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# Display of Department of CS& E Sample POs, PSOs & COs

## Department of Computer Science & Engineering

### PROGRAM OUTCOMES (PO's)

PO 1: Apply the knowledge of Mathematics, Science and Computer Engineering to identify, formulate and solve any engineering problems with varied complexity.

PO 2: Design and develop a system, component or process to meet the desired needs within the realistic constraints to solve the real-time problems for betterment of society.

PO 3: Design and conduct experiments as well as analyze and interpret data.

PO 4: Communicate and Present the information effectively.

PO 5: Use the techniques, skills and modern engineering tools necessary for engineering practice.

PO 6: Handle various technical, administrative and managerial responsibilities successfully in any organizations globally.

PO 7: Get Recognize as successful Entrepreneur globally.

PO 8: Demonstrate commitment in handling any responsibilities with professional, ethical and social importance.

PO 9:Engage in lifelong learning to upgrade their engineering skills consistently.

PO 10: Adapt to any working environment of heterogeneous and multidisciplinary teams with good sustainability and high performance.

PO 11: Clear successfully the competitive exams for placement, higher studies and government services.

PO 12: Understand and demonstrate the impact of engineering solutions in a global , economic , environmental and societal context.

### PROGRAM SPECIFIC OUTCOMES (PSO's)

PSO 1: An ability to design and develop hardware and software in emerging technology environments like cloud computing embedded products and real-time systems. (Orientation towards Systems Programming)

PSO 2: Knowledge of data management system like data acquisition, big data so as to enable students in solving problems using the techniques of data analytics like pattern recognition and knowledge discovery. (Orientation towards Data Sciences)


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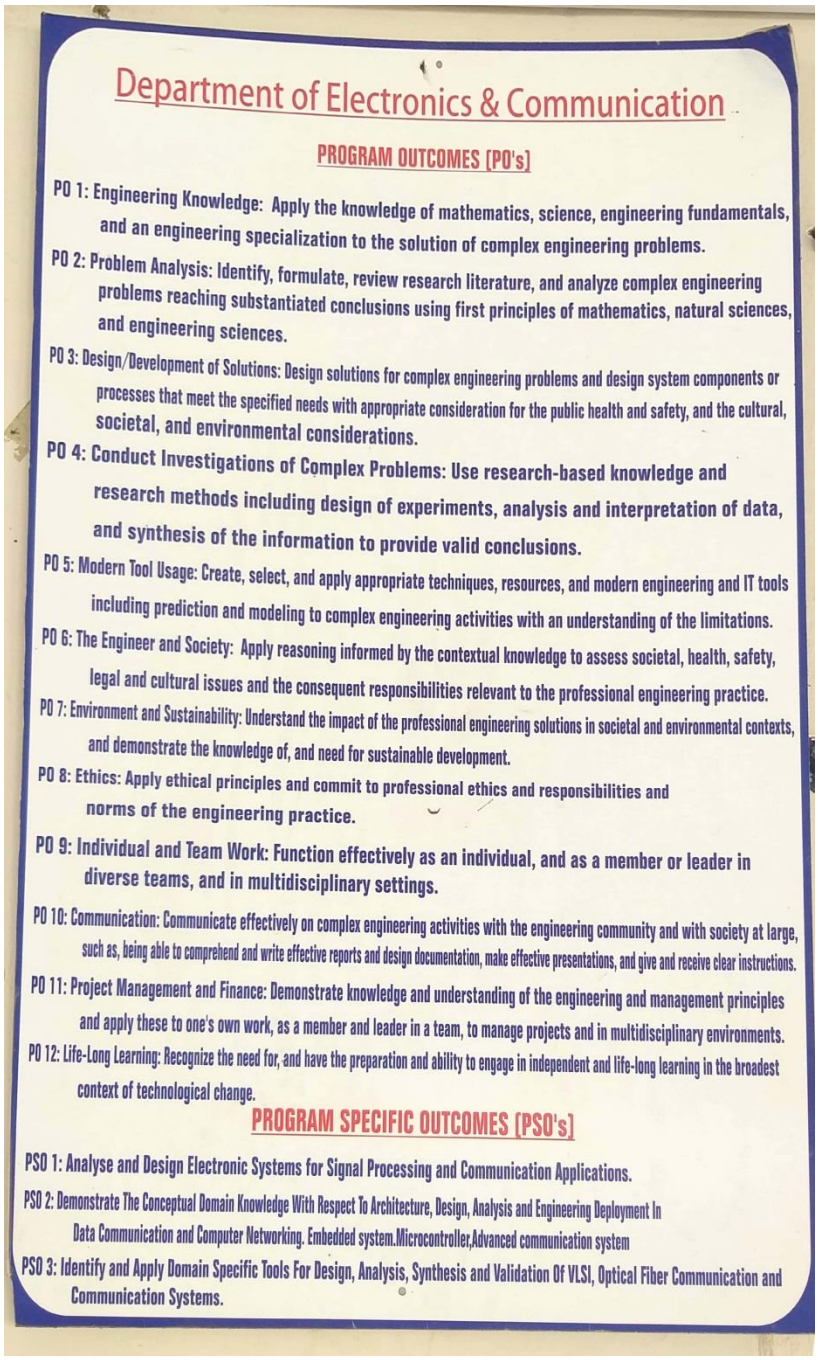
## Display of Department of E& C Sample POs, PSOs & COs



### Department of Electronics & Communication

**PROGRAM OUTCOMES [PO's]**

PO 1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3: Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6: The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11: Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

