FACULTY OF SCIENCES

SYLLABUS

FOR

Bachelor of Vocation (B.Voc.)
(SOLAR ENERGY)
(FOR COLLEGES)

(SEMESTER: I-II)
Examinations: 2019-20

GURU NANAK DEV UNIVERSITY
AMRITSAR

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    Please visit the University website time to time.
B.VOC. SOLAR ENERGY (SEMESTER SYSTEM) FOR COLLEGES

SCHEME

Semester-I
(Aligned with level 4 of Sector skill Council-Qualification Pack- Solar PV Maintenance Engineer SGJ/Q0116)

<table>
<thead>
<tr>
<th>Paper</th>
<th>Subject</th>
<th>Credits</th>
<th>Theory Marks</th>
<th>Duration</th>
<th>Practical Marks</th>
<th>Total Marks</th>
</tr>
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<tr>
<td></td>
<td><strong>GENERAL EDUCATION COMPONENT</strong></td>
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<tr>
<td>PAPER-I</td>
<td>Communication Skills in English-I</td>
<td>3</td>
<td>50</td>
<td>3 hrs</td>
<td>-</td>
<td>50</td>
</tr>
<tr>
<td>PAPER-II</td>
<td>Punjabi Compulsory OR</td>
<td>3</td>
<td>50</td>
<td>3 hrs</td>
<td>-</td>
<td>50</td>
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<td><strong>हੰਦੀ ਵਧਡਾਂ</strong></td>
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<td><strong>Punjab History &amp; Culture</strong></td>
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<tr>
<td>PAPER-III</td>
<td><strong>Drug Abuse: Problem, Management and Prevention</strong></td>
<td>3</td>
<td>50</td>
<td>3 hrs</td>
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<td>PAPER-IV</td>
<td>Introduction to Renewable Energy</td>
<td>6</td>
<td>50</td>
<td>3 hrs</td>
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<td>50</td>
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<td>PAPER-V</td>
<td>Basic Electronics</td>
<td>6+3</td>
<td>75</td>
<td>3 hrs</td>
<td>50</td>
<td>125</td>
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<tr>
<td>PAPER-VI</td>
<td>PV Systems-Tools &amp; Techniques-I</td>
<td>6+3</td>
<td>75</td>
<td>3 hrs</td>
<td>50</td>
<td>125</td>
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<tr>
<td>PAPER-VII</td>
<td>Industrial Training</td>
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<td>-</td>
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<td>S/US</td>
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</tbody>
</table>

Note:
2. **For those students who are not domicile of Punjab
3. ***This paper marks will not be included in the total marks.
B.V.OC. SOLAR ENERGY (SEMESTER SYSTEM) FOR COLLEGES

SEMESTER–II

Semester-II
(Aligned with level 4 of Sector skill Council-Qualification Pack- Roof Top Solar Grid Engineer
SGJ/Q0106)

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Subject</th>
<th>Credits</th>
<th>Theory Marks</th>
<th>Practical Marks</th>
<th>Duration</th>
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<tr>
<td>PAPER-I</td>
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<td>3</td>
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<td>-</td>
<td>3 hrs</td>
<td>50</td>
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<tr>
<td>PAPER-II</td>
<td>Punjabi Compulsory OR *ਪੰਜਾਬੀ ਕਵਿਤਾ OR **Punjab History &amp; Culture</td>
<td>3</td>
<td>50</td>
<td>-</td>
<td>3 hrs</td>
<td>50</td>
</tr>
<tr>
<td>PAPER-III</td>
<td>***Drug Abuse: Problem, Management and Prevention (Compulsory)</td>
<td>3</td>
<td>50</td>
<td>-</td>
<td>3 hrs</td>
<td>-</td>
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<tr>
<td>PAPER-IV</td>
<td>Solar thermal energy collectors</td>
<td>6</td>
<td>50</td>
<td>-</td>
<td>3 hrs</td>
<td>50</td>
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<tr>
<td>PAPER-V</td>
<td>Basic Electricity</td>
<td>6+3</td>
<td>75</td>
<td>50</td>
<td>3 hrs</td>
<td>125</td>
</tr>
<tr>
<td>PAPER-VI</td>
<td>Photovoltaic systems tools and Techniques-II</td>
<td>6+3</td>
<td>75</td>
<td>50</td>
<td>3 hrs</td>
<td>125</td>
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<tr>
<td>PAPER-VII</td>
<td>Industrial Training (Practical)</td>
<td>2</td>
<td>-</td>
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<td>S/US</td>
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</tbody>
</table>

