



BRAINWARE UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
Bachelor of Technology in Computer Science & Engineering 2019

Mandatory Induction Program (Duration: 3 weeks)

- Physical activity
- Creative Arts
- Universal Human Values
- Literary
- Proficiency Modules
- Lectures by Eminent People
- Visits to local Areas
- Familiarization to Dept./Branch & Innovations

Different components of Mandatory Induction Program will be implemented as per the guidelines of AICTE.

SEMESTER – II

Course Code	Course Name	L	T	P	Credits	Total Marks
HSMC(CSE)201	English I	2	0	0	2	100
HSMC(CSE)202	Human Values and Professional Ethics	2	1	0	3	100
BSC(CSE)201	Linear Algebra and Differential Equations	3	1	0	4	100
BSC(CSE)202	Chemistry	2	1	0	3	100
ESC(CSE)201	Programming for Problem Solving	3	0	0	3	100
HSMC(CSE)291	English I Lab	0	0	2	1	100
BSC(CSE)292	Chemistry Lab	0	0	3	1.5	100
ESC(CSE)291	Programming for Problem Solving Lab	0	0	3	1.5	100
ESC(CSE)292	Workshop/ Manufacturing Practices	1	0	3	3	100
MC-2	Environmental Science	1	0	0	0	0
Total					22	900



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Course Name: English I

Course Code: HSMC(CSE)201

Contact: 2L

Credits: 2

No. of Lectures: 30

Module 1: Grammar

[10L]

Noun and Pronoun (Types and Functions), Verbs (Lexical and Auxiliary), Verb Tenses, Adjectives and Adverb, Article and Preposition, Conjunction, Phrases, Clause (Noun, Adjective, Adverb), Sentence Types (Simple, Compound and Complex), Transformations (Active-Passive, Direct-Indirect)

Module 2: Vocabulary

[2L]

One-word Substitution, Homophones, Proverbs, Synonyms and Antonyms

Module 3: Phonetics

[6L]

Air-stream Mechanism, Vowel and Consonant Sounds, Intonation

Module 4: Communication Theory

[6L]

Definition of Communication, Types of Communication (Verbal & Non-Verbal; Formal & Informal; Intra-personal, Inter-personal, Extra-personal, Group, Mass), Flows of Communication (Vertical, Horizontal and Diagonal), Barriers of Communication

Module 5: Comprehension

[6L]

"A Strange Night for Mr. Shasmal"- Satyajit Ray, Reading and Comprehension, Objective and Subjective Questions

Text Books

1. The Collected Short Stories by Satyajit Ray- Penguin Books
2. A Handbook of Grammar -BRAINWARE
3. Intermediate English Grammar- Cambridge University Press
4. High School English Grammar- Wren and Martin



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Course Name: Human Values and Professional Ethics

Course Code: HSMC(CSE)202

Contact: 2L + 1T

Credits: 3

No. of Lectures: 24 + 12

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education [8L]

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self-Exploration—what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels

Module 2: Understanding Harmony in the Human Being - Harmony in Myself [8L]

1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
2. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha
3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
4. Understanding the characteristics and activities of 'I' and harmony in 'I'
5. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail
6. Programs to ensure Sanyam and Swasthya

Module 3: Understanding Harmony in the Family and Society - Harmony in Human-Human Relationship [8L]

1. Understanding harmony in the Family- the basic unit of human interaction
2. Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*; Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship
3. Understanding the meaning of *Vishwas*; Difference between intention and competence
4. Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship
5. Understanding the harmony in the society (society being an extension of family): *Samadhan*, *Samridhi*, *Abhay*, *Sah-astitva* as comprehensive Human Goals
6. Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyawastha*) - from family to world family!

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Co-existence [4L]

1. Understanding the harmony in the Nature
2. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature
3. Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space
4. Holistic perception of harmony at all levels of existence

Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics [8L]



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1. Natural acceptance of human values
2. Definitiveness of Ethical Human Conduct
3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
4. Competence in Professional Ethics:
 - a) Ability to utilize the professional competence for augmenting universal human order,
 - b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models
5. Case studies of typical holistic technologies, management models and production systems
6. Strategy for transition from the present state to Universal Human Order:
 - a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers
 - b) At the level of society: as mutually enriching institutions and organizations

Text Books:

1. R. R. Gaur, R. Sangal, G. P. Bagaria, "A Foundation Course in Human Values and Professional Ethics", Excel Books, New Delhi, 2010, ISBN 978-8-174-46781-2.