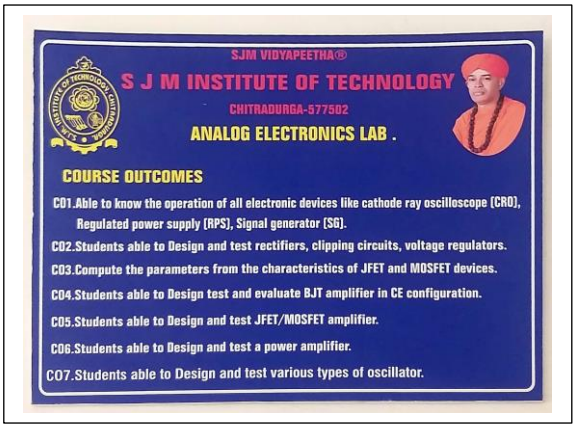
PO 12: Life-Long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**PROGRAM SPECIFIC OUTCOMES [PSO's]**

PSO 1: Analyse and Design Electronic Systems for Signal Processing and Communication Applications.

PSO 2: Demonstrate The Conceptual Domain Knowledge With Respect To Architecture, Design, Analysis and Engineering Deployment In Data Communication and Computer Networking. Embedded system.Microcontroller,Advanced communication system

PSO 3: Identify and Apply Domain Specific Tools For Design, Analysis, Synthesis and Validation Of VLSI, Optical Fiber Communication and Communication Systems.



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**ANALOG ELECTRONICS LAB .**

**COURSE OUTCOMES**

CO1.Able to know the operation of all electronic devices like cathode ray oscilloscope (CRO), Regulated power supply (RPS), Signal generator (SG).
CO2.Students able to Design and test rectifiers, clipping circuits, voltage regulators.
CO3.Compute the parameters from the characteristics of JFET and MOSFET devices.
CO4.Students able to Design test and evaluate BJT amplifier in CE configuration.
CO5.Students able to Design and test JFET/MOSFET amplifier.
CO6.Students able to Design and test a power amplifier.
CO7.Students able to Design and test various types of oscillator.

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## Display of Department of E& E Sample POs, PSOs & COs

### Department of Electrical &Electronics

#### PROGRAM OUTCOMES (PO's)

Po 1:Engineering Knowledge: Apply Knowledge Of Differential Equations, Vector Calculus, Complex Variables, Matrix Theory, Probability Theory, Physics And Chemistry, Electrical And Electronic Engineering Fundamentals.

PO 2:Problem Analysis: Graduates will Identify, formulate and solve complex electrical and electronics engineering problems using the first principles of mathematics natural sciences and engineering science

PO 3:Design: Graduates will design Electrical and Electronics systems meeting the given specifications for different problems taking safety and precautions into consideration.

PO 4:Investigations: Graduates will Perform investigations, design and conduct experiments, analyze and interpret the results to provide valid conclusions.

PO 5:Tool Usage: Graduates will use modern software tools to model and analyze problems, apply appropriate techniques and IT tools for the design & analysis of the systems keeping in view their limitations.

PO 6:The Engineer and Society: Graduates will understand the impact of local and global issues / happenings and assess societal, health, legal and cultural issue with competency in professional engineering practice on Electrical Engineers.

PO 7: Environment and Sustainability: Graduates will Demonstrate professional skills and contextual reasoning and provide sustainable solutions for problems related to Electrical and Electronics Engineering and also will understand their impact on environment.

PO 8:Ethics: Graduates will have knowledge of professional ethics and code of conduct as applied to Electrical Engineers.

PO 9:Individual and Team work:Graduates will work effectively as an individual and as a member or leader in diverse teams and in multi-disciplinary settings.

PO 10:Communication: Graduates will communicate effectively in both verbal and written form among engineering community, being able to comprehend and write reports, presentation and give / receive clear instructions.

PO 11:Project Management and Finance:Graduates will plan, demonstrate and execute engineering & management principles in their own / team projects in multidisciplinary environment

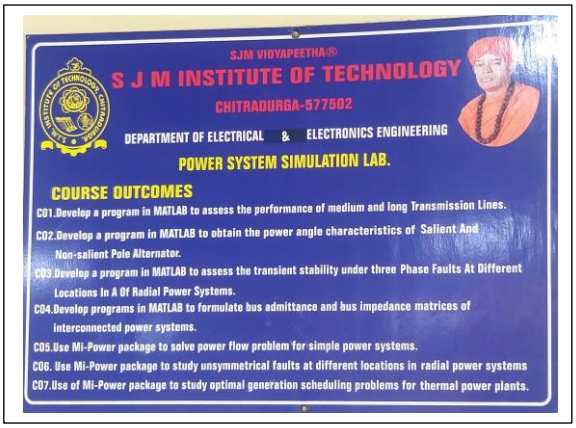
PO 12:Life-long learning: Graduates will have the ability for self- education, recognize the need for and have the ability to engage in independent and lifelong learning.

#### PROGRAM SPECIFIC OUTCOMES (PSO's)

PSO 1: Ability to specify architect, design and analyze systems that efficiency generate, transmit, distribute and utilize electrical power.

PSO 2: Ability to specify design, prototype and test modern electronic systems that perform analog and digital processing function.

PSO 3: Ability to use software for design, simulation and analysis of electrical system.