**GENERAL EDUCATION COMPONENT**

**SKILL COMPONENT**

Note:
2. **For those students who are not domicile of Punjab
3. ***This paper marks will not be included in the total marks.
Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section–A
Reading Skills: Reading Tactics and strategies; Reading purposes–kinds of purposes and associated comprehension; Reading for direct meanings.

Section–B
Reading for understanding concepts, details, coherence, logical progression and meanings of phrases/expressions.

Activities:
- Comprehension questions in multiple choice format
- Short comprehension questions based on content and development of ideas

Section–C
Writing Skills: Guidelines for effective writing; writing styles for application, personal letter, official/business letter.

Activities
- Formatting personal and business letters.
- Organising the details in a sequential order

Section–D
Resume, memo, notices etc.; outline and revision.

Activities:
- Converting a biographical note into a sequenced resume or vice-versa
- Ordering and sub-dividing the contents while making notes.
- Writing notices for circulation/boards

Recommended Books:
2. English Grammar in Use (Fourth Edition) by Raymond Murphy, CUP
भाग-सेक्शन अंतः परीक्षणकाल कभी उर्जारित

1. धुति पूर्ण दे चार बण वे। उत्तर बण दिच है धुति पूर्ण है।
2. विद्यालय के लंब धुति पूर्ण बनते रहे। उत्तर बण दिच है धुति पूर्ण है।
3. यद्व धुति के बनवन बन रहे।
4. वेतन मौट लगल सप्त नेवत करे। उं सौ सौ लंब अंत दे लंब चार धुति-पूर्ण है लंब सबसे रहे।

पाठ-बूः अंतः पाठ-पाठबाबा

मौसम-हे

चांद अलवा (विद्यार्थी बण),
(वैभव शूरिशल बंद अदेह विकास संग्रह)
बाबु धुति देख पुलिस्टिकी। पाठ-प्रयास (धुति-पूर्ण, बाबा)

मौसम-ही

विश्वकर्मा जानव (विश्वकर्मा जेई-संग्रह),
मेघ. म.म.बाबा,
पैसो मानित धुति-पूर्ण, साधारण। (खेल 1 थे 6)
(विवेक लग मच, लिख-सैली)

मौसम-मी

(४) वेतन उद्दाहरण
(अ) वेतन पंज है धुति दे पूर्ण है उद्दाहरण।

मौसम-वी

(५) पैसो धुति विश्वकर्मा : धुति-पूर्ण अंत, धुति-पूर्ण मौसम दे लिख-सैली, बाबा, दिशेन्द्र,
मूर्त-पूर्ण।
(अ) अध्ययन इंडियनम : अध्ययन डेंडर लैंड, अध्ययन अदेह धुति-पूर्ण रा अंत, पैसो
धुति-पूर्ण है पाठ-प्रयास।
भूमिका सूची

1. प्युस्त प्योल मे छन उपन बुधने। उत उपन लिखें दे प्युस्त प्योल तखती।
2. हिंदीबालबी ते बुठं धूस प्युस्त कबाने उठ। उत उपन लिखें हिंद प्युस्त समावे।
3. धूस प्युस्त दे धलधल उठ।
4. पेड़त मैंट बाबर धारा सेवत वचे उा प्युस्त सी डेड आली डेंप उा डेंप चन धूस-प्युस्त हिंद चन मस्त क्या।

पाठ-चूह

मैवश्रूम

पेड़ी बालकी, भूष वुँम, पेड़ सारी लड़े बाबर भुजे पेड़ लिखे बाबर भुजे भुजे भुजे पेड़ (भूमिका सार-डंडक)

सरापत (सिंही, सिंही, भोपल) : पट्टा भुजे दत्ते

मैवश्रुम-वी

पाया-सक्षर-वाघड़ (पप्पली सक्षर-वाघड़)
(भाषास शक्षर, भीतरोध, भीतरोध, भूमि शक्षर, भरोड़ भुजे पिंडडक)

