5.1 AUDIO VIDEO SYSTEMS

L	T	P
3	-	2

RATIONALE

The objective of teaching this subject is to give students an in depth knowledge of various electronic audio and video devices and systems. Further this subject will introduce the students with working principles, block diagram, main features of consumer electronics gadgets/goods/devices. Which in-turn will develop in them capabilities of assembling, fault diagnosis and rectification in a systematic way.

LEARNING OUTCOMES

After completion of the course, the learner should be able to:

- Explain the working of loudspeakers and microphones.
- Describe the basics of digital audio signals.
- Describe the working of colour television system (PAL).
- Use the basic principles of digital video and its compression techniques.
- Illustrate basic techniques of digital television transmission and reception.
- Compare the working of LCD, LED, HDTV and plasma screen television.
- Test color TV using pattern generator

DETAILED CONTENTS

1. Audio Systems (06 hrs)

   1.1. Microphones and Loudspeakers
   - a) Carbon, moving coil, cordless microphone
   - b) Direct radiating and horn loudspeaker
   - c) Multi-speaker system

2. Digital Audio Fundamentals (05 hrs)

   Audio as Data and Signal, Digital Audio Processes Outlined, Time Compression and Expansion.

3. Television (10 hrs)

   3.1. Basics of Television
   - Elements of TV communication system
   - Scanning and its need
   - Need of synchronizing and blanking pulses, VSB
   - Composite Video Signal

3.2 Colour Television
- Primary, secondary colours
- Concept of Mixing, Colour Triangle
- Camera tube
- PAL TV Receiver
- NTSC, PAL, SECAM (brief comparison)

4. Digital Video, Compression Techniques and Standards (05 hrs)

Digital Video, The RGB and YUV Representation of Video Signals, The Need for Compression, How compression works, Compression formats for video - MPEG-x format, H.26x format

5. Digital Television-Transmission and Reception (10 hrs)

Digital satellite television, Direct-To-Home(DTH) satellite television, Digital TV receiver, Merits of digital TV receivers, Digital Terrestrial Television(DTT), Introduction to :Video on demand, CCTV, CATV with optical fibre.

6. Liquid Crystal and Plasma Screen Televisions (10 hrs)

LCD technology, LCD matrix types and operation, LCD screens for television, Plasma and conduction of charge, Plasma television screens, Signal processing in Plasma TV receivers, A Plasma colour receiver, LCD colour receivers, Single LCD receivers, 3-LCD colour receivers, Performance comparison of Plasma and LCD televisions, Introduction to LED TV, RGB dynamic LEDs, Edge-LEDs, Differences between LED-backlit and Backlit LCD displays, Comparison of Plasma TV and LED TV, Introduction to OLED TVs.

7. Introduction to Projection Display Systems and Television Home Theaters. (02 hrs)

LIST OF PRACTICALS

1. To plot the directional response of a Microphone
2. To plot the directional response of a Loud Speaker
3. To study public address system and its components.
4. To test color TV using pattern generator.
5. To perform fault identification in Colour TV.

RECOMMENDED BOOKS

1. Modern Television Practice by R. R. Gulai; New Age International Publishers.
2. Audio Video Systems by R. G. Gupta; McGraw Hill Education System.
3. Television and Video Engineering by A. M. Dhake McGraw Hill Education System

4. Essential Guide to Digital Video by John Watkinson; Snell Wilcox Inc Publication
5. Guide to Compression by John Watkinson; Snell Wilcox Inc Publication
6. Audio Video Systems Principles Practices and Troubleshooting by Bali & Bali; Khanna Publishing Company
7. Consumer Electronics by S. P. Bali; Pearson Education, New Delhi

SUGGESTED DISTRIBUTION OF MARKS:

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	06	12
2	05	10
3	10	20
4	5	10
5	10	22
6	10	22
7	02	04
Total	**48**	**100**

5.2 COMPUTER NETWORKS

L	T	P
3	-	3

RATIONALE

The future of computer technology is in computer networks. Global connectivity can be achieved through computer networks. A diploma holder in electronics and communication engineering should therefore understand the function of networks. Knowledge about hardware and software requirements of networks is essential.