Reference Books

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA.
2. E. F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Susan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991.
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
5. A. Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
6. P. L. Dhar, R. R. Gaur, 1990, Science and Humanism, Commonwealth Publishers.
7. A. N. Tripathy, 2003, Human Values, New Age International Publishers.
8. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
9. E. G. Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press
10. M. Govindrajran, S. Natrajan & V. S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
11. B. P. Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
12. B. L. Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008



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Course Name: Linear Algebra and Differential Equations

Course Code: BSC(CSE)201

Contact: 3L+1T

Credit: 4

No. of Lectures: 36+12

Module 1: Matrices

[5L]

Basic Operations on Matrices, Determinants, Cramer's Rule, Inverse of a Matrix using Gauss Jordan Elimination, Rank of a Matrix, Solution of System of Linear Equations: Gauss Elimination Method.

Module 2: Vector Spaces-I

[8L]

Vector Space, Linear Independence of Vectors, Basis, Dimension; Linear Transformations (Maps), Range and Kernel of a Linear Map, Rank, Nullity, Rank-Nullity Theorem, Inverse of a Linear Transformation, Composition of Linear Maps, Matrix associated with a Linear Map.

Module 3: Vector Spaces-II

[8L]

Eigen values, Eigenvectors, Symmetric, Skew-symmetric, and Orthogonal Matrices, Eigenbases, Diagonalization, Inner Product Spaces, Gram-Schmidt Orthogonalization.

Module 4: Ordinary Differential Equations

[8L]

Basic Concepts, Exact Differential Equations, Linear Differential Equations of Second and Higher Order with Constant Coefficients, Method of Variation of Parameters, Cauchy-Euler Equation, System of linear Differential Equations with Constant Coefficients, Applications of Linear Differential Equations.

Module 5: Partial Differential Equations

[7L]

Basic Concepts, Classification of Second Order Linear PDE, Method of Separation of Variables and its application in solving Wave Equation (one dimension), Heat Equation (one dimension) and Laplace's equation (two dimensions).

Text Books:

1. Poole D., Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
2. Kreyszig Erwin, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2010.
3. Jain R. K. and Iyengar S.R.K, Advanced Engineering Mathematics, 5th Edition, Narosa Publishers, 2016.

Reference Books:

1. Peter V. O'Neil, Advanced Engineering Mathematics, 7th Edition, Cengage Learning, 2012.
2. Grewal B. S, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.



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Course Name: Chemistry
Course Code: BSC(CSE)202
Contact: 2L+1T
Credit: 3
No. of Lectures: 24+12

Course Objectives:

1. To draw schematically atomic structure of different elements.
2. To represent the formation of molecules schematically.
3. To acquire general knowledge of different trends in periodic table and changes in periodic properties of different element
4. To identify the properties and structures of organic molecules and their stereochemistry.

Pre-Requisite : 12th level Chemistry

Module-I: Atomic and Molecular Structure: **[6H]**

Schrodinger equation. Particle in a 1D-box solution and their applications to simple system. Crystal field theory and the energy level diagram for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

Module-IIA: Spectroscopic Techniques and Applications: **[4H]**

Principles of spectroscopy and selection rule. Electronic spectroscopy of diatomic molecules and applications.

Module-IIB: Intermolecular Forces and Potential Energy Surfaces: **[2H]**

Ionic, dipolar and Vander walls interactions, equation of state of real gases and critical phenomena.

Module-III: Periodic Properties: **[3H]**

Effective nuclear charge, penetration of orbitals, variations of s,p,d, and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic radii, ionization energies, electron affinity and electro negativity, polarizability, oxidation states.

Module-IV: Use of Free Energy in Chemical Equilibrium: **[4H]**

First and second laws of thermodynamics and thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications.

Module-VA: Stereochemistry **[3H]**

Representations of 3-dimensional structures, structural isomers and stereoisomers, configurations, symmetry and chirality, enantiomers, diastereoisomers, optical activity, absolute configurations and conformational analysis.



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Module-VB: Organic Reactions:

[2H]

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.

