

Ch. Ranbir Singh University, Jind
Undergraduate Programs

Part A - Introduction			
Subject	Physics		
Semester	5 th		
Name of the Course	Refrigeration and Air Conditioning		
Course Code	PHY-VOC-114		
Course Type: (CC/MCC/MDC/CC-M/DSEC/ VOC/DSE/PC/AEC/VAC)	VOC		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Student of the 5 th sem of any undergraduate scheme under NEP		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: <ol style="list-style-type: none"> 1. Learn about the factors contributing to food spoilage, causes of food spoilage, methods of food preservation 2. Learn about the Commercial Applications of air-conditioning 3. Understand the principles of ice production, different methods of ice manufacturing 4. Learn about the Industrial Applications of air-conditioning. 5. Learn to present observations, results, analysis and different concepts related to refrigerators and air conditioners. 		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks: 30 End Term Exam Marks: 70		Time:3hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u>			
1. Nine questions will be set in total.			

2. Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No.
3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts.
4. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Food Preservation: Introduction, factors contributing to food spoilage, causes of food spoilage, methods of food preservation, freezing method of food preservation, preservation of food with direct contact of liquid N ₂ , freeze drying, preservation of different products, cold storage and commercial cabinets	8
II	Commercial Applications of air-conditioning: Introduction, air-conditioning of houses, offices, hotels, restaurants, departmental stores, theatres, auditoriums, hospitals and medical stores.	7
III	Ice-Manufacturing: Introduction, principles of ice production, different methods of ice manufacturing, treatment of water for making ice, brines, freezing tanks, ice cans, quality of ice.	7
IV	Industrial Applications of Refrigeration: Introduction, importance of relative humidity in different industries, ice-cream manufacturing, refrigeration for breweries, selection of refrigerant for breweries, use of liquid N ₂ for fabric, quality, air conditioning in textile and photographic industries.	8
	<p><u>Practicum</u></p> <ol style="list-style-type: none"> 1. To check and replace electrical components of refrigerator. 2. To check Common faults and their remedies in conventional refrigerator. 3. To install and inspect a new domestic refrigerator. 4. Checking door alignment & replacing gaskets. 5. To strip out defective compressor. 6. To clean and flush for contamination in condenser coil, evaporator coil of conventional refrigerator. 7. Evacuating, leakage testing and gas charging in refrigerator. 8. To check and test electrical accessories in frost free refrigerator. 9. Servicing of components of frost free refrigerator. 10. Identification the electrical and mechanical components of window air conditioner. 11. Servicing and maintenance of window air conditioner. 12. Leak testing in window air conditioner. 13. Evacuation and gas charging in window air conditioner. 14. Identifying various components of split air conditioner. 15. Leakage testing in split air conditioner. 16. Evacuation and gas charging in split air conditioner. <p>Note: Student will perform at least eight experiments. The examiner will allot one practical at the time of end term examination.</p>	60

Suggested Evaluation Methods

Internal Assessment:

> Theory (15 Marks)

- Class Participation: **05 Marks**
- Seminar/presentation/assignment/quiz/class test etc.:**05 Marks**
- Mid-Term Exam: **5 Marks**

> Practicum (15 Marks)

- Class Participation: **Nil**
- Seminar/Demonstration/Viva-voce/Lab records etc.:**15 Marks**
- Mid-Term Exam: **Nil**

**End Term
Examination
: 35 Marks**

: 35 Marks

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Refrigeration and Air Conditioning, Sadhu Singh, Khanna Publishing House
2. Refrigeration and Air Conditioning by C.P.Arora, McGraw Hill education (India) (P) limited, New Delhi
3. Principles of Refrigeration by Roy J. Dossat, Pearson education, New Delhi
4. Refrigeration and Air Conditioning by Manohar Prasad, New age international (P) limited, New Delhi
5. Course in Refrigeration and Air Conditioning by S.C.Arora and S. Domkundwar, Dhanpatrai and sons, Delhi

Part A - Introduction			
Subject	Physics		
Semester	6 th		
Name of the Course	Maintenance of Laboratory Instruments		
Course Code	PHY-VOC-322		
Course Type: (CC/MCC/MDC/CC-M/DSEC/ VOC/DSE/PC/AEC/VAC)	VOC		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Student of the 6 th sem of any undergraduate scheme under NEP		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: <ol style="list-style-type: none"> 1. Understand the standard operating procedure related to Physics Laboratory. 2. Understand the Maintenance of Electronics experiment 3. Understand the Maintenance of mechanics experiments 4. Understand the Maintenance of optics experiments 5. Able to design the basic electronic circuits using diodes and transistors and analyze their input/output. 		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks:100 Internal Assessment Marks:30 End Term Exam Marks: 70		Time:3hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u>			
<ol style="list-style-type: none"> 1. Nine questions will be set in total. 2. Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No. 3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. 4. All questions will carry equal marks. 			

