

"PVC" NSSK Govt. Polytechnic Bilaspur at Kalol
Lecture Planning (Theory)

Branch : Electrical Engg.
 Subject : ELECTRICAL TESTING AND COMMISSIONING
 Teacher : Jyoti Bala

Semester: 5th
 Session: AUG- DEC, 26
 Cass Room : L4

Sr. No.	No. of Lectures	Chapter/ Unit Description	Detail of Contents	Reference Resources	Remarks
1.	1-16	Electrical Safety and Insulation	Do's and don'ts regarding safety in domestic electrical appliances as well for substation/power station operators, Electrical safety in industry/power stations/ substations at the time of operation/ control/maintenance. Fire detection alarm, fire-fighting equipments Factors affecting life of insulating materials. Measuring insulation resistance by different methods such as i) Polarization, ii) Dielectric, absorption, iii) Megger and to predict the condition of insulation	R1,R2, R3,R4	
2.	17-30	Installation and Erection	Concept of foundation for installation of machinery. Requirements of foundation for static and rotating electrical machinery. Concept of leveling and aligning Procedure for leveling and aligning alignment of direct coupled drive, effects of mis-alignment Installation of transformer and procedure of installation of transformer, Requirements of installation of pole mounted transformer	-do-	
3.	31-50	Testing and Commissioning	Concept of testing, Objectives of testing. Roles of I.S.S. in testing of electrical equipment, Types of tests and concepts, Routine tests, type tests, supplementary test, special tests, Methods of testing - Direct/Indirect/Regenerative testing. Tolerances for the various items for equipment - transformer, induction motor, dc motor, synchronous machines Commissioning, Tests before Commissioning for transformer, induction motor, alternator	-do-	
4.	51-64	Troubleshooting Plans	Internal and external causes for failure / abnormal operation of equipment. List of mechanical faults, electrical faults and magnetic faults in the electrical equipment, remedies, applications Use of tools like megger, earth tester and growler.	-do-	

5.	65-80	Maintenance	Concept of maintenance, types of maintenance, routine, preventive and breakdown maintenance. Causes of failure of electrical machines. Preventive maintenance-procedure or developing maintenance schedules for electrical machines. Factors affecting preventive maintenance schedules, Concept of TPM, Pillars of TPM Identification of different types of faults developed such as mechanical/ electrical/ magnetic faults.	-do-
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Reference Resource:

1. Deshpande. M. V. PHI Learning Pvt. Ltd., 2010, Design and Testing of Electrical Machines ISBN No 8120336453, 9788120336452.
2. R-2. Rao, B V S Asia Club House, First Reprint, 2011, Operation and Maintenance of Electrical Equipment VolI, ISBN No 8185099022
- R-3. Rosenberg. Mc GRAW-HILL, 1 st Edition, May 2003, Maintenance and Repairs, ISBN No 9780071396035
- R-4. Sharotri, S.K. Glencoe/ Mcgraw- Hill; 2nd Edition , June 1969; Preventive Maintenance of Electrical 25 Apparatus, ISBN No 10: 007030839X 13: 978-0070308398

"PVC" NSSK Govt. Polytechnic Bilaspur at Kalol
Lecture Planning (Theory)

Branch : **ELECTRICAL ENGINEERING**
 Subject : **SOLAR POWER TECHNOLOGIES**
 Teacher : **SRISHTI NEGI**

Semester: 5TH
 Session: **AUG - DEC, 26**
 Class Room: **L5**

Sr. No.	No. of Lectures	Chapter/ Unit Description	Detail of Contents	Reference Resources	Remarks
1.	1 - 12	Solar Energy	Solar Map of India: Global solar power radiation Different types of Solar water heaters: Construction, working. Different types of solar cookers, Solar Drying process, solar lighting, and Preventive maintenance of all of the above.	R1,R2, R3,R4,R5	
2.	13 - 28	Concentrated Solar Power (CSP)	Concentrated Solar Power (CSP) plants or solar thermal electric systems, Parabolic Trough: Construction, working and specifications Parabolic Dish: Construction, working and specifications Fresnel Reflectors: Construction, working and specifications Preventive maintenance of all of the above.	-do-	
3.	29 - 44	Solar PV Systems	Solar PV cell: Types, construction, working of solar cells. Solar PV working principle: Series and parallel connections of solar modules. Solar Photovoltaic (PV) system: components, layout and working. Solar modules and solar arrays. Solar PV systems and typical specifications. Maintenance of all of the above.	-do-	
4.	45 - 64	Solar PV Electronics	Solar Charge controllers: working and specifications, switchgear and cables Batteries: Different types for solar PV systems, Solar Inverters: working and specifications Solar Power tracking: construction, working, tilt angle, maximum power point tracking (MPPT) Maintenance of these systems.	-do-	
5.	65 - 80	Solar PV Off-grid and Grid Tied Systems	Solar off grid systems: layout and specifications Solar Grid tied (on grid) systems: Working principle of grid-tied dc-ac inverter, grid synchronization and active power export. Brief introduction to Solar-Wind Hybrid systems.	-do-	