LEARNING OUTCOME

After completion of the course, the learner should be able to

- Recognize the physical topology and cabling (coaxial, OFC, UTP, STP) of a network
- Recognize various types of connectorsRJ-45, RJ-11,BNC and SCST
- Demonstrate various types of networking models and protocol suites
- Install and configure a network interface card in a workstation
- Identify the IP address of a workstation and the class of the address and configure the IP Address on a workstation
- Configure the routers
- Demonstrate sub netting of IP address
- Identify connectivity troubleshooting using PING, IPCONFIG, IFCONFIG
- Explain concepts of wireless networking

DETAILED CONTENTS

1. Networks Basics (6 hrs)
   - What is network
   - Peer-to –peer Network
   - Server Client Network
   - LAN, MAN and WAN
   - Network Services
   - Topologies
   - Switching Techniques

2. OSI Model (8 hrs)
   - Standards
   - OSI Reference Model
   - OSI Physical layer concepts
   - OSI Data-link layer concepts
   - OSI Networks layer concepts
   - OSI Transport layer concepts

- OSI Session layer concepts
- OSI presentation layer concepts
- OSI Application layer concepts

3. Introduction to TCP/IP (7 hrs)
   - Concept of physical and logical addressing
   - Different classes of IP addressing, special IP address
   - Sub netting and super netting
   - Loop back concept
   - IPV4 and IPV6 packet Format
   - Configuring IPV4 and IPV6

4. Cables and Connectors (6 hrs)
   - Types of Cables(Coaxial, Twisted Pair), Shielded and Unshielded Pair of Cables
     (Straight wire Cable, CrossOver Cables) with colour coding.
   - Ethernet Specification and Standardization:
     10 Mbps (Traditional Ethernet), 100 Mbps (Fast Ethernet) and 1000 Mbps (Gigabit Ethernet),Leased lines.
   - Use of RJ45, RJ11, BNC,SCST.

5. Network Connectivity (6 hrs)
   - Network connectivity Devices
   - NICs
   - Hubs
   - Repeaters
   - Switches
   - Routers and Routing Protocols.
   - Configuring of Routers.
   - VOIP and Net-to-Phone Telephony

6. Network Administration / Security (6 hrs)
   - Client/Server Technology
   - Server Management
   - RAID management and mirroring
   - Cryptography
   - Ethical Hacking

7. Network Trouble Shooting Techniques (5 hrs)
   - Trouble Shooting process
   - Trouble Shooting Tools: PING,IPCONFIG, IFCONFIG, NETSTAT, TRACEROOT, Wiresharp/ Dsniffer/ Pcop

8. Wireless Networking (4 hrs)
   Basics of Wireless: Wireless MAN, Networking, Wireless LAN, Wi-Fi, WiMax (Broad-band Wireless) and Li-Fi.

LIST OF PRACTICALS

1. Recognize the physical topology and cabling (coaxial, OFC, UTP, STP) of a network.
2. Recognition and use of various types of connectors RJ-45, RJ-11,BNC and SCST
3. Making of cross cable and straight cable.
4. Install and configure a network interface card in a workstation.
5. Identify the IP address of a workstation and the class of the address and configure the IP Address on a workstation
6. Configuring of router using simulator (Example - Cisco Packet Tracer).
7. Study and demonstration of sub netting of IP address
8. Use of Netstat and its options.
9. Connectivity troubleshooting using PING, IPCONFIG, IFCONFIG
10. Configuring of IP addresses using simulator (Example - Cisco Packet Tracer).

Note: Students must be taken for a visit to nearby industry for latest networking.

techniques.

Required Software

- Cisco Packet Tracer

Required Tools and Supplies

1) Crimping tool, crone Tool, Cable tester,
2) RJ 45 connectors, RJ-11, BNC, SCST
3) Coaxial Cable, UTP, STP, OFC cable
4) Screwdriver Kit
5) Switch/Hub
6) Manageable Switch

INSTRUCTIONAL STRATEGY

This subject deals with both theory and practicals. The students should be made to practically establish LAN with various hardware and software and their integration.