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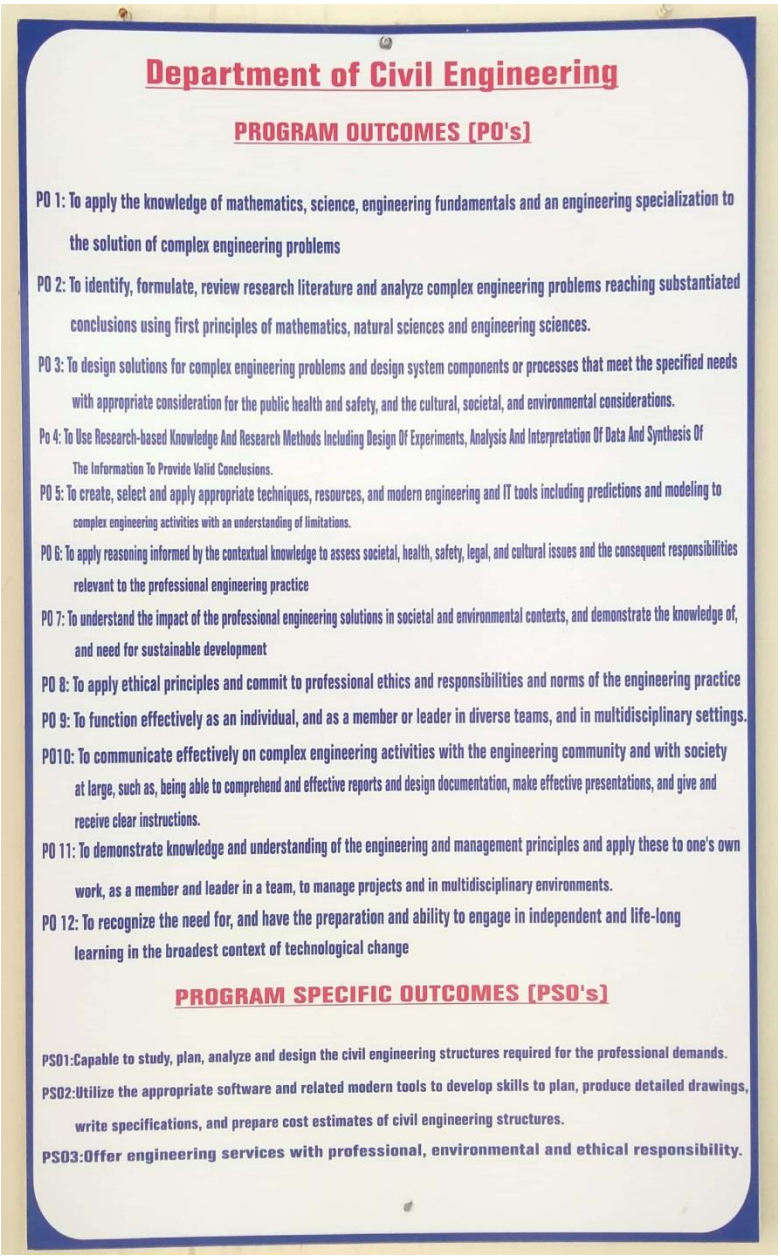
## Display of Department of Civil Engineering Sample POs, PSOs & COs



### Department of Civil Engineering

#### PROGRAM OUTCOMES [PO's]

PO 1: To apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems

PO 2: To identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PO 3: To design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

Po 4: To Use Research-based Knowledge And Research Methods Including Design Of Experiments, Analysis And Interpretation Of Data And Synthesis Of The Information To Provide Valid Conclusions.

PO 5: To create, select and apply appropriate techniques, resources, and modern engineering and IT tools including predictions and modeling to complex engineering activities with an understanding of limitations.

PO 6: To apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

PO 7: To understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

PO 8: To apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice

PO 9: To function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: To communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11: To demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

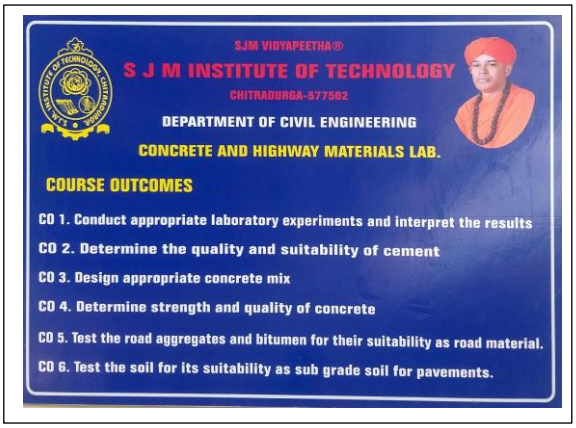
PO 12: To recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

#### PROGRAM SPECIFIC OUTCOMES [PSO's]

PSO1:Capable to study, plan, analyze and design the civil engineering structures required for the professional demands.

PSO2:Utilize the appropriate software and related modern tools to develop skills to plan, produce detailed drawings, write specifications, and prepare cost estimates of civil engineering structures.

PSO3:Offer engineering services with professional, environmental and ethical responsibility.



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DEPARTMENT OF CIVIL ENGINEERING

CONCRETE AND HIGHWAY MATERIALS LAB.

COURSE OUTCOMES

CO 1. Conduct appropriate laboratory experiments and interpret the results

CO 2. Determine the quality and suitability of cement

CO 3. Design appropriate concrete mix

CO 4. Determine strength and quality of concrete

CO 5. Test the road aggregates and bitumen for their suitability as road material.

CO 6. Test the soil for its suitability as sub grade soil for pavements.

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## Display of Department of Mechanical Engineering Sample POs, PSOs & COs

### Department of Mechanical Engineering

#### PROGRAM OUTCOMES (PO's)

PO 1: Engineering Knowledge: Apply The Knowledge Of Mathematics, Science, Mechanical Engineering, Engineering Fundamentals, To The Solution Of Complex Engineering Problems.

