

SCHEME OF EXAMINATION

And

SYLLABI

For

BACHELOR OF VOCATION

In

(REFRIGERATION AND AIR CONDITIONING)

3rd SEMESTER & 4th SEMESTER

Offered by

University School of Engineering and Technology



**Guru Gobind Singh Indraprastha University
Dwarka, Delhi – 110078 [INDIA]**

www.ipu.ac.in

Scheme and Syllabi for B. Voc. (Refrigeration and Air Conditioning)(2nd year) w. e. f. batch 2016-17, approved in the BOS of USET/USICT held on 19th July, 2016 & AC Sub Committee Meeting of USET/USICT held on 27th July, 2016.

NOMENCLATURE OF CODES GIVEN IN THE SCHEME OF B.VOC

1. **ET** stands for Engineering and Technology.
2. **V** stands for Vocation.
3. **MC** stands for Mobile Communication.
4. **SD** stands for Software Development.
5. **AE** stands for Automobile.
6. **CE** stands for Consumer Electronics.
7. **PT** stands for Printing Technology.
8. **CT** stands for Construction Technology.
9. **RA** stands for Refrigeration & Air-Conditioning.
10. **PD** stands for Power Distribution Management.
11. **ID** stands for Interior Design.
12. **AA** stands for Applied Arts.
13. **CS** stands for Computer Science.
14. **MS** stands for Management Studies.
15. **EN** stands for Environmental Engineering
16. **AS** stands for Applied Science.
17. **HS** stands for Humanities and Social Sciences.
18. **SS** stands for Social Services.
19. **L/T** stands for Lecture and Tutorial
20. **P** stands for Practicals.
21. **S/D** stands for Drawing/Studio
22. **P/D** stands for Practical/Drawing



**GURU GOBIND SINGH
INDRAPRASTHA
UNIVERSITY**

**BACHELOR OF VOCATION
(REFRIGERATION AND AIR CONDITIONING)
THIRD SEMESTER EXAMINATION
(LEVEL-VI)**

Paper Code	Paper ID	Paper	L	T/P	Credits
THEORY PAPERS					
ETVRA-601		Heat Transfer	3	0	3
ETVRA-603		Refrigeration-II	3	0	3
ETVRA-605		Applied Electronics	3	0	3
ETVRA-607		Applied Thermodynamics	3	0	3
OPEN ELECTIVE-III (Select any one)					
ETVMS-611		Financial Accounting	3	0	3
ETVMS-613		Organizational Behaviour	3	0	3
ETVMS-615		Operations Research	3	0	3
ETVMS-617		Industrial Management	3	0	3
ETVMS-619		Managerial Economics	3	0	3
PRACTICAL/VIVA VOCE					
ETVRA-651		Heat Transfer Lab	0	4	4
ETVRA-653		Refrigeration –II Lab	0	4	4
ETVRA-655		Applied Electronics Lab	0	4	4
ETVRA-657		Industrial Training-II	0	2	4
TOTAL			15	14	31

NOTE:

There are five industrial trainings to be carried out by the student(s) in B.Voc course. Industrial Trainings I, III and V will be with weightage of two credits each. These trainings are to be carried out during winter vacations for the duration of two weeks. Industrial Trainings II and IV will be with weightage of four credits each. These trainings are to be carried out during summer vacations for the duration of four to six weeks. These training may be done from industry/Skill Knowledge Providers (SKPs) /Sector Skill Councils (SSCs) / Training Centers/Institutes. Student should submit training report during evaluation. Industrial Training done at the end of the semester will be evaluated in the subsequent semesters.

GURU GOBIND SINGH
INDRAPRASTHA
UNIVERSITY

**BACHELOR OF VOCATION
(REFRIGERATION AND AIR CONDITIONING)
FOURTH SEMESTER EXAMINATION
(LEVEL-VI)**

Paper Code	Paper ID	Paper	L	T/P	Credits
THEORY PAPERS					
ETVRA-602		Fluid Mechanics & Hydraulics	3	0	3
ETVRA-604		Air conditioning -II	3	0	3
ETVRA-606		Work Shop Technology	3	0	3
CORE ELECTIVE-I (Select any one)					
ETVRA-608		Impact of Science & Technology on Society	3	0	3
ETVRA-610		Impact of RAC on Environment	3	0	3
OPEN ELECTIVE-IV (Select any one)					
ETVCT-614		Global Warming & Climate Change	3	0	3
ETVMS-616		Entrepreneurship Development and Planning	3	0	3
ETVMS-618		Business Informatics	3	0	3
PRACTICAL/VIVA VOCE (Select any one Lab based on Core Elective-I)					
ETVRA-658		Impact of Science & Technology on Society	0	4	4
ETVRA-660		Impact of RAC on Environment	0	4	4
PRACTICAL/VIVA VOCE					
ETVRA-652		Fluid Mechanics & Hydraulics Lab	0	4	4
ETVRA-654		Air Conditioning –II Lab	0	4	4
ETVRA-656		Industrial Training-III	0	0	2
ETVRA-662		Project-II (RAC)	0	6	3
TOTAL			15	18	32

NOTE:

There are five industrial trainings to be carried out by the student(s) in B.Voc course. Industrial Trainings I, III and V will be with weightage of two credits each. These trainings are to be carried out during winter vacations for the duration of two weeks. Industrial Trainings II and IV will be with weightage of four credits each. These trainings are to be carried out during summer vacations for the duration of four to six weeks. These training may be done from industry/Skill Knowledge Providers (SKPs) /Sector Skill Councils (SSCs) / Training Centers/Institutes. Student should submit training report during evaluation. Industrial Training done at the end of the semester will be evaluated in the subsequent semesters.

NOTE FOR PROJECT:

The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format, thereafter he/she will have to present the progress of the work through seminars and progress reports.

HEAT TRANSFER**Paper Code: ETVRA-601****Paper: Heat Transfer**

L	T/P	C
3	0	3

INSTRUCTIONS TO PAPER SETTERS:**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective and pre-requisite: The objective of the paper is to facilitate the student with the basics of Heat & Mass Transfer that are required for an engineering student.

UNIT-I

Introduction: Definition of Heat: Modes of Heat Transfer; Basic Laws of heat transfer; Electrical Analogy of heat conduction; Conduction through composite walls; Overall heat transfer coefficient.

Conduction: The general conduction equation in Cartesian, coordinates; steady one dimensional heat conduction without internal heat generation; the plane slab; the cylindrical shell; the spherical shell; critical thickness of insulation. Fins of uniform cross-section; Governing equation; Temperature distribution and heat dissipation rate; Efficiency and effectiveness of fins.