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Reference Resource:

- R1: Solanki, Chetan Singh, - Solar Photovoltaics: Fundamentals, Technologies and Applications, PHI Learning, New Delhi, ISBN: 9788120351110
 R2: Kothari, D.P. et al: Renewable Energy Sources and Emerging Technologies, PHI
 R3: David M. Buchla, Thomas E. Kissell, Thomas L. Floyd, - Renewable Energy Systems, Pearson Education New Delhi, ISBN: 9789332586826
 R4: Rachel, Sthuthi, Earnest, Joshua; - Wind Power Technologies, PHI Learning
 R5: O.P. Gupta, Energy Technology, Khanna Publishing House, ISBN: 978-93-86173-683

"PVC" NSSK Govt. Polytechnic Bilaspur at Kalol

Lecture Planning (Theory)

Branch : Electrical Engg.

Semester: 5th

Subject : Switchgear & Protection

Session: Aug 26 - Dec 26

Teacher : Ashwani Kumar

Cass Room : LT9

Sr. No.	No. of Lectures	Chapter/ Unit Description	Detail of Contents	Reference Resources	Rem
1.	1-10	Basics of Protection	Necessity, functions of protective system, Normal and abnormal conditions. Types of faults and their causes. Protection zones and backup protection.	R1,R2,R3	
2	11-26	Circuit Interruption Devices	Isolators - Vertical break, Horizontal break and Pantograph type. HRC fuses – Construction, working, characteristics and applications. Arc formation process, methods of arc extinction (High resistance and Low resistance), Arc voltage, Recovery voltage, Re-striking voltage, RRRV. HT circuit breakers: Sulphur-hexa Fluoride (SF ₆), Vacuum circuit breaker – (Working, construction, specifications and applications). L.T. circuit breaker: Air circuit breakers (ACB), Miniature circuit breakers (MCB), Moulded case circuit breakers (MCCB) and Earth leakage circuit breaker (ELCB)) - Working and applications. Brief introduction to gas insulated switchgear.	-do-	
3.	27-42	Protective Relays	Fundamental quality requirements: Selectivity, Speed, Sensitivity, Reliability, Simplicity, Economy. Basic relay terminology - Protective relay, Relay time, Pick up, Reset current, current setting, Plug setting multiplier, Time setting multiplier. Protective relays: Classification, principle of working, construction and operation of – Electromagnetic attraction (Attracted armature type, Solenoid type and Watt-hour meter type only) relays. Electromagnetic Induction relays: Over current relays: Block diagram, working. Distance relaying- Principle, operation of Definite distance relays. Directional relay: Need and operation. Operation of current and voltage differential relay. Brief introduction to Thermal Relay. Brief introduction to Static and Microprocessor based relays and their applications.	-do-	
4.	43-55	Protection of Alternator and Transformer Alternator Protection	Faults, Differential protection over current, earth fault, overheating and field failure protection. Reverse power protection. Transformer Protection: Different Faults (brief introduction), Differential, over current, earth fault, over heating protection, Limitations of differential protection. Buchholz relay: Construction, operation, merits and demerits.	-do-	

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| 5. | 56-65 | Protection of Motors, Bus-bar and Transmission Line Motor | Faults, Short circuit protection, Overload protection, Single phase preventer. 8 Bus bar and Transmission line Faults on Bus bar and Transmission Lines. Bus bar protection: Differential and Fault bus protection. Transmission line: Over current, Distance and Pilot wire protection | -do- |
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Reference Resource:

- R1: Mehta V. K ; Rohit Mehta, Principles of Power System, S. Chand and Co., New Delhi.
- R2: Gupta. J. B. Switchgear and Protection, S. K. Kataria and Sons, New Delhi.
- R3: Singh, R. P. Switchgear and Power System Protection, PHI Learning, New Delhi.