PO 2: Problem Analysis: Identify, Formulate, Review Research Literature, And Analyze Complex Engineering Problems Reaching Substantiated Conclusions Using First Principles Of Mathematics, Natural Sciences, And Engineering Sciences.

PO 3: Design/development Of Solutions: Design Solutions For Complex Engineering Problems And Design System Components Or Processes That Meet The Specified Needs With Appropriate Consideration For The Public Health, Societal, And Environmental Considerations.

PO 4: Conduct Investigations Of Complex Problems: Use Research Based Knowledge And Research Methods Including Design Of Experiments, Analysis And Interpretation Of Data, And Synthesis Of The Information To Provide Valid Conclusions.

PO 5: Modern Tool Usage: Create, Select, And Apply Appropriate Techniques, Resources, Including Prediction And Modeling To Complex Engineering Activities With An Understanding Of The Limitations.

PO 6: The Engineer And Society: Apply Reasoning Informed By The Contextual Knowledge To Assess Societal, Health, Safety, Legal And Cultural Issues And T He Consequent Responsibilities Relevant To The Professional Engineering Practice.

PO 7: Environment And Sustainability: Understand The Impact Of The Professional Engineering Solutions In Societal And Environmental Contexts, And Demonstrate The Knowledge Of, And The Need For Sustainable Developments.

PO 8: ethics: apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual And Team Work: Function Effectively As An Individual, And As A Member Or Leader In Diverse Teams, And In Multidisciplinary Settings.

PO 10: Communication: Communicate Effectively On Complex Engineering Activities With The Engineering Community And With Society At Large, Such As, Being Able To Comprehend And Write Effective Reports And Design Documentation, Make Effective Presentations, And Give And Receive Clear Instructions.

PO 11: Project Management And Finance: Demonstrate Knowledge And Understanding Of The Engineering And Management Principles And Apply These To One's Own Work, As A Member And Leader In A Team, To Manage Projects And In Multi-disciplinary Environments.

PO 12: Life-long Learning: Recognize The Need For Identifying Contemporary Technical Challenges And Redefining To Develop Solutions To Satisfy Given Criteria In An Optimal Manner Using Creativity In Design.

#### PROGRAM SPECIFIC OUTCOMES (PSO's)

PSO 1: Apply Their Knowledge In The Domain Of Engineering Mechanics, Thermal And Fluid Sciences To Solve Engineering Problems Utilizing Advanced Technology.

PSO 2: Successfully Apply The Principles Of Design, Analysis And Implementation Of Mechanical Systems/processes Which Have Been Learned As A Part Of The Curriculum.

PSO 3: Develop And Implement New Ideas On Product Design And Development With The Help Of Modern Cad/cam Tools, While Ensuring Best Manufacturing Practices.


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## Display of POs, PSOs & COs in Laboratory Manuals

VISVESVARAYA TECHNOLOGICAL UNIVERSITY,
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**S.J.M. Institute of Technology,**
**Chitradurga – 577 502**

Department of Computer Science and Engineering

**"COMPUTER NETWORK LABORATORY MANUAL"**

[ 18CSL57 ]

**5th Semester - 'CBCS Scheme'**

2020 - 21

: FACULTIES IN-CHARGE :

Prof. Shruthi M K B.E., M.Tech.,

Prof. Dharaneesha H D B.E., M.Tech.,

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**Department of Computer Science & Engineering**

## Program Outcomes (POs)

**PO 1:** Apply the knowledge of Mathematics, Science and Computer Engineering to identify, formulate and solve any engineering problems with varied complexity.

**PO 2:** Design and develop a system, component or process to meet the desired needs within the realistic constraints to solve the real-time problems for betterment of society.

**PO 3:** Design and conduct experiments as well as analyze and interpret data.

**PO 4:** Communicate and Present the information effectively.

**PO 5:** Use the techniques, skills and modern engineering tools necessary for engineering practice.

**PO 6:** Handle various technical, administrative and managerial responsibilities successfully in any organizations globally.

**PO 7:** Get Recognize as successful Entrepreneur globally.

**PO 8:** Demonstrate commitment in handling any responsibilities with professional, ethical and social importance.

**PO 9:** Engage in lifelong learning to upgrade their engineering skills consistently.

**PO 10:** Adapt to any working environment of heterogeneous and multidisciplinary teams with good sustainability and high performance.

**PO 11:** Clear successfully the competitive exams for placement, higher studies and government services.

**PO 12:** Understand and demonstrate the impact of engineering solutions in a global , economic , environmental and societal context.

## Program Specific Outcomes (PSOs)

**PSO 1:** An ability to design and develop hardware and software in emerging technology environments like cloud computing embedded products and real-time systems. (Orientation towards Systems Programming)

**PSO 2:** Knowledge of data management system like data acquisition, big data so as to enable students in solving problems using the techniques of data analytics like pattern recognition and knowledge discovery. (Orientation towards Data Sciences)

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**Department of Computer Science & Engineering**

## Course Outcomes (COs)

**CO1:** Analyze and Compare various networking protocols

**CO2:** Demonstrate the working of different concepts of networking

**CO3:** Implement, analyze and evaluate networking protocols in NS2/NS3 and JAVA Programming Language

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## VTU curriculum syllabus sample copy providing COs

**B. E. ELECTRICAL AND ELECTRONICS ENGINEERING**
**Choice Based Credit System (CBCS) and Outcome Based Education (OBE)**
**SEMESTER - VI**

**POWER SYSTEM ANALYSIS – 1 (Core Subject)**

| | | | |
|---|---|---|---|
| Course Code | 18EE62 | CIE Marks | 4 |
| Number of Lecture Hours/Week (L:T:P) | 3:2:0 | SEE Marks | 6 |
| Credits | 04 | Exam Hours | 0 |