[T1, T2][No. of Hrs. 11]**UNIT- II**

Convection: Free and forced convection; Newton's law of cooling; convective heat transfer Coefficient; Nusselt number; Dimensional analysis of free and forced convection; the concept of boundary layer; hydrodynamic and thermal boundary layer; Analysis of free convection; governing equations for velocity and temperature fields. Relation between fluid friction and heat transfer, Reynolds analogy, Dimensionless numbers; Reynolds, Prandtl, Nusselt, Grashoff and Stanton Numbers and their significance, Heat transfer with change of phase; Nusselt theory of laminar film condensation.

[T1, T2][No. of Hrs.11]**UNIT -III**

Heat Exchangers: Introduction; classification of heat exchangers; Logarithmic mean temperature Difference; Area calculation for parallel and counter flow heat exchangers; Effectiveness of heat exchangers; NTU method of heat exchanger design, Applications of heat exchangers.

[T1, T2][No. of Hrs. 11]**UNIT-IV**

Radiation: Theories of thermal radiation; Absorption, reflection and transmission; Monochromatic and total emissive power; Black body concept; Planck's distribution law; Stefan Boltzman law; Wien's displacement law; Lambert's cosine law; Kirchoff's law;

Diffusion in Fluids: Molecular and eddy diffusion, Diffusivity, Diffusion through liquids and gases.

[T1, T2][No. of Hrs. 12]**Text Book(s):**

[T1] D. S. Kumar, Heat and Mass Transfer, Katson Publishing House, Ludhiana.

[T2] R K Rajput, Heat and Mass Transfer, S Chand, 2007

References Book(s):

[R1] S.P. Sukhatme, A text book on heat transfer, University Press

[R2] Holman, Heat Transfer, McGraw-Hill

[R3] R. Yadav, Heat and Mass Transfer, Central Publishing House, Allahabad

REFRIGERATION-II**Paper Code: ETVRA-603****Paper: Refrigeration-II**

L	T/P	C
3	0	3

INSTRUCTIONS TO PAPER SETTERS:**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective and pre-requisite: The objective of the paper is to facilitate the student with the basics of refrigeration that are required for an engineering student.

UNIT-I**Air Refrigeration Cycle:**

Introduction: Introduction to air refrigeration systems, Types of air refrigeration system, advantages & disadvantages of closed system and open system.

[T1, T2][No. of Hrs. 11]**UNIT-II**

Air Refrigeration Cycle: Bell Coleman or reversed joule air refrigeration cycle. Advantages & disadvantages of Bell Coleman cycle. Closed Bell Coleman air cycle.

[T1, T2][No. of Hrs. 11]**UNIT-III**

Air Craft Refrigeration: Air craft refrigeration system , classification of air craft refrigeration system – simple air cooling system , simple air evaporative system , Boot strap air refrigeration system , Boot strap air evaporative cooling system , reduced ambient air cooling system , regenerative air cooling system , Dry air rated temperature (DART).

[T1, T2][No. of Hrs. 11]**UNIT-IV**

Vapour Compression system: Multistage vapour compression system – two stage compressions with liquid inter cooler, two stage compression systems with water intercooler and liquid sub cooler with or without flash chamber.

Multi evaporator system with single compressor – Multiple evaporator system at the same temperature, multiple evaporators at different temperatures with individual expansion valves and BPV, multiple evaporators with multiple expansion valves and BPV, multiple evaporator with individual expansion valves and individual compressors , multiple evaporator with individual compressor and multiple expansion valves.

Cascade system of refrigeration.

[T1, T2][No. of Hrs. 12]**Text Book(s):**

[T1] P.L. Ballaney, Refrigeration & Air conditioning, Khanna publisher.

[T2] C. P. Arora, Refrigeration & Air conditioning, Tata Mc Graw Hill

Reference Book(s):

[R1] Dossat, Principles of refrigeration, John Wiley & sons

APPLIED ELECTRONICS

Paper Code: ETVRA-605
Paper: Applied Electronics

L	T/P	C
3	0	3

INSTRUCTIONS TO PAPER SETTERS:**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: Objective of the paper is to facilitate the student with the basics of electronic aspects that are required for his understanding and applications in their respective field of study. The pre-requisites are, to have a basic understanding of Applied Physics and Mathematics.

UNIT-I

Evaluation of Electronics: Introduction & Application Of Electronics, Energy Band Theory Of Crystals, Energy Band Structures In Metals, Semiconductors And Insulators, Theory Of Semiconductors: Classification Of Semiconductors, Conductivity Of Semiconductors, Carrier Concentration In Intrinsic & Extrinsic Semiconductors, Properties Of Intrinsic And Extrinsic Semiconductors, Variation In Semiconductors Parameters With Temperature, Fermi-Dirac Function, Fermi Level In A Semiconductor Having Impurities, Band Structure Of Open-Circuited P-N Junction, Drift And Diffusion Currents, Carrier Life Time, Continuity Equation (Elementary Treatment Only).

[T1][T2][T3][No. of Hours: 11]**UNIT – II**

Theory of p-n Junction Diode: Diode Current Equation, Diode Resistance, Transition Capacitance, Diffusion Capacitance, (Elementary treatment only), Effect of Temperature on p-n Junction Diode, Switching Characteristics, Piecewise Linear Model,

Special Diodes: Zener Diode, Varactor Diode, Tunnel Diode, Photodiode, Light Emitting Diodes, Schottky Barrier Diode,

Applications of Diodes: Half-Wave Diode Rectifier, Full-Wave Rectifier, Clippers and Clampers (Elementary treatment only).

[T1][T2][T3][No. of Hours: 11]**Unit – III**

Bipolar Junction Transistor: Introduction of transistor, construction, transistor operations, BJT characteristics, load line, operating point, leakage currents, saturation and cut off mode of operations, Eber-moll's model.

[T1][T2][T3][No. of Hours: 11]**Unit – IV**

Application of BJT: CB, CE, CC configurations, hybrid model for transistor at low frequencies, Introduction to FETs and MOSFETs.

Fundamentals of Digital Electronics: Digital and analog signals, number systems, Boolean algebra, logic gates with simple applications, logic gates, karnaugh maps.

[T1][T2][T3][No. of Hours: 12]**Text Book(s):**

[T1] S. Salivahanan, N. Suresh Kr. & A. Vallavaraj, "Electronic Devices & Circuit", Tata McGraw Hill, 2008

[T2] Millman, Halkias and Jit, "Electronic Devices and Circuits" McGraw Hill

[T3] Boylestad & Nashelsky, "Electronic Devices & Circuits", Pearson Education, 10th Edition.

