and cohesionless soils, Earth pressure distribution.

7 Hours

PART - B

UNIT - 5

STABILITY OF EARTH SLOPES: Types of slopes, causes and type of failure of slopes. Definition of factor of safety, Stability of infinite slopes, Stability of finite slopes by Method of slices and Friction Circle method, Taylor's stability number, Fellineous method,.

7 Hours

UNIT - 6

BEARING CAPACITY: Definitions of ultimate, net and safe bearing capacities, Allowable bearing pressure. Terzaghi's and Brinch Hansen's bearing capacity equations - assumptions and limitations, Bearing capacity of footing subjected to eccentric loading. Effect of ground water table on bearing capacity. Field methods of evaluation of bearing capacity - Plate load test, Standard penetration test and cone penetration test. **8 Hours**

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Computer Science Engineering

DATABASE MANAGEMENT SYSTEMS

Subject Code: 10CS54	I.A. Marks : 25	Hours/Week : 04
Exam Hours: 03	Total Hours : 52	Exam Marks: 100

PART - A

UNIT – 1 **6 Hours**

Introduction: Introduction; An example; Characteristics of Database approach; Actors on the screen; Workers behind the scene; Advantages of using DBMS approach; A brief history of database applications; when not to use a DBMS. Data models, schemas and instances; Three- schema architecture and data independence; Database languages and interfaces; The database system environment; Centralized and client-server architectures; Classification of Database Management systems.

UNIT – 2 **6 Hours**

Entity-Relationship Model: Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design; ER Diagrams, Naming Conventions and Design Issues; Relationship types of degreehigher than two.

UNIT – 3 **8 Hours**

Relational Model and Relational Algebra : Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations : JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra; Relational Database Design Using ER- to-Relational Mapping.

UNIT – 4 6 Hours

SQL – 1: SQL Data Definition and Data Types; Specifying basic constraints in SQL; Schema change statements in SQL; Basic queries in SQL; More complex SQL Queries.

PART - B

UNIT – 5 **6 Hours**

SQL – 2 : Insert, Delete and Update statements in SQL; Specifying constraints as Assertion and Trigger; Views (Virtual Tables) in SQL; Additional features of SQL; Database programming issues and techniques; Embedded SQL, Dynamic SQL; Database stored procedures and SQL / PSM.

UNIT – 6 **6 Hours**

Database Design – 1: Informal Design Guidelines for Relation Schemas; Functional ependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form

UNIT – 7 **6 Hours**

Database Design -2: Properties of Relational Decompositions; Algorithmsfor Relational Database Schema Design; Multivalued Dependencies andFourth Normal Form; Join Dependencies and Fifth Normal Form; Inclusion Dependencies; Other Dependencies and Normal Forms

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UNIT – 8 **8 Hours**

Transaction Management: The ACID Properties; Transactions and Schedules; Concurrent Execution of Transactions; Lock- Based Concurrency Control; Performance of locking; Transaction support in SQL; Introduction to crash recovery; 2PL, Serializability and Recoverability; Lock Management; Introduction to ARIES; The log; Other recovery-relatedstructures; The write-ahead log protocol; Checkpointing; Recovering from aSystem Crash; Media Recovery; Other approaches and interaction withconcurrency control.

Text Books:

1. Elmasri and Navathe: Fundamentals of Database Systems,5th Edition, Pearson Education, 2007.(Chapters 1, 2, 3 except 3.8, 5, 6.1 to 6.5, 7.1, 8, 9.1, 9.2 except SQLJ, 9.4, 10)
2. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003. (Chapters 16, 17.1, 17.2, 18)

Reference Books:

1. Silberschatz, Korth and Sudharshan: Data base System Concepts, 6th Edition, Mc-GrawHill, 2010.
2. C.J. Date, A. Kannan, S. Swamynatham: An Introduction to Database Systems, 8th Edition, Pearson Education, 2006

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JAVA AND J2EE

Subject Code:10CS753	**IA Marks: 25**
Hours/Week: 4	**Exam Marks: 100**
Total Hours: 52	**Exam Hours: 3**

PART - A

UNIT – 1 **6 Hours**

Introduction to Java: Java and Java applications; Java Development Kit (JDK); Java is interpreted, Byte Code, JVM; Object-oriented programming; Simple Java programs.

Data types and other tokens: Boolean variables, int, long, char, operators, arrays, white spaces, literals, assigning values; Creating and destroying objects; Access specifiers.

Operators and Expressions: Arithmetic Operators, Bitwise operators, Relational operators, The Assignment Operator, The ? Operator; Operator Precedence; Logical expression; Type casting; Strings

Control Statements: Selection statements, iteration statements, Jump Statements.

UNIT – 2 **6 Hours**

Classes, Inheritance, Exceptions, Applets : Classes: Classes in Java; Declaring a class; Class name; Super classes; Constructors; Creating instances of class; Inner classes.

Inheritance: Simple, multiple, and multilevel inheritance; Overriding, overloading.

Exception handling: Exception handling in Java.

The Applet Class: Two types of Applets; Applet basics; Applet Architecture; An Applet skeleton; Simple Applet display methods; Requesting repainting; Using the Status Window; The HTML APPLET tag; Passing parameters to Applets; getDocumentbase() and getCodebase(); AppletContext and showDocument(); The AudioClip Interface; The AppletStub Interface; Output to the Console.

UNIT – 3 **7 Hours**

Multi Threaded Programming, Event Handling: Multi Threaded Programming: What are threads? How to make the classes threadable; Extending threads; Implementing runnable; Synchronization; Changing state of the thread; Bounded buffer problems, read-write problem, producer-consumer problems.

Event Handling: Two event handling mechanisms; The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model; Adapter classes; Inner classes.

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UNIT – 4 **7 Hours**

Swings: Swings: The origins of Swing; Two key Swing features; Components and Containers; The Swing Packages; A simple Swing Application; Create a Swing Applet; Jlabel and ImageIcon; JTextField;The Swing Buttons; JTabbedpane; JScrollPane; JList; JComboBox; JTable.

PART – B

UNIT – 5 **6 Hours**

Java 2 Enterprise Edition Overview, Database Access: Overview of J2EE and J2SE

The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Data types; Exceptions.

UNIT – 6 **7 Hours**

Servlets: Background; The Life Cycle of a Servlet; Using Tomcat for Servlet Development; A simple Servlet; The Servlet API; The Javax.servlet Package; Reading Servlet Parameter; The Javax.servlet.http package; Handling HTTP Requests and Responses; Using Cookies; Session Tracking.

UNIT – 7 **6 Hours**

JSP, RMI: Java Server Pages (JSP): JSP, JSP Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects.

Java Remote Method Invocation: Remote Method Invocation concept; Server side, Client side.

UNIT – 8 **7 Hours**

Enterprise Java Beans: Enterprise java Beans; Deployment Descriptors; Session Java Bean, Entity Java Bean; Message-Driven Bean; The JAR File.

Text Books:

1. Herbert Schildt: Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007.
   (Chapters 1, 2, 3, 4, 5, 6, 8, 10, 11, 21, 22, 29, 30, 31)
2. Jim Keogh: J2EE - The Complete Reference, Tata McGraw Hill, 2007.
   (Chapters 5, 6, 11, 12, 15)

Reference Books:

1. Y. Daniel Liang: Introduction to JAVA Programming, 7th Edition, Pearson Education, 2007.
   Stephanie Bodoff et al: The J2EE Tutorial, 2nd Edition, Pearson Education, 2004.

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10. Write a C/C++ program to set up a real-time clock interval timer using the **alarm** API.

List of Experiments for Compiler Design: Design, develop, and execute the following programs.

11. Write a C program to implement the syntax-directed definition of "if E then S1" and "if E then S1 else S2". (Refer Fig. 8.23 in the text book prescribed for 06CS62 Compiler Design, Alfred V Aho, Ravi Sethi, and Jeffrey D Ullman: Compilers- Principles, Techniques and Tools, 2nd Edition, Pearson Education, 2007).

12. Write a yacc program that accepts a regular expression as input and produce its parse tree as output.

Note: In the examination *each* student picks one question from the lot of *all* 12 questions.

VII SEMESTER

OBJECT-ORIENTED MODELING AND DESIGN

Subject Code: 10CS71	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **7 Hours**

Introduction, Modeling Concepts, class Modeling: What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history

Modeling as Design Technique: Modeling; abstraction; The three models.

Class Modeling: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models; Practical tips.

UNIT – 2 **6 Hours**

Advanced Class Modeling, State Modeling: Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages; Practical tips.

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State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips.

UNIT – 3 **6 Hours**

Advanced State Modeling, Interaction Modeling: Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; Practical tips.

Interaction Modeling: Use case models; Sequence models; Activity models. Use case relationships; Procedural sequence models; Special constructs for activity models.

UNIT – 4 **7 Hours**

Process Overview, System Conception, Domain Analysis: Process Overview: Development stages; Development life cycle.

System Conception: Devising a system concept; Elaborating a concept; Preparing a problem statement.

Domain Analysis: Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis.

PART – B

UNIT – 5 **7 Hours**

Application Analysis, System Design: Application Analysis: Application interaction model; Application class model; Application state model; Adding operations.

Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example.

UNIT – 6 **7 Hours**

Class Design, Implementation Modeling, Legacy Systems: Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example.

Implementation Modeling: Overview of implementation; Fine-tuning classes; Fine-tuning generalizations; Realizing associations; Testing.

Legacy Systems: Reverse engineering; Building the class models; Building the interaction model; Building the state model; Reverse engineering tips; Wrapping; Maintenance.

UNIT – 7 **6 Hours**

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Design Patterns – 1: What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns; Pattern description
Communication Patterns: Forwarder-Receiver; Client-Dispatcher-Server; Publisher-Subscriber.

UNIT – 8 **6 Hours**

Design Patterns – 2, Idioms: Management Patterns: Command processor; View handler.
Idioms: Introduction; what can idioms provide? Idioms and style; Where to find idioms; Counted Pointer example

Text Books:

1. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education, 2005. (Chapters 1 to 17, 23)
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2007. (Chapters 1, 3.5, 3.6, 4)

Reference Books:

1. Grady Booch et al: Object-Oriented Analysis and Design with Applications, 3rd Edition, Pearson Education, 2007.
2. Brahma Dathan, Sarnath Ramnath: Object-Oriented Analysis, Design, and Implementation, Universities Press, 2009.
3. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, Wiley- Dreamtech India, 2004.
4. Simon Bennett, Steve McRobb and Ray Farmer: Object-Oriented Systems Analysis and Design Using UML, 2nd Edition, Tata McGraw-Hill, 2002.

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LEX and YACC, LEX and Hand- Written Lexers, Using LEX - Regular Expression, Examples of Regular Expressions, A Word Counting Program, Parsing a Command Line.

UNIT – 8 **6 Hours**

Lex and Yacc - 2: Using YACC – Grammars, Recursive Rules, Shift/Reduce Parsing, What YACC Cannot Parse, A YACC Parser - The Definition Section, The Rules Section, Symbol Values and Actions, The LEXER, Compiling and Running a Simple Parser, Arithmetic Expressions and Ambiguity, Variables and Typed Tokens.

Text Books:

1. Leland.L.Beck: System Software, 3rd Edition, Pearson Education, 1997.
   (Chapters 1.1 to 1.3, 2 (except 2.5.2 and 2.5.3), 3 (except 3.5.2 and 3.5.3), 4 (except 4.4.3))
2. John.R.Levine, Tony Mason and Doug Brown: Lex and Yacc, O'Reilly, SPD, 1998.
   (Chapters 1, 2 (Page 2-42), 3 (Page 51-65))

Reference Books:

1. D.M.Dhamdhere: System Programming and Operating Systems, 2nd Edition, Tata McGraw - Hill, 1999.

OPERATING SYSTEMS

Subject Code: 10CS53	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**

Introduction to Operating Systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and security; Distributed system; Special-purpose systems; Computing environments.Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating System design and implementation; Operating System structure; Virtual machines; Operating System generation; System boot.

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UNIT – 2 **7 Hours**

Process Management: Process concept; Process scheduling; Operations on processes; Inter-process communication. Multi-Threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms; Multiple-Processor scheduling; Thread scheduling.

UNIT – 3 **7 Hours**

Process Synchronization : Synchronization: The Critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors.

UNIT – 4 **6 Hours**

Deadlocks: Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.

PART – B

UNIT – 5 **7 Hours**

Memory Management: Memory Management Strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation. Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing.

UNIT – 6 **7 Hours**

File System, Implementation of File System: File System: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection. Implementing File System: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management

UNIT – 7 **6 Hours**

Secondary Storage Structures, Protection : Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management. Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights, Capability-Based systems.

UNIT – 8 **6 Hours**

Case Study: The Linux Operating System: Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory management; File systems, Input and output; Inter-process communication.

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V SEMESTER

SOFTWARE ENGINEERING

Subject Code: 10IS51	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**

Overview: Introduction: FAQ's about software engineering, Professional and ethical responsibility.

Socio-Technical systems: Emergent system properties; Systems engineering; Organizations, people and computer systems; Legacy systems.

UNIT – 2 **6 Hours**

Critical Systems, Software Processes: Critical Systems: A simple safety-critical system; System dependability; Availability and reliability.

Software Processes: Models, Process iteration, Process activities; The Rational Unified Process; Computer Aided Software Engineering.

UNIT – 3 **7 Hours**

Requirements: Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; Interface specification; The software requirements document.

Requirements Engineering Processes: Feasibility studies; Requirements elicitation and analysis; Requirements validation; Requirements management.

UNIT – 4 **7 Hours**

System models, Project Management: System Models: Context models; Behavioral models; Data models; Object models; Structured methods.

Project Management: Management activities; Project planning; Project scheduling; Risk management

PART - B

UNIT – 5 **7 Hours**

Software Design: Architectural Design: Architectural design decisions; System organization; Modular decomposition styles; Control styles.

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Object-Oriented design: Objects and Object Classes; An Object-Oriented design process; Design evolution.

UNIT – 6 **6 Hours**

Development: Rapid Software Development: Agile methods; Extreme programming; Rapid application development.
Software Evolution: Program evolution dynamics; Software maintenance; Evolution processes; Legacy system evolution.

UNIT – 7 **7 Hours**

Verification and Validation: Verification and Validation: Planning; Software inspections; Automated static analysis; Verification and formal methods.
Software testing: System testing; Component testing; Test case design; Test automation.

UNIT – 8 **6 Hours**

Management: Managing People: Selecting staff; Motivating people; Managing people; The People Capability Maturity Model.
Software Cost Estimation: Productivity; Estimation techniques; Algorithmic cost modeling, Project duration and staffing.

Text Books:

1. Ian Sommerville: Software Engineering, 8th Edition, Pearson Education, 2007.
   (Chapters-: 1, 2, 3, 4, 5, 6, 7, 8, 11, 14, 17, 21, 22, 23, 25, 26)

Reference Books:

1. Roger.S.Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill, 2007.
2. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India, 2009.

SYSTEM SOFTWARE

Subject Code: 10CS52	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**

Machine Architecture: Introduction, System Software and Machine Architecture, Simplified Instructional Computer (SIC) - SIC Machine Architecture, SIC/XE Machine Architecture, SIC Programming Examples.

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RTOS-Based Design - 2: Inter process Communication mechanisms, Evaluating OS performance, Choice of RTOS, Power Optimization. Design Example: Telephone Answering machine

UNIT – 7 **7 Hours**

Distributed Embedded Systems: Distributed Network Architectures, Networks for Embedded Systems: I2C Bus, CAN Bus, SHARC Link Ports, Ethernet, Myrinet, Internet, Network Based Design. Design Example: Elevator Controller.

UNIT – 8 **7 Hours**

Embedded Systems Development Environment: The Integrated Development Environment, Types of File generated on Cross Compilation, Dis-assembler /Decompiler, Simulators, Emulators, and Debugging, Target Hardware Debugging.

Text Books:

1. Wayne Wolf: Computers as Components, Principles of Embedded Computing Systems Design, 2nd Edition, Elsevier, 2008.
2. Shibu K V: Introduction to Embedded Systems, Tata McGraw Hill, 2009
   (Chapters 10, 13)

Reference Books:

1. James K. Peckol: Embedded Systems, A contemporary Design Tool, Wiley India, 2008
2. Tammy Neorgaard: Embedded Systems Architecture, Elsevier, 2005.

PROGRAMMING THE WEB

Subject Code: 10CS73	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

UNIT – 1 **6 Hours**

Fundamentals of Web, XHTML – 1: Internet, WWW, Web Browsers and Web Servers, URLs, MIME, HTTP, Security, The Web Programmers Toolbox.

XHTML: Basic syntax, Standard structure, Basic text markup, Images, Hypertext Links.

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UNIT – 2 **7 Hours**

XHTML – 2, CSS: XHTML (continued): Lists, Tables, Forms, Frames
CSS: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The box model, Background images, The and tags, Conflict resolution.

UNIT – 3 **6 Hours**

Javascript: Overview of Javascript, Object orientation and Javascript, Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts, Examples.

UNIT – 4 **7 Hours**

Javascript and HTML Documents, Dynamic Documents with Javascript: The Javascript execution environment, The Document Object Model, Element access in Javascript, Events and event handling, Handling events from the Body elements, Button elements, Text box and Password elements, The DOM 2 event model, The navigator object, DOM tree traversal and modification.
Introduction to dynamic documents, Positioning elements, Moving elements, Element visibility, Changing colors and fonts, Dynamic content, Stacking elements, Locating the mouse cursor, Reacting to a mouse click, Slow movement of elements, Dragging and dropping elements.

PART - B

UNIT – 5 **6 Hours**

XML: Introduction, Syntax, Document structure, Document type definitions, Namespaces, XML schemas, Displaying raw XML documents, Displaying XML documents with CSS, XSLT style sheets, XML processors, Web services.

UNIT – 6 **7 Hours**

Perl, CGI Programming: Origins and uses of Perl, Scalars and their operations, Assignment statements and simple input and output, Control statements, Fundamentals of arrays, Hashes, References, Functions, Pattern matching, File input and output; Examples.
The Common Gateway Interface; CGI linkage; Query string format; CGI.pm module; A survey example; Cookies.
Database access with Perl and MySQL

UNIT – 7 **6 Hours**

PHP: Origins and uses of PHP, Overview of PHP, General syntactic characteristics, Primitives, operations and expressions, Output, Control

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NET'S

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

CERTIFICATE

Certified that the project work entitled "NEAREST KEYWORD SEARCH SET IN MULTIDIMENSINAL DATASETS" is carried out by Mr. "R. AKSHAY KUMAR, USN 3NA14CS403, G A RAGHAVENDRA, USN 3NA12CS008, ANKUSH K, USN 3NA13CS400 SANDYARANI USN 3NA12CS020" a bonafide student of in Navodaya Institute Of Technology in partial fulfillment for the award of Bachelor of Engineering in "Computer Science & Engineering" of the **Visvesvaraya Technological University, Belagavi,** during the year 2016-2017. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the Report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for the said Degree.

