Swarrnim Startup & Innovation University

Swarrnim Institute Of Technology

Study Material – Computer Hardware & Networking (Bridge Course)

---

1. Introduction to Computer Hardware & Software

- **Hardware:** Physical components (CPU, RAM, HDD, SSD, Monitor, Keyboard, Mouse, Motherboard, SMPS, Ports, etc.).
- **Software:** Programs that run on hardware.
  - **System Software:** Operating Systems (Windows, Linux).
  - **Application Software:** MS Office, Browsers, Media Players, etc.

---

2. Motherboards, Chipsets & Microprocessor

- **Motherboard:** Main circuit board; connects CPU, RAM, storage, expansion cards, and peripherals.
- **Chipset:** Controls communication between CPU, RAM, storage, and peripherals.
  - **Northbridge** – Manages communication between CPU, RAM, GPU.
  - **Southbridge** – Manages I/O devices, USB, SATA, BIOS.
- **Microprocessor (CPU):** "Brain" of the computer. Processes instructions. Examples: Intel i3/i5/i7, AMD Ryzen.
- **Storage Devices:**
  - **Floppy (outdated), HDD, DVD, SSD, RAM** (temporary memory).
- **Power Supply (SMPS):** Converts AC → DC for system.
- **BIOS:** Firmware that initializes hardware before OS loads.

---

3. Handling & Installation of Hardware

- **Handling Sensitive Equipment:**
  - Use Anti-Static Wrist Strap.
  - Avoid touching circuit pins.
  - Work on non-conductive surface.
- **Installing Motherboards:**
  - Fix motherboard inside cabinet with standoffs.

Kalpesh

- Connect power, CPU, RAM, storage, front panel.
- **Cabinet & Cooling**:
  - Air Cooling (fans, heatsinks).
  - Liquid Cooling (advanced systems).
- **Installing CPU**:
  - Align CPU pins, lock with socket lever.
  - Apply thermal paste before attaching heatsink.

---

4. Assembling a Computer

- Step 1: Install CPU & RAM on motherboard.
- Step 2: Fix motherboard inside cabinet.
- Step 3: Connect SMPS to motherboard.
- Step 4: Attach storage devices (HDD/SSD).
- Step 5: Install GPU (if required).
- Step 6: Connect front panel switches & USB.
- Step 7: Close cabinet, connect monitor, keyboard, mouse.
- Step 8: Power ON & enter BIOS.

---

5. Ports & Slots

- **Ports**:
  - USB, HDMI, VGA, LAN, Audio, Power, Serial/Parallel (old).
- **Slots**:
  - **SATA** – Storage devices.
  - **IDE** – Old HDD/DVD drives.
  - **PCI/PCIe** – Graphics card, network card.
- **Wires**: SATA cables, Power cables, Ribbon cables.

---

6. BIOS & CMOS

- **BIOS**: Basic Input Output System; checks hardware (POST).
- **CMOS**: Stores BIOS settings (time, boot sequence). Powered by CMOS battery.
- **BIOS Configurations**:
  - Set boot device order.
  - Enable/disable devices.
  - Adjust CPU/RAM settings.

---

7. Networking Basics

Kalpesh.

- **Tools & Devices:**
  - **Switch** – Connects multiple computers.
  - **Hub** – Broadcasts data to all ports.
  - **Router** – Connects LAN to Internet.
  - **I/O Sockets** – RJ-45 ports for LAN.
- **Wires:**
  - Straight Cable – PC to Switch/Router.
  - Cross Cable – PC to PC.
- **Punching/Crimping Tools**: Used for fixing RJ-45 connectors.

---

8. Creation of Cables

- **Straight Cable Wiring Order (TIA/EIA-568B):**
  - Orange/White – Orange – Green/White – Blue – Blue/White – Green – Brown/White – Brown.
- **Cross Cable**: One end standard, other end swaps Green & Orange pairs.

---

9. IP Addressing & LAN Setup

- **IP Address**: Unique number to identify a computer (IPv4: 192.168.1.1).
- **LAN (Local Area Network)**: Connects PCs within small area (office, lab).
- **Steps to Set Up**:
  1. Connect PCs with Switch/Router using LAN cables.
  2. Assign IP addresses manually or via DHCP.
  3. Verify using `ping` command.
  4. Share files/printers across LAN.