"PVC" NSSK Govt. Polytechnic Bilaspur at Kalol
Lecture Planning (Theory)

Branch : **Electrical Engg.**
 Subject : **ENERGY CONSERVATION AND AUDIT**
 Teacher : **Er. Satish Kumar**

Semester: **5th**
 Session: **AUG- DEC, 26**
 Cass Room : **L4**

Sr. No.	No. of Lectures	Chapter/ Unit Description	Detail of Contents	Reference Resources	Remarks
1.	1-12	Energy Conservation Basics	Energy Scenario: Primary and Secondary Energy. Energy demand and supply, National scenario. Energy conservation and Energy audit; concepts and difference Star Labelling: Need and its benefits	R1,R2, R3,R4,R5,R6, R-7,R-8.R-9	
2.	13-29	Energy Conservation in Electrical Machines	Need for energy conservation in induction motor. Energy conservation techniques in induction motor by: Motor survey Matching motor to load. Operating in star mode. Rewinding of motor. Replacement by energy efficient motor, Periodic maintenance Energy efficient motor; significant features, advantages, applications and limitations. Need for energy conservation in transformer: Energy efficient transformers, amorphoustransformers; epoxy Resin cast transformer / Dry type of transformer.	-do-	
3.	30-46	Energy conservation in Electrical Installation systems	Aggregated Technical and commercial losses (ATC); Power system at state, regional, national and global level. Technical losses; causes and measures to reduce these (no expression only theory part) a) Controlling I ² R losses. b) Optimizing distribution voltage c) Balancing phase currents Energy conservation in lighting sources: a) Replacing Lamp sources. b) Using energy efficient luminaries	-do-	
4.	47-64	Energy conservation through Cogeneration and Tariff	Co-generation and Tariff; concept, significance for energy conservation Co-generation Types of cogeneration on basis of sequence of energy use (basic introduction to Topping cycle & Bottoming cycle) Types of cogeneration basis of technology (Steam turbine cogeneration, Gas turbine cogeneration). Factors governing the selection of cogeneration system, advantages of cogeneration. Tariff: Types of tariff structure: Special tariffs; Time-off-day tariff, Peak-off-day tariff, Power factor tariff, Maximum Demand tariff, Load factor tariff. Application of tariff system to reduce energy bill.	-do-	
5.	65-80	Energy Audit of Electrical System	Energy audit (definition as per Energy Conservation Act) Energy audit instruments and their use. Questionnaire for energy audit projects. Energy flow diagram (Sankey diagram)	-do-	

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Reference Resource:

- R-1. Guide Books No. 1 and 3 for National Certification Examination for Energy Managers and Energy Auditors, Bureau of Energy Efficiency (BEE), Bureau of Energy Efficiency (A Statutory body under Ministry of Power, Government of India) (Fourth Edition 2015).
- R- 2. O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi
- R-3. Henderson, P. D., India - The Energy Sector, University Press, Delhi, 2016. ISBN: 978-0195606539
- R-4. Turner, W. C., Energy Management Handbook, Fairmount Press, 2012, ISBN 9781304520708 R-5. Sharma, K. V., Venkateshaiah; P., Energy Management and Conservation, I K International Publishing House Pvt. Ltd; 2011 ISBN 9789381141298
- R- 6. Mehta ,V. K., Principles of Power System, S. Chand &Co.New Delhi, 2016, ISBN 9788121905947
- R-7. Singh, Sanjeev; Rathore, Umesh, Energy Management, S K Kataria & Sons,New Delhi ISBN13:9789350141014.
- R-8. Desai, B. G.; Rana, J. S.; A. Dinesh, V.; Paraman, R., Efficient Use and Management of Electricity in Industry, Devki Energy Consultancy Pvt. Ltd.
- R-9. Chakrabarti, Aman, Energy Engineering And Management, e-books Kindle Edition

PVCNSSK Govt. Polytechnic Bilaspur
Planning Theory and Coverage Detail

Department : Mechanical Engg. And Electrical Engg.

Branch & Sem. : 5th Sem.

Session: August 2026- December 2026

Subject : Life Skills for Professional and Personal Life(LSPPL)

Course – Elect. Engg. 5 th				Duration - 14 weeks		
Theory						
Sr. No.	Period No.	Topics	Details	Instruction Reference	Additional Study Recommended	Remark
1	1-11	Life Skills, Soft Skills & Interpersonal Skills	Def. of Life skills & soft skills, Significance of life skills and soft skills in personal and professional life, Types of soft skills and life skills, ways to develop soft skills and life skills, Concept of Interpersonal skills and tips to improve interpersonal skills, Meaning of Team dynamics and Tips for improving Team dynamics.	1. Soft Skills & Employability skills by Sabina Pillai & Agna Fernandez.		
2	12-19	Communication Skills	Meaning of Communication Skills, Significance and Characteristics of Assertive Communication, Techniques of Assertive Communication, Tips to develop Assertive Communication.	2. Soft Skills, by K. Alex. S. Chand		
3	20-42	Life Skills	(A) Self Awareness: 1. Self Introspection (a) Meaning of Self awareness : Introspection, Self Reflection and Insight (b) Strategies to improve self awareness (c) Importance of counseling and coaching 2. Stress Management (a) Meaning of Stress (b) Factors causing positive and negative types of stress (c) Effects of Stress on mind and body (d) Stress Management techniques 3. Emotional Intelligence: (a) Meaning and Significance of EI (b) Strategies to develop and enhance Emotional Intelligence 4. Self-Esteem (a) Concept, Meaning and Significance of			

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PVCNSSK Govt. Polytechnic Bilaspur
Planning Theory and Coverage Detail

Department : Mechanical Engg. And Electrical Engg.

