

# FACULTY OF SCIENCES

## SYLLABUS

### FOR

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

(SEMESTER: I-II)

Examinations: 2019-20



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# GURU NANAK DEV UNIVERSITY AMRITSAR

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## 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)

Paper	Subject	Credits	Theory Marks	Duration	Practical Marks	Total Marks
<b>GENERAL EDUCATION COMPONENT</b>						
<b>PAPER-I</b>	Communication Skills in English-I	3	50	3 hrs	-	<b>50</b>
<b>PAPER-II</b>	Punjabi Compulsory <b>OR</b> *ਮੁੱਢਲੀ ਪੰਜਾਬੀ <b>OR</b> **Punjab History & Culture	3	50	3 hrs	-	<b>50</b>
<b>PAPER-III</b>	***Drug Abuse: Problem, Management and Prevention (Compulsory)	3	50	3 hrs.	-	-
<b>SKILL COMPONENT</b>						
<b>PAPER-IV</b>	Introduction to Renewable Energy	6	50	3 hrs		<b>50</b>
<b>PAPER-V</b>	Basic Electronics	6+3	75	3 hrs	50	<b>125</b>
<b>PAPER-VI</b>	PV Systems-Tools & Techniques-I	6+3	75	3 hrs	50	<b>125</b>
<b>PAPER-VII</b>	Industrial Training	2	-	-	-	<b>S/US</b>
					<b>TOTAL = 400</b>	

## Note:

1. \*Special Paper in lieu of Punjabi Compulsory.
2. \*\*For those students who are not domicile of Punjab
3. \*\*\*This paper marks will not be included in the total marks.

**SEMESTER>II****Semester-II**

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

Paper Code	Subject	Credits	Theory Marks	Practical Marks	Duration	Total Marks
<b>GENERAL EDUCATION COMPONENT</b>						
<b>PAPER-I</b>	Communication Skills in English-II	3	<b>50</b>	-	<b>3 hrs</b>	<b>50</b>
<b>PAPER-II</b>	Punjabi Compulsory <b>OR</b> *ਮੁੱਢਲੀ ਪੰਜਾਬੀ <b>OR</b> **Punjab History & Culture	3	<b>50</b>	-	<b>3 hrs</b>	<b>50</b>
<b>PAPER-III</b>	***Drug Abuse: Problem, Management and Prevention (Compulsory)	3	<b>50</b>	-	<b>3 hrs</b>	-
<b>SKILL COMPONENT</b>						
<b>PAPER-IV</b>	Solar thermal energy collectors	6	<b>50</b>		<b>3 hrs</b>	<b>50</b>
<b>PAPER-V</b>	Basic Electricity	6+3	<b>75</b>	<b>50</b>	<b>3 hrs</b>	<b>125</b>
<b>PAPER-VI</b>	Photovoltaic systems tools and Techniques-II	6+3	<b>75</b>	<b>50</b>	<b>3 hrs</b>	<b>125</b>
<b>PAPER-VII</b>	Industrial Training (Practical)	2	-	-		<b>S/US</b>

**Note:**

1. \*Special Paper in lieu of Punjabi Compulsory.
2. \*\*For those students who are not domicile of Punjab
3. \*\*\*This paper marks will not be included in the total marks.

**Paper-I: COMMUNICATION SKILLS IN ENGLISH-I****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**

**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:**

1. *Oxford Guide to Effective Writing and Speaking* by John Seely.
2. *English Grammar in Use* (Fourth Edition) by Raymond Murphy, CUP

**Paper-II: ਪੰਜਾਬੀ (ਲਾਜ਼ਮੀ)**

ਸਮਾਂ : 3 ਘੰਟੇ

ਕੁਲ ਅੰਕ : 50

**ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ**

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹੋਣਗੇ। ਹਰ ਭਾਗ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਭਾਗ ਵਿਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ ਅੰਕ ਹਨ।
4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

**ਪਾਠ-ਕ੍ਰਮ ਅਤੇ ਪਾਠ-ਪੁਸਤਕਾਂ****ਸੈਕਸ਼ਨ-ਏ**

ਆਤਮ ਅਨਾਤਮ (ਕਵਿਤਾ ਭਾਗ),  
(ਸੰਪ. ਸੁਹਿੰਦਰ ਬੀਰ ਅਤੇ ਵਰਿਆਮ ਸਿੰਘ ਸੰਧੂ)  
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ।  
(ਪ੍ਰਸ਼ਗ ਸਾਹਿਤ ਵਿਆਖਿਆ, ਸਾਰ )