Summary

- **Hardware**: CPU, RAM, Storage, Motherboard, SMPS, Ports.
- **Software**: System (OS), Applications.
- **Assembly**: Careful handling, proper installation.
- **Networking**: Tools (Switch, Hub, Router), Cables (Straight/Cross).
- **BIOS/CMOS**: Essential for system configuration.
- **LAN Setup**: Assign IP, connect devices, test with ping.

Kalpesh

Swarrnim Institute of Technology
Bridge Course Maths – Class Notes

Course Objectives

- Understand Mathematics as a discipline, not just a subject.
- Bridge the gap between School-level Mathematics and Engineering-level Mathematics.
- Make learning mathematics a pleasant and practical experience.

Unit 1: Exponential and Logarithms, Algebraic Expression (5 Hours)

Exponential Functions: a^x, where a > 0 and a ≠ 1.

- Laws of Exponents:
  - a^m · a^n = a^(m+n)
  - a^m / a^n = a^(m-n)
  - (a^m)^n = a^(mn)
  - a^0 = 1
  - a^(-m) = 1/a^m

Logarithms: If a^x = N, then log_a(N) = x.

- Laws of Logarithms:
  - log_a(MN) = log_a(M) + log_a(N)
  - log_a(M/N) = log_a(M) - log_a(N)
  - log_a(M^n) = n log_a(M)
  - Change of base: log_a(M) = log_b(M) / log_b(a)

Algebraic Expressions: Monomial, Binomial, Polynomial.

- Important Identities:
  - (a+b)^2 = a^2 + 2ab + b^2
  - (a-b)^2 = a^2 - 2ab + b^2
  - (a+b)(a-b) = a^2 - b^2

Activity: Simplify expressions and apply logarithm rules.

Unit 2: Trigonometry (5 Hours)

Basic Trigonometric Ratios: sin θ, cos θ, tan θ, cosec θ, sec θ, cot θ.

- Important Identities:
  - $\sin^2\theta + \cos^2\theta = 1$
  - $1 + \tan^2\theta = \sec^2\theta$
  - $1 + \cot^2\theta = \csc^2\theta$
- Addition & Subtraction formulas:
  - $\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$
  - $\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$

Activity: Prove identities and solve triangles.

Unit 3: Permutation, Combination & Probability (5 Hours)

Permutation: Arrangement of objects.

- Formula: $nPr = n! / (n-r)!$

Combination: Selection of objects.

- Formula: $nCr = n! / (r!(n-r)!)$
- Relation: $nCr = nPr / r!$
- Probability: P(E) = Favorable Outcomes / Total Outcomes

Activity: Solve card, dice, and coin-toss problems.

Unit 4: Differential and Integration (5 Hours)

Differentiation: Measures the rate of change.

- Basic rules:
  - $d/dx(x^n) = nx^{(n-1)}$
  - $d/dx(e^x) = e^x$
  - $d/dx(\sin x) = \cos x$
  - $d/dx(\cos x) = -\sin x$

Integration: Reverse of differentiation.

- Basic formulas:
  - $\int x^n\,dx = (x^{(n+1)})/(n+1) + C \quad (n \neq -1)$
  - $\int e^x\,dx = e^x + C$
  - $\int \sin x\,dx = -\cos x + C$
  - $\int \cos x\,dx = \sin x + C$

Activity: Differentiate and integrate simple algebraic and trigonometric functions.

References

- Mathematical Statistics – J. N. Kapur & H. C. Saxena
- Probability and Statistics for Engineers – Irwin Miller & John E. Freund
- Elements of Probability and Statistics – A. P. Baisnab & M. Jas
- Statistics – M. R. Spiegel & L. J. Stephens
- Probability and Statistics – M. R. Spiegel, J. J. Schiller, R. A. Srinivasan
- Mathematics Text Books – NCERT (Class X, XI, XII)

Bridge Course English – Class Notes

Course Objectives

- Strengthen grammar foundation.
- Enhance LSRW skills (Listening, Speaking, Reading, Writing).
- Build confidence for communication in English.
- Prepare students for English-medium college education.