RECOMMENDED BOOKS

1. Computer Networks by Tanenbaum, Prentice Hall of India, New Delhi
2. Data Communications and Networking by Forouzan, (Edition 2^{nd} and 4^{th}),Tata McGraw Hill Education Pvt Ltd , New Delhi
3. Data and Computer Communication by William Stallings, Pearson Education, New Delhi

4. Local Area Networks by Peter Hudson
5. Understanding Local Area Network by Neil Jenkins
6. Area Networks by Stan Schatt, Prentice Hall of India, New Delhi
7. Network+ Lab manual,- BPB Publications -by Tami Evanson
8. Networking Essentials – BPB Publications New Delhi
9. Computer Network and Communications By V.K. Jain and Narija Bajaj, Cyber Tech Publications, New Delhi.
10. Linux – The complete Reference by Richard Peterson, Tata McGraw Hill Education Pvt Ltd, New Delhi.
11. Linux – Install and Configuration Black Book by Dee Annleblanc and Issac Yates, IDG Books India Private Limited, Delhi.
12. Computer Network by J.S. Katre, Tech-Max Publication, Pune

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (%)
1.	06	12
2.	08	18
3.	07	15
4.	06	12
5.	06	12
6.	06	13
7.	05	10
8.	04	08
Total	**48**	**100**

5.3 OPTICAL FIBER COMMUNICATION

L	T	P
4	-	2

RATIONALE

Progressing from communication over copper wire to today's fibre optic communication, we have increased our ability to transmit more information, more quickly and over longer distances. This has expanded our boundaries and is finding a good slot in communication system. Optical fibers has replaced existing transmission media due to its advantages. As a result the technicians are supposed to have knowledge of optical communication. This subject will provide basic concepts and requisite knowledge and skill required.

LEARNING OUTCOME

After completion of the course, the learner should be able to:

- Set up a fiber analog link and optic digital link
- Measure bending losses in optical fibers
- Measure the splice or connector loss
- Measure and calculate numerical aperture of optical fiber
- Explain and demonstrate characteristics of optical source and optical detector
- Connect a fiber with connector at both ends
- Identify and demonstrate use of various components and tools used in optical fiber communication

DETAILED CONTENTS

1. Introduction (12 hrs)

   - Historical perspective, basic communication systems, optical frequency range, advantages of optical fibre communication, application of fibre optic communication
   - Electromagnetic spectrum used, Advantages and disadvantages of optical communication.
   - Principle of light penetration, reflection, critical angle.

2. Optical Fibers and Cables (08 hrs)

   - Constructional details of various optical fibers, multimode and mono-mode fibers, step index and graded index fibers, acceptance angle and types of optical fiber cables.
   - Optical Fibers cable connectors and splicing techniques (Mechanical, fusion)

3. Losses in Optical Fiber Cable: (08 hrs)

   a) Absorption Losses: Scattering Losses, Radiation losses, Connector losses, Bending loses.
   b) Dispersion: Types and its effect on data rate.
   c) Testing of losses using OTDR(Optical Time Domain Reflectometer).

4. Optical Sources (10hrs)

   Characteristics of light used in optical communication, principle of operation of LED, different types of LED structures used and their brief description, Injection laser diode, principle of operation, different injection laser diodes, comparison of LED and ILD.

5. l Optical Detectors (08 hrs)

   Characteristics of photo detectors used in optical communication; PIN diode and avalanche photo diode (APD), Noise in detectors

6. Optical Amplifiers (10 hrs

   Types of optical amplifiers, semiconductor & fiber optical amplifiers Functional types, principal of operation of SOA, types of SOA. FPA, TWA, SOA applications, advantages, Drawbacks, EDFAS, Raman amplifiers

7. Optical Fiber System Application (08 hrs)

   FTTx(Fiber to the x, NGN(Next Generation Network), NFS(Need for Spectrum), IOT(Internet of Things), Apparel Technology.

LIST OF PRACTICALS

1. Setting up of fiber analog link
2. Setting up of optic digital link
3. Measurement of bending losses in optical fibers
4. To observe and measure the splice or connector loss
5. To measure and calculate numerical aperture of optical fiber
6. To observe characteristics of optical source
7. To observe characteristics of optical detector
8. To splice the available optical fiber
9. To connect a fiber with connector at both ends
10. Demonstration of various components and tools used in optical fiber communication

INSTRUCTIONAL STRATEGY

This subject gives the complete knowledge of optical fibre communication techniques. The teacher should make the students aware about the historical development, optical sources and optical fibre system in addition to applications of optical fibre in communication system. Since this subject deals with theory and practical, the theory should be re-enforced by visit to sites and industries like HFCL having optical fiber installations in addition to practical work in the laboratory.