Reference Book(s):

[R1] Sedra & Smith, "Micro Electronic Circuits" Oxford University Press, VIth Edition

[R2] Robert T. Paynter, "Introducing Electronic Devices & Circuits", Pearson Education, VIIth Edition, 2006

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APPLIED THERMODYNAMICS

Paper Code: ETVRA-607
Paper: Applied Thermodynamics

L	T/P	C
3	0	3

INSTRUCTIONS TO PAPER SETTERS:**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective and pre-requisite: The objective of the paper is to facilitate the student with the basics of refrigeration that are required for an engineering student.

UNIT-I

Thermodynamic relations: Concept & application of Exergy Joule-Thompson coefficient and Inversion curve. Coefficient of volume expansion, Adiabatic and Isothermal compressibility.

Fuels and Combustion: Combustion analysis, heating values, air requirement, Air/Fuel ratio, standard heat of reaction and effect of temperature on standard heat of reaction, heat of formation, Adiabatic flame temperature.

[T1, T2][No. of Hrs. 11]**UNIT-II**

Boilers: Classifications and working of boilers, boiler mountings and accessories, Draught and its calculations, air pre heater, feed water heater, super heater. Boiler efficiency, Equivalent evaporation. Boiler trial and heat balance.

Condenser: Classification of condenser, air leakage, condenser performance parameters.

Steam Engines: Modified Rankine cycles, working and classification of steam engines, Indicator diagram, Saturation curve, Missing quantity, Heat balance.

[T1, T2][No. of Hrs. 11]**UNIT-III**

Steam and Gas Nozzles: Flow through Convergent and convergent-divergent nozzles, variation of velocity, area and specific volume, Choked flow, throat area, Nozzle efficiency, Off design operation of nozzle, Effect of friction on nozzle, Super saturated flow.

Steam Turbines : Classification of steam turbine, Impulse and Reaction turbines, Staging, Stage and Overall efficiency, Reheat factor, Bleeding, Velocity diagram of simple and compound multistage impulse and reaction turbines and related calculations, work done, efficiencies of reaction, Impulse reaction turbines, state point locus, Losses in steam turbines, Governing of turbines, Comparison with steam engine.

[T1, T2][No. of Hrs. 11]**UNIT-IV**

Gas Turbine: Gas turbine classification, Brayton cycle, Principles of gas turbine, Gas turbine cycles with intercooling, reheat and regeneration and their combinations, Stage efficiency, Polytropic efficiency. Deviation of actual cycles from ideal cycles.

Jet Propulsion: Introduction to the principles of jet propulsion, Turbojet and turboprop engines and their processes, Principle of rocket propulsion, Introduction to Rocket Engine.

[T1, T2][No. of Hrs. 12]**Text Book(s):**

- [T1] Basic and Applied Thermodynamics by P.K. Nag, TMH
- [T2] Applied Thermodynamics by Onkar Singh, New Age International
- [T3] Applied Thermodynamics for Engineering Technologists by Eastop, Pearson Education

Reference Book(s):

- [R1] Applied Thermodynamics for Engineering Technologists by Eastop, Pearson Education
- [R2] Fundamentals of classical thermodynamics by Van Wylen, Wiley Eastern Limited

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FINANCIAL ACCOUNTING
(Open Elective-III)

Paper Code: ETVMS-611
Paper: Financial Accounting

L	T/P	C
3	0	3

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

accounting principles and techniques of preparing and presenting the accounts for user of accounting information.

UNIT-I

Meaning and Scope of Accounting: Objectives and Nature of Accounting, Definition and Functions of Accounting, Book Keeping and Accounting, Interrelationship of Accounting with other Disciplines, Branches of Accounting, Limitation of Accounting, Accounting Equation.

Accounting Principles and Standards: Accounting Principles, Accounting Concepts and Conventions, Accounting cycle system of accounting Introduction to Accounting Standards Issued by ICAI.

Journalizing Transactions: Journal, Rules of Debit and Credit,

Sub Division of Journal: Cash Journal, Petty Cash Book, Purchase Journal, Purchase Return, Sales Journal, Sales Return Journal, Voucher System.

[T1][No. of Hrs. 11]

UNIT-II

Ledger Posting and Trial Balance: Ledger, Posting, Rules Regarding Posting, Trial Balance. Capital and Revenue: Classification of Income, Classification of Expenditure, Classification of Receipts, Difference between Capital Expenditure & Capitalized, Expenditure.

Inventory Valuation: Meaning of Inventory, Objectives of Inventory Valuation, Inventory Systems, Methods of Valuation of Inventories,

Depreciation Provisions and Reserves: Concept of Depreciation, Causes of Depreciation, Basic Features of Depreciation, Meaning of Depreciation Accounting, Objectives of Providing Depreciation, Fixation of Depreciation Amount, Method of Recording Depreciation, Methods of Providing Depreciation, Depreciation Policy, AS-6 (Revised) Provisions and Reserves, Change of Method of Depreciation (by both Current and Retrospective Effect).

[T2][No. of Hrs. 11]

UNIT-III

Shares and Share Capital: Introduction to Joint Stock Company, Shares, Share Capital, Accounting Entries, Under Subscription, Oversubscription, Calls in Advance, Calls in Arrears, Issue of Share at Premium, Issue of Share at Discount, Forfeiture of Shares, Surrender of Shares, Issue of Two Classes of Shares, Right Shares, Re-issue of Shares.

Debentures: Classification of Debentures, Issue of Debentures, Different Terms of Issue of Debentures, Writing off Loss on Issue of Debentures, Accounting Entries, Redemption of Debentures.

[T1][No. of Hrs. 11]

UNIT-IV

Company Final Accounts: Preparation of Final Accounts, Manufacturing Account; Trading Account, Profit and Loss Account; Balance Sheet (with adjustments), Contents of Corporate Annual Reports with Annexures.

[T2][No. of Hrs. 12]

Text Book(s):

[T1] Tulsian, P.C., (2015), *Financial Accountancy*, Pearson Education.

[T2] Maheshwari, S.N. and Maheshwari, S. K., (2015), *An Introduction to Accountancy*, Vikas Publishing House.

Reference Book(s):

[R1] Bhattacharyya, Ashish K., (2015), *Essentials of Financial Accounting*, Prentice Hall of India.

[R2] Rajasekran, (2015), *Financial Accounting*, Pearson Education.

[R3] Bhattacharyya, S.K. and Dearden, J., (2015), *Accounting for Manager – Text and Cases*, Vikas Publishing House.

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[R4] Glautier, M.W.E. and Underdown, B., (2015), *Accounting Theory and Practice*, Pearson Education.

ORGANIZATIONAL BEHAVIOR
(Open Elective-III)

Paper Code: ETVMS-613
Paper: Organizational Behavior

L	T/P	C
3	0	3

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The aim of this paper is to provide managerial skills in the students.