Unit 1: Parts of Speech (5 Hours)

Definition: Parts of speech are categories of words according to their function in a sentence.

1. Noun: Names a person, place, thing, or idea. Example: Ramesh, book, honesty. Types: Proper, Common, Abstract, Collective, Countable, Uncountable.
2. Pronoun: Replaces a noun. Example: He, she, it, they. Types: Personal, Reflexive, Relative, Demonstrative, Interrogative, Indefinite.
3. Verb: Shows action or state of being. Example: run, eat, is, have. Main verbs, Auxiliary verbs, Modal verbs.
4. Adjective: Describes a noun or pronoun. Example: beautiful girl, tall building. Types: Quality, Quantity, Demonstrative, Interrogative, Possessive.
5. Adverb: Modifies a verb, adjective, or another adverb. Example: She runs quickly. Types: Time, Place, Manner, Degree, Frequency.
6. Preposition: Shows relationship between noun/pronoun and another word. Example: in, on, under, with, by.
7. Conjunction: Connects words or groups of words. Example: and, but, or, because, although.
8. Interjection: Expresses sudden emotion. Example: Oh! Alas! Hurrah!

Activity: Identify parts of speech in sentences.

Unit 2: Sentence and Its Parts (5 Hours)

Sentence – A group of words that makes complete sense.

Parts of a Sentence: Subject (who/what the sentence is about) and Predicate (what is said about the subject).

- Types of Sentences:
  - Declarative (statement): She is a doctor.
  - Interrogative (question): Are you coming?
  - Imperative (command/request): Please sit down.

- Exclamatory (strong feeling): What a beautiful day!

Clauses: Independent Clause (complete sense), Dependent Clause (cannot stand alone).

Phrases: Group of words without a verb (e.g., in the garden).

Activity: Break down sentences into subject, predicate, clauses.

Unit 3: Tenses (5 Hours)

Definition: Tense shows the time of an action.

9. Present Tense

- Simple: She writes.
- Continuous: She is writing.
- Perfect: She has written.
- Perfect Continuous: She has been writing.

10. Past Tense

- Simple: She wrote.
- Continuous: She was writing.
- Perfect: She had written.
- Perfect Continuous: She had been writing.

11. Future Tense

- Simple: She will write.
- Continuous: She will be writing.
- Perfect: She will have written.
- Perfect Continuous: She will have been writing.

Activity: Convert sentences into different tenses.

Unit 4: LSRW Skills (5 Hours)

12. Listening

- Active listening with note-taking.
- Listening to lectures, news, stories.
- Practice: listen and summarize.

13. Speaking

- Role plays, group discussions, debates.

- Practice pronunciation, stress, intonation.
- Overcome stage fear.

14. Reading

- Skimming (quick understanding) and scanning (finding details).
- Reading comprehension exercises.
- Vocabulary building.

15. Writing

- Paragraph writing, essay writing, letter writing.
- Correct grammar, punctuation, and coherence.
- Practice: write daily diary entries.

Activity: Group discussion + writing assignment.

References

- Books (for Faculty):
  - English Grammar & Composition – Pearson Education
  - Contemporary English Grammar, Structure and Usage – David Green
  - High School English Grammar – Wren and Martin
- Websites (for Students):
  - http://www.free-english-study.com
  - http://www.english-online.org.uk/course.htm
  - http://www.english-online.org.uk

Swarrnim startup & Innovation University

Swarrnim Institute Of Technology

Bridge Course Study Material

Part A – Workshop (Mechanical/Automobile Workshop for Computer Engineering)

1. Introduction to Workshop

- Workshop is a place where students gain **practical knowledge** of hand tools, power tools, and machines.
- Divided into shops: Carpentry, Fitting, Welding, Smithy, Tin-smithy, Plumbing, Machine shop.
- **Importance:** Develops accuracy, confidence, and skill for engineering practice.
- **Safety Measures:**
  - Always wear protective equipment (gloves, goggles, apron).
  - Keep the workplace clean and tools properly arranged.
  - Avoid loose clothing and careless handling of machines.