**ਸੈਕਸ਼ਨ-ਬੀ**

ਇਤਿਹਾਸਕ ਯਾਦਾਂ (ਇਤਿਹਾਸਕ ਲੇਖ-ਸੰਗ੍ਰਹਿ)  
ਸੰਪਾ. ਸ.ਸ.ਅਮੋਲ,  
ਪੰਜਾਬੀ ਸਾਹਿਤ ਪ੍ਰਕਾਸ਼ਨ, ਲੁਧਿਆਣਾ। (ਲੇਖ 1 ਤੋਂ 6)  
(ਨਿਬੰਧ ਦਾ ਸਾਰ, ਲਿਖਣ-ਸ਼ੈਲੀ)

**ਸੈਕਸ਼ਨ-ਸੀ**

(ੳ) ਪੈਰਾ ਰਚਨਾ  
(ਅ) ਪੈਰਾ ਪੜ੍ਹ ਕੇ ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉੱਤਰ।

**ਸੈਕਸ਼ਨ-ਡੀ**

(ੳ) ਪੰਜਾਬੀ ਧੁਨੀ ਵਿਉਂਤ : ਉਚਾਰਨ ਅੰਗ, ਉਚਾਰਨ ਸਥਾਨ ਤੇ ਵਿਧੀਆਂ, ਸਵਰ, ਵਿਅੰਜਨ,  
ਸੁਰ-ਪ੍ਰਬੰਧ।  
(ਅ) ਭਾਸ਼ਾ ਵੰਨਗੀਆਂ : ਭਾਸ਼ਾ ਦਾ ਟਕਸਾਲੀ ਰੂਪ, ਭਾਸ਼ਾ ਅਤੇ ਉਪ-ਭਾਸ਼ਾ ਦਾ ਅੰਤਰ, ਪੰਜਾਬੀ ਉਪਭਾਸ਼ਾਵਾਂ ਦੇ ਪਛਾਣ-ਚਿੰਨ੍ਹ।

**Paper-II: ਮੁੱਢਲੀ ਪੰਜਾਬੀ**  
(In lieu of Compulsory Punjabi)

ਸਮਾਂ : 3 ਘੰਟੇ

ਕੁਲ ਅੰਕ: 50

**ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ**

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹੋਣਗੇ। ਹਰ ਭਾਗ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਭਾਗ ਵਿਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ ਅੰਕ ਹਨ।
4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

**ਪਾਠ-ਕ੍ਰਮ**

**ਸੈਕਸ਼ਨ-ਏ**

ਪੈਂਤੀ ਅੱਖਰੀ, ਅੱਖਰ ਕ੍ਰਮ, ਪੈਰ ਬਿੰਦੀ ਵਾਲੇ ਵਰਣ ਅਤੇ ਪੈਰ ਵਿਚ ਪੈਣ ਵਾਲੇ ਵਰਣ ਅਤੇ ਮਾਤ੍ਰਵਾਂ (ਮੁੱਢਲੀ ਜਾਣ-ਪਛਾਣ)  
ਲਗਾਖਰ (ਬਿੰਦੀ, ਟਿੱਪੀ, ਅੱਧਕ) : ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ

**ਸੈਕਸ਼ਨ-ਬੀ**

ਪੰਜਾਬੀ ਸ਼ਬਦ-ਬਣਤਰ : ਮੁੱਢਲੀ ਜਾਣ-ਪਛਾਣ  
(ਸਾਧਾਰਨ ਸ਼ਬਦ, ਸੰਯੁਕਤ ਸ਼ਬਦ, ਮਿਸ਼ਰਤ ਸ਼ਬਦ, ਮੂਲ ਸ਼ਬਦ, ਅਗੇਤਰ ਅਤੇ ਪਿਛੇਤਰ)

**ਸੈਕਸ਼ਨ-ਸੀ**

ਨਿੱਤ ਵਰਤੋਂ ਦੀ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ : ਬਾਜ਼ਾਰ, ਵਪਾਰ, ਰਿਸ਼ਤੇ-ਨਾਤੇ, ਖੇਤੀ ਅਤੇ ਹੋਰ ਧੰਦਿਆਂ ਆਦਿ ਨਾਲ ਸੰਬੰਧਤ।

**ਸੈਕਸ਼ਨ-ਡੀ**

ਹਫ਼ਤੇ ਦੇ ਸੱਤ ਦਿਨਾਂ ਦੇ ਨਾਂ, ਬਾਰਾਂ ਮਹੀਨਿਆਂ ਦੇ ਨਾਂ, ਰੁੱਤਾਂ ਦੇ ਨਾਂ, ਇਕ ਤੋਂ ਸੌ ਤਕ ਗਿਣਤੀ ਸ਼ਬਦਾਂ ਵਿਚ ।

**Paper-II: Punjab History & Culture (From Earliest Times to C 320)**  
**(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. 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.
4. The Indo-Aryans: Original home and settlements in Punjab.