Project Guide	HOD	Principal
Prof. Rajashekar Reddy	Prof. Vijay Kumar Yadav	Dr. Shivaprakash C K

Examiners: **Signature with Date**

1. Vijay Kumar yadav .....

2. Dr. N.B. Patil .....

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ABSTRACT

We consider objects that are tagged with keywords and are embedded in a vector space. For these datasets, we study queries that ask for the tightest groups of points satisfying a given set of keywords. We propose a novel method called ProMiSH (Projection and Multi Scale Hashing) that uses random projection and hash-based index structures, and achieves high scalability and speedup. We present an exact and an approximate version of the algorithm. Our empirical studies, both on real and synthetic datasets, show that ProMiSH has a speedup of more than four orders over state-of-the-art tree-based techniques.

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- Indexing time indicates the amount of time used to build ProMiSH variants. the memory usage and indexing time of ProMiSH-E and ProMiSH-A under different input real data.
- Memory usage grows slowly in both ProMiSH-E and ProMiSH-A when the number of dimensions in data points increases.
- ProMiSH-A is more efficient than ProMiSH-E in terms of memory usage and indexing time: it takes 80% less memory and 90% less time, and is able to obtain near-optimal results.

4. Hashing

- The hashing technique is inspired by Locality Sensitive Hashing (LSH). which is a state-of-the-art method for nearest neighbor search in high-dimensional spaces.

  Unlike LSH-based methods that allow only approximate search with probabilistic guarantees, the index structure in ProMiSH-E supports accurate search.
- Random projection with hashing has come to be the state-of-the-art method for nearest neighbour search in high-dimensional datasets.

3.4 SOFTWARE REQUIREMENTS

SPECIFICATION

Operating System	: Windows
Technology	: Java and J2EE
Web Technologies	: Html, JavaScript, CSS
IDE	: My Eclipse
Web Server	: Tomcat
Tool kit	: Android Phone
Database	: My SQL
Java Version	: J2SDK1.5

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3.4.1 Java technology

- Java technology is both a programming language and a platform independent.

The Java Programming Language

The Java programming language is a high-level language that can be characterized by all of the following buzzwords:

- Simple
- Architecture neutral
- Object oriented
- Portable
- Distributed
- High performance
- Interpreted
- Multithreaded
- Robust
- Dynamic

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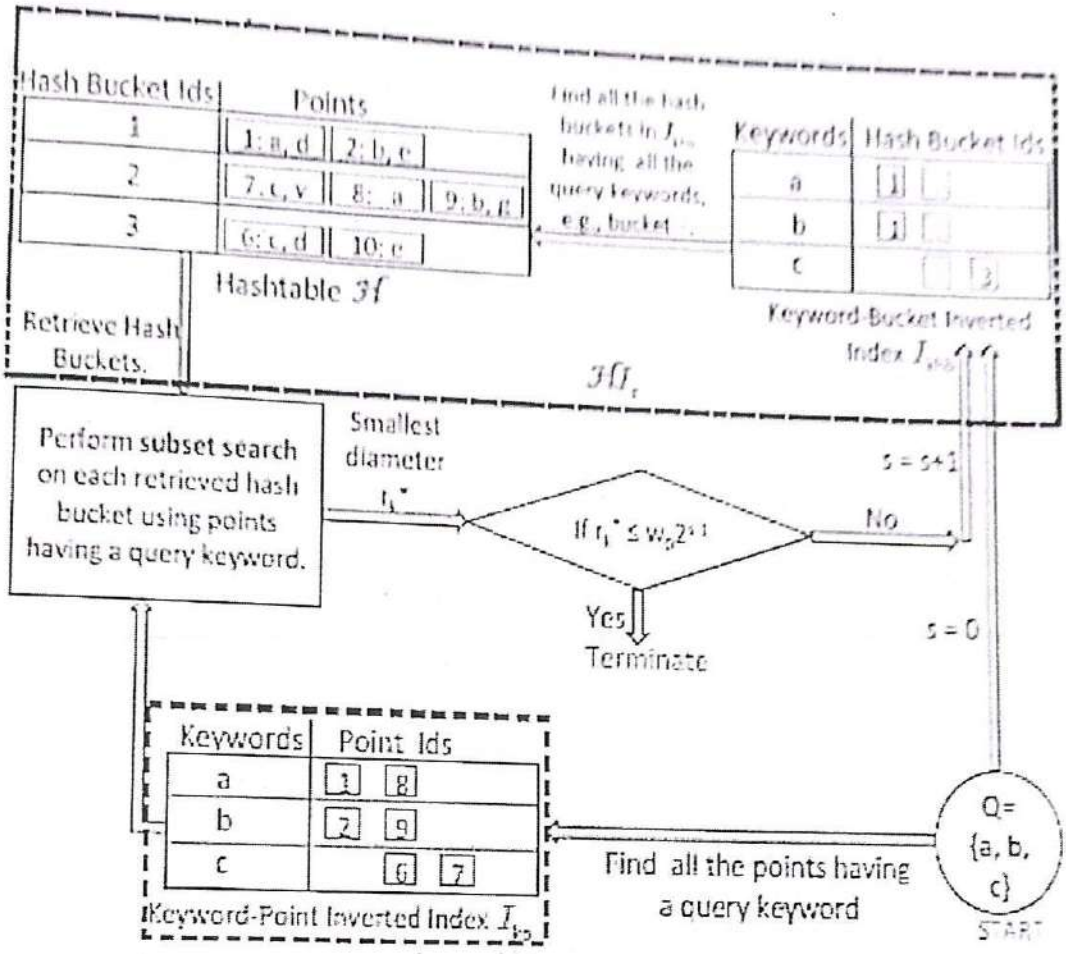
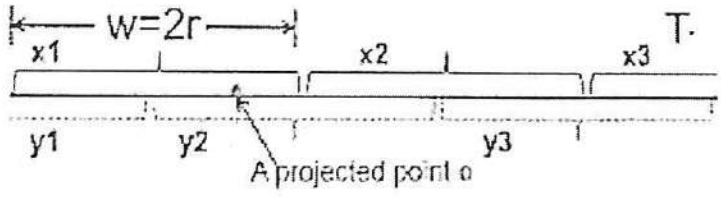
2.4 SYSTEM ARCHITECTURE



Index structure and flow of execution of ProMiSH.



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3.3.2 Modules Description

1. Multi-dimensional data

- Keyword-based search in text-rich multi-dimensional datasets facilitates many novel applications and tools. multi-dimensional datasets where each data point has a set of keywords.
- The presence of keywords in feature space allows for the development of new tools to query and explore these multi-dimensional datasets.
- These algorithms may take hours to terminate for a multi-dimensional dataset of millions of points.
- Therefore, there is a need for an efficient algorithm that scales with dataset dimension, and yields practical query efficiency on large datasets. multi-dimensional spaces, it is difficult for users to provide meaningful coordinates, and our work deals with another type of queries where users can only provide keywords as input.

2. Nearest Keyword

- We consider multi-dimensional datasets where each data point has a set of keywords.
- The presence of keywords in feature space allows for the development of new tools to query and explore these multi-dimensional datasets.
- An NKS query is a set of user-provided keywords, and the result of the query may include k sets of data points each of which contains all the query keywords and forms one of the top-k tightest cluster in the multi-dimensional space.
- Location-specific keyword queries on the web and in the GIS systems were earlier answered using a combination of R-Tree and inverted index.
- Developed IR2-Tree to rank objects from spatial datasets based on a combination of their distances to the query locations and the relevance of their text descriptions to the query keywords.

3. Indexing

- Indexing time as the metrics to evaluate the index size for ProMiSH-E and ProMiSH-A.

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LIST OF CONTENTS

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3.4.2 MySQL Database

MySQL is a fast, easy-to-use RDBMS being used for many small and big businesses. MySQL is developed, marketed, and supported by MySQL AB, which is a Swedish company. MySQL is becoming so popular because of many good reasons:

- MySQL is released under an open-source license. So you have nothing to pay to use it.
- MySQL is a very powerful program in its own right. It handles a large subset of the functionality of the most expensive and powerful database packages.
- MySQL uses a standard form of the well-known SQL data language.
- MySQL works on many operating systems and with many languages including PHP, PERL, C, C++, JAVA, etc.
- MySQL works very quickly and works well even with large data sets.
- MySQL is very friendly to PHP, the most appreciated language for web development.
- MySQL supports large databases, up to 50 million rows or more in a table.
- MySQL is customizable. The open-source GPL license allows programmers to modify the MySQL software to fit their own specific environments.

3.4.3 JSP

Java Server Page (JSP) is a technology for controlling the content or appearance of Web pages through the use of servlets, small programs that are specified in the Web page and run on the Web server to modify the Web page before it is sent to the user who requested it. Sun Microsystems, the developer of Java, also refers to the JSP technology as the Servlet application program interface (API). JSP is comparable to Microsoft's Active Server Page (ASP) technology. Whereas a Java Server Page calls a Java program that is executed by the Web server, an Active Server Page contains

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- Secure

With most programming languages, you either compile or interpret a program so that you can run it on your computer.

- The Java programming language is unusual in that a program is both compiled and interpreted.
- With the compiler, first you translate a program into an intermediate language called Java byte codes —the platform-independent codes interpreted by the interpreter on the Java platform.
- The interpreter parses and runs each Java byte code instruction on the computer. Compilation happens just once; interpretation occurs each time the program is executed.
- You can think of Java byte codes as the machine code instructions for the Java Virtual Machine (Java VM).
- Every Java interpreter, whether it's a development tool or a Web browser that can run applets, is an implementation of the Java VM. Java byte codes help make "write once, run anywhere" possible.
- You can compile your program into byte codes on any platform that has a Java compiler. The byte codes can then be run on any implementation of the java VM.
- That means that as long as a computer has a Java VM, the same program written in the java programming language can run on Windows 2000, a Solaris workstation, or on an iMac.

The Java Platform

- A platform is the hardware or software environment in which a program runs.
- We've already mentioned some of the most popular platforms like Windows 2000, Linux, Solaris, and MacOS.
- Most platforms can be described as a combination of the operating system and hardware.
- The Java platform differs from most other platforms in that it's a software-only that runs on top of other hardware-based platforms.

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CHAPTER - 4

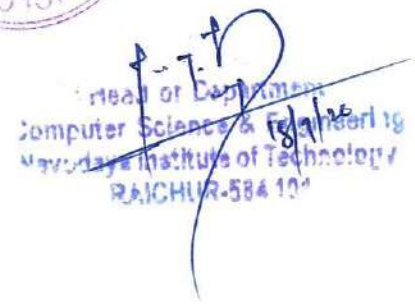
SOFTWARE DESIGN

4.1 INTRODUCTION

A software design description is a written description of a software product, that a software designer writes in order to give a software development team overall guidance to the architecture of the software project.

4.2 DATA FLOW DIAGRAM

- The DFD is also called as bubble chart.
- It is a simple graphical formalism that can be used to represent a system in terms of input data to the system, various processing carried out on this data, and the output data is generated by this system.
- The data flow diagram (DFD) is one of the most important modeling tools. It is used to model the system components.
- These components are the system process, the data used by the process, an external entity that interacts with the system and the information flows in the system.
- DFD shows how the information moves through the system and how it is modified by a series of transformations.
- It is a graphical technique that depicts information flow and the transformations that are applied as data moves from input to output.
- DFD is also known as bubble chart. A DFD may be used to represent a system at any level of abstraction.
- DFD may be partitioned into levels that represent increasing information flow and functional detail.



a script that is interpreted by a script interpreter (such as VBScript or JScript) before the page is sent to the user.

3.4.4 HTML

HTML is a formal Recommendation by the World Wide Web Consortium (W3C) and is generally adhered to by the major browsers, Microsoft's Internet Explorer and Netscape's Navigator, which also provide some additional non-standard codes. The current version of HTML is HTML 4.0. However, both Internet Explorer and Netscape implement some features differently and provide non-standard extensions. Web developers using the more advanced features of HTML 4 may have to design pages for both browsers and send out the appropriate version to a user. Significant features in HTML 4 are sometimes described in general as dynamic HTML. What is sometimes referred to as HTML 5 is an extensible form of HTML called Extensible Hypertext Markup Language (XHTML).

3.5 HARDWARE REQUIREMENT SPECIFICATION

Hardware	:	Pentium
Speed	:	1.1 GHz
RAM	:	1GB
Hard Disk	:	20 GB
Floppy Drive	:	1.44 MB

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4.3.1 Usecase Diagram

- A Use case diagram shows a set of use cases and actors (a special kind of class) and their relationships. Use case diagrams address the static use case view of a system. These diagrams are especially important in organizing and modeling the behaviors of a system

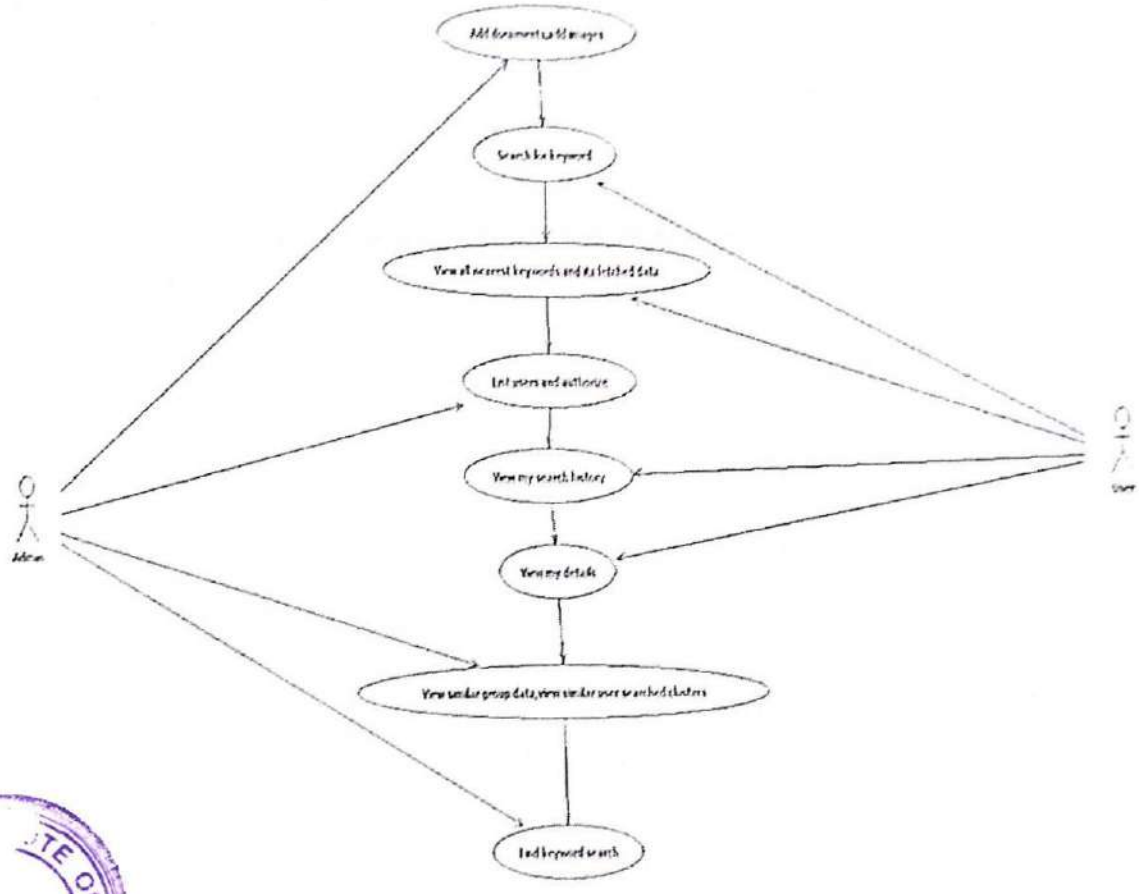

Fig: 4.3.1 Usecase diagram for the system

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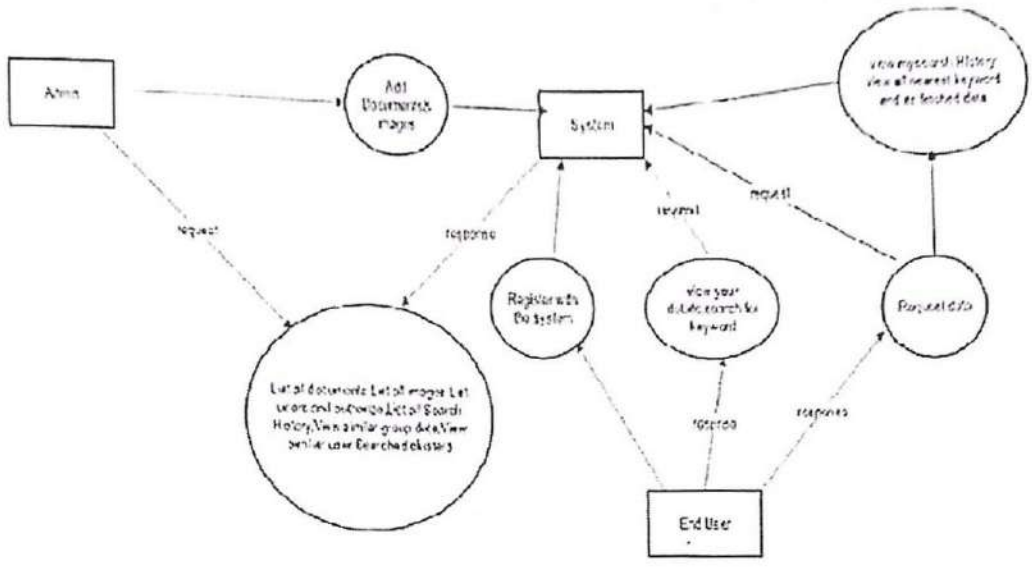

Fig: 4.2.1 Dataflow diagram for the system

4.3 UML DIAGRAMS

- UML stands for Unified Modeling Language.UML is a standardized general-purpose modeling language in the field of object-oriented software engineering. The standard is managed, and was created by, the Object Management Group.
- The goal is for UML to become a common language for creating models of object oriented computer software. In its current form UML is comprised of two major components: a Meta-model and a notation. In the future, some form of method or process may also be added to; or associated with, UML.
- The Unified Modeling Language is a standard language for specifying, Visualization, Constructing and documenting the artifacts of software system, as well as for business modeling and other non-software systems.
- The UML represents a collection of best engineering practices that have proven successful in the modeling of large and complex systems.
- The UML is a very important part of developing objects oriented software and the software development process. The UML uses mostly graphical notations to express the design of software projects.