Branch & Sem. : 5th Sem.

Session: August 2026- December 2026

Subject : Life Skills for Professional and Personal Life(LSPPL)

			Self-Esteem (b) Types of Self-Esteem.(c) Characteristics of people with High and Low Self-Esteem.(d) Steps and Tips for improving Self-Esteem (R) Social Awareness: 1. Meaning and Techniques of social awareness and social skills 2. Empathy: (a) Meaning and types of Empathy (b) Benefits of Empathy (c) Steps for developing Empathy 3. Compassion: (a) Meaning and Benefits of Compassion (b) Steps to practice Compassion 4. Body Language: (a) Elements of Body Language (b) Develop Positive Body language that helps in building positive relationships (c) Avoiding Negative Body Language (C) Thinking Skills: 1. Positive Thinking (a) Meaning and Benefits of Positive Thinking.(b) Tips to develop positive attitude and practice Positive Thinking. 2. Listening Skills: (a) Concept, Significance and Process of Listening Skills. (b) Kinds of Listening (c) Factors hindering effective Listening (d) Tips for Active and Empathetic Listening. 3. Resilience: (a) Meaning and Types of Resilience (b) Case studies of Resilience (Students should undertake minimum Two case studies of Resilience)		
4.	43-49	Time Management Skills	1. Concept and Significance of Time Management.2. Benefits of Time Management.3. Tools and Techniques to use Time Management.4. How to overcome procrastination and avoid time-wasters		

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PVCNSSK Govt. Polytechnic Bilaspur
Planning Theory and Coverage Detail

Department : Mechanical Engg. And Electrical Engg.

Session: August 2026- December 2026

Branch & Sem. : 5th Sem.

Subject : Life Skills for Professional and Personal Life(LSPPL)

5.	50-56	Human Values and Ethics	Meaning of Human Values, Morals and Ethics, What is Value and types of Values. Human Dignity and Humility: Meaning of Human Dignity and Fundamental rights of a person, Significance of humility. Developing and practicing humility			
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"PVC" NSSK Govt. Polytechnic Bilaspur at Kalol
Lecture Planning (Theory)

Branch : **Electrical Engg.**

Semester : **5th**

Subject : **Switchgear & Protection Lab**

Session: **Aug 26 - Dec 26**

Teacher : **Ashwani Kumar**

Lab : **Elect. Measurements Lab**

Pract. No.	Description of Practical	Reference for Procedure/ Writeup	Likely Dates	Actual Dates	Sign
1.	Identify various switchgears in the laboratory and write their specifications.	Lab Manual			
2.	Test HRC fuse by performing the load test.	Lab Manual			
3.	Test MCB by performing the load test.	Lab Manual			
4.	Dismantle MCCB/ELCB and identify various parts.	Lab Manual			
5.	Dismantle ACB/VCB and identify different parts.	Lab Manual			
6.	Set the plug and time (with PSM, TSM) of induction type electromagnetic relay.	Lab Manual			
7.	Test electromagnetic over-current relay by performing load test.	Lab Manual			

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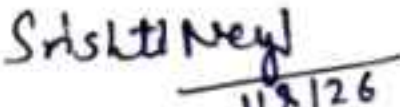
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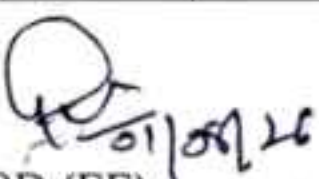
PVC" NSSK Govt. Polytechnic Bilaspur at Kalol
Practical Planning & Coverage

Branch : **ELECTRICAL ENGINEERING**
Subject : **SOLAR POWER TECHNOLOGIES LABORATORY**
Teacher : **SRISHTI NEGI**

Semester: **5TH**
Session: **AUG - DEC, 26**
Lab Name:

Practical No.	Description of Practical	Reference for Procedure/ Write up	Likely Dates	Actual Dates	Sign
1	Assemble the parabolic dish CSP plant.	Lab Manual			
2.	Dismantle the parabolic dish CSP plant.	Lab Manual			
3.	Troubleshoot a CSP plant	Lab Manual			
4.	Assemble the solar PV system.	Lab Manual			
5	Dismantle the solar PV system	Lab Manual			
6	Troubleshoot a solar PV system	Lab Manual			
7	Troubleshoot a solar PV panels and arrays	Lab Manual			


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