---

2. Carpentry Shop

- **Objective:** Working with wood to prepare different joints and components.
- **Tools Used:**
  - **Jack Plane** – smoothens wood surface.
  - **Saws** – used for cutting wood pieces.
  - **Chisels** – for shaping and cutting grooves.
  - **Hammers & Mallets** – for striking and joining.
- **Types of Joints:**
  - Half-lap joint → simple overlapping joint.
  - Corner joint → used in making boxes and frames.
  - Mortise & Tenon joint → strong joint for furniture.
- **Exercises:**
  - Using jack plane for surface finishing.
  - Preparing half-lap and mortise-tenon joints.
  - Simple exercise on wood lathe (turning cylindrical shapes).

---

3. Fitting (Bench Work) Shop

- **Objective:** Performing work on metals using bench tools.
- **Tools Used:**
  - Files – smoothening surface.
  - Hacksaw – cutting metal pieces.
  - Calipers – measurement.
  - Bench Vice – holding the job.
  - Taps & Dies – for making internal and external threads.
- **Common Operations:**
  - **Marking** → layout of workpiece with scriber and surface plate.
  - **Cutting & Filing** → reducing dimensions, smooth finish.
  - **Drilling** → creating holes.
  - **Tapping &Dieing** → making threads.
- **Exercises:** Making small metal jobs with accuracy.

---

4. Welding Shop

- **Objective:** Joining metals using heat.
- **Types of Welding:**
  - **Gas Welding** – uses oxy-acetylene flame.
  - **Arc Welding** – electric arc between electrode &workpiece.
- **Common Joints:**
  - Butt Joint – joining ends of two plates.
  - Lap Joint – overlapping of two plates.
- **Special Process:** Oxy-acetylene cutting for metals.
- **Applications:** Used in automobile, construction, pipelines, manufacturing industries.

Part B – Basic Engineering (Mechanical Principles & Applications)

1. Internal Combustion Engines (IC Engines)

- **Definition:** Engine that burns fuel inside the cylinder to produce power.
- **Types:**
  - Petrol Engine (Spark Ignition).
  - Diesel Engine (Compression Ignition).
- **Cycles:**
  - **2-Stroke:** Power every revolution, lightweight, used in bikes, scooters.
  - **4-Stroke:** Power every 2 revolutions, more efficient, used in cars, buses.
- **Performance Terms:**
  - **Indicated Power (IP):** Power developed inside the cylinder.
  - **Brake Power (BP):** Actual power available at the crankshaft.
  - **Efficiency:** Ratio of BP to IP.
- **Applications:** Automobiles, generators, ships, aircraft.

---

2. Pumps

- **Definition:** Mechanical device used to lift or move fluids.
- **Types of Pumps:**
  - **Reciprocating Pump:** Works like a piston-cylinder, suitable for high head, low discharge.
  - **Rotary Pump:** Uses gears/vanes, gives continuous flow.
  - **Centrifugal Pump:** Uses impeller, widely used, handles large volumes.
- **Priming:** Filling pump with liquid before starting to remove air.
- **Applications:** Irrigation, water supply, chemical plants, industries.

---

3. Air Compressors

- **Definition:** Mechanical device that compresses air to high pressure.
- **Types:**
  - **Reciprocating Compressor:** Piston-cylinder, used for high pressure but low volume.
  - **Rotary Compressor:** Screw or vane type, used for large volumes.
- **Applications:**
  - Pneumatic tools (drills, hammers).
  - Refrigeration cycles.

- Spray painting.
- Supercharging IC engines.

---

4. Refrigeration & Air Conditioning (RAC)

- **Refrigeration:** Process of removing heat from a space or substance to keep it cool.
- **Air Conditioning:** Maintaining comfortable air temperature, humidity, and purity.
- **Refrigerants:** Cooling substances like Freon, Ammonia, CO□.
- **Systems:**
  - **Vapor Compression System:** Most common, used in refrigerators and AC.
  - **Vapor Absorption System:** Uses ammonia-water, requires less electricity, more reliable.
- **Applications:**
  - Domestic refrigerators.
  - Window & split ACs.
  - Cold storage in industries.
  - Industrial process cooling.