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4.3.3 Sequence diagram

- A Sequence diagram is a virtual representation of a scenario.
- A sequence diagram shows the various actors in the scenario, and the way they interact with all the subsystems.
- A sequence diagram is an interaction diagram that emphasizes the time ordering of messages

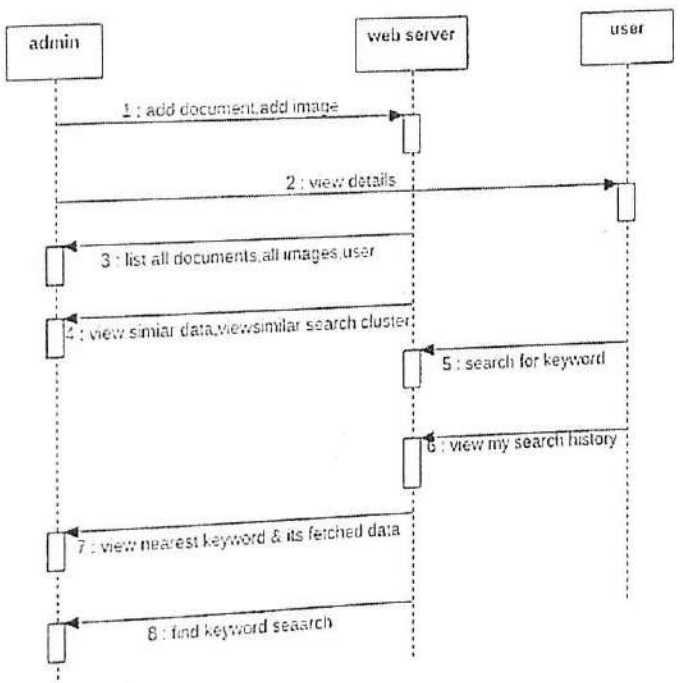

Fig: 4.3.3 Sequence diagram for the system

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4.3.2 Class diagram

- A class diagram shows a set of classes, interfaces, and collaborations and their relationships.
- Class diagram address the static design view of a system. Class diagrams that include Active classes address the static process view of a system.
- A class is a description of a set of objects that share the same attributes, operations, relationships, and semantics. A class implements on or more interfaces.

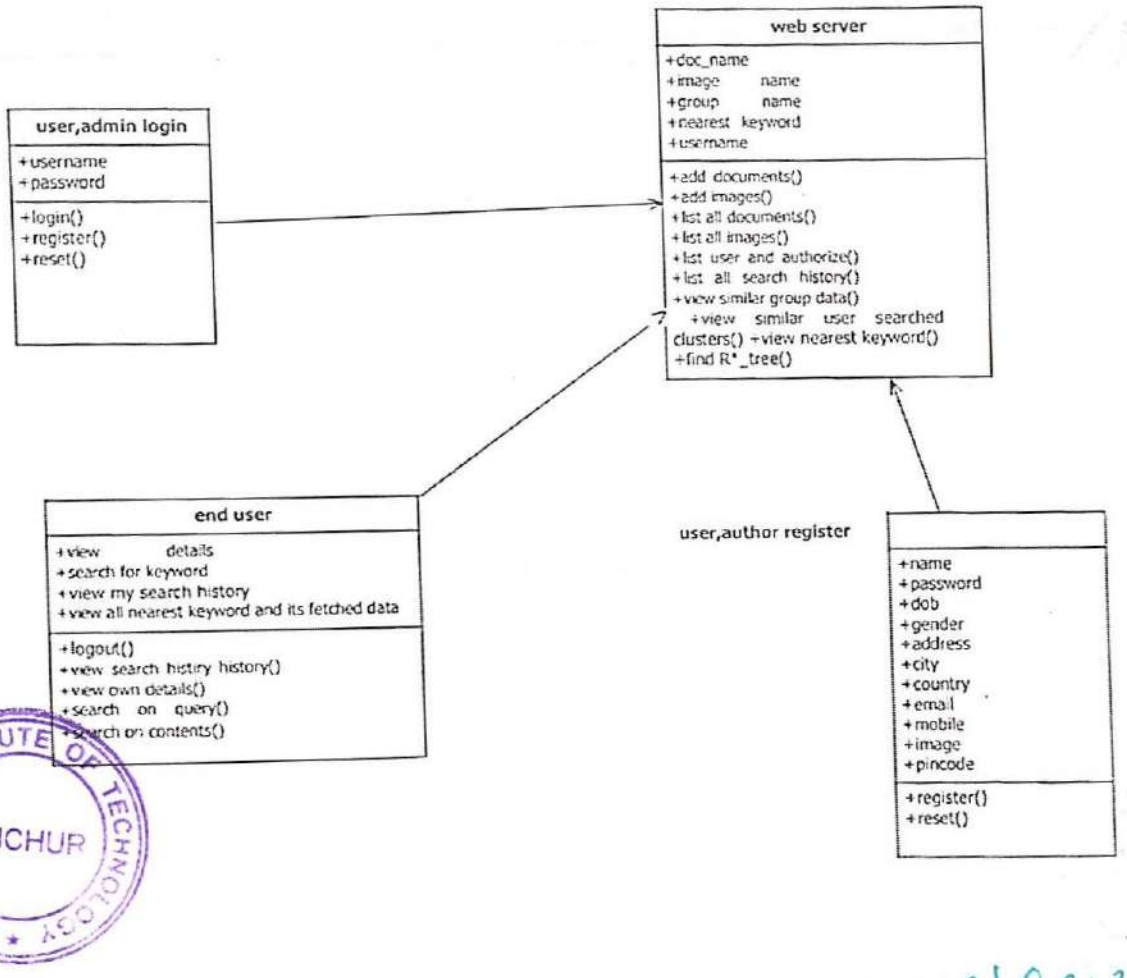

Fig: 4.3.2 Class diagram for the system

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Design Patterns – 1: What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns; Pattern description
Communication Patterns: Forwarder-Receiver; Client-Dispatcher-Server; Publisher-Subscriber.

UNIT – 8 **6 Hours**

Design Patterns – 2, Idioms: Management Patterns: Command processor; View handler.
Idioms: Introduction; what can idioms provide? Idioms and style; Where to find idioms; Counted Pointer example

Text Books:

1. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education, 2005. (Chapters 1 to 17, 23)
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2007. (Chapters 1, 3.5, 3.6, 4)

Reference Books:

1. Grady Booch et al: Object-Oriented Analysis and Design with Applications, 3rd Edition, Pearson Education, 2007.
2. Brahma Dathan, Sarnath Ramnath: Object-Oriented Analysis, Design, and Implementation, Universities Press, 2009.
3. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, Wiley- Dreamtech India, 2004.
4. Simon Bennett, Steve McRobb and Ray Farmer: Object-Oriented Systems Analysis and Design Using UML, 2nd Edition, Tata McGraw-Hill, 2002.

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Electronics and Communication Engineering

2016-17

MICROCONTROLLERS
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	:	10ES42	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:
Microprocessors and microcontroller. Introduction, Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture, Computer software.
The 8051 Architecture: Introduction, Architecture of 8051, Pin diagram of 8051, Memory organization, External Memory interfacing, Stacks.
6 Hours

UNIT 2:
Addressing Modes: Introduction, Instruction syntax, Data types, Subroutines, Addressing modes: Immediate addressing , Register addressing, Direct addressing, Indirect addressing, relative addressing, Absolute addressing, Long addressing, Indexed addressing, Bit inherent addressing, bit direct addressing.
Instruction set: Instruction timings, 8051 instructions: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction.
6 Hours

UNIT 3:
8051 programming: Assembler directives, Assembly language programs and Time delay calculations. **6 Hours**

UNIT 4:
8051 Interfacing and Applications: Basics of I/O concepts, I/O Port Operation, Interfacing 8051 to LCD, Keyboard, parallel and serial ADC, DAC, Stepper motor interfacing and DC motor interfacing and programming
7 Hours

PART – B

UNIT 5:
8051 Interrupts and Timers/counters: Basics of interrupts, 8051 interrupt structure, Timers and Counters, 8051 timers/counters, programming 8051 timers in assembly and C .
6 Hours

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Interfacing LED, LCD, External memory. Seven segment LED modules interfacing. Example – Real-time clock.

2 Hours

Case Studies of applications of MSP430 - Data acquisition system, Wired Sensor network, Wireless sensor network with Chipcon RF interfaces.

3 Hours

TEXT BOOKS:

1. **"The 8051 Microcontroller and Embedded Systems – using assembly and C "-**, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006
2. **"MSP430 Microcontroller Basics",** John Davies, Elsevier, 2010 (Indian edition available)

REFERENCE BOOKS:

1. **"The 8051 Microcontroller Architecture, Programming & Applications",** 2e Kenneth J. Ayala ;, Penram International, 1996 / Thomson Learning 2005.
2. **"The 8051 Microcontroller",** V.Udayashankar and MalikarjunaSwamy, TMH, 2009
3. **MSP430 Teaching CD-ROM,** Texas Instruments, 2008 (can be requested **http://www.uniti.in**)
4. **Microcontrollers: Architecture, Programming, Interfacing and System Design",**Raj Kamal, "Pearson Education, 2005

CONTROL SYSTEMS
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	:	**10ES43**	**IA Marks**	:	**25**
Hrs/ Week	:	**04**	**Exam Hours**	:	**03**
Total Hrs.	:	**52**	**Exam Marks**	:	**100**

PART – A

UNIT 1:

Modeling of Systems: Introduction to Control Systems, Types of Control Systems, Effect of Feedback Systems, Differential equation of Physical Systems -Mechanical systems, Friction, Translational systems (Mechanical accelerometer, systems excluded), Rotational systems, Gear trains, Electrical systems, Analogous systems. **7 Hours**

UNIT 2:

Block diagrams and signal flow graphs: Transfer functions, Block diagram algebra, Signal Flow graphs (State variable formulation excluded), **6 Hours**

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UNIT 3:

Time Response of feed back control systems: Standard test signals, Unit step response of First and second order systems, Time response specifications, Time response specifications of second order systems, steady – state errors and error constants. Introduction to PID Controllers(excluding design) **7 Hours**

UNIT 4:

Stability analysis: Concepts of stability, Necessary conditions for Stability, Routh- stability criterion, Relative stability analysis; More on the Routh stability criterion. **6 Hours**

PART – B

UNIT 5:

Root–Locus Techniques: Introduction, The root locus concepts, Construction of root loci. **6 Hours**

UNIT 6:

Frequency domain analysis: Correlation between time and frequency response, Bode plots, Experimental determination of transfer functions, Assessment of relative stability using Bode Plots. Introduction to lead, lag and lead-lag compensating networks (excluding design). **7 Hours**

UNIT 7:

Stability in the frequency domain: Introduction to Polar Plots, (Inverse Polar Plots excluded) Mathematical preliminaries, Nyquist Stability criterion, Assessment of relative stability using Nyquist criterion, (Systems with transportation lag excluded). **7 Hours**

UNIT 8:

Introduction to State variable analysis: Concepts of state, state variable and state models for electrical systems, Solution of state equations. **6 Hours**

TEXT BOOK :

1. **J. Nagarath and M.Gopal,** "Control Systems Engineering", New Age International (P) Limited, Publishers, Fourth edition – 2005.

REFERENCE BOOKS:

1. **"Modern Control Engineering ",** K. Ogata, Pearson Education Asia/ PHI, 4th Edition, 2002.

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MICROCONTROLLERS LAB
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	:	10ESL47	IA Marks	:	25
Hrs/ Week	:	03	Exam Hours	:	03
Total Hrs.	:	42	Exam Marks	:	50

I. PROGRAMMING

1. Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array.
2. Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube – (16 bits Arithmetic operations – bit addressable).
3. Counters.
4. Boolean & Logical Instructions (Bit manipulations).
5. Conditional CALL & RETURN.
6. Code conversion: BCD – ASCII; ASCII – Decimal; Decimal - ASCII; HEX - Decimal and Decimal - HEX .
7. Programs to generate delay, Programs using serial port and on-Chip timer / counter.

Note: Programming exercise is to be done on both 8051 & MSP430.

II. INTERFACING:

Write C programs to interface 8051 chip to Interfacing modules to develop single chip solutions.

8. Simple Calculator using 6 digit seven segment displays and Hex Keyboard interface to 8051.
9. Alphanumeric LCD panel and Hex keypad input interface to 8051.
10. External ADC and Temperature control interface to 8051.
11. Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface to 8051; change the frequency and amplitude.
12. Stepper and DC motor control interface to 8051.
13. Elevator interface to 8051.

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UNIT 6:

Power Amplifiers: Definitions and amplifier types, series fed class A amplifier, Transformer coupled Class A amplifiers, Class B amplifier operations, Class B amplifier circuits, Amplifier distortions. Designing of Power amplifiers. **7 Hours**

UNIT 7:

Oscillators: Oscillator operation, Phase shift Oscillator, Wienbridge Oscillator, Tuned Oscillator circuits, Crystal Oscillator. (BJT Version Only) Simple design methods of Oscillators. **6 Hours**

UNIT 8:

FET Amplifiers: FET small signal model, Biasing of FET, Common drain common gate configurations, MOSFETs, FET amplifier networks.

6 Hours

TEXT BOOK:

1. **"Electronic Devices and Circuit Theory",** Robert L. Boylestad and Louis Nashelsky, PHI/Pearson Eduication. 9TH Edition.

REFERENCE BOOKS:

1. **'Integrated Electronics',** Jacob Millman & Christos C. Halkias, Tata - McGraw Hill, 2nd Edition, 2010
2. **"Electronic Devices and Circuits",** David A. Bell, PHI, 4th Edition, 2004
3. **"Analog Electronics Circuits: A Simplified Approach"**, U.B. Mahadevaswamy, Pearson/Saguine, 2007.

LOGIC DESIGN
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES33**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:

Principles of combinational logic-1: Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables,

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Karnaugh maps-3, 4 and 5 variables, Incompletely specified functions (Don't Care terms), Simplifying Max term equations. **6 Hours**

UNIT 2:

Principles of combinational Logic-2: Quine-McCluskey minimization technique- Quine-McCluskey using don't care terms, Reduced Prime Implicant Tables, Map entered variables. **7 Hours**

UNIT 3:

Analysis and design of combinational logic - I: General approach, Decoders-BCD decoders, Encoders. **6 Hours**

UNIT 4:

Analysis and design of combinational logic - II: Digital multiplexers-Using multiplexers as Boolean function generators. Adders and subtractors-Cascading full adders, Look ahead carry, Binary comparators. Design methods of building blocks of combinational logics.

7 Hours

PART – B

UNIT 5:

Sequential Circuits – 1: Basic Bistable Element, Latches, SR Latch, Application of SR Latch, A Switch Debouncer, The $\overline{S}\,\overline{R}$ Latch, The gated SR Latch, The gated D Latch, The Master-Slave Flip-Flops (Pulse-Triggered Flip-Flops): The Master-Slave SR Flip-Flops, The Master-Slave JK Flip-Flop, Edge Triggered Flip-Flop: The Positive Edge-Triggered D Flip-Flop, Negative-Edge Triggered D Flip-Flop. **7 Hours**

UNIT 6:

Sequential Circuits – 2: Characteristic Equations, Registers, Counters - Binary Ripple Counters, Synchronous Binary counters, Counters based on Shift Registers, Design of a Synchronous counters, Design of a Synchronous Mod-6 Counter using clocked JK Flip-Flops Design of a Synchronous Mod-6 Counter using clocked D, T, or SR Flip-Flops **7 Hours**

UNIT 7:

Sequential Design - I: Introduction, Mealy and Moore Models, State Machine Notation, Synchronous Sequential Circuit Analysis and Design.

6 Hours

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UNIT - 8

Design of IIR filters from analog filters (Butterworth and Chebyshev) - impulse invariance method. Mapping of transfer functions: Approximation of derivative (backward difference and bilinear transformation) method, Matched z transforms, Verification for stability and linearity during mapping

7 Hours

TEXT BOOK:

1. **Digital signal processing – Principles Algorithms & Applications**, Proakis & Monalakis, Pearson education, 4th Edition, New Delhi, 2007.

REFERENCE BOOKS:

1. **Discrete Time Signal Processing**, Oppenheim & Schaffer, PHI, 2003.
2. **Digital Signal Processing**, S. K. Mitra, Tata Mc-Graw Hill, 3rd Edition, 2010.
3. **Digital Signal Processing**, Lee Tan: Elsivier publications, 2007

ANALOG COMMUNICATION

Subject Code	: **10EC53**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

RANDOM PROCESS: Random variables: Several random variables. Statistical averages: Function of Random variables, moments, Mean, Correlation and Covariance function: Principles of autocorrelation function, cross – correlation functions. Central limit theorem, Properties of Gaussian process.

7 Hours

UNIT - 2

AMPLITUDE MODULATION: Introduction, AM: Time-Domain description, Frequency – Domain description. Generation of AM wave: square law modulator, switching modulator. Detection of AM waves: square law detector, envelop detector. Double side band suppressed carrier modulation (DSBSC): Time-Domain description, Frequency-Domain representation, Generation of DSBSC waves: balanced modulator, ring modulator. Coherent detection of DSBSC modulated waves. Costas loop.