UNIT-I

Introduction: Concept and nature of Organizational Behaviour; Contributing disciplines to the field of O.B.; O.B. Models; Need to understand human behaviour; Challenges and Opportunities, Management functions, Tasks and responsibilities of a professional manager; Managerial skills.

[T1, T2][No. of Hrs. 11]

UNIT-II

Individual & Interpersonal Behaviour: Biographical Characteristics; Ability; Values; Attitudes-Formation, Theories, Organization related attitude, Relationship between attitude and behaviour; Personality – determinants and traits; Emotions; Learning-Theories and reinforcement schedules, Perception –Process and errors.

[T1, T2][No. of Hrs. 11]

UNIT-III

Organization Structure and Process: Organizational climate and culture, Organizational Structure and Design, Managerial Communication, Motivation, Stress and its management, Decision Making: Organizational Context of Decisions, Decision Making Models; Problem Solving.

[T1, T2][No. of Hrs. 11]

UNIT-IV

Interactive Aspects of Organizational Behaviour: Interpersonal Behaviour: Johari Window; Transactional Analysis – ego states, types of transactions, life positions, applications of T.A, Group Dynamics; Management of Organizational Conflicts; Leadership Styles.

[T1, T2][No. of Hrs. 12]

Text Book(s):

- [T1] Luthans Fred., “Organizational Behaviour”, McGraw Hill, 2010, 12th ed.
[T2] Robbins & Judge (15th ed.), “Essentials of Organizational Behaviour”, Pearson 2012.

References Book(s):

- [R1] Stoner, R. James A.F., Edward Freeman Daniel R Gilbert Jr., Management 6TH Ed, PHI
[R2] George, J. M. & Jones, G.R. (2009). Understanding and Managing Organizational Behaviour, 5th Edition, Pearson Education.
[R3] Green Berg, J. and Baron, R.A. (2008), Behaviour in Organization. Prentice Hall of India.
[R4] Mcshane, S.L., Von Glinow, M.A., Sharma, R.R. (2006) Organizational Behaviour. Tata McGrawHill

OPERATIONS RESEARCH
(Open Elective-III)

Paper Code: ETVMS-615
Paper: Operations Research

L	T/P	C
3	0	3

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The objective of the paper is to acquaint the student with mathematical techniques being adopted in industry which help managers in decision taking.

UNIT-I

Linear Programming: Formulation of LP Problem. Graphical method, Simplex method for maximization and minimization LP Problems. Duality in Simplex Problems,

Queuing Theory: Introduction to probability concept for queuing problems. Basic structure, Terminology, Classification, Birth and Death Process. Queuing Models.

[T1][No. of Hrs. 11]

UNIT-II

Transportation Models: MODI method for optimality check, North West Corner Method, Least-cost Method and Vogel's Approximation Method (VAM) for solving balanced and unbalanced transportation problems. Problems of degeneracy and maximization.

Assignment Models: Assignment model for maximization & minimization problems. Travelling Salesman Problems, Industrial Problems.

[T2][No. of Hrs. 11]

UNIT-III

Sequencing Theory: Processing of n-jobs through m-machines with each job having same processing order. Processing of two jobs through m-machines with each job having different processing order.

Decision Theory: Decision making under uncertainty and under risk, Multistage decision making, Multi criteria decision making.

[T1][No. of Hrs. 11]

UNIT-IV

Network Models: Introduction to PERT and CPM. Fundamental concept of Network models and construction of network diagrams. Activity time estimates. Critical path and project time duration. Probability of completing the project on or before specified time. Concept of Float and slack.

Game Theory: Two person zero-sum games. Minimax and Maximin principle. Arithmetic, Algebraic, Matrix Algebra method. Solution by Dominance, Subgame, Graphical method, Linear programming method.

[T2][No. of Hrs. 12]

Text Book(s):

- [T1] Hira and Gupta, "Operation Research" S. Chand Publications
[T2] H.A. Taha, "Operations Research", Prentice-Hall India, 6th Edition, 2004.

Reference Book(s):

- [R1] S.Kalavathy, "Operations Research", Vikas Publication, 4th Edition, 2013.
[R2] N.D. Vohra, "Operations Research", Tata McGraw Hill, 2004.
[R3] Richard Bronson, Govindasami Naadimuthu, "Operations Research", Tata McGraw Hill, 2004
[R4] A.P. Verma, "Operations Research", S.K. Kataria & Sons, 2004.
[R5] J.K. Sharma, "Operation Research", Macmillan India Ltd. 2005.

INDUSTRIAL MANAGEMENT
(Open Elective-III)

Paper Code: ETVMS-617
Paper: Industrial Management

L	T/P	C
3	0	3

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The course provides a broad introduction to some aspects of business management and running of business organization.

UNIT-I

Industrial relations- Definition and main aspects. Industrial disputes and strikes. Collective bargaining.

Labour Legislation- Labour management cooperation/worker's participation in management. Factory legislation. International Labour Organization.

[T1, T2][No. of Hrs. 11]

UNIT-II

Trade Unionism- Definition, Origin, Objectives of Trade Unions. Methods of Trade unions. Size and finance of Indian Trade unions-size, frequency distribution, factors responsible for the small size. Finance-sources of income, ways of improving finance.

[T1, T2][No. of Hrs. 11]

UNIT-III

Work Study-Method study and time study. Foundations of work study. Main components of method study. Time study standards. Involvement of worker's unions. Work Sampling. Application of work study to office work.

[T1, T2][No. of Hrs. 11]

UNIT-IV

Quality Management- What is Quality? Control Charts. Quality is everybody's job. Taguchi Philosophy. Service Quality. What is Total Quality Management (TQM)? Roadmap for TQM. Criticism of TQM. Six Sigma.

[T1, T2][No. of Hrs. 12]

Text Book(s):

[T1] Sinha, P.R.N., Sinha I.B. and Shekhar S.M.(2013), Industrial Relations, Trade Unions and Labour Legislation. Pearson Education

[T2] Chary, S.N. (2012), Production and Operations Management. Tata McGraw Hill Education.

Reference Books:

[R1] Srivastava, S.C. (2012), Industrial Relations and Labour Laws, Vikas Publishing

[R2] Shankar R (2012), Industrial Engineering and Management. Galgotia Publications

[R3] Telsang, M. (2006), Industrial Engineering and Production Management. S.Chand

[R4] Thukaram, Rao (2004), M.E. Industrial Management. Himalaya Publishing House.

MANAGERIAL ECONOMICS
(Open Elective-III)

Paper Code: ETVMS-619
Paper: Managerial Economics

L	T/P	C
3	0	3

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objectives: The objective of this subject is to give understanding of the basic concepts and issues in economics and their application in business decisions.