मैवश्रुम-भी

हिंद दत्ते दी पाया-सक्षर-वाघड़ : यानां, दांग, दिमुड़-हुड़, बेड़ी भुजे भुजे पद्धार्भो भाति ठाट मांबाट।

मैवश्रुम-बी

उहदे दे मांड लिखा दे तां, साल भूलखावे दे तां, हुंडा दे तां, लिख दे मे उल विठ्ठी शक्षरं दिलं।
In this document, the instructions for the Paper Setters are as follows:

Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section A
1. Physical features of the Punjab and its impact on history.
2. Sources of the ancient history of Punjab

Section B
3. Harappan Civilization: Town planning; social, economic and religious life of the Indus Valley People.

Section C
5. Social, Religious and Economic life during Rig Vedic Age.

Section D
7. Teachings and impact of Buddhism
8. Jainism in the Punjab

Suggested Readings
1. L. M Joshi (ed.), History and Culture of the Punjab, Art-I, Patiala, 1989 (3rd edition)
B.VOC. SOLAR ENERGY (SEMESTER-I) FOR COLLEGES

Paper-III: Drug Abuse: Problem, Management and Prevention
(COMPULSORY PAPER)

PROBLEM OF DRUG ABUSE

Time: 3 Hours  Max. Marks: 50

Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section – A
Meaning of Drug Abuse:

Section – B
Consequences of Drug Abuse for:
- Family: Violence.
- Society: Crime.
- Nation: Law and Order problem.

Section – C
Management of Drug Abuse:
Medical Management: Medication for treatment and to reduce withdrawal effects.

Section – D
Psychiatric Management: Counselling, Behavioural and Cognitive therapy.
Social Management: Family, Group therapy and Environmental Intervention.

References:
1. Ahuja, Ram (2003), Social Problems in India, Rawat Publication, Jaipur.
PAPER-IV: Introduction to Renewable Energy

Time: 3 Hours  
Max. Marks: 50

Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

SECTION-A

Introduction to Energy Sources

SECTION-B

Solar Energy
Potential of Solar Energy, Solar water heating systems, Solar air heating and cooling systems, Solar thermal electric conversion, Solar photovoltaic system, Other applications of solar energy like distillation, pumping, furnace, green house.

SECTION-C

Wind Energy
Scope for Wind energy in India-Types of wind machines- Performance of Wind machines- Application of Wind Energy- Solar wind hybrid system

SECTION-D

Other sources of sustainable energy
Biomass and Biogas energy, Tidal energy, Geo-thermal energy, Magneto Hydro Dynamic energy, Nuclear Energy

References
1. Non-conventional energy sources; G.D.Rai; 2011; Fifth Edition, Khanna Publishers
Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

SECTION-A

SECTION-B
Semiconductors- bonds in semiconductors crystals commonly used semiconductors Effect of temperature on semiconductors hole current intrinsic semiconductor extrinsic Semiconductor charge on n type and p type semiconductors majority and minority carriers p n junction current flow in forward biased pn junction VI characteristics of pn junction Important terms limitations in the operating conditions of a p n junction

SECTION-C
Semiconductor diode and transistors:
Diode as a rectifier. Half wave rectifiers and full wave rectifiers (Centre tap and bridge). Nature of rectifier output, ripple factor, Comparison of rectifiers, Zener diode. Zener diode as voltage stabilizer. Transistors Bipolar junction transistor, naming of transistor terminals, transistor action, transistor symbols, Common emitter, common base and common collector configurations their characteristics.