7 Hours

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UNIT - 3

SINGLE SIDE-BAND MODULATION (SSB): Quadrature carrier multiplexing, Hilbert transform, properties of Hilbert transform, Pre-envelope, Canonical representation of band pass signals, Single side-band modulation, Frequency-Domain description of SSB wave, Time-Domain description. Phase discrimination method for generating an SSB modulated wave, Time-Domain description. Phase discrimination method for generating an SSB modulated wave. Demodulation of SSB waves. **6 Hours**

UNIT - 4

VESTIGIAL SIDE-BAND MODULATION (VSB): Frequency – Domain description, Generation of VSB modulated wave, Time - Domain description, Envelop detection of VSB wave plus carrier, Comparison of amplitude modulation techniques, Frequency translation, Frequency division multiplexing, Application: Radio broadcasting, AM radio. **6 Hours**

PART – B

UNIT - 5

ANGLE MODULATION (FM)-I: Basic definitions, FM, narrow band FM, wide band FM, transmission bandwidth of FM waves, generation of FM waves: indirect FM and direct FM. **6 Hours**

UNIT - 6

ANGLE MODULATION (FM)-II: Demodulation of FM waves, FM stereo multiplexing, Phase-locked loop, Nonlinear model of the phase – locked loop, Linear model of the phase – locked loop, Nonlinear effects in FM systems.

7 Hours

UNIT - 7

NOISE: Introduction, shot noise, thermal noise, white noise, Noise equivalent bandwidth, Narrow bandwidth, Noise Figure, Equivalent noise temperature, cascade connection of two-port networks. **6 Hours**

UNIT - 8

NOISE IN CONTINUOUS WAVE MODULATION SYSTEMS: Introduction, Receiver model, Noise in DSB-SC receivers, Noise in SSB receivers, Noise in AM receivers, Threshold effect, Noise in FM receivers, FM threshold effect, Pre-emphasis and De-emphasis in FM,.

7 Hours

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VI SEMESTER

DIGITAL COMMUNICATION

Subject Code	: 10EC61	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

Basic signal processing operations in digital communication. Sampling Principles: Sampling Theorem, Quadrature sampling of Band pass signal, Practical aspects of sampling and signal recovery. **7 Hours**

UNIT - 2

PAM, TDM. Waveform Coding Techniques, PCM, Quantization noise and SNR, robust quantization. **6 Hours**

UNIT - 3

DPCM, DM, applications. Base-Band Shaping for Data Transmission, Discrete PAM signals, power spectra of discrete PAM signals. **7 Hours**

UNIT - 4

ISI, Nyquist's criterion for distortion less base-band binary transmission, correlative coding, eye pattern, base-band M-ary PAM systems, adaptive equalization for data transmission. **6 Hours**

PART – B

UNIT - 5

DIGITAL MODULATION TECHNIQUES: Digital Modulation formats, Coherent binary modulation techniques, Coherent quadrature modulation techniques. Non-coherent binary modulation techniques. **6 Hours**

UNIT - 6

Detection and estimation, Model of DCS, Gram-Schmidt Orthogonalization procedure, geometric interpretation of signals, response of bank of correlators to noisy input. **6 Hours**

UNIT - 7

Detection of known signals in noise, correlation receiver, matched filter receiver, detection of signals with unknown phase in noise. **7 Hours**

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UNIT - 8

Spread Spectrum Modulation: Pseudo noise sequences, notion of spread spectrum, direct sequence spread spectrum, coherent binary PSK, frequency hop spread spectrum, applications. **7 Hours**

TEXT BOOK:

1. **Digital communications,** Simon Haykin, John Wiley India Pvt. Ltd, 2008.

REFERENCE BOOKS:

1. **Digital and Analog communication systems,** Simon Haykin, John Wildy India Lts, 2008
2. **An introduction to Analog and Digital Communication**, K. Sam Shanmugam, John Wiley India Pvt. Ltd, 2008.
3. **Digital communications** - Bernard Sklar: Pearson education 2007

MICROPROCESSOR

Subject Code	: **10EC62**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

8086 PROCESSORS: Historical background, The microprocessor-based personal computer system, 8086 CPU Architecture, Machine language instructions, Instruction execution timing. **6 Hours**

UNIT - 2

INSTRUCTION SET OF 8086: Assembler instruction format, data transfer and arithmetic, branch type, loop, NOP & HALT, flag manipulation, logical and shift and rotate instructions. Illustration of these instructions with example programs, Directives and operators. **6 Hours**

UNIT - 3

BYTE AND STRING MANIPULATION: String instructions, REP Prefix, Table translation, Number format conversions, Procedures, Macros, Programming using keyboard and video display. **7 Hours**

UNIT - 4

8086 INTERRUPTS: 8086 Interrupts and interrupt responses, Hardware interrupt applications, Software interrupt applications, Interrupt examples. **7 Hours**

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PART – B

UNIT - 5

8086 INTERFACING: Interfacing microprocessor to keyboard (keyboard types, keyboard circuit connections and interfacing, software keyboard interfacing, keyboard interfacing with hardware), Interfacing to alphanumeric displays (interfacing LED displays to microcomputer), Interfacing a microcomputer to a stepper motor. **7 Hours**

UNIT - 6

8086 BASED MULTIPROCESSING SYSTEMS: Coprocessor configurations, The 8087 numeric data processor: data types, processor architecture, instruction set and examples. **6 Hours**

UNIT - 7

SYSTEM BUS STRUCTURE: Basic 8086 configurations: minimum mode, maximum mode, Bus Interface: peripheral component interconnect (PCI) bus, the parallel printer interface (LPT), the universal serial bus (USB) **6 Hours**

UNIT - 8

80386, 80486 AND PENTIUM PROCESSORS: Introduction to the 80386 microprocessor, Special 80386 registers, Introduction to the 80486 microprocessor, Introduction to the Pentium microprocessor. **7 Hours**

TEXT BOOKS:

1. **Microcomputer systems-The 8086 / 8088** Family – Y.C. Liu and G. A. Gibson, 2E PHI -2003
2. **The Intel Microprocessor, Architecture, Programming and Interfacing**-Barry B. Brey, 6e, Pearson Education / PHI, 2003

REFERENCE BOOKS:

1. **Microprocessor and Interfacing- Programming & Hardware,** Douglas hall, 2nd , TMH, 2006.
2. **Advanced Microprocessors and Peripherals** - A.K. Ray and K.M. Bhurchandi, TMH, 2nd , 2006.
3. **8088 and 8086 Microprocessors - Programming, Interfacing, Software, Hardware & Applications** - Triebel and Avtar Singh, 4e, Pearson Education, 2003

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TEXT BOOKS:

1. **Antennas and Wave Propagation**, John D. Krauss, 4th Edn,McGraw-Hill International edition, 2010.
2. **Antennas and Wave Propagation** - Harish and Sachidananda: Oxford Press 2007.

REFERENCE BOOKS:

1. **Antenna Theory Analysis and Design** - C A Balanis, 3rd Edn, John Wiley India Pvt. Ltd, 2008.
2. **Antennas and Propagation for Wireless Communication Systems** - Sineon R Saunders, John Wiley, 2003.
3. **Antennas and wave propagation** - G S N Raju: Pearson Education 2005.

OPERATING SYSTEMS

Subject Code	: **10EC65**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

INTRODUCTION AND OVERVIEW OF OPERATING SYSTEMS: Operating system, Goals of an O.S, Operation of an O.S, Resource allocation and related functions, User interface related functions, Classes of operating systems, O.S and the computer system, Batch processing system, Multi programming systems, Time sharing systems, Real time operating systems, distributed operating systems. **6 Hours**

UNIT - 2

STRUCTURE OF THE OPERATING SYSTEMS: Operation of an O.S, Structure of the supervisor, Configuring and installing of the supervisor, Operating system with monolithic structure, layered design, Virtual machine operating systems, Kernel based operating systems, and Microkernel based operating systems. **7 Hours**

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UNIT - 3

PROCESS MANAGEMENT: Process concept, Programmer view of processes, OS view of processes, Interacting processes, Threads, Processes in UNIX, Threads in Solaris. **6 Hours**

UNIT - 4

MEMORY MANAGEMENT: Memory allocation to programs, Memory allocation preliminaries, Contiguous and noncontiguous allocation to programs, Memory allocation for program controlled data, kernel memory allocation. **7 Hours**

PART – B

UNIT - 5

VIRTUAL MEMORY: Virtual memory basics, Virtual memory using paging, Demand paging, Page replacement, Page replacement policies, Memory allocation to programs, Page sharing, UNIX virtual memory. **6 Hours**

UNIT - 6

FILE SYSTEMS: File system and IOCS, Files and directories, Overview of I/O organization, Fundamental file organizations, Interface between file system and IOCS, Allocation of disk space, Implementing file access, UNIX file system. **7 Hours**

UNIT - 7

SCHEDULING: Fundamentals of scheduling, Long-term scheduling, Medium and short term scheduling, Real time scheduling, Process scheduling in UNIX. **6 Hours**

UNIT - 8

MESSAGE PASSING: Implementing message passing, Mailboxes, Inter process communication in UNIX. 7 Hours

TEXT BOOK:

1. **"Operating Systems - A Concept based Approach"**, D. M. Dhamdhare, TMH, 3rd Ed, 2010.

REFERENCE BOOK:

1. **Operating Systems Concepts**, Silberschatz and Galvin, John Wiley India Pvt. Ltd, 5th Edition, 2001.
2. **Operating System – Internals and Design Systems**, Willaim Stalling, Pearson Education, 4th Ed, 2006.
3. **Design of Operating Systems,** Tennambhaum, TMH, 2001.

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ADVANCED COMMUNICATION LAB

Subject Code	: **10ECL67**	IA Marks	: 25
No. of Practical Hrs/Week: 03		Exam Hours	: 03
Total no. of Practical Hrs. : 42		Exam Marks	: 50

LIST OF EXPERIMENTS USING DESCERTE COMPONENTS and LABVIEW – 2009 can be used for verification and testing.

1. TDM of two band limited signals.
2. ASK and FSK generation and detection
3. PSK generation and detection
4. DPSK generation and detection
5. QPSK generation and detection
6. PCM generation and detection using a CODEC Chip
7. Measurement of losses in a given optical fiber (propagation loss, bending loss) and numerical aperture
8. Analog and Digital (with TDM) communication link using optical fiber.
9. Measurement of frequency, guide wavelength, power, VSWR and attenuation in a microwave test bench
10. Measurement of directivity and gain of antennas: Standard dipole (or printed dipole), microstrip patch antenna and Yagi antenna (printed).
11. Determination of coupling and isolation characteristics of a stripline (or microstrip) directional coupler
12. (a) Measurement of resonance characteristics of a microstrip ring resonator and determination of dielectric constant of the substrate. (b) Measurement of power division and isolation characteristics of a microstrip 3 dB power divider.

MICROPROCESSOR LAB

Subject Code	: **10ECL68**	IA Marks	: 25
No. of Practical Hrs/Week: 03		Exam Hours	: 03
Total no. of Practical Hrs. : 42		Exam Marks	: 50

I) **Programs involving**

1) Data transfer instructions like:
   i] Byte and word data transfer in different addressing modes.

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ii] Block move (with and without overlap)
iii] Block interchange

2) Arithmetic & logical operations like:
   i] Addition and Subtraction of multi precision nos.
   ii] Multiplication and Division of signed and unsigned Hexadecimal nos.
   iii] ASCII adjustment instructions
   iv] Code conversions
   v] Arithmetic programs to find square cube, LCM, GCD, factorial

3) Bit manipulation instructions like checking:
   i] Whether given data is positive or negative
   ii] Whether given data is odd or even
   iii] Logical 1's and 0's in a given data
   iv] 2 out 5 code
   v] Bit wise and nibble wise palindrome

4) Branch/Loop instructions like:
   i] Arrays: addition/subtraction of N nos.
   Finding largest and smallest nos.
   Ascending and descending order
   ii] Near and Far Conditional and Unconditional jumps, Calls and Returns

5) Programs on String manipulation like string transfer, string reversing, searching for a string, etc.

6) Programs involving Software interrupts
   Programs to use DOS interrupt INT 21h Function calls for Reading a Character from keyboard, Buffered Keyboard input, Display of character/ String on console

II) Experiments on interfacing 8086 with the following interfacing modules through DIO (Digital Input/Output-PCI bus compatible) card
   a) Matrix keyboard interfacing
   b) Seven segment display interface
   c) Logical controller interface
   d) Stepper motor interface

III) Other Interfacing Programs
   a) Interfacing a printer to an X86 microcomputer
   b) PC to PC Communication

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UNIT - 7

DC CHOPPERS: Introduction, Principles of step down and step up choppers, Step down chopper with RL loads, Chopper classification, Switch mode regulators – buck, boost and buck – boost regulators. **6 Hours**

UNIT - 8

INVERTORS: Introduction, Principles of operation, Performance parameters, 1φ bridge inverter, voltage control of 1φ invertors, current source invertors, Variable DC link inverter.

7 Hours

TEXT BOOKS:

1. **"Power Electronics"** - M. H. Rashid 3rd edition, PHI / Pearson publisher 2004.
2. **"Power Electronics"** - M. D. Singh and Kanchandani K.B. TMH publisher, 2nd Ed. 2007.

REFERENCE BOOKS:

1. **"Power Electronics, Essentials and Applications", L Umanand,** John Wiley India Pvt. Ltd, 2009.
2. **"Power Electronics"** , Daniel W. Hart, McGraw Hill, 2010.
3. **"Power Electronics"**, V Nattarasu and R.S. Anandamurhty, **Pearson/Sanguine Pub. 2006.**

EMBEDED SYSTEM DESIGN

Subject Code	: **10EC74**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT 1:

Introduction to Embedded System: Introducing Embedded Systems, Philosophy, Embedded Systems, Embedded Design and Development Process. **5 Hours**

UNIT 2:

The Hardware Side: An Introduction, The Core Level, Representing Information, Understanding Numbers, Addresses, Instructions, Registers-A

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First Look, Embedded Systems-An Instruction Set View, Embedded Systems-A Register View, Register View of a Microprocessor
The Hardware Side: Storage Elements and Finite-State Machines (2 hour)
The concepts of State and Time, The State Diagram, Finite State Machines-A Theoretical Model.

8 Hours

UNIT 3:
Memories and the Memory Subsystem: Classifying Memory, A General Memory Interface, ROM Overview, Static RAM Overview, Dynamic RAM Overview, Chip Organization, Terminology, A Memory Interface in Detail, SRAM Design, DRAM Design, DRAM Memory Interface, The Memory Map, Memory Subsystem Architecture, Basic Concepts of Caching, Designing a Cache System, Dynamic Memory Allocation.

7 Hours

UNIT 4:
Embedded Systems Design and Development : System Design and Development, Life-cycle Models, Problem Solving-Five Steps to Design, The Design Process, Identifying the Requirements, Formulating the Requirements Specification, The System Design Specification, System Specifications versus System Requirements, Partitioning and Decomposing a System, Functional Design, Architectural Design, Functional Model versus Architectural Model, Prototyping, Other Considerations, Archiving the Project.

6 Hours

PART – B

UNIT 5 & 6:
Real-Time Kernels and Operating Systems: Tasks and Things, Programs and Processes, The CPU is a resource, Threads – Lightweight and heavyweight, Sharing Resources, Foreground/Background Systems, The operating System, The real time operating system (RTOS), OS architecture, Tasks and Task control blocks, memory management revisited.

12 Hours

UNIT 7 & 8:
Performance Analysis and Optimization: Performance or Efficiency Measures, Complexity Analysis, The methodology, Analyzing code, Instructions in Detail, Time, etc. – A more detailed look, Response Time, Time Loading, Memory Loading, Evaluating Performance, Thoughts on Performance Optimization, Performance Optimization, Tricks of the Trade, Hardware Accelerators, Caches and Performance.

12 Hours

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REAL-TIME SYSTEMS

Subject Code	: 10EC762	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

INTRODUCTION TO REAL-TIME SYSTEMS: Historical background, RTS Definition, Classification of Real-time Systems, Time constraints, Classification of Programs. **6 Hours**

UNIT - 2

CONCEPTS OF COMPUTER CONTROL: Introduction, Sequence Control, Loop control, Supervisory control, Centralised computer control, Distributed system, Human-computer interface, Benefits of computer control systems. **6 Hours**

UNIT - 3

COMPUTER HARDWARE REQUIREMENTS FOR RTS: Introduction, General purpose computer, Single chip microcontroller, Specialized processors, Process-related Interfaces, Data transfer techniques, Communications, Standard Interface. **7 Hours**

UNIT - 4

LANGUAGES FOR REAL-TIME APPLICATIONS: Introduction, Syntax layout and readability, Declaration and Initialization of Variables and Constants, Modularity and Variables, Compilation, Data types, Control Structure, Exception Handling, Low-level facilities, Co routines, Interrupts and Device handling, Concurrency, Real-time support, Overview of real-time languages. **7 Hours**

PART – B

UNIT - 5 & 6

OPERATING SYSTEMS: Introduction, Real-time multi-tasking OS, Scheduling strategies, Priority Structures, Task management, Scheduler and real-time clock interrupt handles, Memory Management, Code sharing, Resource control, Task co-operation and communication, Mutual exclusion, Data transfer, Liveness, Minimum OS kernel, Examples. **14 Hours**

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UNIT - 7

DESIGN OF RTSS – GENERAL INTRODUCTION: Introduction, Specification documentation, Preliminary design, Single-program approach, Foreground/background, Multi-tasking approach, Mutual exclusion, Monitors. **6 Hours**

UNIT - 8

RTS DEVELOPMENT METHODOLOGIES: Introduction, Yourdon Methodology, Requirement definition for Drying Oven, Ward and Mellor Method, Hately and Pirbhai Method. **6 Hours**

TEXT BOOKS:

1. **Real - Time Computer Control- An Introduction**, Stuart Bennet, 2nd Edn. Pearson Education. 2005.

REFERENCE BOOKS:

1. **Real-Time Systems Design and Analysis**, Phillip. A. Laplante, second edition, PHI, 2005.
2. **Real-Time Systems Development**, Rob Williams, Elsevier. 2006.
3. **Embedded Systems**, Raj Kamal, Tata Mc Graw Hill, India, 2005.