UNIT-I

Introduction: Nature, Scope and Significance of Managerial Economics, its Relationship with other Disciplines, Role of Managerial Economics in Decision Making; Opportunity cost Principle, Production Possibility Curve, Incremental Concept, Cardinal and Ordinal Approaches to Consumer Behaviour: Equi-marginal principle, Law of Diminishing Marginal Utility, Indifference curve Analysis.

[T1][No. of Hrs. 11]

UNIT-II

Demand Analysis and Theory of Production: Demand Function, Determinants of Demand, Elasticity of Demand, Demand Estimation and Forecasting, Applications of Demand Analysis in Managerial Decision Making; Theory of Production: Production Function, Short Run and Long Run Production Analysis.

[T2][No. of Hrs. 11]

UNIT-III

Theory of Cost and Market Structures: Traditional and Modern Theory of Cost in Short and Long Runs, Economies of Scale and Economies of Scope; Market Structures: Price-Output decisions under Perfect Competition, Monopoly, Monopolistic Competition.

[T1][No. of Hrs. 11]

UNIT-IV

Introduction to Macro Economics: Nature and Importance; Economic Growth and Development, Methods of Measurement of National Income; Inflation: meaning, Theories, and Control measures.

[T2][No. of Hrs. 12]

Text Book(s):

- [T1] Samuelson, Paul and Nordhaus, William, (2016), *Economics*, McGraw Hill Education.
[T2] Dwivedi, D.N., (2015), *Managerial Economics*, Vikas Publishing House.

Reference Book(s):

- [R1] Salvatore, Dominick, (2015), *Managerial Economics in a Global Economy*, Oxford University Press.
[R2] Kreps, David, (2015), *MicroEconomics for Managers*, Viva Books Pvt. Ltd.
[R3] Peterson, Lewis and Jain, (2016), *Managerial Economics*, Pearson Education.
[R4] Colander, David, C., (2015), *Economics*, McGraw Hill Education.

HEAT TRANSFER LAB**Paper Code: ETVRA-651****Paper: Heat Transfer Lab**

L	T/P	C
0	4	4

Note:- The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.

List of Experiments:

1. Conduction - Composite wall experiment
2. Conduction - Composite cylinder experiment
3. Convection - Pool Boiling experiment
4. Convection - Heat transfer through fin-natural convection.
5. Convection - Heat transfer through tube/fin-forced convection.
6. Any experiment on Stefan's Law, on radiation determination of emissivity.
7. Heat exchanger - Parallel flow experiment
8. Heat exchanger - Counter flow experiment
9. Any other suitable experiment on critical insulation thickness.
10. Determination of thermal conductivity of fluids or solid



**GURU GOBIND SINGH
INDRAPRASTHA
UNIVERSITY**

REFRIGERATION-II LAB

Paper Code: ETVRA-653
Paper: Refrigeration-II Lab

L	T/P	C
0	4	4

Note:- The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.

List of Experiments:

- 1) To disassemble and assemble :
 - a) Hermetic reciprocating compressor
 - b) Semi sealed reciprocating compressor
 - c) Open type reciprocating compressor

- 2) To disassemble and assemble:
 - a) Oil separators
 - b) Dehydrators
 - c) Strainers
 - d) Receiver tank valve
 - e) Compressor service valve
 - f) Manual valve
 - g) Crank case heater
 - h) Moisture indicators and sight glasses



**GURU GOBIND SINGH
 INDRAPRASTHA
 UNIVERSITY**

APPLIED ELECTRONICS LAB**Paper Code: ETVRA-655****L T/P C****Paper: Applied Electronics Lab****0 4 4**

Note:- The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.

List of Experiments:

1. Introduction to C.R.O, Function Generator & Bread Board Kit & to generate different types of waveform with the help of Function Generator & to calculate their frequency, amplitude AC & DC voltage.
2. Identification & testing of Active & passive components
3. To plot V-I characteristics of a semiconductor diode &
Calculate Static & Dynamic Resistance
4. To Study the Reverse characteristics of Zener diode
5. To Study the Rectifier circuit.
 - a) Half Wave Rectifier
 - b) Centre Tapped Rectifier.
 - c) Bridge Rectifier.
6. To Study the output waveforms of different Filter Ckts of Rectifier.
7. To Plot Input & Output characteristics CB transistor.
8. To Plot Input & Output characteristics of CE transistor.
9. Realization of basic gates.
10. Implementation of Boolean functions (two or three variables).
11. Few experiments mentioned above to be performed on P-spice.
12. To develop a working model of any electronic circuit.

**GURU GOBIND SINGH
INDRAPRASTHA
UNIVERSITY**

FLUID MECHANICS & HYDRAULICS

Paper Code: ETVRA-602
Paper: Fluid Mechanics & Hydraulics

L	T/P	C
3	0	3

INSTRUCTIONS TO PAPER SETTERS:**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

***Objective and pre-requisite:** The objective of this subject to provide an understanding of the fundamentals of fluid mechanics, an appreciation of the design principles in fluid systems, the ability to analyses existing fluid systems and contribute to new designs.*

UNIT-I

Fundamental Concepts of Fluid Flow: Fundamental definitions, Fluid properties, classification of fluids, Flow characteristics, Foundations of flow analysis, Incompressible and compressible fluids, one, two and three dimensional flows.

Pressure and its measurements: Pascal's law, pressure variation in a fluid at rest, Classification of different manometers.

Fluid Statics: Fluid pressure, Forces on solid surfaces, Buoyant forces, Metacentre and Metacentric height. Stability of floating bodies.

[T1, T2, T3][No. of Hrs.11]

UNIT-II

Kinematics of Fluid Flow: Types of fluid flow, streamline, path line and streak line; continuity equation, Equations for acceleration, Irrotational and rotational flow, velocity potential and stream function, Vortex flow, Continuity equation.

Dynamics of Fluid Flow: Control volume analysis, Eulers equation of motion, Bernoulli's equation, Bernoulli's theorems from steady flow energy equation, Venturi meter; Pitot tube, Momentum equation.

[T1, T2, T3][No. of Hrs.11]

UNIT-III

Laminar Flow : Flow through circular pipe and parallel plates, Kinetic energy correction factor, Momentum correction factor; Loss of head due to friction; determination of coefficient of viscosity.

Boundary Layer: Concept and development of boundary layer, Laminar and turbulent boundary layers and their analysis, boundary layer thickness; Critical Reynolds number; Boundary layer separation and control.

Turbulent flow: Shear stress, velocity distribution in smooth and rough pipes, Resistance of smooth and rough pipes.

Flow Measurements: Measurement of flow using, orifice meter, nozzle, Measurement of flow in open channels – rectangular, triangular, trapezoidal weir, Cipoletti weir. Hot-wire anemometer.