**Course Learning Objectives:**

- To introduce the per unit system and explain its advantages and computation.
- To explain the concept of one line diagram and its implementation in problems.
- To explain the necessity and conduction of short circuit analysis.
- To explain analysis of three phase symmetrical faults on synchronous machine and simple power systems.
- To discuss selection of circuit breaker.
- To explain symmetrical components, their advantages and the calculation of symmetrical components of voltages and currents in un-balanced three phase circuits.
- To explain the concept of sequence impedance and its analysis in three phase unbalanced circuits.
- To explain the concept of sequence networks and sequence impedances of an unloaded synchronous generator, transformers and transmission lines.
- To explain the analysis of synchronous machine and simple power systems for different unsymmetrical faults using symmetrical components.
- To discuss the dynamics of synchronous machine and derive the power angle equation for a synchronous machine.
- Discuss stability and types of stability for a power system and the equal area criterion for the evaluation of stability of a simple system. ■

**Module-1**

**Representation of Power System Components:** Introduction, Single-phase Representation of Balanced Three Phase Networks, One-Line Diagram and Impedance or Reactance Diagram, Per Unit (PU) System, Steady State Model of Synchronous Machine, Power Transformer, Transmission of Electrical Power, Representation of Loads. ■

**Module-2**

**Symmetrical Fault Analysis:** Introduction, Transient on a Transmission Line, Short Circuit of a Synchronous Machine(On No Load), Short Circuit of a Loaded Synchronous Machine, Illustrative simple examples on power systems. Selection of Circuit Breakers. ■

**Module-3**

**Symmetrical Components:** Introduction, Symmetrical Component Transformation, Phase Shift in Star-Delta Transformers, Sequence Impedances of Transmission Lines, Sequence Impedances and Sequence Network of Power System, Sequence Impedances and Networks of Synchronous Machine, Sequence Impedances of Transmission Lines, Sequence Impedances and Networks of Transformers, Construction of Sequence Networks of a Power System. ■

**Module-4**

**Unsymmetrical Fault Analysis:** Introduction, Symmetrical Component Analysis of Unsymmetrical Faults, Single Line-To-Ground (LG) Fault, Line-To-Line (LL) Fault, Double Line-To-Ground (LLG) Fault, Open Conductor Faults. ■

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**Module-5**

**Power System Stability:** Introduction, Dynamics of a Synchronous Machine, Review of Power Angle Equation, Simple Systems, Steady State Stability, Transient Stability, Equal Area Criterion, Factors Affecting Transient Stability, Multi machine stability studies, classical representation. ■

**Course Outcomes:** At the end of the course the student will be able to:

- Model the power system components & construct per unit impedance diagram of power system.
- Analyze three phase symmetrical faults on power system.
- Compute unbalanced phasors in terms of sequence components and vice versa, also develop sequence networks.
- Analyze various unsymmetrical faults on power system.
- Examine dynamics of synchronous machine and determine the power system stability. ■

COs

**Question paper pattern:**

- The question paper will have ten questions.
- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of three sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module. ■

**Text Book**

| | | | | |
|---|---|---|---|---|
| 1. | Elements of Power System | William D. StevensonJr | McGraw Hill | 4th Edition, 1982 |

**Reference Books**

| | | | | |
|---|---|---|---|---|
| 1 | Modern Power System | D. P. Kothari | McGraw Hill | 4th Edition, 2011 |
| 2 | Power System Analysis and Design | J.Duncan Glover et al | Cengage | 4th Edition, 2008 |
| 3 | Power System Analysis | Hadi Sadat | McGraw Hill | 1st Edition, 2002 |

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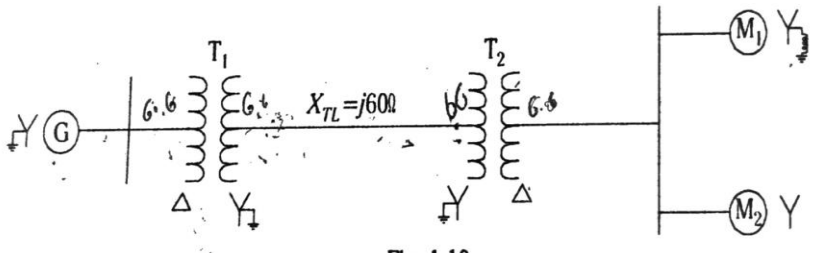
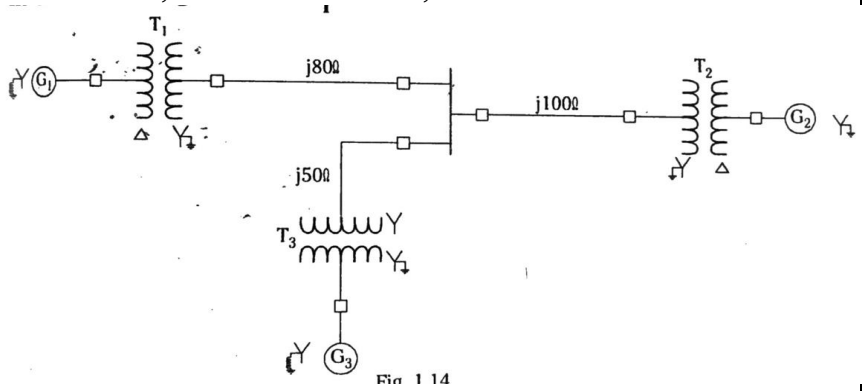
## Sample Internal Test question Papers with COs