Text Books:

1. A Text Book of Physical Chemistry by KK Sharma and L K Sharma, Vikas Publishing.
2. Physical Chemistry by Peter Atkins and Julio de Paula's, Oxford.
3. Inorganic Chemistry: Principles of Structure and Reactivity, J. E Huheey, E. A. Keiter, R. L. Keiter, Pearson.
4. Concise Inorganic Chemistry: Fifth Edition by J.D. Lee, Wiley.
5. Organic Chemistry: Structure and Function by K P C Volhardt and NE Schore, publisher W. H. Freeman.
6. Fundamentals of Molecular Spectroscopy by C N Banwell, McGraw Hill Education.
7. Organic Chemistry Vol 1, by I. L. Finar, Pearson.

Reference Books:

1. A Text Book of Physical Chemistry by A.S. Negi and S C Anand, New Age International.
2. Organic Chemistry: Structure and Function by K P C Volhardt and NE Schore, publisher W. H. Freeman.



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Course Name: Programming for Problem Solving

Course Code: ESC(CSE)201

Contact: 3L

Credits: 3

No. of Lectures: 36

Module 1 **[8L]**

Introduction to Programming: Introduction to components of a computer system (disks, memory, processor, operating system, compilers) Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. Algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

Module 2 **[8L]**

Arithmetic expressions and precedence

Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching
Iteration and loops

Arrays: Arrays (1-D, 2-D), Character arrays and Strings

Module 3 **[10L]**

Function: Built in libraries, Parameter passing in functions, call by value, Passing arrays to functions: call by reference

Recursion: Example programs, Finding Factorial, Fibonacci series, Ackerman function, Quick sort or Merge sort.

Module 4 **[6L]**

Structure: Structures, Defining structures and Array of Structures

Pointers: Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list

Module 5 **[4L]**

File handling

File concepts, parameters, modes of operation

Text Books

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
3. Gary J. Bronson, A First Book of ANSI C, 4th Edition, ACM
4. Kenneth A. Reek, Pointers on C, Pearson

Reference Books

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India



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Course Name: English I Lab

Course Code: HSMC(CSE)291

Contact: 2P

Credits: 1

No. of Periods: 24

Module 1: Listening Skills

Listening to audio clips, inspirational videos, telephonic conversations, aural comprehension, Voice modulation and clarity

Module 2: Speaking Skills

Self-introduction, Pronunciation practice through audio-visual aids, Extempore, HAM and JAM, Group Discussion, Debate, Situation-based conversation

Module 3: Reading Skills

Reading and understanding technical/non-technical passages, dialogues, essays and short stories

Module 4: Writing Skills

Make sentences with the given words, paragraphs, essays, summary of a given passage, picture study, expansion of a proverb

Module 5: Lab Activities

Student-designed quizzes, role play, skit



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Course Name: CHEMISTRY LAB

Course Code: BSC(CSE)292

Contact: 3P

Credit: 1.5

Course Objectives:

1. To perform the experiments illustrating the principles of chemistry relevant to the study of science and engineering.
2. To Estimate rate constants of reactions from concentration of reactants/products as a function of time.
3. To measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc.

Pre-Requisite : 12th level Chemistry

Choose 10 experiments from the following:

1. Conductometric titration for determination of the strength of a given HCl solution by titrating against a standard NaOH solution.
2. pH metric titration for determination of strength of a given HCl solution against a standard NaOH solution.
3. Determination of dissolved oxygen present in a given water sample.
4. To determine chloride ion in a given water sample by Argentometric method (using chromate indicator solution)
5. Determination of surface tension and viscosity.
6. Thin layer chromatography.
7. Ion exchange column for removal of hardness of water.
8. Determination of the rate constant of a reaction.
9. Determination of cell constant and conductance of solutions.
10. Potentiometric determination of redox potentials and emfs.
11. Saponification/acid value of oil.
12. Chemical analysis of a salt.
13. Determination of the partition coefficient of a substance between two immiscible liquids.
14. Adsorption of acetic acid by charcoal.
15. Use of the capillary viscometers to demonstrate the isoelectric point as the pH of minimum viscosity for gelatin sols and/ or coagulation of the white part of egg.

Reference Books:

1. Vogel's Qualitative Inorganic Analysis, G. Svehla, 7th edition, Pearson.
2. Vogel's Text Book of Quantitative Chemical Analysis, J. Mendham, R. C. Denny, J. D. Barnes, M. J. K. Thomas, 6th edition, Pearson
3. Practical Physical Chemistry, S. R. Palit, S. K. De, Science Book Agency
4. B. Sc. Honours Practical Chemistry, S. Dutta, Bharati Book Stall.