SECTION-D
Opto-electronic devices
LED Principle, characteristics (V-I and light-current), applications, Advantages Photo-detectors: Introduction classification of detectors, qualitative idea of each type photodiode, phototransistor, PIN photodiode

References
2. Optoelectronic Engineering, S.N. Biswass, DhanpatRai Publications
PAPER-V : Basic Electronics (Practical)

Time: 3 Hours

Max. Marks: 50

1. To study Multi meter-Functioning
2. To study Diode Characteristics
3. To study Half wave rectifier
4. To study Full wave rectifier
5. To study diode as clipping element
6. To study characteristics of Zener diode
7. To study transistor characteristics Common base configurations.
8. To study transistor characteristics Common emitter configurations.
Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

SECTION-A

SECTION-B
Solar Cells and PV modules: Solar cell types, Equivalent circuit diagrams of solar cells, Spectral sensitivity, Efficiency of solar cells and PV modules, Types of modules, Design options for PV modules, Module cable outlets and junction boxes, Wiring symbols, Characteristic I-V curves for modules, Irradiance dependence and temperature characteristics

SECTION-C
PV Related Equipments: Batteries, Inverters, Grid controlled inverters, Self commuted inverters, Grid connected inverters, Charge controllers, PV array combiners/junction boxes, String diodes and fuses, Cabling, DC main cable, AC connection cable, DC main switch, AC switch disconnector.

SECTION-D

Reference
1. Planning and installing photovoltaic systems-A guide for installers, architects and engineers; The German Energy Society; 2008; Second Edition; Earthscan, UK.
2. Solar energy Engineering Processes and systems; Academic Press 2009
B.VOC. SOLAR ENERGY (SEMESTER-I) FOR COLLEGES

PAPER-VI : Photovoltaic systems- Tools and Techniques-I (Practical)

Time: 3 Hours

1. Solar cell I-V characteristics in the dark
2. Solar cell I-V characteristics under illumination
3. Connecting PV system to the grid through a domestic distribution board.
4. To study Effect of wavelength on cell current
5. To study Effect of shading on cell current
6. To study Effect of shading on cell current with PV cells in series
7. To study effect of tilt on cell current
8. Designing solar array
B.VOC. SOLAR ENERGY (SEMESTER-II) FOR COLLEGES

PAPER-I: COMMUNICATION SKILLS IN ENGLISH-II

Time: 3 Hours

Max. Marks: 50
Theory Marks: 35
Practical Marks: 15

Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Course Contents:

SECTION–A
Listening Skills: Barriers to listening; effective listening skills; feedback skills.
Activities: Listening exercises – Listening to conversation, News and TV reports

SECTION–B
Attending telephone calls; note taking and note making.
Activities: Taking notes on a speech/lecture

SECTION–C
Speaking and Conversational Skills: Components of a meaningful and easy conversation; understanding the cue and making appropriate responses; forms of polite speech; asking and providing information on general topics.
Activities: 1) Making conversation and taking turns
2) Oral description or explanation of a common object, situation or concept

SECTION–D
The study of sounds of English,
Stress and Intonation,
Situation based Conversation in English,
Essentials of Spoken English.
Activities: Giving Interviews

PRACTICAL / ORAL TESTING

Marks: 15

Course Contents:-
1. Oral Presentation with/without audio visual aids.
2. Group Discussion.
3. Listening to any recorded or live material and asking oral questions for listening comprehension.

Questions:-
1. Oral Presentation will be of 5 to 10 minutes duration (Topic can be given in advance or it can be student’s own choice). Use of audio visual aids is desirable.
2. Group discussion comprising 8 to 10 students on a familiar topic. Time for each group will be 15 to 20 minutes.

Note: Oral test will be conducted by external examiner with the help of internal examiner.
B.VOC. SOLAR ENERGY (SEMESTER-II) FOR COLLEGES

Paper-II: पैमाना (लघुभाषी)

मान: 3 पृष्ठ        वस्त्र भाग: 50

1. पृष्ठ पेठ दे चान जगा टेटनी। उत जगा हिंदें दे पृष्ठ पुंडे साठनी।
2. विमानाहत्ती हे बेंग पैं पृष्ठ चलते रहा। उत जगा हिंदें हिंद पृष्ठ लघुभाषी रह। पृष्ठ पृष्ठ सिंह  ही जगा हिंदें लौड सा मन्द रह।
3. उतें चान पृष्ठ दे चलत भाग रहा।
4. देहत मेंट चलत हाला मेंट चले उं पृष्ठ दी बेंग अंकॉं दंग उं दंग चान चौ-पृष्ठं हिंद लत मन्द रह।