| | | | | |
|---|---|---|---|---|
| Department : **Electrical & Electronics Engg** | | | Name of the Faculty : **Dr. Manjunatha S C** | |
| Course : **Power System Analysis-1** | | | Code : **18EE62** | |
| Semester : **6th** | Test : **1st** | Date : **09/05/2022** | Time : **2:45 PM to 3:45 PM** | Max. Marks : **30** |
| **Note : Answer any TWO full questions** | | | | |

| *Q. No.* | | *Questions* | *Marks* | *CL* | *CO* | *PO* |
|---|---|---|---|---|---|---|
| 1 | a) | Show that per unit impedance of two winding transformer will remain same referred to primary as well as secondary. | 5 | R/ U | 1 | 1 |
| | b) | Define per unit quantity. Mention the advantages of per unit system. | 5 | R/ U | 1 | 1 |
| | c) | Draw the reactance diagram of the system shown in fig. the ratings of the components are:<br>G: 15 MVA, 6.6 kV, X''= 12%<br>T1: 20 MVA, 6.6/66 kV, X = 8%<br>T2: 20 MVA, 66/6.6 kV, X = 8%<br>M1 & M2 : 5 MVA, 6.6 kV, X''= 20%<br>  | 5 | R | 2 | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2 | a) | Define one line diagram. Explain with diagram. | 5 | R/U | 1 | 1,2 |
| | b) | Obtain the equivalent circuit of a synchronous machine. | 5 | R/U/ AP | 1 | 2,3 |
| | c) | A three winding transformer has rating as follows:<br>Primary: Y connected, 6.6 kV, 15 MVA<br>Secondary: Y connected, 33 kV, 10 MVA<br>Tertiary: Δ connected, 2.2 kV, 7.5 MVA<br>Leakage impedance measured from primary as $Z_{ps}$ = j0.232Ω, $Z_{pt}$= j0.29Ω, and on the secondary side $Z_{st}$= j8.7Ω. Find the star connected equivalent on a base of 15 MVA, 6.6 KV in the primary circuit. Neglect resistances. | 5 | R/U | 2 | 1,3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3 | a) | Obtain the equivalent circuit of two winding transformer. | 5 | R/ U | 2 | 1,3 |
| | b) | The one line diagram of an unloaded generator is shown in fig. draw the per unit impedance diagram. Choose a base of 50 MVA, 13.8 kV in the circuit of generator $G_1$. The generators and transformers are rated as follows:<br>$G_1$: 20 MVA, 13.8 kV, X'' = 0.2 p.u<br>G2: 30 MVA, 18 kV, X''= 0.2 p.u<br>G1: 30 MVA, 20 kV, X''= 0.2 p.u<br>T1: 25 MVA, Y 220 kV/13.8kV Δ , X= 10%<br>T2: Three single phase units each rated 10 MVA,127/18 kV, X = 10%<br>T3: 35 MVA, 220 kV Y/22 kV Y, X=10%<br>  <br><br>Fig. 1.14 | 5 | R/ U | 2 | 1,2 |
| | c) | Obtain equivalent circuit of a three winding transformer & mention its advantages. | 5 | R/ U/ | 2 | 1,3 |

| |
|---|
| **CO1**: *Model the power system components & construct per unit impedance diagram of power system.* |
| **CO2**: *Analyze three phase symmetrical faults on power system.* |
| **CO3**: *Compute unbalanced phasors in terms of sequence components and vice versa, also develop sequence networks.* |
| **CO4**: *Analyze various unsymmetrical faults on power system.* |
| **CO5:** *Examine dynamics of synchronous machine and determine the power system stability.* |

COs

***CL: COGNITIVE LEVEL (R: Remember; U: Understand; Ap: Apply; A: Analyze; E: Evaluate; C: Create)***

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| | | | | |
|---|---|---|---|---|
| Department : **Electrical & Electronics Engg** | | | Name of the Faculty : **Dr. Manjunatha S C** | |
| Course : **Power System Analysis-1** | | | Code : **18EE62** | |
| Semester : **6th** | Test : **2nd** | Date : **06/05/2022** | Time : **2:45 PM to 3:45 PM** | Max. Marks : **30** |
| **Note : Answer any TWO full questions** | | | | |

| *Q. No.* | | *Questions* | *Marks* | *CL* | *CO* | *PO* |
|---|---|---|---|---|---|---|
| 1 | a) | What is fault? What are the factors responsible for the faults? | 7 | R/ U | 1 | 1 |
| | b) | Explain the transients occurring on a transmission line on the occurrence of a short circuit. Obtain the expression for maximum momentary current. | 8 | R/ U | 1 | 1 |
| 2 | a) | Prove that $X_d'' < X_d' < X_d$ | 7 | R/U | 1 | 1,2 |
| | b) | A synchronous generator and motor are rated for 30,000 KVA, 13.2 KV and both have sub transient reactance of 20%. The line connecting them has a reactance of 10% on the base of machine ratings. The motor is drawing 20,000 KW at 0.8 p.f. leading. The terminal voltage of the motor is 12.8 KV. When a symmetrical three phase fault occurs at motor terminals, find the sub transient current in the generator, motor and at the fault point. ( using Thevnin's Theorem ) | 8 | R/U/ AP | 2 | 2,3 |
| 3 | a) | Two generators are connected in parallel to the low voltage (LV) side of a three phase Delta-Star transformer. The ratings of the machines are<br>Generator G1: 50 MVA, 13.98 KV, $X_d'' = 25\%$<br>Generator G2: 25 MVA, 13.8 KV, $X_d'' = 25\%$<br>Transformer T: 75 MVA, 13.8KV/69 KV, X = 10%<br>Before the fault occurs, the voltage on the high voltage side of the transformer is 66 KV. The transformer is unloaded and there is no circulating current between the generators. Find the sub transient current in each generator when a three phase fault occurs on the high voltage side of the transformer. | 8 | R/ U | 2 | 1,3 |
| | b) | Write a short note on selection of circuit breakers. | 7 | R/ U | 3 | 1,2 |