RECOMMENDED BOOKS

1. Optical fiber Communication by John M Senior, Prentice Hall of India, New Delhi
2. Optical fiber Communication by J. Gower , Prentice Hall of India, New Delhi
3. Optical fiber Communication by Gerd Keiser, McGraw Hill International Editions
4. Optical Communications – Components and Systems by JH Franz and VK Jain, Narosa Publishing House, New Delhi
5. Optical Fiber Communication by Sangar and Sahdev, Uneek Publications, Jalandhar

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	12	20
2	8	15
3	8	15
4	10	15
5	8	10
6	10	15
7	8	10
Total	**64**	**100**

5.4 DIGITAL COMMUNICATION

L	T	P
4	-	2

RATIONALE

This course deals with the advanced digital and data communication techniques beyond the conventional communication. It involves the use of modems in synchronous and asynchronous data transmission. It encompasses the modern communication network and integrated services like ISDN and Radio paging along with cellular mobile telephones, FAX, electronic exchanges etc. so vital for present day communication.

LEARNING OUTCOMES

After completion of the course, the learner should be able to:

- Describe and identify block diagram of digital and data communication link
- Demonstrate and explain different coding schemes(5-bit Baudot, 7-bit ASCII, ARQ, EBCDIC) and error detecting and correcting techniques(redundancy, parity, Block Check Character, Vertical Redundancy Check, Longitudinal Redundancy Check, Cyclic Redundancy Check, Hamming code
- Transmit Hamming code on a serial link and reconvert at the receiving end
- Plot and interpret wave forms at input and output of ASK and FSK modulators
- Transmit parallel data on a serial link using USART
- Transmit data using MODEM
- Describe Space and time switching systems.

DETAILED CONTENTS

1. Introduction: (05 hrs)

   Basic block diagram of digital and data communication systems. Their comparison with analog communication systems.

2. Coding (12 hrs)

   a) Introduction to various common codes 5 bit Baudot code, 7 bit ASCII, ARQ, EBCDIC
   b) Code error detection and correction techniques - Redundancy, parity, block check character (BCC), Vertical Redundancy check (VRC), Longitudinal Redundancy Check (LRC), Cyclic Redundancy check (CRC), Hamming code

3. Digital Modulation Techniques: (13 hrs)

   - Basic block diagram and principle of working of the following:

- Amplitude shift keying (ASK): Interrupted continuous wave (ICW), two tone modulation
- Frequency Shift keying (FSK)
- Phase shift keying (PSK), Quadrature Phase Shift Keying(QPSK)

4. Characteristics/working of data transmission circuits; bandwidth requirements, data transmission speeds, noise, cross talk, echo suppressors, distortion, equalizers (12 hrs)

5. Modems: (12 hrs)

   Need and function of modems, Mode of modems operation (low speed, medium speed and high speed modems). Modem interconnection, Modem data transmission speed, Modem modulation method.

6. Space and time switching: Working principle of STS and TST switches. (10 hrs)

LIST OF PRACTICALS

1. Transmission of Hamming code on a serial link and its reconversion at the receiving end.
2. Observe wave forms at input and output of ASK and FSK modulators with the help of CRO
3. Transmission of data using MODEM.
4. Observe wave forms at input and output of QPSK modulators
5. Observe wave forms at input and output of PSK modulators
6. Observe the working of space and time switching circuit.

NOTE:

Visits to the sites of all types of telephone exchanges (including mobile and rural exchanges), Carrier telephony should be made with a view to understand their working. A comprehensive report must be prepared by all the students on these visits, especially indicating the dates and locations of their visits.

INSTRUCTIONAL STRATEGY

This subject provides information to the students regarding the various techniques used in Digitals and Data Communication. Emphasize should be made in the laboratory on the conduct of experiments. For the better awareness, visit must be arranged to the industries like telephone exchange, various cellular industries etc.