Flow through pipes: Loss of head / energy in pipes - Major losses-friction loss by Darcy Weisbach formula, Chezy's formula; Types of minor losses; Hydraulic gradient and total energy line, Flow through siphon, Pipes in series, concept of equivalent pipe, flow through parallel and branched pipes; Water hammer in pipes, sudden and gradual closure of valve.

[T1, T2, T3][No. of Hrs.12]

UNIT-IV

Centrifugal pumps: Main parts; Head, efficiencies and work done computations, minimum speed for starting a centrifugal pump, specific speed, centrifugal pump; Cavitations in turbines and centrifugal pumps and their effects and precautions, Computation for maximum suction lift.

[T1, T2, T3][No. of Hrs.11]

Text Books:

[T1] R.K. Bansal, "Fluid Mechanics & Hydraulic Machines", Laxmi Publications(P) Ltd.,2002.

[T2] D.S. Kumar, "Fluid Mechanics and Fluid Power Engineering", S.K. Kataria & Sons,2000.

Scheme and Syllabi for B. Voc. (Refrigeration and Air Conditioning)(2nd year) w. e. f. batch 2016-17, approved in the BOS of USET/USICT held on 19th July, 2016 & AC Sub Committee Meeting of USET/USICT held on 27th July, 2016.

[T3] Hughes and Brighton, "Fluid Mechanics", Tata McGraw Hill

Reference Books:

[R1] I.H. Shames, "Mechanics of Fluids", Tata McGraw Hill

[R2] V.L. Streeter and E.B. Wylie, "Fluid Mechanics", Tata McGraw Hill

[R3] Douglas, Gasiorek, Swaffield and Jack, "Fluid Mechanics", Pearson Education.

[R4] Fay A. James, "Introduction to Fluid Mechanics", PHI Publications

[R5] Kothandaraman and Rudramoorthy, "Fluid Mechanics and Machinery", New Age Publication

[R6] Douglas, Gasiorek, Swaffield and Jack, "Fluid Mechanics", Pearson Education.



AIR CONDITIONING-II

Paper Code: ETVRA-604
Paper: Air Conditioning-II

L	T/P	C
3	0	3

INSTRUCTIONS TO PAPER SETTERS:**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective and pre-requisite: The objective of the paper is to facilitate the student with the basics of air-conditioning that are required for an engineering student.

UNIT-I

Unitary system: Window Air Conditioner, Split air Conditioner, Package air Conditioner.

Central air conditioning system: Direct expansion system, all water system, all air system, air water system.

[T1, T2][No. of Hrs. 11]**UNIT-II**

Air Conditioning Equipments: Air cleaners, types of filters, cooling coil, heating devices, Humidifiers.

Fans: Axial fans, Centrifugal fans (Forward, Radial, backward and aerofoil blade fans). Fans laws, Selection of fan, Fan control.

[T1, T2][No. of Hrs. 11]**UNIT-III**

Duct design: Introduction of duct, classification of duct, flow through duct, Shape of duct – (Circular duct, Square duct, Rectangular duct) Pressure loss through duct – Friction loss, Fitting loss.

Methods of duct design – Velocity reduction method, Equal friction method, Static regain method.

[T1, T2][No. of Hrs. 11]**UNIT-IV**

Room Air Distribution: Terms of air distribution, Types of supply air out lets, location of supply out let, location of return out let, Fire dampers, Noise and duct insulation.

[T1, T2][No. of Hrs. 12]**Text Book(s):**

[T1] P. L. Ballaney, Refrigeration & Air Conditioning, Khanna Publication.

[T2] C. P. Arora, Refrigeration & Air Conditioning, Tata McGraw Hill

Reference Book(s):

[R1] Pita, Air Conditioning Principles & Systems, Prentice Hall of India Pvt. Ltd.

[R2] Jones, Air Conditioning, Tata McGraw Hill

WORKSHOP TECHNOLOGY

Paper Code: ETVRA-606
Paper: Workshop Technology

L	T/P	C
3	0	3

INSTRUCTIONS TO PAPER SETTERS:**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective and pre-requisite:**UNIT-I**

Cutting Tools & Cutting Materials: Various type of single point cutting tools & their uses, Tool Geometry, Tool Signature & Its Effect, Cutting Speed, Feed, Depth of cut & their effect.

Cutting Tool Material – properties & study of various type cutting tools material, viz. High speed steel, tungsten carbide, cobalt steel cemented carbides, ceramics and diamond.

[T1, T2][No. of Hrs. 12]**UNIT-II**

Lathe: Function & classification of lathe machine. Lathe tools and operation. Introduction to capstan & turret lathe.

Milling: Function & classification of milling machine, Milling operations

Grinding: Purpose of grinding, various elements & materials of grinding wheel. Grinding Methods, Types of grinding machines.

[T1, T2][No. of Hrs. 11]**UNIT-III**

Welding: Principle of welding, classification of welding process, advantages & limitations of welding.

Gas welding, Arc welding, Other Welding Process – Resistance welding, spot, seam, Projection welding, TIG, MIG, Ultrasonic, Laser welding, Welding defects.

[T1, T2][No. of Hrs. 11]**UNIT-IV**

Moulding & Casting: Mould making, Casting process, Gating & Rise ring process, melting furnaces, casting defects.

[T1, T2][No. of Hrs. 11]**Text Book(s):**

[T1] Production Technology by R.K. Jain

[T2] Production Engg. Science by P.C. Pandey

Reference Book(s):

[R1] Manufacturing Science by Ghosh and Mallik

[R2] Manufacturing Engineering & Technology by Kalpakjian, Pearson

[R3] Manufacturing Technology by P.N. Rao., TMH

[R4] Manufacturing Processes by Shan, Pearson.

IMPACT OF SCIENCE & TECHNOLOGY ON SOCIETY**Paper Code: ETVRA-608****Paper: Impact of Science & Technology on Society**

L	T/P	C
3	0	3

INSTRUCTIONS TO PAPER SETTERS:**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective and pre-requisite:**UNIT-I**

Nature of Environment Introduction to Environmental Science - Definition and scope and need for public awareness Ecosystems Concept, structure and functions, restoration of damaged ecosystems Biodiversity – Definition, description at national and global level, threats and conservation Natural Resources - Renewable and non-renewable and their equitable use for sustainability, Material cycles – carbon, nitrogen and sulphur cycle. Conventional and Non-conventional Energy Sources – fossil fuel-based, hydroelectric, wind, -nuclear and solar energy, Biomass, biodiesel, hydrogen as an alternative fuel.

[T1, T2][No. of Hrs. 11]**UNIT-II**

Impact of Human Activity on Environment Human Population and Environment – Population growth, population explosion and migration; Impact of farming, housing, mining, transportation and industrial growth Social Issues Related to Environment– Sustainable development.