| |
|---|
| **CO1**: *Model the power system components & construct per unit impedance diagram of power system.* |
| **CO2**: *Analyze three phase symmetrical faults on power system.* |
| **CO3**: *Compute unbalanced phasors in terms of sequence components and vice versa, also develop sequence networks.* |
| **CO4**: *Analyze various unsymmetrical faults on power system.* |
| **CO5:** *Examine dynamics of synchronous machine and determine the power system stability.* |

COs

***CL: COGNITIVE LEVEL (R: Remember; U: Understand; Ap: Apply; A: Analyze; E: Evaluate; C: Create)***

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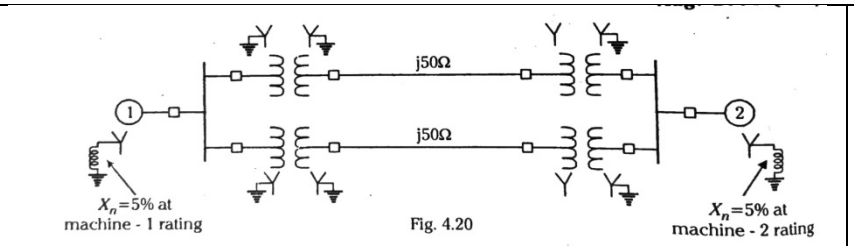
**NAAC Accredited with B++ Grade**

| | | | | |
|---|---|---|---|---|
| Department : **Electrical & Electronics Engg** | | | Name of the Faculty : **Dr. Manjunatha S C** | |
| Course : **Power System Analysis-1** | | | Code : **18EE62** | |
| Semester : **6th** | Test : **3rd** | Date : **13/07/2022** | Time : **2:45 PM to 3:45 PM** | Max. Marks : **30** |
| **Note : Answer any TWO full questions** | | | | |

| *Q. No.* | | *Questions* | *Marks* | *CL* | *CO* | *PO* |
|---|---|---|---|---|---|---|
| 1 | a) | Derive expression for symmetrical components in terms of phase voltages. | 5 | R/U | 2 | 1 |
| | b) | Derive relation between sequence components of phase and line voltages in star connected system. | 5 | R/U | 2 | 1 |
| | c) | A balanced delta connected load is connected to a three phase symmetrical supply. The line currents are each 10A in magnitude. If fuse in one of the lines blows out, determine the sequence components of line current. | 5 | R | 2 | 1 |
| 2 | a) | Draw the zero sequence components for star-star, delta-delta, and star-delta connected transformers. | 5 | R/U | 2 | 1,2 |
| | b) | Explain the sequence impedance of a synchronous generator. | 5 | R/U /AP | 3 | 2,3 |
| | c) | Draw the positive, negative and zero sequence networks for the power system shown below.<br>Choose a base of 50 MVA, 220 kV in the 50 ohm transmission lines and mark all reactance in p.u. the ratings of the generators and transformers are:<br>Generator 1: 25 MVA, 11 kV, X''= 20%<br>Generator 1: 25 MVA, 11 kV, X''= 20%<br>Three phase transformer (each): 20MVA, 11Y/220 Y kV. X=15%.<br>The negative sequence reactance of each synchronous machine is equal to the sub transient reactance. The zero sequence reactance of each machine is 8%. Assume that the zero sequence reactances of lines are 250% of their positive sequence reactances. | 5 | R/U | 4 | 1,3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | |  Fig. 4.20 | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3 | a) | Derive an expression for fault current in case of single line to ground fault (LG). Draw the interconnection of sequence network. | 5 | R/ U | 3 | 1,3 |
| | b) | Derive an expression for fault current in case of single line to ground fault (LLG). Draw the interconnection of sequence network. | 5 | R/ U | 4 | 1,2 |
| | c) | In a 3 phase, 3 wire system, the line currents are $I_a = 100\angle 0^0$ A and $I_b = 100\angle -100$ A. determine the sequence components of line currents. | 5 | R/ U/ | 5 | 1,3 |

| |
|---|
| **CO1**: *Model the power system components & construct per unit impedance diagram of power system.* |
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COs

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## Sample of COs written in Internal Test Answer Book

**COURSE OUTCOME'S (COs)**

At the end of the course the student will be able to :

→ Explain the construction, operation and classification of DC Motor, AC Motor and Special purpose motors.

→ Describe the performance characteristics and applications of Electric Motors.

→ Demonstrate and explain the methods of testing of DC machines and determine losses and efficiency.

→ Control the speed of DC Motor and induction motor.

→ Explain the starting methods, equivalent circuit and phasor diagrams, torque angle, effect of change in excitation and change in load, hunting and damping of synchronous motors.

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## Sample of COs written in Laboratoty Record Book

Experiment No. :  Date :

Name of the Experiment  Page No.:

:- COURSE OUTCOMES :-

At the end of the course the Student will be able to

* Test DC machine to determine their characteristics and also to control the speed of DC motors
* pre-determine the performance characteristics of DC machines by conducting suitable test
* perform load test on single phase and three phase induction motors to assess its performance.
* Conduct test on load induction motors to pre determine the performance characteristics.
* Conduct test on synchronous motors to draws the performance curves.