IMAGE PROCESSING

Subject Code	: **10EC763**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

DIGITAL IMAGE FUNDAMENTALS: What is Digital Image Processing. fundamental Steps in Digital Image Processing, Components of an Image processing system, elements of Visual Perception. **6 Hours**

UNIT - 2

Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels, Linear and Nonlinear Operations. **6 Hours**

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VIII SEMESTER
WIRELESS COMMUNICATION

Subject Code	: **10EC81**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

Introduction to wireless telecommunication systems and Networks, History and Evolution Different generations of wireless cellular networks 1G, 2g,3G and 4G networks. **6 Hours**

UNIT - 2

Common Cellular System components, Common cellular network components, Hardware and software, views of cellular networks, 3G cellular systems components, Cellular component identification Call establishment. **7 Hours**

UNIT - 3

Wireless network architecture and operation, Cellular concept Cell fundamentals, Capacity expansion techniques, Cellular backbone networks, Mobility management, Radio resources and power management Wireless network security. **7 Hours**

UNIT - 4

GSM and TDMA techniques, GSM system overview, GSM Network and system Architecture, GSM channel concepts, GSM identifiers **6 Hours**

PART – B

UNIT - 5

GSM system operation, Traffic cases, Cal handoff, Roaming, GSM protocol architecture. TDMA systems. **6 Hours**

UNIT - 6

CDMA technology, CDMA overview, CDMA channel concept CDMA operations. **6 Hours**

UNIT - 7

Wireless Modulation techniques and Hardware, Characteristics of air interface, Path loss models, wireless coding techniques, Digital modulation

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techniques, OFDM, UWB radio techniques, Diversity techniques, Typical GSM Hardware. **7 Hours**

UNIT - 8

Introduction to wireless LAN 802.11X technologies, Evolution of Wireless LAN Introduction to 802.15X technologies in PAN Application and architecture Bluetooth Introduction to Broadband wireless MAN, 802.16X technologies. **7 Hours**

TEXT BOOK:

1. **Wireless Telecom Systems and networks**, Mullet: Thomson Learning 2006.

REFERENCE BOOKS:

1. **Mobile Cellular Telecommunication**, Lee W.C.Y, MGH, 2nd, 2009.
2. **Wireless communication** - D P Agrawal: 2nd Edition Thomson learning 2007.
3. **Fundamentals of Wireless Communication**, David Tse, Pramod Viswanath, Cambridge 2005.
4. S. S. Manvi, M. S. Kakkasageri, **"Wireles and Mobile Network concepts and protocols"**, John Wiley India Pvt. Ltd, 1st edition, 2010.
5. **"Wireless Communication – Principles & Practice"** , T.S. Rappaport, PHI 2001.

DIGITAL SWITCHING SYSTEMS

Subject Code	: **10EC82**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

Developments of telecommunications, Network structure, Network services, terminology, Regulation, Standards. Introduction to telecommunications transmission, Power levels, Four wire circuits, Digital transmission, FDM, TDM, PDH and SDH, Transmission performance.

7 Hours

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(Affiliated to Visvesvaraya Technological University, Belgaum)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CERTIFICATE

Certified that the project work entitled **SMART RAILWAYS WITH FIRE DETECTION AND AUTOMATIC GATE CONTROL** carried out by **Ms. DIVYALAXMI M (3NA13EC008), Ms. G AMANI REDDY (3NA13EC009), Ms. PALLAVI KULKARNI (3NA13EC018), Mr. KIRANKUMAR V HIREMATH (3NA14EC404)** are bonafide students of **NAVODAYA INSTITUTE OF TECHNOLOGY, RAICHUR** in partial fulfillment for the award of **Bachelor of Engineering** in **Electronics and Communication Engineering** of the Visvesvaraya Technological University, Belagavi during the year **2016-17**. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the Report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for the said Degree.

Guide	HOD	Principal
(Prof. Gauravi Shetty)	(DR.K.M.Palani Swamy)	(Dr.Shivaprakash.C.K.)

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External Viva

Name of the examiners	Signature with date
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ABSTRACT

A Derailment is said to take place when a vehicle such as a train runs off its rails. This does not necessarily mean that it leaves its track. Although many derailments are minor, all result in temporary disruption of the proper operation of the railway system, and they are potentially seriously hazardous to human health and safety. Usually, the derailment of a train can be caused by a collision with another object, an operational error, the mechanical failure of tracks, such as broken rails.

To know the derailing of the rails (tracks), we use IR sensor, and a GPS module, also the location of the particular tracks which have distance more than threshold distance between the tracks respectively. This feed will be sent to the nearest railway station and also to the gate control units. So that rails can be managed efficiently, these modules can be installed at the remote places where men can't check the continuity of the tracks. Many accidents can be reduced by implementing this method. Nowadays many accidents take place at the railway gate crossing due to uneven crossings, even when the gate is about to close. In general, a railway gate is normally operated by a gate keeper as he receives the information about the arrival of the train. Automatic railway gate control system is implemented to prevent accidents of the traction system at the railway crossing levels. Automatic gate control system can be implemented using different technologies such as GSM, Bluetooth, and Android.

Now-a-days, fire accidents are occurring very frequently in public transport system which causes the loss of most valuable human lives and the government property. There are a number of methods to avoid fire accidents and to reduce the severity of loss in case of fire accidents in public transport system. The system which is proposed in this paper uses the modern technology to detect the fire accidents and also to inform the respective authorities with minimum delay. Three types of sensors fire, smoke and heat sensors are used to detect the fire accidents. The signals from these sensors will activate the microcontroller which in-turn activates the message transfer system, alarm system, water sprinkler system and the motor to automatically open the emergency door of the bogie in which the accident took place. The proposed system is designed by using GSM technology and AT89c52 microcontroller along with sensors. Keywords: GSM, Microcontroller, Motor drivers, Sensors, Water sprinklers.

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In the rapidly flourishing country like ours, even though all the latest technologies are the retrain collisions are occurring frequently. The railway accidents are happening due to the carelessness in manual operations or lack of workers.

The other main reasons for the collisions of Train are:

1. Train Derailment incurves and bend.
2. Running Train collisions with the Standing Train,
3. Train Accidents in Slopes.
4. Miss-signaling due to fog or Mist.

There is no fruitful steps have been taken so far in these areas. This paper deals about one of the efficient methods to avoid train Collision and derailment. Also by using simple electronic components we tried to automate the control of railway gate in an embedded platform. The system has been implemented and demonstrated by using vibration sensor and ZigBee with the help of microcontroller.

1.2. SCOPE

Review the present status of level-crossing accidents and train collisions. Present statistics, indicators, technology and problems relating to the systems adopted for railway protection; in practice.

Analyze various alternative systems for train collision avoidance; and Make recommendations pertaining to the selection of cost-effective protection systems.

1.3. OBJECTIVE

- To avoid the accidents happening in the day to day railway transportation by using the linear displacement sensor which is connected to the server through IOT?
- A GPS module is used to update the location of the misalignment part of the rails.
- The Separate cloud accessing system is used to access regular feed from the whole module.
- To manage the control system of railway gate using the ARM LPC2148 processor.

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- To avoiding the fire accident we can use an automatic fire accident avoiding system which senses the fire and which give the information to driver and guard of the train or nearest station master and automatically disconnect the bogie.

1.4. METHODOLOGY

The following analyses are considered:

Evaluation of the requirements of a safety management information system which adequately addresses the needs of railway management for information on train collision avoidance performance.

Review of the essential and effective safety, enhancements, measures and priorities for railway security.

Assessment of level crossing safety performance and safety measures Examination of Cost Benefit Analysis of investments on level crossing safety enhancement.

Review of the technical attributes and suitability of Networked Anti Collision System (ACD) for level crossing protection system. Recommendations and guidelines for adoption of networked ACD Systems by railways.

1.5. ORGANISATION OF THE REPORT

In the following chapter we are going to discuss more about the literature review in chapter2, the proposed system in chapter3, results, discussion and conclusion of the system in chapter4. At the end of the report the list of references and related appendices are attached.

We start with the literature review about the railway security monitoring system and the existing system. Then we discuss about the flow of the project and the important components of the project development in chapter3.

Finally we made the conclusion and future recommendations in chapter4, followed by the references and appendices.

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Oral communication through telephonic and telegraphic conversations.IR sensors are also used to identify the crack in the railway. LASER, proximity sensor and detectors are, use to satellite communication. No combined solution for collisions avoidance, derailment and railway gate control. In this process is high cost, difficult, time wastage.

2.2. PROPOSED SYSTEM

This technique is used for outside of base station. Measuring distance between two rail tracks IR sensors are used to detect the crack in the track. If anyone pursuing on the track means they stop the surveying work IR sensors used to detect the crack in railway track. Two IR sensors are fixed in front of the train is used to find out the crack on the rail. Each sensor will produce the signal related position with the rail. Infrared (IR) transmitter is one type of LED which emits infrared rays generally called as IR transmitter.

Similarly IR Receiver is used to receive the IR rays transmitted both IR transmitter. One important point is both IR transmitter and receiver should be placed straight line to each other. If the track is normal on its position both the sensor gives the constant Sensed output. If anyone misses their output condition to fail then there is defect on that side. It will inform this by giving alarm and also fire sensor are used to detect the fire. If the fire is detected automatically spread the water over a fire detected surface.

The GSM module is being used to send the current latitude and longitude data to the relevant authority as a SMS. The importance of this project is applicable both day & night time detection process.

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CHAPTER 3

SYSTEM BLOCK DIAGRAM

DESCRIPTION:

To know the derailing of the rails (tracks), we use IR/Metal sensor, and a GPS module to know the distance between two rails (tracks), also the location of the particular tracks which have distance more than threshold distance between the tracks respectively. This feed will be sent to the nearest railway station. So that rails can be managed efficiently, these modules can be installed at the remote places where men can't check the continuity of the tracks. Many accidents can be reduced by implementing this method. It even senses the fire and detaches the fired compartments; sprinklers are fitted in compartments to water the fire. The database can be maintained so that each passenger gets SMS to alert their mobile phone whenever the destination is reached. We can even send SMS to next station passengers about arrival of train to that particular station.

Automation of railway gates is also included where failure to close the gate during train arrival it closes automatically when the train is distanced about 100m from the railway gates and opens soon after the train passes the gate. IR sensors are used to signify the entry and exit of the gate. Stepper motor does the job of opening and closing of the gates.

The database can be maintained so that each passenger gets SMS to alert their mobile phone whenever the destination is reached. We can even send SMS to next station passengers about arrival of train to that particular station.

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3.1. BLOCK DIAGRAM (Working):

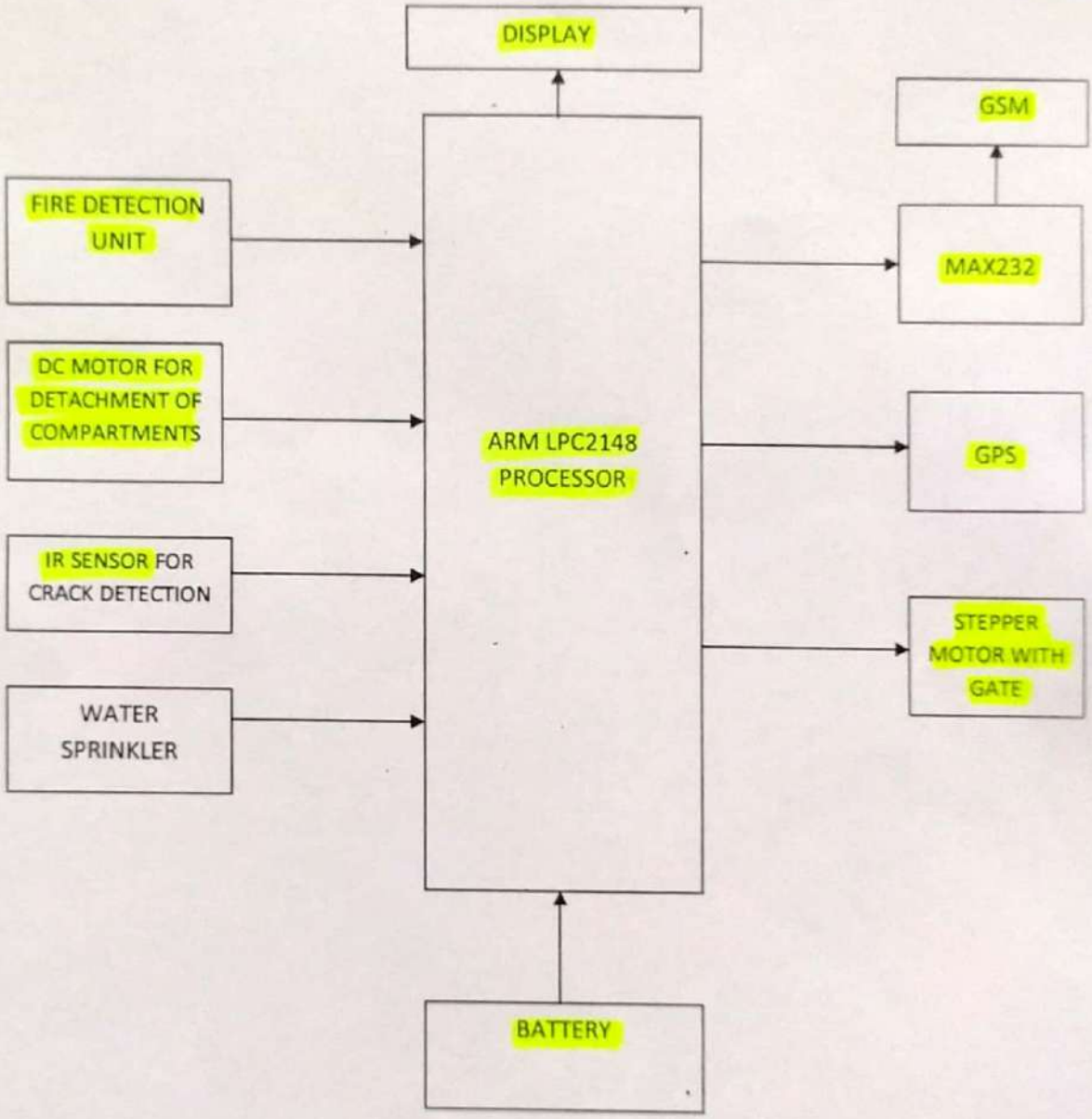

Fig.3.1. Block Diagram

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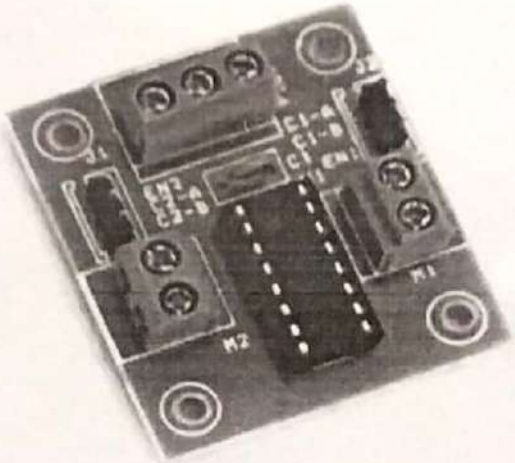

Fig 3.11. Motor Driver

3.11. REGULATED POWER SUPPLY

A regulated power supply is an embedded circuit; it converts unregulated AC into a constant DC. With the help of a rectifier it converts AC supply into DC. Its function is to supply a stable voltage (or less often current), to a circuit or device that must be operated within certain power supply limits. The output from the regulated power supply may be alternating or unidirectional, but is nearly always DC (Direct Current).

The type of stabilization used may be restricted to ensuring that the output remains within certain limits under various load conditions, or it may also include compensation for variations in its own supply source. The latter is much more common today.

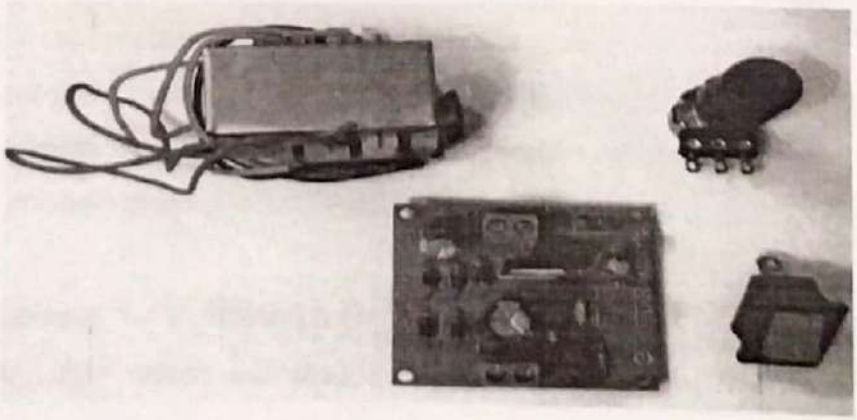

Fig 3.12. RPS Component

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3. **Analysis of Linear Systems**, David K. Cheng, Narosa Publishing House, 11th reprint, 2002

10EE35 ELECTRICAL and ELECTRONIC MEASUREMENTS and INSTRUMENTATION

Subject Code	:	10EE35	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:

1-(a) Units and Dimensions: Review of fundamental and derived units. S.I. units. Dimensional equations, problems. **3 Hours**

1-(b) Measurement of Resistance: Wheatstone's bridge, sensitivity, limitations. Kelvin's double bridge. Earth resistance, measurement by fall of potential method and by using Megger. **3 Hours**

UNIT 2:

Measurement of Inductance and Capacitance: Sources and detectors, Maxwell's inductance bridge, Maxwell's inductance &capacitance bridge,Hay's bridge, Anderson's bridge, Desauty's bridge, Schering bridge. Shielding of bridges. Problems. **07 Hours**

UNIT 3:

Extension of Instrument Ranges: Shunts and multipliers. Construction and theory of instrument transformers, Equations for ratio and phase angle errors of C.T. and P.T (derivations excluded). Turns compensation, illustrative examples (excluding problems on turns compensation),Silsbees's method of testing CT. **07 Hours**

UNIT 4:

Measurement of Power and Energy: Dynamometer wattmeter. UPF and LPF wattmeters, Measurement of real and reactive power in three-phase circuits. Induction type energy meter — construction, theory, errors, adjustments and calibration. Principle of working of electronic energy meter. **06 Hours**

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PART – B

UNIT 5:

(a) Construction and operation of electro-dynamometer single-phase power factor meter. Weston frequency meter and phase sequence indicator. **04 Hours**

(b) Electronic Instruments: Introduction. True RMS responding voltmeter. Electronic multimeters. Digital voltmeters. Q meter. **04 Hours**

UNIT 6:

Dual trace oscilloscope — front panel details of a typical dual trace oscilloscope. Method of measuring voltage, current, phase, frequency and period. Use of Lissajous patterns. Working of a digital storage oscilloscope. Brief note on current probes. **06 Hours**

UNIT 7:

Transducers: Classification and selection of transducers. Strain gauges. LVDT. Measurement of temperature and pressure. Photo-conductive and photo-voltaic cells. **06 Hours**

UNIT 8:

(a) Interfacing resistive transducers to electronic circuits. Introduction to data acquisition systems. **2 Hours**

(b) Display Devices and Signal Generators: X-Y recorders. Nixie tubes. LCD and LED display. Signal generators and function generators. **4 Hours**

Text Books

1. **Electrical and Electronic Measurements and Instrumentation,** A. K. Sawhney, Dhanpatrai and Sons, New Delhi.
2. **Modern Electronic Instrumentation and Measuring Techniques,** Cooper D. and A.D. Heifrick, PHI, 2009 Edition.