RECOMMENDED BOOKS

1. Electronic Communication Systems by George Kennedy Tata McGraw Hill Education Pvt. Ltd, New Delhi
2. Communication system by A.K. Gautam S.K. Kataria Sons, Delhi
3. Electronics communication by K.S. Jamwal, Dhanpat Rai and Sons, Delhi

SUGGESTED DISTRIBUTION OF MARKS:

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	05	07
2	12	18
3	13	20
4	12	20
5	12	20
6	10	15
Total	**64**	**100**

5.5 MICROCONTROLLERS AND EMBEDDED SYSTEM

L	T	P
4	-	3

RATIONALE

Embedded systems and Micro-controllers have also assumed a great significance in the electronic and consumer goods industry and are a very vital field. The subject aims to expose students to the embedded systems besides giving them adequate knowledge of Micro controllers.

LEARNING OUTCOMES

After completion of the course, the learner should be able to

- Work on a microcontroller kit
- Describe architecture, instruction set and addressing modes of 8051/8031 microcontroller, introduction of PIC microcontroller
- Write, edit a assembly language program(PC based)
- Write, edit C language program
- Write program for LCD interface, A/D converter, D/A converter, serial data transmission from kit to PC
- Write program to interface different sensors with microcontroller
- Demonstrate applications of microcontroller

DETAILED CONTENTS

1. Microcontroller series (MCS) – 51 Overview (14 hrs)

   Architecture of 8051 Microcontroller
   - Pin details
   - I/O Port structure
   - Memory Organization
   - Special Function Registers (SFRs)
   - External Memory

2. Instruction Set; Addressing Modes, Instruction types (14 hrs)

   - Timer operation
   - Serial Port operation
   - Interrupts

3. Assembly/C programming(KEIL) for Micro controller (14 hrs)

   - Assembler directives
   - Assembler operation
   - Programming Examples

4. Design and Interface (12 hrs)

   Examples like: keypad interface, 7- segment interface, LCD, stepper motor. A/D, D/A, RTC interface.

5. Block diagram and pin details: PIC, ARDUINO (04 hrs)

6. Application of Micro controllers in Communication System (06 hrs)

LIST OF PRACTICALS

1. Demonstration of Micro-controller Kit
2. Assembly Language Programming
3. C Language Programming- (PC Based)
4. Write Program for LCD interface.
5. Write Program for A/D converter, result on LCD.
6. Write Program for D/A converter, result on LCD.
7. Write a Program for serial data transmission from Kit to PC.
8. Write a program to Interface Sensors.

INSTRUCTIONAL STRATEGY

More emphasis while teaching this subject should be given on practical aspects along with the theory input. Lots of programming exercises may be given to the students. Mini-projects based on microprocessor and micro-controller operations may be identified and given to students as assignments.

RECOMMENDED BOOKS:

1. Microcontrollers by Deshmukh, Tata McGraw Hill Education Pvt Ltd, New Delhi
2. Microcontrollers by Ayala
3. Microcontrollers by Mazidi, Pearon Education, Delhi
4. Microcontrollers by Neil Makanzi, Pearon Education, Delhi
5. Embedded GSM Applications
6. Microcontrollers and Embedded Systems by Sangar and Sahdev, Uneek Publications, Jalandhar
7. Embedded Systems Architechture, Programming and design by Raj Kamal, Tata McGraw Hill Education Pvt Ltd, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allocation (%)
1.	14	20
2.	14	20
3.	14	25
4.	12	20
5.	4	5
6.	6	10
Total	**64**	**100**

5.6 PLCs AND SCADA

L	T	P
4	-	3

RATIONALE

A diploma holder when employed in automated industrial process controls or in automated power station will be required to know the basics of Programmable Logic Controllers, their working and their programming. In industry, many manufacturing processes demand a sequence of operation, which are to be performed repetitively. Early automation systems were mechanical in design, timing and sequencing being effected by gears and cams. Slowly these design concepts were replaced by electrical drives which were controlled by relays and now by programmable logic controllers (PLCs). A PLC is a solid state device, designed to operate in noisy industrial environments and can perform all logic functions. PLCs are widely used in all industries for efficient control operations. A diploma holder in industry is called upon to design, modify and troubleshoot such control circuits. Looking at the industrial applications of PLCs in the modern industry, this subject finds its usefulness in the present curriculum.