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Course Name: Programming for Problem Solving Lab

Course Code: ESC(CSE)291

Contact: 3P

Credits: 2

No. of Periods: 24

Module 1

Problem solving using computers: Familiarization with programming environment, Variable types and type conversions, Simple computational problems using arithmetic expressions

Module 2

Branching and logical expressions: Problems involving if-then-else structures, Loops, while and for loops - Iterative problems e.g., sum of series

Module 3

Array: 1D Arrays: searching, sorting, 1D Array manipulation, 2D arrays and Strings, Matrix problems, String operations

Module 4

Functions: call by value, Simple functions, Recursion, structure of recursive calls, Recursive functions
Pointers and structures

Module 5

File handling: File operations



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Course Name: Workshop/ Manufacturing Practices

Course Code: ESC(CSE)292

Contact: 1L + 3P

Credits: 3

Week	Topic	Contents
1	Machine shop	Study of Lathe with its common features and basic operations To make a pin from a mild steel rod in a lathe.
2	Fitting shop	Study of Basic operations and hand tools used in fitting shop To make a Gauge from MS plate.
3	Carpentry	Study of Basic operations and hand tools used in carpentry/pattern shop To make wooden joints and/or a pattern or like
4	Welding shop	ARC WELDING: To join two thick (approx. 6mm) MS plates by manual metal arc welding. GAS WELDING: To join two thin mild steel plates or sheets by gas welding. Resistance Welding: To make welded joints using spot welding Soldering Brazing

Text Books

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. and Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology – I" Pearson Education, 2008.
4. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
5. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata Mc Graw Hill House, 2017.



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Course Name: Environmental Science

Course Code: MC-2

Contact: 1L

Credits: 0

Module 1: The Multidisciplinary Nature of Environmental Studies

[1L]

Definition, scope and importance.

Module 2: Natural Resources

[2L]

Natural resources and associated problems:

- a. Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. Forest fire and its effect.
- b. Water resources: Use and over-utilization of surface and ground water, conflicts over water.
- c. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- d. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- e. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources
- f. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

Module 3: Ecosystems

[2L]

Concept of an ecosystem.

- a) Structure and function of an ecosystem
- b) Producers, consumers and decomposers.
- c) Energy flow in the ecosystem.
- d) Food chains, food webs and ecological pyramids.

Introduction, types, characteristic features, structure and function of the following ecosystem:

- i. Forest ecosystem
- ii. Grassland ecosystem
- iii. Desert ecosystem
- iv. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Module 4: Environmental Pollution

[2L]

Definition, cause, effects and control measures of

- i. Air pollution
- ii. Water pollution
- iii. Soil pollution
- iv. Marine pollution
- v. Noise pollution

Solid waste Management: Causes, effects and control measures of urban and industrial wastes.

- i. Role of an individual in prevention of pollution.
- ii. Pollution case studies.

Module 5: Social Issues and the Environment

[3L]

- a) From Unsustainable to Sustainable development



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- b) Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.
- c) Environment Protection Act.
- d) Air (Prevention and Control of Pollution) Act.
- e) Water (Prevention and control of Pollution) Act
- f) Wildlife Protection Act
- g) Forest Conservation Act

Module 6: Human Population and the Environment

[2L]

- a) Population growth, variation among nations.
- b) Population explosion – Family Welfare Programme.
- c) Environment and human health.
- d) Human Rights.
- e) Value Education.

Text Books:

1. Environmental Chemistry, De A.K., New Age International Pvt. Ltd.
2. Ecology and Environment, Sharma P.D., Rastogi Publications.
3. Environmental Chemistry, Sharma B.K., Krishna Prakashan.
4. 4. Environment and Ecology, Anil Kumar De & Arnab Kumar Dey, New Age International Pvt. Ltd.
5. Text Book of Environmental Studies, Asthana, D. K., S. Chand Publishing.
6. Fundamentals of Environmental Studies, M. Basu, S. Xavier, Cambridge University Press, India.

Reference Books:

1. Environmental Science: Your World, Your Turn by Withgott, Jay, Pearson.
2. Textbook of Environmental Studies for Undergraduate Courses, E. Bharucha, Universities Press.

N. B. A student will be eligible to get Under Graduate degree with Honours or additional Minor Engineering, if he/she completes an additional 20 credits. These could be acquired through MOOCs.

The said course is however optional and the student is entitled to acquire such credits during the entire period of study.