References

1. **Electronic Instrumentation and Measurement,** David A. Bell, oxford Publication ,2nd Edition, 2009.
2. **Electrical Measurements and Measuring Instruments,** Golding and Widdies, Pitman

10EE36 ELECTRIC POWER GENERATION

Subject Code	:	10EE36	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:

Sources of Electrical Power: Wind, solar, fuel cell, tidal, geo-thermal, hydro-electric, thermal-steam, diesel, gas, nuclear power plants (block diagram approach only). Concept of co-generation. Combined heat and power distributed generation. **06 Hours**

UNIT 2:

Diesel electric plants. Gas turbine plants. Mini, micro, and bio generation. Concept of distributed generation. **06 Hours**

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2. Erwin Kreyszig, Advanced Engineering Mathematics, Latest edition, Wiley Publications.

Reference Book:

1. B.V. Ramana, Higher Engineering Mathematics, Latest edition, Tata Mc. Graw Hill Publications.
2. Peter V. O'Neil, Engineering Mathematics, CENGAGE Learning India Pvt Ltd.Publishers

MICROCONTROLLERS

(Common to EC/TC/EE/IT/BM/ML)

Sub Code	:	10ES42	*IA Marks*	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

UNIT 1:

Microprocessors and microcontroller. Introduction, Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture, Computer software.

The 8051 Architecture: Introduction, Architecture of 8051, Pin diagram of 8051, Memory organization, External Memory interfacing, Stacks.

6 Hours

UNIT 2:

Addressing Modes: Introduction, Instruction syntax, Data types, Subroutines, Addressing modes: Immediate addressing , Register addressing, Direct addressing, Indirect addressing, relative addressing, Absolute addressing, Long addressing, Indexed addressing, Bit inherent addressing, bit direct addressing.

Instruction set: Instruction timings, 8051 instructions: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instructions.

6 Hours

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UNIT 3:

8051 programming: Assembler directives, Assembly language programs and Time delay calculations.

6 Hours

UNIT 4:

8051 Interfacing and Applications: Basics of I/O concepts, I/O Port Operation, Interfacing 8051 to LCD, Keyboard, parallel and serial ADC, DAC, Stepper motor interfacing and DC motor interfacing and programming

7 Hours

UNIT 5:

8051 Interrupts and Timers/counters: Basics of interrupts, 8051 interrupt structure, Timers and Counters, 8051 timers/counters, programming 8051 timers in assembly and C .

6 Hours

UNIT 6:

8051 Serial Communication: Data communication, Basics of Serial Data Communication, 8051 Serial Communication, connections to RS-232, Serial communication Programming in assembly and C.

8255A Programmable Peripheral Interface:, Architecture of 8255A, I/O addressing,, I/O devices interfacing with 8051 using 8255A.

6 Hours

Course Aim – The MSP430 microcontroller is ideally suited for development of low-power embedded systems that must run on batteries for many years. There are also applications where MSP430 microcontroller must operate on energy harvested from the environment. This is possible due to the ultra-low power operation of MSP430 and the fact that it provides a complete system solution including a RISC CPU, flash memory, on-chip data converters and on-chip peripherals.

UNIT 7:

Motivation for MSP430microcontrollers – Low Power embedded systems, On-chip peripherals (analog and digital), low-power RF capabilities. Target applications (Single-chip, low cost, low power, high performance system design).

MSP430 RISC CPU architecture, Compiler-friendly features, Instruction set, Clock system, Memory subsystem. Key differentiating factors between different MSP430 families. **2 Hours**

Introduction to Code Composer Studio (CCS v4). Understanding how to use CCS for Assembly, C, Assembly+C projects for MSP430 microcontroller. Interrupt programming. **2 Hours**

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Digital I/O – I/O ports programming using C and assembly, Understanding the muxing scheme of the MSP430 pins. **3 Hours** **2 Hours**

UNIT 8:

On-chip peripherals. Watchdog Timer, Comparator, Op-Amp, Basic Timer, Real Time Clock (RTC), ADC, DAC, SD16, LCD, DMA.

Using the Low-power features of MSP430. Clock system, low-power modes, Clock request feature, Low-power programming and Interrupt. **2 Hours**

Interfacing LED, LCD, External memory. Seven segment LED modules interfacing. Example – Real-time clock. **2 Hours**

Case Studies of applications of MSP430 - Data acquisition system, Wired Sensor network, Wireless sensor network with Chipcon RF interfaces. **2 Hours**

3 Hours

TEXT BOOKS:

1. "The 8051 Microcontroller and Embedded Systems – using assembly and C,"-, **Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006**
2. "MSP430 Microcontroller Basics", **John Davies, Elsevier, 2010**

(Indian edition available)

REFERENCE BOOKS:

1. "The 8051 Microcontroller, Architecture, Programming & Applications", **2e Kenneth J. Ayala ;, Penram International, 1996 / Thomson Learning 2005.**
2. "The 8051 Microcontroller", **V.Udayashankar and MalikarjunaSwamy, TMH, 2009**
3. MSP430 Teaching CD-ROM, **Texas Instruments, 2008 (can be requested** http://www.uniti.in)
4. Microcontrollers: Architecture, Programming, Interfacing and System Design",**Raj Kamal, "Pearson Education, 2005**

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10EE71 COMPUTER TECHNIQUES IN POWER SYSTEM ANALYSIS

Subject Code	:	10EE71	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

NETWORK TOPOLOGY: Introduction, Elementary graph theory – oriented graph, tree, co-tree, basic cut-sets, basic loops; Incidence matrices – Element-node, Bus incidence, Tree-branch path, Basic cut-set, Augmented cut-set, Basic loop and Augmented loop, Primitive network – impedance form and admittance form. 6 Hours

UNIT - 2

NETWORK MATRICES: Introduction. Formation of Y_{BUS} by method of inspection (including transformer off-nominal tap setting) and method of singular transformation ($Y_{BUS} = A^T y A$), Formation of Bus Impedance matrix by step by step building algorithm (without mutual coupling elements). 6 Hours

UNIT - 3 & 4

LOAD FLOW STUDIES: Introduction, Power flow equations, Classification of buses, Operating constraints, Data for load flow, Gauss-Seidal Method – Algorithm and flow chart for PQ and PV buses (numerical problem for one iteration only), Acceleration of convergence; Newton Raphson's Method – Algorithm and flow chart for NR method in polar coordinates (numerical problem for one iteration only). Algorithm for Fast Decoupled load flow method, Comparison of Load Flow Methods. 14 Hours

PART - B

UNIT - 5 & 6

ECONOMIC OPERATION OF POWER SYSTEM: Introduction, Performance curves, Economic generation scheduling neglecting losses and generator limits. Economic generation scheduling including generator limits and neglecting losses; Iterative techniques; Economic Dispatch including transmission losses – approximate penalty factor, iterative technique for solution of economic dispatch with losses; Derivation of transmission loss formula; Optimal scheduling for Hydrothermal plants – problem formulation, solution procedure and algorithm. 12 Hours

UNIT - 7 & 8

TRANSIENT STABILITY STUDIES: Numerical solution of Swing Equation – Point-by-point method, Modified Euler's method, Runge-Kutta method, Milne's predictor corrector method. Representation of power system for transient stability studies – load representation, network performance equations. Solution techniques with flow charts. 14 Hours

TEXT BOOKS:

1. Computer Methods in Power System Analysis, Stag, G. W., and El-Abiad, A. H.- McGraw Hill International Student Edition. 1968
2. Computer Techniques in Power System Analysis, Pai, M. A.- TMH, 2nd edition, 2006.

REFERENCE BOOKS:

1. Modern Power System Analysis, Nagrath, I. J., and Kothari, D. P, TMH, 3rd Edition, 2003.
2. Advanced Power System Analysis and Dynamics, Singh, L. P, New Age International (P) Ltd, New Delhi, 2001.
3. Computer Aided Power System Operation and Analysis, Dhar, R. N, TMH, 1984.
4. Power System Analysis, Haadi Sadat, TMH, 2nd edition, reprint 2007

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10EE62 SWITCHGEAR & PROTECTION

Subject Code	:	10EE62	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

SWITCHES AND FUSES: Introduction, energy management of power system, definition of switchgear, switches - isolating, load breaking and earthing. Introduction to fuse, fuse law, cut -off characteristics, Time current characteristics, fuse material, HRC fuse, liquid fuse, Application of fuse

4 Hours

UNIT - 2

PRINCIPLES OF CIRCUIT BREAKERS: Introduction, requirement of a circuit breakers, difference between an isolator and circuit breaker, basic principle of operation of a circuit breaker, phenomena of arc, properties of arc, initiation and maintenance of arc, arc interruption theories - Slepian's theory and energy balance theory, Restriking voltage, recovery voltage, Rate of rise of Restriking voltage, DC circuit breaking, AC circuit breaking, current chopping, capacitance switching, resistance switching, Rating of Circuit breakers.

10 Hours

UNIT - 3 & 4

CIRCUITS BREAKERS: Air Circuit breakers – Air break and Air blast Circuit breakers, oil Circuit breakers – Single break, double break, minimum OCB, SF_6 breaker - Preparation of SF_6 gas, Puffer and non Puffer type of SF_6 breakers, Vacuum circuit breakers - principle of operation and constructional details. Advantages and disadvantages of different types of Circuit breakers, Testing of Circuit breakers, Unit testing, synthetic testing, substitution test, compensation test and capacitance test.

LIGHTNING ARRESTERS: Causes of over voltages – internal and external, lightning, working principle of different types of lightning arresters. Shield wires.

12 Hours

PART - B

UNIT - 5

PROTECTIVE RELAYING: Requirement of Protective Relaying, Zones of protection, primary and backup protection. Essential qualities of Protective Relaying, Classification of Protective Relays

4 Hours

UNIT - 6

INDUCTION TYPE RELAY: Non-directional and directional over current relays, IDMT and Directional characteristics. Differennal relay – Principle of operation, percentage differennal relay, bias characteristics, distance relay – Three stepped distance protection, Impedance relay, Reactance relay, Mho relay, Buchholz relay, Negative Sequence relay, Microprocessor based over current relay – block diagram approach.

10 Hours

UNIT - 7 & 8

PROTECTION SCHEMES: Generator Protection - Merz price protection, prime mover faults, stator and rotor faults, protection against abnormal conditions – unbalanced loading, loss of excitation, over speeding. Transformer Protection - Differential protection, differential relay with harmonic restraint, Inter turn faults Induction motor protection - protection against electrical faults such as phase fault, ground fault, and abnormal operating conditions such as single phasing, phase reversal, over load.

12 Hours

TEXT BOOKS:

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10EE756 TESTING AND COMMISSIONING OF ELECTRICAL EQUIPMENT

Subject Code	:	10EE756	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1 & 2

TRANSFORMERS:

a. Specifications: Power and distribution transformers as per BIS standards.

b. Installation: Location, site, selection, foundation details (like bolts size, their number, etc), code of practice for terminal plates, polarity & phase sequence, oil tanks, drying of windings and general inspection.

5 Hours

c. Commissioning tests: Following tests as per national & International Standards, volt ratio test, earth resistance, oil strength, Bucholz & other relays, tap changing gear, fans & pumps, insulation test, impulse test, polarizing index, load & temperature rise test.

7 Hours

d. Specific Tests: Determination of performance curves like efficiency, regulation etc, and determination of mechanical stress under normal &abnormal conditions.

3 Hours

UNIT - 3 & 4

SYNCHRONOUS MACHINES:

a. Specifications: As per BIS standards.

b. Installation: Physical inspection, foundation details, alignments, excitation systems, cooling and control gear, drying out.

c. Commissioning Tests: Insulation, Resistance measurement of armature & field windings, waveform & telephone interference tests, line charging capacitance.

4 Hours

d. Performance tests: Various tests to estimate the performance of generator operations, slip test, maximum lagging current, maximum reluctance power tests, sudden short circuit tests, transient & sub

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transient parameters, measurements of sequence impedances, capacitive reactance, and separation of losses, temperature rise test, and retardation tests.

6 Hours

e. Factory tests: Gap length, magnetic eccentricity, balancing vibrations, bearing performance

2 Hours

PART - B

UNIT - 5, 6 & 7

INDUCTION MOTORS:

a. Specifications for different types of motors, Duty, I.P. protection

2 Hours

b. Installation: Location of the motors (including the foundation details) & its control apparatus, shaft & alignment for various coupling, fitting of pulleys & coupling, drying of windings.

4 Hours

c. Commissioning Test: Mechanical tests for alignment, air gap symmetry, tests for bearings, vibrations & balancing

5 Hours

Electrical Tests: Insulation test, earth resistance, high voltage test, starting up, failure to speed up to take the load, type of test, routine test, factory test and site test (in accordance with ISI code

4 Hours

d. Specific Tests: Performance & temperature raise tests, stray load losses, shaft alignment, and re-rating & special duty capability.

4 Hours

UNIT - 8

SWITCH GEAR & PROTECTIVE DEVICES: Standards, types, specification, installation, commissioning tests, maintenance schedule, type & routine tests.

6 Hours

TEXT BOOKS:

1. Testing & Commissioning Of Electrical Equipment -S. Rao,Khanna Publishers,2004
2. Testing & Commissioning Of Electrical Equipment -B. V. S. Rao, Media Promoters and Publication Pvt., Ltd.

REFERENCE BOOKS:

1. Relevant Bureau of Indian Standards
2. A Handbook on Operation and Maintenance of Transformers- H. N. S. Gowda, Published by H. N. S. Gowda,2006
3. Handbook of SwitchGears,BHEL, TMH Publications
4 J and P Transformer Book,Elsevier Publications

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10EE56 LINEAR IC'S AND APPLICATIONS

Subject Code	:	10EE56	IA Marks	:	25
No. of Lecture Hrs / Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs	:	52	Exam Marks	:	100

PART - A

UNIT - 1

OP-AMPS AS AC AMPLIFIER: Capacitor coupled voltage follower, high Z_{in} capacitor coupled voltage follower, capacitor coupled non-inverting amplifier, high Z_{in} capacitor coupled non-inverting amplifier, capacitor coupled inverting amplifier, setting upper cut off frequency, capacitor coupled difference amplifier, and use of single polarity supply.6 Hours

UNIT 2

OP-AMPS FREQUENCY RESPONSE AND COMPENSATION: Op amp circuits stability, frequency and phase response, frequency compensating methods ,manufacturer's recommended compensation, op-amp circuit band width, slew rate effects,stray capacitance effects, load capacitance effects, Z_{in} mode compensation, circuit stability precautions.7 Hours

UNIT - 3

SIGNAL PROCESSING CIRCUITS: Precision half wave & full wave rectifiers, limiting circuits, clamping circuits, peak detectors, sample &hold circuit. DAC and ADC (Flash and successive approximations) 7 Hours

UNIT - 4

OPAMPS AND NONLINEAR CIRCUITS: Op-amps in switching circuits, zero crossing detectors, inverting Schmitt trigger circuits, non-inverting Schmitt circuits, astable multivibrator, and monostable multivibrator. 6 Hours

PART - B

UNIT - 5

SIGNAL GENERATOR: Triangular/rectangular wave generator, waveform generator design, phase shift oscillator, oscillator amplitude stabilization, Wein bridge oscillator, signal generators, output controllers 7 Hours

UNIT - 6

ACTIVE FILTERS: First and second order high pass and low pass filters, band pass filter, band stop filter. 7 Hours

UNIT - 7

SPECIALIZED IC APPLICATIONS: Universal active filter, switched capacitor filter, phase locked loops, power amplifiers. 6 Hours

UNIT - 8

DC VOLTAGE REGULATORS: Voltage regulators basics, voltage follower regulator, adjustable output regulator, precision voltage regulators, and integrated circuit voltage regulators. 6 Hours

TEXT BOOKS:

1. Operational amplifiers and linear IC's, David A Bell, Oxford University Press, 2010.
2. Operational amplifiers and linear IC's, Ramakanth A Gayakwad, PHI, 4th edition,2009.
3. Linear integrated circuits,S.P.Bali,TMH,2009.

REFERENCE BOOKS:

1. Op Amps and Linear Integrated Circuits-Concepts and Applications, James M.Fiore,Cengage Learing,2009.
2. Op Amps, Design, Applications and Trouble Shooting,Elsevier,2nd Edition.
3. Operational amplifiers and linear IC's, Stanley William D, - 4th edition, Pearson Education.
4. Linear Integrated Circuits- Analysis, Design and Applications,B Somanathan Nair, Wiley India, First Edition, 2009.

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10EE72 ELECTRICAL POWER UTILIZATION

Subject Code	:	10EE72	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

HEATING AND WELDING: Advantages and methods of electric of heating, resistance ovens, induction heating, dielectric heating, the arc furnace, heating of building. Electric welding, resistance and arc welding, control devices and welding equipment. 10 Hours

UNIT - 2

ELECTROLYTIC PROCESS: Fundamental principles, extraction, refining of metals and electroplating. Factors affecting electro deposition process, power supply for electrolytic process. 6 Hours

UNIT - 3 & 4

ILLUMINATION: Laws of illumination, lighting calculation, factory lighting, flood lighting, street lighting, different types of lamps-incandescent, fluorescent, vapor, CFL and LED lamps and their working, comparision, Glare and its remedy. 10 Hours

PART - B

UNIT - 5, 6 & 7

ELECTRIC TRACTION: Introduction, requirements of an ideal traction,systems of traction, speed time curve, tractive effort,co-efficient of adhesion, selection of traction motors, method of speed control, energy saving by series parallel control, ac traction equipment. AC series motor, characteristics, regenerative braking, linear induction motor and their use. AC traction, diesel electric equipment, mains lighting system, specific energy, factors affecting specific energy consumption. 20 Hours

UNIT - 8

INTRODUCTION TO ELECTRIC AND HYBRID VEHICLES: Configuration and performance of electrical vehicles, traction motor characteristics, tractive effort, transmission requirement, vehicle performance and energy consumption. 6 Hours

TEXT BOOKS:

1. Utilization Of Electric Energy,E Openshaw Taylor, 12th Impression, 2009,Universities Press.
2. Modern Electric, Hybrid Electric and Fuel Cell Vehicles, Mehrdad. Ehsani, Yimin Gao, Sabastien. E. Gay, Ali Emadi- CRC Press.