Bridge Course Physics – Class Notes

Department of Science & Humanities – SIT
Course: Bridge Course Physics

Unit 1: Classical Mechanics

1.1 Introduction to Mechanics – Statics, Kinematics, Dynamics.

1.2 Kinematics – Scalars, Vectors, Equations of motion, Projectile motion.

1.3 Newton's Laws – First (Inertia), Second (F=ma), Third (Action-Reaction).

1.4 Work, Energy, and Power – Work, KE, PE, Conservation of Energy, Power.

1.5 Rotational Motion – Torque, Moment of Inertia, Angular momentum.

Unit 1: Classical Mechanics – Key Formulas

- $v = u + at$
- $s = ut + 1/2\ at^2$
- $v^2 = u^2 + 2as$
- Projectile: R, H, T formulas
- Work $W = Fd\cos\theta$
- $KE = 1/2\ mv^2$
- $PE = mgh$
- Torque $\tau = Fr$

Unit 1: Classical Mechanics – Solved Examples

✔Projectile motion problem (H, R, T).

✔Torque problem with force applied at distance r.

Unit 1: Classical Mechanics – Diagrams (Insert Here)

[Placeholder for diagrams/figures related to this unit]

Unit 2: Electricity and Magnetism

2.1 Electrostatics – Coulomb's law, Electric field, Potential.

2.2 Capacitance – C=Q/V, Parallel plate capacitor, Series/parallel combinations.

2.3 Current Electricity – Ohm's law, Resistance, Power, Kirchhoff's laws.

2.4 Magnetism – Biot-Savart law, Force on charge, Force on conductor.

2.5 Electromagnetic Induction – Faraday's law, Lenz's law, Self/mutual induction.

Unit 2: Electricity and Magnetism – Key Formulas

- Coulomb's law: F = k q1q2 / r^2
- E = F/q
- V = W/q
- Capacitance C = Q/V
- Ohm's law: V = IR
- R = ρL/A
- Power = VI = I^2R = V^2/R
- F = BIL sinθ
- Faraday's law: ε = -dΦ/dt

Unit 2: Electricity and Magnetism – Solved Examples

✔Capacitance in series solved example.

✔Force on conductor in magnetic field example.

Unit 2: Electricity and Magnetism – Diagrams (Insert Here)

[Placeholder for diagrams/figures related to this unit]

Unit 3: Basic Electronics

3.1 Semiconductors – Intrinsic and extrinsic types.

3.2 p-n Junction Diode – Forward/reverse bias, applications.

3.3 Rectifiers – Half-wave, Full-wave, Bridge.

3.4 Transistors – n-p-n, p-n-p, modes, configurations.

3.5 Digital Electronics – Logic gates and truth tables.

Unit 3: Basic Electronics – Key Formulas

- Diode equation: $I \approx Is(e^{(V/nVT)}-1)$
- Rectifier outputs: Half-wave, Full-wave
- Transistor current: $Ic = \beta Ib$
- Logic Gates: AND, OR, NOT truth tables

Unit 3: Basic Electronics – Solved Examples

✔Half-wave rectifier output voltage example.

✔Transistor amplifier Ic calculation.

✔Logic gate (AND) truth table.

Unit 3: Basic Electronics – Diagrams (Insert Here)

[Placeholder for diagrams/figures related to this unit]

Unit 4: Properties of Matter

4.1 Elasticity – Stress, Strain, Hooke's law, Young's modulus.

4.2 Surface Tension – Definition, Capillary rise.

4.3 Viscosity – Newton's law, Stokes' law, Terminal velocity.

4.4 Thermal Properties – Specific heat, Latent heat, Thermal conductivity.

Unit 4: Properties of Matter – Key Formulas

- Stress = F/A
- Strain = $\Delta L/L$
- Hooke's law: $\sigma = E\varepsilon$
- Capillary rise: $h = 2T\cos\theta / (\rho g r)$
- Stokes' law: $F = 6\pi\eta rv$
- Heat: $Q = mc\Delta T$
- Latent heat: $Q = mL$
- Conduction: $Q = KA\Delta T/d$

Unit 4: Properties of Matter – Solved Examples

✔Young's modulus calculation.

✔Capillary rise problem.

✔Viscous force using Stokes' law.

✔Heat conduction through rod.