**Section C**

5. Social, Religious and Economic life during *Rig* Vedic Age.
6. Social, Religious and Economic life during Later 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 (3<sup>rd</sup> edition)
2. L.M. Joshi and Fauja Singh (ed.), *History of Punjab*, Vol.I, Patiala 1977.
3. Budha Parkash, *Glimpses of Ancient Punjab*, Patiala, 1983.
4. B.N. Sharma, *Life in Northern India*, Delhi. 1966.
5. Chopra, P.N., Puri, B.N., & Das, M.N.(1974). *A Social, Cultural & Economic History of India*, Vol. I, New Delhi: Macmillan India.

**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:**

Meaning, Nature and Extent of Drug Abuse in India and Punjab.

**Section – B****Consequences of Drug Abuse for:**

Individual	:	Education, Employment, Income.
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.
2. Extent, Pattern and Trend of Drug Use in India, Ministry of Social Justice and Empowerment, Government of India, 2004.
3. Inciardi, J.A. 1981. *The Drug Crime Connection*. Beverly Hills: Sage Publications.
4. Kapoor. T. (1985) *Drug epidemic among Indian Youth*, New Delhi: Mittal Pub.
5. Kessel, Neil and Henry Walton. 1982, *Alcoholism*. Harmond Worth: Penguin Books.
6. Modi, Ishwar and Modi, Shalini (1997) *Drugs: Addiction and Prevention*, Jaipur: Rawat Publication.



## B.VOC. SOLAR ENERGY (SEMESTER-I) FOR COLLEGES

7. National Household Survey of Alcohol and Drug abuse. (2003) New Delhi, Clinical Epidemiological Unit, All India Institute of Medical Sciences, 2004.
8. Ross Coomber and Others. 2013, *Key Concept in Drugs and Society*. New Delhi: Sage Publications.
9. Sain, Bhim 1991, *Drug Addiction Alcoholism, Smoking obscenity* New Delhi: Mittal Publications.
10. Sandhu, Ranvinder Singh, 2009, *Drug Addiction in Punjab: A Sociological Study*. Amritsar: Guru Nanak Dev University.
11. Singh, Chandra Paul 2000. *Alcohol and Dependence among Industrial Workers*: Delhi: Shipra.
12. Sussman, S and Ames, S.L. (2008). *Drug Abuse: Concepts, Prevention and Cessation*, Cambridge University Press.
13. Verma, P.S. 2017, “*Punjab’s Drug Problem: Contours and Characteristics*”, Economic and Political Weekly, Vol. LII, No. 3, P.P. 40-43.
14. World Drug Report 2016, United Nations office of Drug and Crime.
15. World Drug Report 2017, United Nations office of Drug and Crime.

**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**

Energy sources and their availability- Conventional energy sources- Energy-Related Environmental Problems: Acid Rain, Ozone Layer Depletion, Global Climate Change, Nuclear Energy, Renewable Energy Technologies, State of the Climate, Global Temperature, Carbon Dioxide, Methane , Carbon Monoxide , Nitrous Oxide and Sulphur Hexafluoride, Halocarbons, Sea Level. Renewable energy sources Need of renewable 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
2. Non-conventional Energy Sources and Utilization (Energy Engineering); R.K. Rajput; 2012; First Edition.; S. Chand & Company Ltd.
3. Solar Thermal and Biomass Energy; G. Lorenzini, C. Biserni& G. Flacco; 2010; First Edition; WIT Press, UK.

**PAPER-V : Basic Electronics (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**

**Electronics-** Atomic structure, structure of elements, The electron, Energy of an electron, valance electrons, free electrons, Voltage source, Constant voltage source, constant current source, Classification of solids metals insulators and semi-conductors Band structure in solar cell materials.

**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**

1. Principles of Electronics; V. K. Mehta; 2006; Tenth Edition; S. Chand & Co.
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.