REFERENCE BOOKS:

1. A Course in Electrical Power, Soni Gupta and Bhatnagar, Dhanapat Rai & sons.
3. Electrical Power, Dr. S.L.Uppal, Khanna Publishers.

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NAVODAYA

NAVODAYA INSTITUTE OF TECHNOLOGY
NAVODAYA NAGAR, BIJENGERA ROAD, RAICHUR-584103
(Affiliated to Visveshvaraya Technological University, Belgaum)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CERTIFICATE

Certified that the project work entitled "POWER THEFT DETECTION AND CONTROL WITH MODERN GSM" carried out by by JYOTHI. H (3NA14EE406), RAJU. T (3NA14EE410), SARITHA (3NA14EE414), SHIVAPPA (3NA14EE416) are bonafide students of NAVODAYA INSTITUTE OF TECHNOLOGY, RAICHUR in partial fulfillment for the award of **Bachelor of Engineering** in **Electrical and Electronics Engineering** of the Visveshvaraya Technological University, Belgaum during the year **2016-2017**. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the Report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for the said Degree.

Guide	HOD	Principal
(Asst Prof. B.K. MUZUMDAR)	(Dr. Srinivasan,M.)	(Dr. Shiva Prakash.C.K)

External Viva

Name of the Examiners:

1. B.K. Mazumdar
2. RITESH

Signature with Date

28-06-17

28/6/17

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18/6/2017
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ABSTRACT:

Electrical energy is very imperative for ever day life and a spine for the industry. Electricity is indiscipline to our daily life with increasing need of electricity the power theft is also increasing power theft is a problem that continues to plague power sector across the whole country. The design and analysis of a Power theft location system which alerts a Power company in the event of theft or attempted theft of electrical energy. This Project presents a detection of Power theft in all houses and in industries for different methods of theft. Electrical energy is very important for everyday life and spine for the industry. Electricity is indiscipline to our daily life with increasing need of electricity the power theft is also increasing, power theft is a problem that continues to plague power sector across whole country the objective of this project is to design such a system which will try to reduce the illegal use of electricity and also reduce the chances of theft. This project will automatically collect the reading and also detect the theft. This model reduces manual manipulation work and try to achieves theft control.

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CHAPTER 1

INTRODUCTION

Electricity theft is a very common problem in country, were population is very high and the use of electricity is ultimately tremendous. In India, every year there is very increasing number of electricity thefts across domestic electricity connection as well as industrial electricity supply, which results in loss of electricity companies energy and because of which we are facing the frequent problems of load shading in urban as well as rural areas so as to over come up the need of electricity for whole state. Also the ways using which theft can be done are innumerable so we can never keep track of how a theft has occurred, and this issue is needed to be solved as early as possible. In This abstract we propose an electricity theft detection system to detect the theft which is made by the most common way of doing the theft and that is bypassing the meter using the a piece of wire, people simply bypasses electricity meter which is counting the current unit by placing a wire before and after the meter reading unit. The proposed system will be hidden in such meter and as soon as attempt is made for the theft, it will send SMS to control unit of electricity board. In this system current transformer are used, here one current transformer is placed in input side of the post line. Other current transformers are placed at the distribution points of the house lines. The output of CT values is given as input to PIC microcontroller convert analog inputs to digital. Then PIC compares the input current and the same of output current. If compared result has any negative values then this particular post is detected as theft point. This compared value is transmitted to electricity board, this value display in LCD display. The information will then be quickly processed by the microcontroller and a SMS will be send through the GSM technology.

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CHAPTER 2

2.1 EXISTING SYSTEM

In present existing system wireless communication system of energy meter is used with Zigbee, relay control and GPRS. The cryptographic method is used to secure the communication channel and Zigbee for the transmission of data in a serial process. Drawback of this process is to collect the readings; going in the particular range of area and manually cut power supply if needed.

2.2 OBJECTIVE

In this proposed system GSM technology used to transmit the meter reading to the customer and government with the required cost. This process will be happen when needed that means if SMS is received from authorized server mobile transmission between customer and government. Then the energy theft controlled by CT&PT and sensor and Bypass detection. It also cut the power supply automatically as per request of authorized server mobile.The power theft monitoring is an important research in electric power system and electricity stealing prevention became a big problem to the electricity.

Electricity stealing is a long term problem however each power supply department has me huge investments of manpower and material, the phenomenon of defending stealing electricity has increased and not abated and the method of electricity stealing is continuously improved.

The behavior of electricity stealing not only makes the power industry suffering huge financial losses but also threatens the main power supply security and reliability.

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WORKING PRINCIPLE

The input to the circuit is applied from the regulated power supply. The AC input that is 230V from the main supply is step down by the transformer to 12V and is fed to a rectifier. The output obtain from the rectifier is a pulsating DC voltage. So in order to gate a pure DC voltage, the output voltage from the rectifier is fed to a filter to remove any AC components present even after rectification. Now this is given to a voltage regulator to obtain a pure constant dc voltage.

If the person use a the power without connecting to energy meter, that means if he is bypassing the connection in energy meter without any reading in energy meter the person use power in houses at time our circuit send a message to substation controller through GSM with help of PIC controller and cut the power supply automatically by using relay.

In the **Power measurement unit,** the one CT is used to measure total current used and measuring voltage, we use bridge of diode for converting AC to DC and then voltage divider circuit reduce voltage level at measurable scale.

GSM Modem &Max 232 is built with dual band GSM. As mentioned in the above sensing circuit there is power theft then it will send message to microcontroller as per our program and it will send message to GSM through Max 232. Also if mobile received SMS from authorized mobile phone to cut the supply, then supply is off by using relay.

The commonly used 16x2 **LCD display** custom made characters, numbers, alphabets, and special characters. When there is no theft occur in energy meter then the LCD will display voltage current and power. If theft is occurs then it display THEFT IS DETECTED.

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The power supply section is the important one is as shown in Fig.3. It should deliver constant output regulated power supply for successful working of the project. A 0-12v/500 mA transformer is used for this purpose. The primary of this transformer is connected in to main supply through on/off switch& fuse for protecting from overload and short circuit protection. The secondary is connected to the diodes to convert 12v AC to 12v DC voltage and filtered by the capacitors. Which are further regulated to +5v, by using IC 7805. So to generate this 12v and 5v constant dc we used the following components:

- Full wave bridge rectifier
- Step down transformer
- 7805 Voltage regulator
- 1000uf/35v electrolytic Capacitor

4.2 Step down Transformer

As we are using the 230v supply voltage and the circuit needs 12v and 5v dc, we need to use a step down transformer to step down the voltage to nearly 12v so that is will be very convenient to convert it to dc and use it is as shown in Fig.The transformer step down the 230 v ac supply to 18 v dc supply. The 18v is chosen because as the circuit needs pure dc the v min value of the circuit constructed by choosing the 18v ac supply with the maximum current is approximately about 6v. So if the transformer steps down the voltage below this value the v min will be less than the 5v so this will enable the circuit to go through the conditions below 5v. As a step-down unit, the transformer converts high-voltage, low-current power into low-voltage, high-current power. The larger-gauge wire used in the secondary winding is necessary due to the increase in current. The primary winding, which does not have to conduct as much current may be made of smaller-gauge wire.

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Mechanical Engineering

UNIT – 7

Gyroscope: Vectorial representation of angular motion. Gyroscopic couple. Effect of gyroscopic couple on ship, plane disc, aeroplane, stability of two wheelers and four wheelers.

06 Hours

UNIT – 8

Analysis of Cams: Analysis of Tangent cam with roller follower and Circular arc cam operating flat faced and roller followers. Undercutting in Cams

06 Hours

TEXT BOOKS:

1. **Theory of Machines**, Sadhu Singh, Pearson Education. 2nd edition. 2007.
2. **Theory of Machines**, Rattan S.S. Tata McGraw Hill Publishing Company Ltd., New Delhi, 3rd Edition, 2009.

REFERENCE BOOKS:

1. **"Theory of Machines & Mechanisms"**, J.J. Uicker, , G.R. Pennock, J.E. Shigley. OXFORD 3rd Ed. 2009
2. **Mechanism and Machine Theory**, A.G.Ambekar PHI, 2007

MANUFACTURING PROCESS – III

(METAL FORMING PROCESS)

Subject Code	**: 10ME55**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction And Concepts: Classification of metal working processes, characteristics of wrought products, advantages and limitations of metal working processes.Concepts of true stress, true strain, triaxial & biaxial

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TEXT BOOKS:

1. **"Theory of Machines"**, Rattan S.S, Tata McGraw-Hill Publishing Company Ltd., New Delhi, and 3rd edition -2009.
2. **"Theory of Machines"**, Sadhu Singh, Pearson Education (Singapore) Pvt. Ltd, Indian Branch New Delhi, 2nd Edi. 2006

REFERENCE BOOKS:

1. **"Theory of Machines & Mechanisms"**, J.J. Uicker, , G.R. Pennock, J.E. Shigley. OXFORD 3rd Ed. 2009.
2. **Mechanism and Machine theory**, Ambekar, PHI, 2007

Graphical Solutions may be obtained either on the Graph Sheets or on the Answer Book itself.

MANUFACTURING PROCESS – II
(Metal Removing Process)

Subject Code	**: 10ME45**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Theory of Metal Cutting: Single point cutting tool nomenclature, geometry. Mechanics of Chip Formation, Types of Chips. Merchants circle diagram and analysis, Ernst Merchant's solution, shear angle relationship, problems of Merchant's analysis. Tool Wear and Tool failure, tool life. Effects of cutting parameters on tool life. Tool Failure Criteria, Taylor's Tool Life equation. Problems on tool life evaluation.

07 Hours

UNIT - 2

Cutting Tool Materials: Desired properties and types of cutting tool materials – HSS, carbides coated carbides, ceramics. Cutting fluids. Desired properties, types and selection. Heat generation in metal cutting, factors

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MECHANICS OF COMPOSITE MATERIALS

Subject Code	: 10ME662	IA Marks	: 25
Hours/Week	: 04	Exam Hours	: 03
Total Hours	: 52	Exam Marks	: 100

PART – A

UNIT - 1

Introduction To Composite Materials: Definition, classification and characteristics of composite Materials – fibrous composites, laminated composites, particulate composites.

Applications: Automobile, Aircrafts. missiles. Space hardware, Electrical and electronics, Marine, recreational and sports equipment, future potential of composites.

06 Hours

UNIT - 2

Fiber Reinforced Plastic Processing: Lay up and curing, fabricating process, open and closed mould process, hand lay up techniques; structural laminate bag molding, production procedures for bag molding; filament winding, pultrusion, pulforming, thermo-forming, injection molding, blow molding.

07 Hours

UNIT - 3

Micro Mechanical Analysis of a Lamina: Introduction, Evaluation of the four elastic moduli by Rule of mixture, Numerical problems. **Macro Mechanics of a Lamina:** Hooke's law for different types of materials, Number of elastic constants, Two - dimensional relationship of compliance and stiffness matrix.

07 Hours

UNIT – 4.

Macro Mechanics of a Lamina Hooke's law for two-dimensional angle lamina, engineering constants - Numerical problems. Stress-Strain relations for lamina of arbitrary orientation, Numerical problems.

06 Hours

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PART – B

UNIT – 5

Biaxial Strength Theories: Maximum stress theory, Maximum strain theory, Tsai-Hill theory, Tsai, Wu tensor theory, Numerical problems.

06 Hours

UNIT – 6

Macro Mechanical Analysis of Laminate: Introduction, code, Kirchoff hypothesis, CL T, A, B, and D matrices (Detailed derivation) , Special cases of laminates, Numerical problems.

06 Hours

UNIT - 7

Metal Matrix Composites: Reinforcement materials, types, characteristics and selection base metals selection. Need for production MMC's and its application.

Fabrication Process For MMC's: Powder metallurgy technique, liquid metallurgy technique and secondary processing, special fabrication techniques.

07 Hours

UNIT - 8

STUDY PROPERTIES OF MMC'S: Physical Mechanical, Wear, machinability and Other Properties. Effect of size, shape and distribution of particulate on properties.

07 Hours

TEXT BOOKS:

1. **Composite Science and Engineering,** K. K. Chawla Springer Verlag 1998.
2. **Mechanics of composite materials,** Autar K. Kaw CRC Press New York.

REFERENCE BOOKS:

1. **Fiber Reinforced Composites,** P. K. Mallick, Marcel Dekker,Inc
2. **Mechanics of Composite Materials**, Robert M. Jones, McGraw Hill Kogakusha Ltd.1998

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TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Latest edition, Khanna Publishers.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Latest edition, Wiley Publications.

REFERENCE BOOKS:

1. B.V. Ramana, Higher Engineering Mathematics, Latest edition, Tata Mc. Graw Hill Publications.
2. Peter V. O'Neil, Engineering Mathematics, CENGAGE Learning India Pvt Ltd.Publishers.

MATERIAL SCIENCE AND METALLURGY

Subject Code	**: 10ME32A /42A**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Crystal Structure: BCC, FCC and HCP Structures, coordination number and atomic packing factors, crystal imperfections -point line and surface imperfections. Atomic Diffusion: Phenomenon, Ficks laws of diffusion, factors affecting diffusion.

06 Hours

UNIT - 2

Mechanical Behaviour: Stress-strain diagram showing ductile and brittle behaviour of materials, linear and non linear elastic behaviour and properties, mechanical properties in plastic range, yield strength offset yield strength, ductility, ultimate tensile strength, toughness. Plastic deformation of single crystal by slip and twinning.

06 Hours

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UNIT - 3

Fracture: Type I, Type II and Type III.

Creep: Description of the phenomenon with examples. three stages of creep, creep properties, stress relaxation.

Fatigue: Types of fatigue loading with examples, Mechanism of fatigue, fatigue properties, fatigue testing and S-N diagram.

07 Hours

UNIT - 4

Solidification: Mechanism of solidification, Homogenous and Heterogeneous nucleation, crystal growth, cast metal structures.

Phase Diagram I: Solid solutions Hume Rothary rule substitutional, and interstitial solid solutions, intermediate phases, Gibbs phase rule.

07 Hours

PART - B

UNIT - 5

Phase Diagram II: Construction of equilibrium diagrams involving complete and partial solubility, lever rule. Iron carbon equilibrium diagram description of phases, solidification of steels and cast irons, invariant reactions.

06 Hours

UNIT - 6

Heat treating of metals: TTT curves, continuous cooling curves, annealing and its types. normalizing, hardening, tempering, martempering, austempering, hardenability, surface hardening methods like carburizing, cyaniding, nitriding, flame hardening and induction hardening, age hardening of aluminium-copper alloys.

07 Hours

UNIT - 7

Ferrous and non ferrous materials: Properties, Composition and uses of

- Grey cast iron, malleable iron, SG iron and steel
- Copper alloys-brasses and bronzes.
  Aluminium alloys-Al-Cu,Al-Si,Al-Zn alloys.

06 Hours

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UNIT - 8

Composite Materials: Definition, classification, types of matrix materials & reinforcements, fundamentals of production of FRP's and MMC's advantages and application of composites.

07 Hours

TEXT BOOKS:

1. **Foundations of Materials Science and Engineering,** Smith, 4th Edition McGraw Hill, 2009
2. **Materials Science, Shackleford., & M. K. Muralidhara,** Pearson Publication – 2007.

REFERENCE BOOKS:

1. **An Introduction to Metallurgy; Alan Cottrell**, Universities Press India Oriental Longman Pvt. Ltd., 1974.
2. **Engineering Materials Science**, W.C.Richards, PHI, 1965
3. **Physical Metallurgy**; Lakhtin, Mir Publications
4. **Materials Science and Engineering,** V.Raghavan , PHI, 2002
5. **Elements of Materials Science and Engineering,** H. VanVlack, Addison-Wesley Edn., 1998
6. **Materials Science and Engineering,**William D. Callister Jr., John Wiley & Sons. Inc, 5th Edition, 2001.
7. **The Science and Engineering of Materials,** Donald R. Askland and Pradeep.P. Phule, Cengage Learning, 4th Ed., 2003.

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MECHANICAL MEASUREMENTS AND METROLOGY

Subject Code	**: 10ME32B /42B**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART- A

UNIT-1

Standards of measurement: Definition and Objectives of metrology, Standards of length-International prototype meter, Imperial standard yard, Wave length standard, subdivision of standards, line and

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REFERENCE BOOKS:

1. **Thermodynamics**, An Engineering Approach, Yunus A.Cenegal and Michael A.Boles, Tata McGraw Hill publications, 2002
2. **Engineering Thermodynamics**, J.B.Jones and G.A.Hawkins, John Wiley and Sons..
3. **Fundamentals of Classical Thermodynamics**, G.J.Van Wylen and R.E.Sonntag, Wiley Eastern.
4. **An Introduction to Thermodynamcis**, Y.V.C.Rao, Wiley Eastern, 1993,
5. **B.K Venkanna, Swati B. Wadavadagi "Basic Thermodynamics**, PHI, New Delhi, 2010

MECHANICS OF MATERIALS

Subject Code	**: 10ME34**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART-A

UNIT 1:

Simple Stress and Strain: Introduction, Stress, strain, mechanical properties of materials, Linear elasticity, Hooke's Law and Poisson's ratio, Stress-Strain relation - behaviour in tension for Mild steel, cast iron and non ferrous metals. Extension / Shortening of a bar, bars with cross sections varying in steps, bars with continuously varying cross sections (circular and rectangular), Elongation due to self weight, Principle of super position.

07 Hours

UNIT 2:

Stress in Composite Section: Volumetric strain, expression for volumetric strain, elastic constants, simple shear stress, shear strain, temperature stresses (including compound bars).

06 Hours

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UNIT 3:

Compound Stresses: Introduction, Plane stress, stresses on inclined sections, principal stresses and maximum shear stresses, Mohr's circle for plane stress.

07 Hours

UNIT 4:

Energy Methods: Work and strain energy, Strain energy in bar/beams, Castiglinios theorem, Energy methods.

Thick and Thin Cylinder Stresses in thin cylinders, changes in dimensions of cylinder (diameter, length and volume). Thick cylinders Lame's equation (compound cylinders not included).