[T1, T2][No. of Hrs. 11]**UNIT-III**

Environmental Changes and Human Health Environmental Pollution–Definition, causes and effects, control measures for water, air, soil, marine, land, noise, thermal pollution, Climate change– Greenhouse effect and global warming, acid rain, ozone layer formation and depletion Impact on human health.

[T1, T2][No. of Hrs. 11]**UNIT-IV**

Environmental Protection through Assessment and Education Indicators and Impact Assessment – Bio-indicators, Natural disasters and disaster management, Role of individuals, organizations and government in pollution control Laws, Conventions and Treaties–National legislation, issues in the enforcement of environmental legislation, initiatives by non- governmental organizations.

[T1, T2][No. of Hrs. 12]**Text Book(s):**

- [T1] Environmental Studies, J Krishnawamy ,
[T2] R. J. Ranjit Daniels, Wiley India.

Reference Book(s):

- [R1] Environmental Science, Bernard J. Nebel, Richard T. Right, 9780132854467, Prentice Hall Professional 1993.
[R2] Environment and Ecology, R K Khandal, 978-81-265-4277-2, Wiley India.
[R3] Environmental Science, 8th Ed ISV, Botkin and Keller, 9788126534142, Wiley India.
[R4] Environmental Studies, R Rajagopalan, 978-0195673937, Oxford University Press
[R5] Textbook of Environmental Science and Technology, M. Anjireddy, BS Publications
[R6] Textbook of Environment Ecology, Singh, Acme Learning
[R7] Environmental Studies, B. Joseph, 2nd Ed, 978-0070648134, Tata McGraw Hill

IMPACT OF RAC ON ENVIRONMENT**Paper Code: ETVRA-610****Paper: Impact of RAC on Environment**

L	T/P	C
3	0	3

INSTRUCTIONS TO PAPER SETTERS:**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

***Objective and pre-requisite:** To study concepts of ozone depletion, global warming & climatic change. To study factors responsible for ozone depletion, global warming, impact of climatic change, national and international policies. To study and understand Montreal Protocol, Kyoto Protocol. Basic knowledge of environmental studies subject is a pre requisite.*

UNIT-I

History of refrigerants, Properties of refrigerants. uses of refrigerants in refrigeration & air conditioning, industries and in other applications. Its impact on ozone layer and global warming. Measurement of global warming potential (GWP) and ozone depletion potential (ODP)

[T1, T2, T3][No. of Hrs. 11]**UNIT-II**

Key concepts of global warming, climate change, greenhouse gas effect, Interrelationship between these three phenomenon, Green-House Effect as a Natural Phenomenon and increase in Greenhouse gas effect because of anthropogenic activities, Green House Gases (GHGs) and their Emission Sources.

[T2, T3][No. of Hrs. 11]**UNIT-III**

Impacts of climate change, extreme weather change, Temperature Rise, future impacts of global warming, global warming and the hydrological cycle, climate change impact on ecosystems and agriculture.

[T2, T3, T4][No. of Hrs. 11]**UNIT-IV**

Various measures taken to combat with ozone depletion and global warming; National and International policies to combat global warming and climate change-UNFCCC- Montreal Protocol and Kyoto Protocol, Paris agreement its role in Climate Change; IPCC- its role in global climate protection Role of countries and citizens in containing Global Warming.

[T1, T2, T3,T4][No. of Hrs.12]**Text Books**

- [T1] C. P. Arora, Refrigeration & Air Conditioning, Tata McGraw Hill
 [T2] Current trends in Global Environment by A.L. Bhatia (2005) Energy Sources
 [T3] Global Warming – A Very Short Introduction, Mark Maslin, oxford.
 [T4] UNFCCC & IPCC reports (www.unfccc.int & <http://www.ipcc.ch/>)

Reference Books

- [R1] Global Warming The Complete Briefing - John T Houghton Cambridge press
 [R2] Climate Change: A Multidisciplinary Approach, by William James Burroughs, Cambridge press
 [R3] Contemporary climatology-Robinson, Taylor and Francis group

NOTE: Seminars/ discussions should be carried out on issues pertaining to ozone depletion, global warming and climate change among the students.

GLOBAL WARMING & CLIMATE CHANGE
(Open Elective-IV)

Paper Code: ETVCT-614
Paper: Global Warming & Climate Change

L	T/P	C
3	0	3

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Objectives & Pre-requisites: To study concepts of global warming & climatic change. To study factors responsible for global warming, impact of climatic change, national and international policies. To study and understand Kyoto mechanism. Basic knowledge of environmental studies subject is a pre requisite.

Learning outcomes: Understanding of philosophy of global warming and climatic change. Able to realize the factors responsible for global warming and corresponding climatic change. Understanding the importance and nuances of Kyoto mechanism.

UNIT-I

The Climate system: Sun, Atmosphere, Ocean, Ice and energy balance of the earth, history of climate change, human-caused climate change, impacts of climate change on human well-being and the natural world.

[T1, T2][No. of Hrs. 11]

UNIT-II

Key concepts of global warming, climate change, greenhouse gas effect, Interrelationship between these three phenomenon, Green-House Effect as a Natural Phenomenon and increase in Greenhouse gas effect because of anthropogenic activities, Green House Gases (GHGs) and their Emission Sources, Global Warming Potential (GWP) of GHGs, Past Present and Future trends of global warming.

[T1, T2][No. of Hrs. 11]

UNIT-III

Impacts of climate change Extreme weather events, Temperature Rise, Sea Level rise, Coastal Erosion and landslides; future impacts of global warming, global warming and the hydrological cycle, climate change impact on ecosystems and agriculture.

[T1, T2, T3][No. of Hrs. 11]

UNIT-IV

Possible remedies of global warming- various mitigation and adaptation measures taken/ proposed to combat global warming; National and International policies to combat global warming and climate change-UNFCC-Kyoto Protocol, Paris agreement its role in Climate Change; IPCC- its role in global climate protection Role of countries and citizens in containing Global Warming.

[T1, T2, T3][No. of Hrs. 12]

Text Books

- [T1] Current trends in Global Environment by A.L. Bhatia (2005) Energy Sources
 [T2] Global Warming – A Very Short Introduction, Mark Maslin, oxford.
 [T3] UNFCC & IPCC reports (www.unfccc.int & <http://www.ipcc.ch/>)

Reference Books

- [R1] Global Warming The Complete Briefing - John T Houghton Cambridge press
 [R2] Climate Change: A Multidisciplinary Approach, by William James Burroughs, Cambridge press
 [R3] Contemporary climatology-Robinson, Taylor and Francis group

NOTE: Seminars/ discussions should be carried out on issues pertaining to global warming and climate change among the students.