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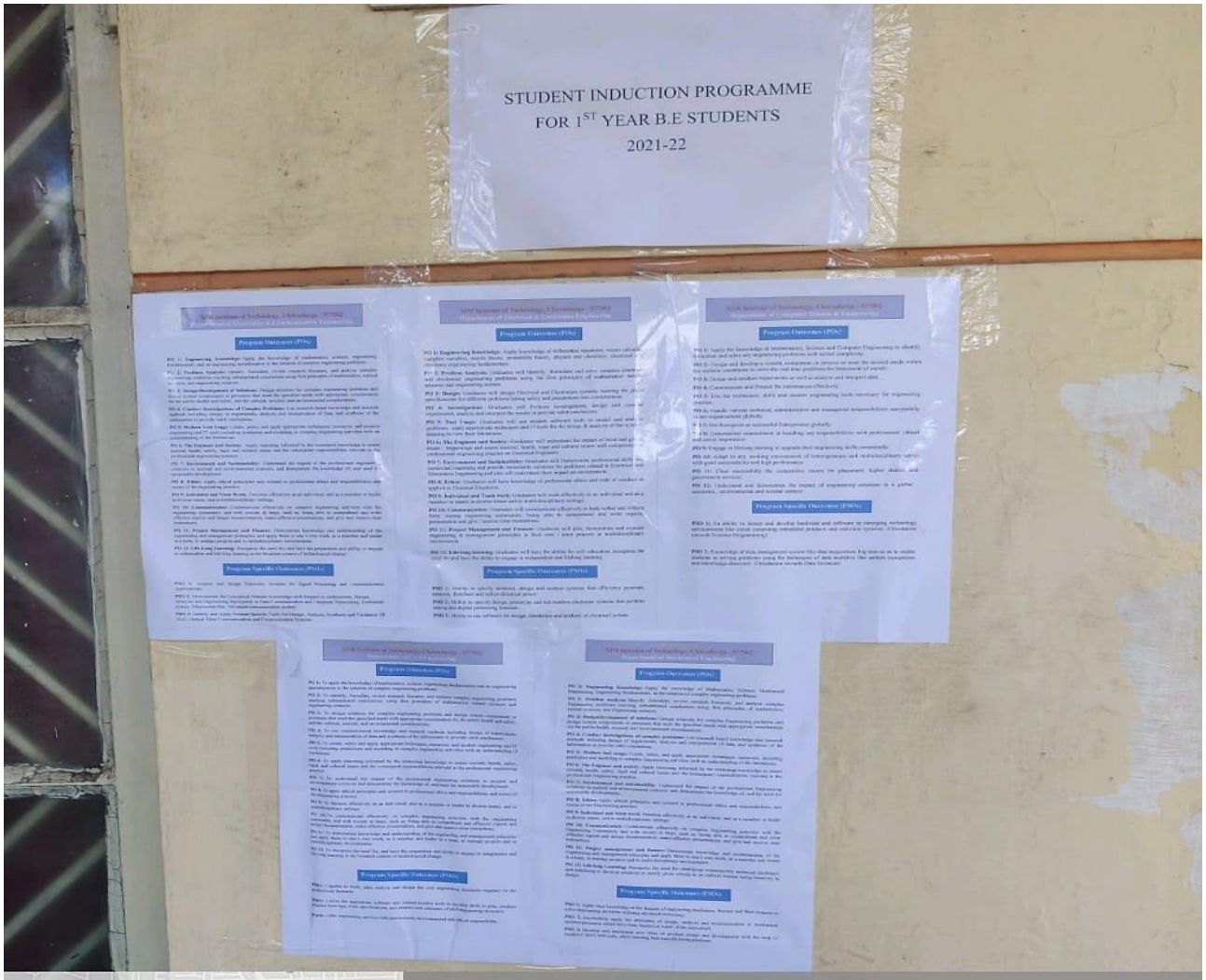
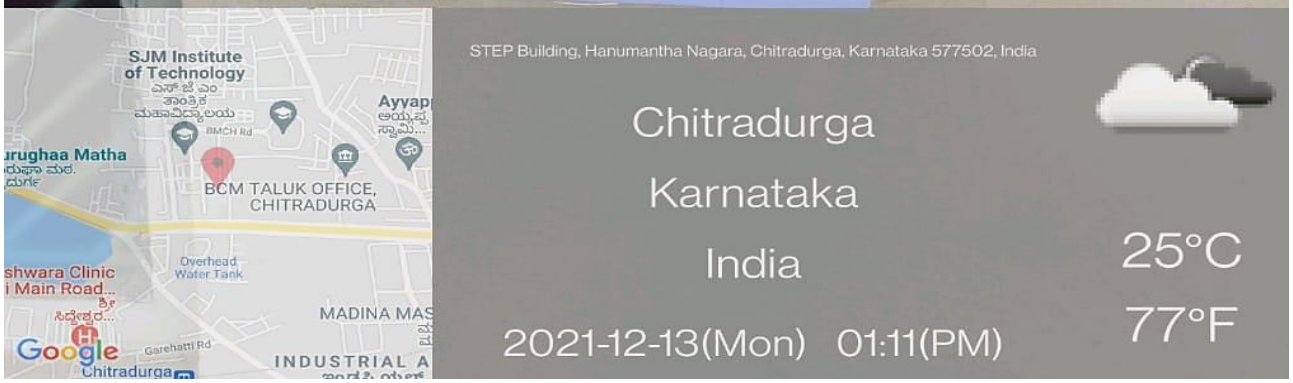
## Display of POs & PSOs for all Programmes during the Induction Program 2021-22

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