पाठ-पूर्व अंके भाग-प्रमाण

मैत्रमात्र-ए

आउन अहत (करणी ब्रजा),
(मैन. सुदिता ब्रज अंके दिलेवभ मिठ मंगु)
मूल राजब देंत पुडीलहंठी, अभिनवत।
(गिम-अमू, पांड तिउसत)

मैत्रमात्र-बी

विद्यामात्र जाना (विद्यामात्र लेख-मंगु)
मैन. नाम.भारत,
पैमाना मरविल पृष्ठमात्र, भविभार। (लेख 7 उं 12)
(माफ, दिनह रेली)

मैत्रमात्र-मी

(१) पाठ-प्रमाण अंके पाठ-प्रमाण : विविधता, भूच लेख नालम
(अ) पाठ पृष्ठमात्र

मैत्रमात्र-बी

(७) मिलें उपर
(अ) भूच लेख अंके अभिनव
Paper-II: पूर्वस्ती पंजाबी
(In lieu of Compulsory Punjabi)

मान: 3 अंक
चुनाव: 50 अंक

1. पूर्वस्ती पंजाबी के दांत जन्म देओ। उन जन्म दिशें दे पूर्वस्ती पंजाबी साधनों।
2. विद्याभूमि से कुछ पूर्वस्ती पंजाबी लिखिते गए। उन जन्म दिशें हिंदी पूर्वस्ती साधनों।
3. यथावत् पूर्वस्ती से पहला अंक उठा।
4. प्रेम पर विषय वक्ता आवश्यक करे उन पूर्वस्ती की पंजाबी भाषा दें देंदं दें दें दें दें।

पत्र-बृहि

मंत्रालय

संपर्क मूलभूतान्तिक: पंजाब अभेंदन
(विभाग, संस्थापत्तन, विज्ञान, विज्ञान, विज्ञान, विज्ञान, संस्थापत्तन, संस्थापत्तन)

मंत्रालय-धीर

पंजाबी घट-घट: पूर्वस्ती सत-घट
(वै) संपर्क घट, संस्थापत्तन अभें विभाग घट (पंजाब अभें घट)
(वै) विश्वविद्यालय घट, पूर्वस्ती पर अभें विभाग घट (पंजाब अभें घट)

मंत्रालय-स्यारी

राष्ट्रीय तालिका
मंत्रालय

मंत्रालय-धीर

मंत्रालय-धीर

पंजाबी घट (पंजाबी अभें घट)
अभें अभें भुकंपको
Paper-II: Punjab History & Culture (C 320 to 1000 B.C.)
(Special Paper in lieu of Punjabi compulsory)
(For those students who are not domicile of Punjab)

Time: 3 Hours                      Max. Marks : 50

Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section A
1. Alexander’s Invasion and its Impact
2. Punjab under Chandragupta Maurya and Ashoka.

Section B
3. The Kushans and their Contribution to the Punjab.
4. The Panjab under the Gupta Empire.

Section C
5. The Punjab under the Vardhana Emperors
6. Socio-cultural History of Punjab from 7th to 1000 A.D.

Section D
7. Development of languages and Education with Special reference to Taxila
8. Development of Art & Architecture

Suggested Readings
1. L. M Joshi (ed), History and Culture of the Punjab, Art-I, Punjabi University, Patiala, 1989 (3rd edition)
Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section – A
Prevention of Drug abuse:
Role of family: Parent child relationship, Family support, Supervision, Shaping values, Active Scrutiny.

Section – B
School: Counselling, Teacher as role-model. Parent-teacher-Health Professional Coordination, Random testing on students.

Section – C
Controlling Drug Abuse:
Media: Restraint on advertisements of drugs, advertisements on bad effects of drugs, Publicity and media, Campaigns against drug abuse, Educational and awareness program

Section – D

References:
1. Ahuja, Ram (2003), Social Problems in India, Rawat Publication, Jaipur.
PAPER-IV : Solar Thermal Energy Collectors

Time: 3 Hours  Max. Marks: 50

Instructions for the Paper Setters:-
Eight questions of equal marks (specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

SECTION-A

Solar radiation: The sun as the source of radiation-Solar constant-Spectral distribution of extraterrestrial radiation and its variation Basic Earth Sun angles Diffuse radiation- Availability of solar radiation-measurement of diffuse and direct radiation