LEARNING OUTCOMES

After completion of the course, the learner will be able to:

- Explain and demonstrate the different modules of a Programmable Logic Controller
- Program a PLC using a hand-held programmer and computer interface
- Implement ladder programming concepts
- Implement basic logic operations using ladder programming
- Demonstrate Logic control systems with time response as applied to clamping operation
- Explain sequence control system
- Program a PLC for a specific application

DETAILED CONTENTS

1. Introduction to PLC (12 hrs)

Concept of PLC, Building blocks of PLC, Functions of various blocks, limitations of relays. Advantages of PLCs over electromagnetic relays. Different programming languages, PLC manufacturer etc.

2. Working of PLC (16 hrs)

- Basic operation and principles of PLC
- Scan Cycle
- Memory structures, I/O structure
- Programming terminal, power supply

3. Instruction Set (20 hrs)

- Basic instructions like latch, master control self holding relays.
- Timer instruction like retentive timers, resetting of timers.
- Counter instructions like up counter, down counter, resetting of counters.
- Arithmetic Instructions (ADD,SUB,DIV,MUL etc.)
- MOV instruction
- RTC(Real Time Clock Function)
- Watch Dog Timer
- Comparison instructions like equal, not equal, greater, greater than equal, less than, less than equal
- Programming based on basic instructions, timer, counter, and comparison instructions using ladder program.

4. DCS Concepts (08 hrs)

Concept of DCS, DCS I/O hardware, Remote Terminal Unit

5. SCADA (08 hrs)

Block Diagram of SCADA, Difference between Open Architecture and Dedicated System. Difference between DCS and SCADA

LIST OF PRACTICALS

1. Demonstration of Components/sub-components and modules of a PLC,
2. Demonstration of ladder diagram programming.
3. Write a ladder diagram program for AND, OR, NOT functions.

4. Write a ladder diagram program for traffic light control.

5. Write a ladder diagram program for industry process control.

6. Write a ladder diagram program for water level control.

7. Write a ladder diagram program for automatic car parking.

8. Write a ladder diagram program for lift control.

9. Development of all above applications using SCADA.

INSTRUCTIONAL STRATEGY

Introduce the subject and make the students familiar with applications of PLCs and Microcontrollers. The inputs shall start with theoretical inputs to architecture, instruction set, assembly language programming, Small projects may be identified, designed and implemented. PLC ladder diagram and programming should be supplemented with visits to industry. More emphasis may be given to practical work.

RECOMMENDED BOOKS

1) Programmable Logic Controller by Job Dan Otter; P.H. International, Inc, USA
2) Introduction to PLCs by Gary Dunning. McGraw Hill
3) Module on PLCs and their Applications by Rajesh Kumar, NITTTR Chandigarh
4) Programmable Logic Controller and Microcontrollers by Gurpreet Kaur and SK Sahdev by Uneek Publications, Jalandhar
5) Module on "Allen Bradlag PlC (SLC 500), Institution set-1, by Rajesh Kumar, NITTTR, Chandigarh
6) Module on "PLC Applications based on SLC 5/03" By Rajesh Kumar, NITTTR Chandigarh
7) Instrument engineers Handbook - Process Control, Modern Control Techniques for Process Industries by G Liptak

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allocation (%)
1.	12	20
2.	16	30
3.	20	30
4.	08	10
5.	08	10
Total	**64**	**100**

PERSONALITY DEVELOPMENT CAMP

This is to be organized at a stretch for two to three days during fifth or sixth semester. Extension Lectures by experts or teachers from the polytechnic will be delivered on the following broad topics. There will be no examination for this subject.

1. Communication Skills
2. Correspondence and job finding/applying/thanks and follow-up
3. Resume Writing
4. Interview Techniques: In-Person interviews; telephonic interviews, panel interviews; group interviews and video conferencing etc.
5. Presentation Techniques
6. Group Discussions Techniques
7. Aspects of Personality Development
8. Motivation
9. Leadership
10. Stress Management
11. Time Management
12. Interpersonal Relationship
13. Health and Hygiene