Recommended Books/e-resources/LMS:

1. B.Sc. Practical Physics, C.L. Arora, S. Chand Publisher, New Delhi
2. Advanced Level Practical Physics, M. Nelkon and Ogborn, Henemann Education Books Ltd., New Delhi
3. Practical Physics, S.S. Srivastava and M.K. Gupta, Atma Ram & Sons, Delhi
4. Practical Physics, S.L. Gupta and V. Kumar, Pragati Prakashan Meerut
5. Modern Approach to Practical Physics, R.K. Singla, Modern Publishers, Jalandhar
6. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, Asia Publishing House

Part A - Introduction			
Subject	Physics		
Semester	4 th		
Name of the Course	Installation and Maintenance of Solar Panels		
Course Code	PHY-VOC-323		
Course Type: (CC/MCC/MDC/CC-M/DSEC/ VOC/DSE/PC/AEC/VAC)	VOC		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Student of the 4 th sem of any undergraduate scheme under NEP		
Course Learning Outcomes (CLO):	<p>After completing this course, the learner will be able to:</p> <ol style="list-style-type: none"> 1. Understand the basics of solar energy and solar panels 2. Learn about the SPV Panels systems and their Installation 3. Get the knowledge about the testing methods and techniques SPV. 4. Learn about Maintenance and Troubleshooting process of SPV. 5. Learn to present observations, results, analysis and different concepts related to solar photo voltaic systems. 		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks:100 Internal Assessment Marks:30 End Term Exam Marks: 70		Time:3hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u>			
<ol style="list-style-type: none"> 1. Nine questions will be set in total. 2. Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No. 3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. 4. All questions will carry equal marks. 			

Unit	Topics	Contact Hours
I	Introduction to solar energy and solar panels: Solar Energy and its potential, Harnessing solar energy, need for Solar energy to electrical energy conversion, Solar photo voltaic (SPV) system, SPV panels and their types, ratings and specifications. Advantages and disadvantages of SPV panels, basics of load calculation and SPV requirement	7
II	SPV Panels systems: Solar panel to SPV systems: OFF grid and ON grid solar systems, Areas of applications of SPV systems, components of solar systems; solar panel, inverter (Stand alone and grid tied), Battery Energy system (BES), Charge controller, Tools and equipments: Digital Multimeter Clamp Meter Hydrometer, Sun pathfinder Thermography Camera, drills and fasteners, sealants, pliers and strippers, Pyranometer, Personal Protective Equipments (PPE), Battery maintenance kit Battery water filler etc.	8
III	Installation of SPV Panels: Site selection criteria, steps and procedure for solar panel array installation, different mounting structures, installation of AC and DC distribution boxes, earthing and grounding pits, optimal cable sizing and cable laying. Testing and Inspection: Testing methods and techniques, testing of SPV open circuit and load voltage, Battery SOC testing, testing of protective systems and earth resistance, Inspection of connected systems and running a test.	8
IV	Maintenance and Troubleshooting: Scheduled and unscheduled maintenance, checking dust accumulation, Module Shading Module Mismatch, Physical Integrity, standard trouble shooting procedure.	7
	<u>Practicum</u> <ol style="list-style-type: none"> 1. To study the various components of A Residential Solar Electric System. 2. To study the Series and Parallel Connection in Solar system. 3. To study the various Parameters in Solar Panel Installations. 4. To study the Solar energy system components used in the Installation of solar panel 5. To study the solar tracking system. 6. Measurement of PV module parameters and study of their characteristics. 7. Testing of Standalone PV system 8. To Measure voltage, current and power of solar photovoltaic modules 9. Identify the components of solar photovoltaic system 10. Identification of types of solar photovoltaic systems 11. Define solar cell parameters List the types of connections of solar photovoltaic panel 12. Identify the batteries used in PV system and describe standard parameters of battery. 13. Recognize functions of a charge controller 14. Identify prerequisites for installing a solar PV system. 	60