SECTION-B

Flat Plate Collectors: Liquid Flat Plate Collector, Materials for flat plate collector, Efficiency of flat plate collectors, Flat plate air heating collectors, Types and novel designs Solar ponds

SECTION-C

Solar Concentrating Collectors: Parameters characterizing solar concentrators Classification of solar concentrators Thermodynamic limits to concentration Solar concentrator mountings Performance analysis of cylindrical parabolic collector Compound parabolic collector Point focusing solar concentrators Materials for solar concentrators

SECTION-D


Reference
2. Solar energy Engineering Processes and systems; Academic Press 2009
B.VOC. SOLAR ENERGY (SEMESTER-II) FOR COLLEGES

PAPER-V : Basics of Electricity (Theory)

Time: 3 Hours Max. Marks: 75

Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

SECTION-A

Measurements: Units Necessity of measurement, concept of unit of a physical quantity, requirements of standard unit, Various system of units (CGS, MKS, SI, FPS), conversions, practical units, fundamental and derived physical quantities and their units. Length measurements rulers standard meter micrometers screw gauges travelling microscopes GPS Angle Measurements Spectrometer vernier scale and telescope Electrical measurements Working principle of galvanometer voltmeter ammeter and digital multi meters

SECTION-B

Varying Currents: Growth and decay of current in an inductive circuit, charge and discharge of a capacitor through a resistance, measurement of high resistance by capacitor leakage method, DC applied to LCR series circuit(charge case), discharging of capacitor through LR circuit(discharge case)

SECTION-C

Alternating currents & Circuit theory: RMS and peak values, AC through series LCR (acceptor circuit) and parallel LCR circuit (rejecter circuit), Q factor, power in AC-power factor, measurement of power in AC circuit, AC watt meter, Distribution of three phase current, star connection, delta connection, Ideal voltage and current sources, Thevenin’s and Norton’s theorems, Maximum power transfer theorem, Superposition Theorem

SECTION-D


Reference
1. Basic Electronics- Solid state; BL Thereja; 2005; S. Chand & Co.
3. Fundamentals of Physics; David Halliday& Robert Resnick; 2010; John Wiley & Sons
PAPER-V : Basics of electricity (Practical)

Time: 3 Hours                      Max. Marks: 50

1. Travelling microscope
2. Spectrometer-Angle of prism
3. Conversion of Galvanometer into voltmeter
4. Determination of the specific resistance of the material of a wire using meter bridge
5. Measurement of average resistance per unit length of a wire using Carey Foster’s bridge
6. Potentiometer-Calibration of a low range voltmeter
7. Series LCR circuit-frequency response
8. Capacitance by flashing and quenching of a neon lamp.
PAPER-VI : Photovoltaic systems- Tools and Techniques II (Theory)

Time: 3 Hours

Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

SECTION-A
Solar resource & Shading Analysis
Solar resource assessment, Shadow types: Temporary shading, shading resulting from the location, shading resulting from the building, Self-shading, Direct shading. Shading Analysis using site plan, using sun path diagram, using solar pathfinder and software

SECTION-B
Configuration of Photovoltaic System
Series connection of photovoltaic panels, Parallel connection of Photovoltaic panels, Comparison of different connection concepts, Calculating load and sizing array, Installing solar array, array orientation, wiring array.

SECTION-C
Planning Photovoltaic system
Sizing the inverter, choosing the number and power rating of inverters, Selecting and sizing cables, Selection and sizing of the PV array combiner/junction box and the DC main disconnect/isolator switch, Lightning protection, earthing/grounding and surge protection.

SECTION-D
Mounting Systems and Building Integration
Roof basics: Roof shapes, Roof constructions, Sloping roof, Flat Roof
Façade basics: Façade types, Fastenings, Joints and Joint sealing, Mounting modules on facades, Facades with integrated modules.

Reference
1. Planning and installing photovoltaic systems-A guide for installers, architects and engineers; The German Energy Society; 2008; Second Edition; Earthscan, UK.
2. Solar energy Engineering Processes and systems; Academic Press 2009
PAPER-VII : Photovoltaic systems-Tools and Techniques II (Practical)

Max. Marks: 50

Project submission: Designing a PV system for any real site describing all requirements and installation procedure