06 Hours

PART-B

UNIT 5:

Bending Moment and Shear Force in Beams: Introduction, Types of beams, loads and reactions, shear forces and bending moments, rate of loading, sign conventions, relationship between shear force and bending moments. Shear force and bending moment diagrams for different beams subjected to concentrated loads, uniformly distributed load, (UDL) uniformly varying load (UVL) and couple for different types of beams.

07 Hours

UNIT 6:

Bending and Shear Stresses in Beams: Introduction, Theory of simple bending, assumptions in simple bending. Bending stress equation, relationship between bending stress, radius of curvature, relationship between bending moment and radius of curvature. Moment carrying capacity of a section. Shearing stresses in beams, shear stress across rectangular, circular, symmetrical I and T sections. (composite / notched beams not included).

07 Hours

UNIT 7:

Deflection of Beams: Introduction, Differential equation for deflection. Equations for deflection, slope and bending moment. Double integration

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METALLOGRAPHY AND MATERIAL TESTING LABORATORY

Subject Code	**: 10MEL37A / 47A**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 48**	**Exam Marks**	**: 50**

PART – A

1. Preparation of specimen for Metallograpic examination of different engineering materials. Identification of microstructures of plain carbon steel, tool steel, gray C.I, SG iron, Brass, Bronze & composites.
2. Heat treatment: Annealing, normalizing, hardening and tempering of steel. Hardness studies of heat-treated samples.
3. To study the wear characteristics of ferrous, non-ferrous and composite materials for different parameters.
4. Non-destructive test experiments like,
   (a). Ultrasonic flaw detection
   (b). Magnetic crack detection
   (c). Dye penetration testing. To study the defects of Cast and Welded specimens

PART – B

1. Tensile, shear and compression tests of metallic and non metallic specimens using Universal Testing Machine
2. Torsion Test
3. Bending Test on metallic and nonmetallic specimens.
4. Izod and Charpy Tests on M.S, C.I Specimen.
5. Brinell, Rockwell and Vickers's Hardness test.
6. Fatigue Test.

Scheme of Examination:

ONE question from part -A:	**20** Marks
ONE question from part -B:	**20** Marks
Viva -Voice:	**10** Marks
Total :	**50** Marks

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DEPARTMENT OF MECHANICAL ENGINEERING

Navodaya Institute of Technology

Affiliated to Visvesvaraya Technological University, Belagavi & Recognized by AICTE New Delhi

Bijangera Road, Raichur – 584101. Karnataka.

DEPARTMENT OF MECHANICAL ENGINEERING

CERTIFICATE

This is to certify that the project work entitled "FABRICATION AND TESTING" carried out by ANWAR ALI(3NA13ME005), MOHAMMAD ARAFATH(3NA13ME019), SUJATHA PATIL(3NA14ME423), SARITHA (3NA14ME420) bonafide student of Navodaya Institute of Technology, Raichur in partial fulfillment for the award of degree Bachelor of Engineering in Mechanical Engineering of Visvesvaraya Technological University, Belagavi during the year 2016-2017. It is certified that all correction/suggestions indicated for internal assessment have been incorporated in the report deposited in the department library. The project report has been approved as it satisfies the academic requirements in respect of project work prescribed of the said degree.

Signature of guide	Signature of the HOD	Signature of principal
Mr. Md Umar	DR. P. RATHNAKUMAR	DR SHIVAPRAKASH C K,

EXTERNAL VIVA

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Name of the examiners	Signature with date
1. Dr. P. Rathnakumar	
2. Vijay Kumar Gouda	

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1.8 FABRICATION METHODS OF COMPOSITES.

There are two general divisions of composites manufacturing processes: open moulding and closed moulding. With open moulding, the gel coat and laminate are exposed to the atmosphere during the fabrication process. In closed moulding, the composite is processed in a two-part mould set, or within a vacuum bag. There are a variety of processing methods within the open and closed moulding categories:

1.8.1 Open Moulding Method: Hand Lay-Up, Spray-Up, Filament Winding.

1.8.2 Closed Moulding Method: Compression moulding, Pultrusion, Vacuum Bag.

1.8.1 Open moulding:

Open moulding process is saturating fiber reinforcement with resin, using manual rollout techniques to consolidate the laminate and removing the entrapped air. A major factor in this operation is the transfer of resin from a drum or storage tanks to the mould. The means used to transport the resin, in many cases, characterizes the specific process method.

1.8.1.1 Hand lay –up technique:

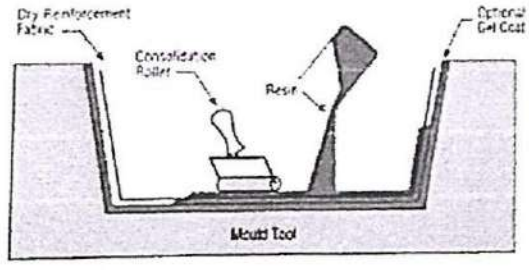

Figure 0-6 Hand Lay Up Technique

Hand lay-up technique is an open moulding method suitable for making a wide variety of composites products including: boats, tanks bath ware, housings, truck/auto components, architectural products and many other products ranging from very small to very large. Production volume per mould is low; however, it is feasible to produce substantial production quantities using multiple moulds. Simple, single-cavity moulds of fiberglass composites construction are generally used. Moulds can range from very small to very large and are low cost in the spectrum of soft composites moulds.

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3.1.1 Density Calculation of Glass Fiber:

Density of the Glass fiber is calculated. The Calculations are as follows

Calculations are as shown below:

Where W_0= Weight of the sample, W_a=weight of bottle +weight of kerosene

W_b= Weight of bottle+sample+kerosene

Weight of the bottle= 34.382 grams

Weight of bottle + kerosene (W_a)= 74.8155 grams

Weight of bottle+ sample =34.4591 grams

=>Weight of sample (W_0)=0.0768 grams

Weight of bottle+ sample + kerosene (W_b) = 74.7740 grams

$W_a - W_b$ - 0.0415grams

$S_0 = W_0 / (W_0+W_a-W_b)$ =.0.6491

Density of the sample i.e. glass fiber = S_0

Figure 3-1 Density Bottle

* ρ_f=0.6491 *0.8=2.52 gram/c.c

($\rho_f = \rho_{kerosene}$=0.8)

3.1.2 Composite Preparation.

The hand lay-up technique was used for preparation of the samples. A wooden mould of dimension (180× 280× 5) mm was used for casting the composite sheet. A laminated sheet was applied at the inner surface of the mould for quick and easy release of the composite slabs. These fibers are now used as fiber material in the composite fabrication. For different weight fraction of fibers, a calculated amount of epoxy resin and hardener (ratio of 10:1 by weight) was thoroughly mixed in a glass jar. Then calculated amount of particulate glass fiber is added to the epoxy resin and hardener mixtures respectively and mixed properly. Then the composite mixtures are poured in to the moulds.

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Care has been taken to avoid formation of air bubbles. Pressure was then applied from the top and the mould was allowed to cure at room temperature for 72 hrs. During application of pressure some amount of epoxy and hardener squeezes out. Adequate care has been taken to consider this loss during manufacturing so that a constant thickness of sample can be maintained. This procedure was adopted for preparations of 5, 10 and 15% weight fractions of fibere reinforced epoxy composite slabs. After 72 hrs the samples were taken out from the mould and then cut in to required sizes as per ASTM standards for Mechanical test. Figure (3.2) shows the wooden mould, fiber reinforced epoxy composite slabs.

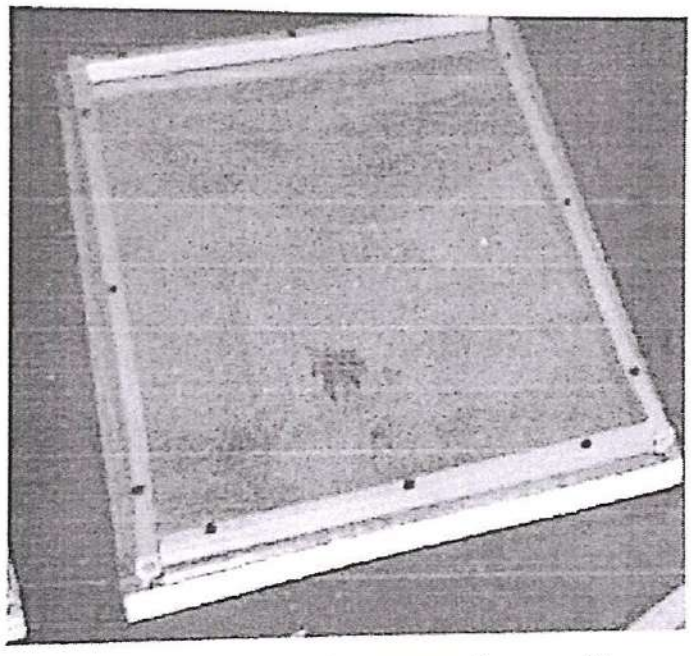

Figure 3-2 Composite preparation mould.

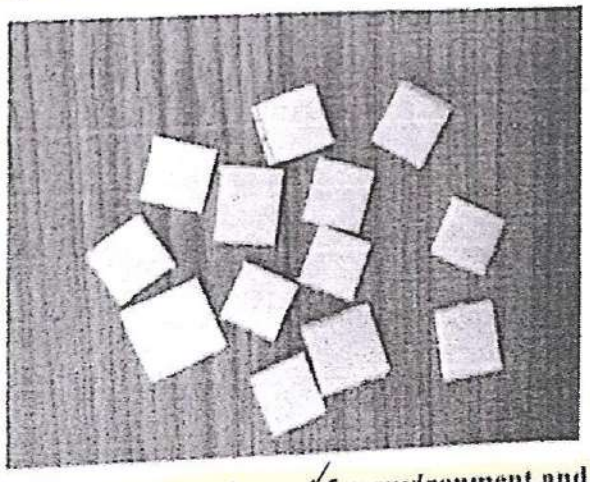

Figure 3-3 square sample used for environment and erosion test

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metal disc mounted on a common shaft and the stream of erodent particles is arranged to strike the upper disc, which has a thin radial slit cut in it.

The exit particles from nozzle impinge on the upper disc with some of the particles passing through the slit, which eventually erode a mark on lower disc. Two erosion exposures are made, one with stationary disc and other with rotating disc at known rpm. These exposures give rise to erosion marks A and B on the lower disc (Figure .1). Measurement of the angular displacement between these marks gives a measure of the flight time of the particles as they cross the space between the discs. The particle velocity can be found by using the following equation.

$$\text{Particle velocity} = \frac{2\pi \times N \times R \times L}{60000 \times S} \qquad 4(a)$$

Where 'L' is separation of two discs, 'N' speed of double disk in rpm, S sector in mm $= R \times \theta$ (in radians)

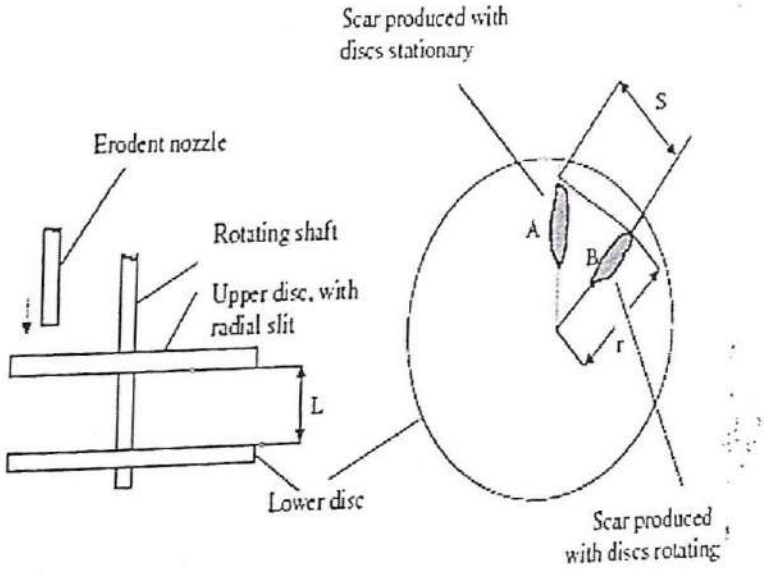

Figure 4-1 Schematic diagram of methodology used for velocity calibration

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Figure 4-2 Photograph of the Solid Particle Erosion Test Set up and reading observations

The condition under which the erosion test has been carried out is given in Table A standard test procedure is employed for each erosion test. The sample were cleaned with petroleum ether and weighted to an accuracy of 0.001g using Pan electronic machine (Contach Mach) before and after each erosion test. The test samples are loaded in the test rig with desired angle of impingement were eroded for 3minutes and weighted to determine the weight loss (W_s). The erosion rate (E_r) is then calculated by using the following equation.

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Results and Discussions

The readings of the samples have been at different pressures of 0.5 bar, 1 bar, 1.5 Bar at angles of 30, 45, 60, 90 degrees and they were tabulated as shown in the table.

The corresponding graphs were drawn using Origin Software and all graphs have been shown in the figures.

Table 4.1 for pressure of 0.5 [*g/(cm^2)*]

	Pressure 0.5 [*kg/(cm^2)*]		
Angle	4	8	12
30	0.00015	0.0001	0.00015
45	8.33E-05	1E-04	8.33E-05
60	0.000133	0.000183	8.33E-05
90	0.000167	0.000133	0.000167

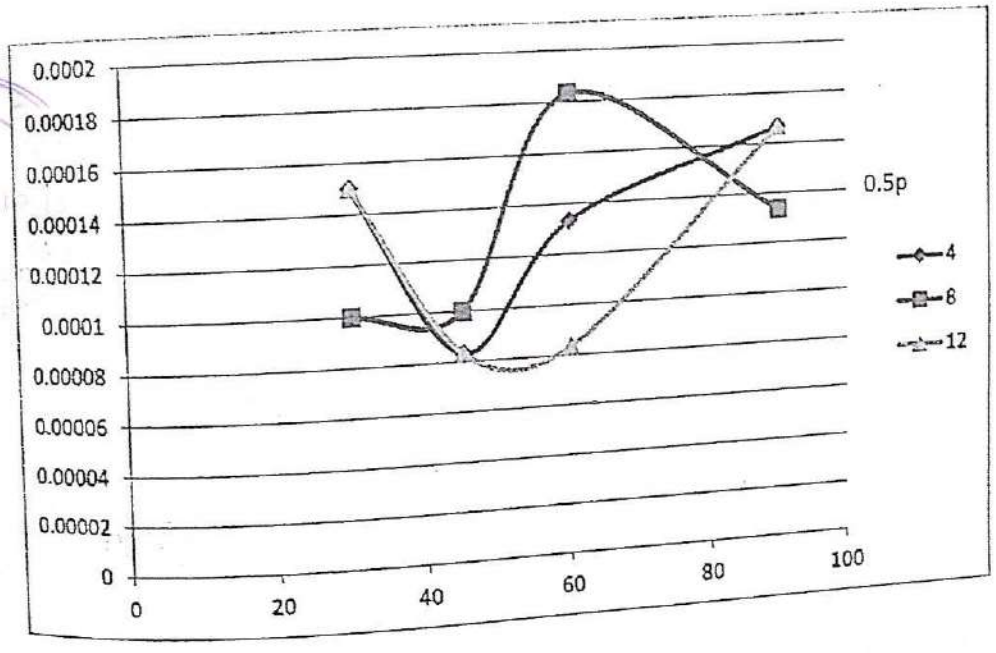

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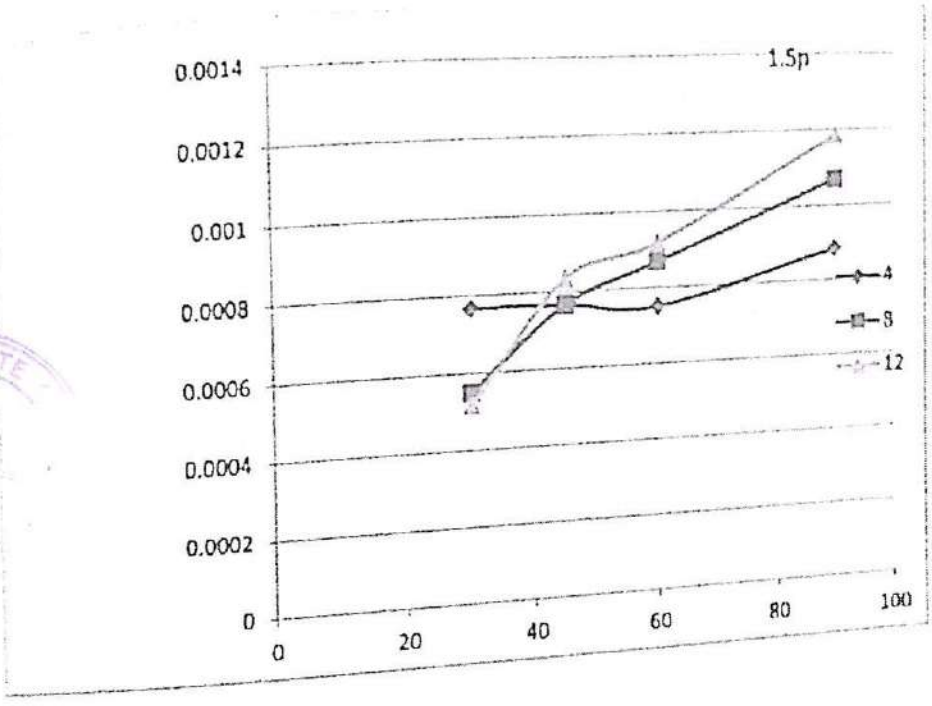
Table 4.1 for pressure of 1.5 [g/(cm^2)]

	Pressure 1.5 [kg/(cm^2)]		
Angle	4	8	12
30	0.000767	0.00055	0.000517
45	0.000767	0.000767	0.000833
60	0.00075	0.000867	0.000917
90	0.000883	0.001067	0.001183



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CONCLUSION

In this work , glass fiber , reinforced epoxy, Titanium oxide composites are developed and their erosion property is evaluated through erosion testing machine(ETM) by which mechanical properties such as Erosion behavior is evaluated and interfacial properties, internal cracks and internal structure of the fractured surfaces are evaluated and the tested readings for different materials of composites are observed and graph is plotted. From the results we have concluded that among **PURE EPOXY , GLASS FIBRE , TITANIUM OXIDE** composite more erosion has observed in the pure epoxy because of low strength compared to titanium and glass fibre composites and titanium oxide composite has less erosion among all because of its high hardness of the material.

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