**PAPER-VI : Photovoltaic Systems-Tools & Techniques I (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**

Solar Angles, The Incidence Angle for Moving Surfaces, Sun Path Diagrams, Shadow Determination, Solar Radiation, Thermal Radiation, Transparent Plates, Radiation Exchange Between Surfaces, Extra terrestrial Solar Radiation, Atmospheric Attenuation, Terrestrial Irradiation, Total Radiation on Tilted Surfaces, Solar Radiation Measuring Equipment

**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 disconnecter.

**SECTION-D**

**PV Systems:** Direct Coupled PV System, Stand-Alone Applications, Grid-Connected Systems, Hybrid-Connected Systems, Types of Applications, Design of PV Systems, Electrical Loads, Absorbed Solar Radiation, Cell Temperature, Sizing of PV Systems, Hybrid PV/T systems

**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-VI : Photovoltaic systems- Tools and Techniques-I (Practical)****Time: 3 Hours****Max. Marks: 50**

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

**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.

**Paper-II: ਪੰਜਾਬੀ (ਲਾਜ਼ਮੀ)**

ਸਮਾਂ : 3 ਘੰਟੇ

ਕੁਲ ਅੰਕ : 50

**ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ**

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹੋਣਗੇ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਇੱਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿੱਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ ਅੰਕ ਹਨ।
4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿੱਚ ਕਰ ਸਕਦਾ ਹੈ।

**ਪਾਠ-ਕ੍ਰਮ ਅਤੇ ਪਾਠ-ਪੁਸਤਕਾਂ****ਸੈਕਸ਼ਨ-ਏ**

ਆਤਮ ਅਨਾਤਮ (ਕਹਾਣੀ ਭਾਗ),  
(ਸੰਪ. ਸੁਹਿੰਦਰ ਬੀਰ ਅਤੇ ਵਰਿਆਮ ਸਿੰਘ ਸੰਧੂ)  
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ।  
(ਵਿਸ਼ਾ-ਵਸਤੂ, ਪਾਤਰ ਚਿਤਰਨ)

**ਸੈਕਸ਼ਨ-ਬੀ**

ਇਤਿਹਾਸਕ ਯਾਦਾਂ (ਇਤਿਹਾਸਕ ਲੇਖ-ਸੰਗ੍ਰਹਿ)  
ਸੰਪਾ. ਸ.ਸ.ਅਮੋਲ,  
ਪੰਜਾਬੀ ਸਾਹਿਤ ਪ੍ਰਕਾਸ਼ਨ, ਲੁਧਿਆਣਾ। (ਲੇਖ 7 ਤੋਂ 12)  
(ਸਾਰ, ਲਿਖਣ ਸ਼ੈਲੀ)

**ਸੈਕਸ਼ਨ-ਸੀ**

(ੳ) ਸ਼ਬਦ-ਬਣਤਰ ਅਤੇ ਸ਼ਬਦ ਰਚਨਾ : ਪਰਿਭਾਸ਼ਾ, ਮੁੱਢਲੇ ਸੰਕਲਪ  
(ਅ) ਸ਼ਬਦ ਸ੍ਰੁਣਾਅ

**ਸੈਕਸ਼ਨ-ਡੀ**

(ੳ) ਸੰਖੇਪ ਰਚਨਾ  
(ਅ) ਮੁਹਾਵਰੇ ਅਤੇ ਅਖਾਣ



**Paper-II: ਮੁੱਢਲੀ ਪੰਜਾਬੀ**  
(In lieu of Compulsory Punjabi)

ਸਮਾਂ: 3 ਘੰਟੇ

ਕੁਲ ਅੰਕ: 50

ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹੋਣਗੇ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਇੱਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿੱਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ ਅੰਕ ਹਨ।
4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿੱਚ ਕਰ ਸਕਦਾ ਹੈ।

ਪਾਠ-ਕ੍ਰਮ

ਸੈਕਸ਼ਨ-ਏ

ਸ਼ਬਦ ਸ਼੍ਰੇਣੀਆਂ : ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ  
(ਨਾਂਵ, ਪੜਨਾਂਵ, ਕਿਰਿਆ, ਵਿਸ਼ੇਸ਼ਣ, ਕਿਰਿਆ ਵਿਸ਼ੇਸ਼ਣ, ਸਬੰਧਕ, ਯੋਜਕ ਅਤੇ ਵਿਸਮਿਕ)

ਸੈਕਸ਼ਨ-ਬੀ

ਪੰਜਾਬੀ ਵਾਕ ਬਣਤਰ : ਮੁੱਢਲੀ ਜਾਣ-ਪਛਾਣ  
(ੳ) ਸਾਧਾਰਨ ਵਾਕ, ਸੰਯੁਕਤ ਵਾਕ ਅਤੇ ਮਿਸ਼ਰਤ ਵਾਕ (ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ)  
(ਅ) ਬਿਆਨੀਆ ਵਾਕ, ਪ੍ਰਸ਼ਨਵਾਚਕ ਵਾਕ ਅਤੇ ਹੁਕਮੀ ਵਾਕ (ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ)