Scheme and Syllabi for B. Voc. (Refrigeration and Air Conditioning)(2nd year) w. e. f. batch 2016-17, approved in the BOS of USET/USICT held on 19th July, 2016 & AC Sub Committee Meeting of USET/USICT held on 27th July, 2016.

ENTREPRENEURSHIP DEVELOPMENT AND PLANNING
(Open Elective-IV)

Paper Code: ETVMS-616

Paper: Entrepreneurship Development and Planning

L	T/P	C
3	0	3

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

***Objectives:** The Course Aims at Instituting Entrepreneurship Skills in the Students by giving an overview of the process of entrepreneurship. The Course aims at inculcating entrepreneurial spirit among the students.*

UNIT-I

Foundations of Entrepreneurship: What is an Entrepreneur? The benefits of Entrepreneurship. The power of small business. Class exercise- case discussion on entrepreneurs like - Dhirubhai Ambani, Karsenbhai Patel, Ramesh Babu, Kailash Katkar, Patricia Narayan etc.

[T1, T2][No. of Hrs.11]

UNIT-II

Launching Entrepreneurial Ventures: Creativity and innovation. Methods to initiate ventures. Legal challenges in Entrepreneurship ventures. The search for Entrepreneurial capital. Class exercise- Survey your locality and come up with at least one entrepreneurial venture. Discuss in class about ways to enhance the business in most innovative manner.

[T1, T2][No. of Hrs.11]

UNIT-III

Formulation of the Entrepreneurial Plan: The assessment functions with opportunities. The marketing Aspects of new ventures. Business plan preparation for new ventures. Class Exercise- Building your own Business Plan.

[T1, T2][No. of Hrs.11]

UNIT-IV

Institutions Supporting Small Business Enterprises: Central level institutions. State level institutions. Other agencies. Industry Associations. Class exercise- discussions on current government schemes supporting entrepreneurship and finding out which scheme will most suit the business plan devised by the student.

[T1, T2][No. of Hrs. 12]

Text Books

[T1] Kuratko, D.F. & Rao T.V. (2012). Entrepreneurship: A South Asian Perspective. Cengage

[T2] Charantimath, P. (2009). Entrepreneurship Development: Small Business Enterprises. Pearson

References Books

[R1] Naggendra S.and Manjunath V.S. (2009). Entrepreneurship and Management. Pearson

BUSINESS INFORMATICS
(Open Elective-IV)

Paper Code: ETVMS-618
Paper: Business Informatics

L	T/P	C
3	0	3

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective and pre-requisite: The objective of this paper is to provide understanding of business processes and managing these processes through improved information management and better use of business intelligence systems

Learning Outcomes: After this course the student is expected to understand how the information in the organizations can be handled effectively using various information types of information systems

UNIT-I

Foundations of Information Systems in Business: Data, Information and Knowledge, Information system and its components, Uses of IS in Business, Types of Information systems, Using Information Systems for competitive advantage, Porter's competitive forces model

[T1, T2][No. of Hrs. 11]

UNIT-II

Functional Business Systems: Overview of system analysis and design; Role of Information systems in marketing, Human Resource Management, Accounting and Finance, manufacturing.

[T1, T2][No. of Hrs. 11]

UNIT-III

Enterprise Business Systems: Customer Relationship Management -Benefits and Challenges of CRM, Trends in CRM; Supply Chain Management-Benefits and Challenges of SCM, Trends in SCM; Enterprise Resource Planning-Benefits and Challenges of ERP, Causes of ERP failures, Trends in ERP;e-Commerce-Categories of e-commerce, Essential e-Commerce processes, Electronic payment processes

[T1, T2][No. of Hrs. 11]

UNIT-IV

Decision Support in Business: Management Information Systems, Decision Support Systems, Online Analytical Processing, Executive Information Systems, Knowledge Management Systems, Expert Systems

[T1, T2][No. of Hrs. 12]

Text Book(s):

- [T1] James A O'Brien, George M Marakas and Ramesh Behl (2013). Management Information Systems, Tenth Edition, Tata McGraw Hill Education, New Delhi.
- [T2] Ken Laudon and Jane Laudon (2014). Management Information Systems, Twelfth Edition, Pearson, New Delhi.

Reference Book(s):

- [R1] D.P.Goyal (2014). Management Information Systems-Managerial Perspectives, Fourth Edition, Vikas Publishing House, New Delhi.
- [R2] Waman S Jawadekar(2009). Management Information Systems. Fourth Edition, Tata McGraw Hill, New Delhi

FLUID MECHANICS & HYDRAULICS LAB**Paper Code: ETVRA-652****L T/P C****Paper: Fluid Mechanics & Hydraulics Lab****0 4 4**

Note:- The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.

List of Experiments:

1. To determine the coefficient of discharge, velocity and contraction of an orifice.
2. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
3. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
4. To study the variation of friction factor, 'f' for turbulent flow in commercial pipes.
5. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.
6. Verify Bernoulli theorem
7. Study of reciprocating pump.
8. Study of centrifugal pump.
9. Visit of any water pumping station/plant



**GURU GOBIND SINGH
INDRAPRASTHA
UNIVERSITY**

AIR CONDITIONING-II LAB**Paper Code: ETVRA-654****Paper: Air Conditioning-II Lab**

L	T/P	C
0	4	4

Note:- The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.

List of Experiments:

1. Study of cooling coil.
2. Study of air curtains.
3. Study of desert cooler.
4. Designing of duct.
5. Study of fire dampers.
6. Study of duct insulation.
7. Study of different types of duct.
8. Study of fans.



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IMPACT OF SCIENCE & TECHNOLOGY ON SOCIETY LAB**Paper Code: ETVRA-658****L T/P C****Paper: Impact of Science & Technology on Society Lab****0 4 4**

Note:- The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.

List of Experiments:

1. Study pH Value of a given water sample.
2. Study Suspended Solids of given water sample.
3. Measure COD of Wastewater Sample.
4. To illustrate the various operations involved in gravimetric analysis and to determine the various categories of solids that are commonly defined in water and wastewater.
5. Determination of Total Solids, Suspended & Dissolved Solids in given water sample.
6. Study of few air pollution control devices.
7. Study of temperature sensor.
8. Study of hardness of water.



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IMPACT OF RAC ON ENVIRONMENT LAB**Paper Code: ETVRA-660****L T/P C****Paper: Impact of RAC on Environment Lab****0 4 4**

Note:- The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.

List of Experiments:

1. Study of ODP
2. Study of GWP
3. Study pH Value of a given water sample.
4. Study Suspended Solids of given water sample.
5. Determination of Total Solids, Suspended & Dissolved Solids in given water sample.
6. Study of few air pollution control devices.
7. Study of Kyoto protocol role in climate change.
8. Study of Green House gas emission.



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