ਸੈਕਸ਼ਨ-ਸੀ

ਪੈਰਾ ਰਚਨਾ  
ਸੰਖੇਪ ਰਚਨਾ

ਸੈਕਸ਼ਨ-ਡੀ

ਚਿੱਠੀ ਪੱਤਰ (ਘਰੇਲੂ ਅਤੇ ਦਫ਼ਤਰੀ)  
ਅਖਾਣ ਅਤੇ ਮੁਹਾਵਰੇ

**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 7<sup>th</sup> 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 (3<sup>rd</sup> edition)
2. L.M. Joshi and Fauja Singh (ed.), *History of Punjab* , Vol.I, Punjabi University, Patiala, 1977.
3. Budha Parkash, *Glimpses of Ancient Punjab*, Patiala, 1983.
4. B.N. Sharma: *Life in Northern India*, Delhi. 1966.

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

**DRUG ABUSE: MANAGEMENT AND PREVENTION**

**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**

**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**

Legislation: NDPs act, Statutory warnings, Policing of Borders, Checking Supply/Smuggling of Drugs, Strict enforcement of laws, Time bound trials.

**References:**

1. Ahuja, Ram (2003), *Social Problems in India*, Rawat Publication, Jaipur.
2. Extent, Pattern and Trend of Drug Use in India, Ministry of Social Justice and Empowerment, Government of India, 2004.
3. Inciardi, J.A. 1981. *The Drug Crime Connection*. Beverly Hills: Sage Publications.
4. Kapoor. T. (1985) *Drug epidemic among Indian Youth*, New Delhi: Mittal Pub.
5. Kessel, Neil and Henry Walton. 1982, *Alcoholism*. Harmond Worth: Penguin Books.
6. Modi, Ishwar and Modi, Shalini (1997) *Drugs: Addiction and Prevention*, Jaipur: Rawat Publication.

7. National Household Survey of Alcohol and Drug abuse. (2003) New Delhi, Clinical Epidemiological Unit, All India Institute of Medical Sciences, 2004.
8. Ross Coomber and Others. 2013, *Key Concept in Drugs and Society*. New Delhi: Sage Publications.
9. Sain, Bhim 1991, *Drug Addiction Alcoholism, Smoking obscenity* New Delhi: Mittal Publications.
10. Sandhu, Ranvinder Singh, 2009, *Drug Addiction in Punjab: A Sociological Study*. Amritsar: Guru Nanak Dev University.
11. Singh, Chandra Paul 2000. *Alcohol and Dependence among Industrial Workers*: Delhi: Shipra.
12. Sussman, S and Ames, S.L. (2008). *Drug Abuse: Concepts, Prevention and Cessation*, Cambridge University Press.
13. Verma, P.S. 2017, "*Punjab's Drug Problem: Contours and Characteristics*", Economic and Political Weekly, Vol. LII, No. 3, P.P. 40-43.
14. World Drug Report 2016, United Nations office of Drug and Crime.
15. World Drug Report 2017, United Nations office of Drug and Crime.

**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 extra terrestrial 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**

**Solar Thermal Applications:** Solar water heater-Natural and forced circulation type- Solar cookers-Types-Solar Still- Solar drying of food-Basics- Types-Solar heating of buildings active and passive-Solar cooling of buildings-refrigeration and air conditioning- Solar furnaces-Solar thermal energy storage

**Reference**

1. Solar Energy: Fundamentals and Applications; H. P. Garg & J. Prakash; 2000; Tata McGraw-Hill
2. Solar energy Engineering Processes and systems; Academic Press 2009

**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**

Resistors: Fixed and Variable type (preliminary ideas), Color Code of Standard Resistors. Capacitors: Fixed and Variable type, Color Coding of capacitors. Cables/Wires: Types: flexible, hook-up, coaxial and fiber optic, Multi-core Power and Control cables. Switches: Slide, Toggle, Push to ON, Push to OFF, Rocker, Their applications. Relays: Construction, rating & working principle of general purpose relay, Reed relay.

**Reference**

1. Basic Electronics- Solid state; BL Thereja; 2005; S. Chand & Co.
2. Instrumentation devices and systems, C.S Rangan, G.R. Sharma, V.S.V. Mani, Tata McGraw Hil
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****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****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

Facade 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