

## HIGHER NITEC IN CIVIL & STRUCTURAL ENGINEERING DESIGN

### COURSE SYNOPSIS

On completion of the course, students should be able to

- Prepare civil and structural layout plans.
- Prepare civil and structural components' schedule and details such as beams, slabs, columns, foundation, roads, drainage and sewerage.
- Prepare civil and structural detailed drawings.
- Prepare shop drawings for construction.
- Liaise with engineers to resolve discrepancies and site problems.

### JOB OPPORTUNITIES

*Higher Nitec* in Civil & Structural Engineering Design graduates are employed by government departments, statutory boards and civil structural consultancy companies in the building and construction sector. They perform a crucial role of ensuring the structural drawings, civil engineering drawings and detailed drawings on structural building are produced to meet the needs of the users such as clients, contractors, authorities, consultants and building occupants, at the different stages of the project. Some of the job titles held by graduates include Civil & Structural Draftsman, Technical Executive, Technical Officer and CAD Designer.

### CERTIFICATION

Credits required for certification:

Core Modules	:	52
Life Skills Modules	:	12
Elective Modules	:	4
<b>Total</b>	:	<b>68</b>

### COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Engineering Graphics	6
Engineering Mathematics and Statics	8
Building Information Modelling	7
Building Structures and External Works	8
Reinforced Concrete Detailing and Design	8
Steel Structure Detailing and Design	7
Industry Attachment	8
<b>ELECTIVES (COURSE-SPECIFIC)</b>	
Elementary Quantities	2
Model Making	2
Land Surveying	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 276-277	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### Engineering Graphics

On completion of the module, students should be able to produce technical sketches, engineering detailed drawings, 3D solid modelling, assembly drawings in accordance with ISO standards.

#### Engineering Mathematics and Statics

On completion of the module, students should be able to apply knowledge of mathematics to solve engineering problems involving the use of algebra, indices, logarithms, trigonometry and basic statistics. Students would also be equipped with the fundamental knowledge of statics and be able to solve engineering problems involving equilibrium of bodies subjected to forces.

#### Building Information Modelling

On completion of the module, students should be able to create 3D models, extract information, perform taking-off from BIM model and produce BIM components.

#### Building Structures and External Works

On completion of the module, students should be able to produce foundation layout plans and schedules of footing and staircase, reinforced concrete drawings of floor, staircase and, structural components such as foundations, retaining walls and detailed drawings of external works such as drains, sewers, culverts, carriageway, drainage and sewerage systems.

#### Reinforced Concrete Detailing and Design

On completion of the module, students should be able to create 3D models using BIM, to draw structural drawings for piling, pile caps, reinforced concrete core walls, prepare column schedules and detailed drawings of reinforced concrete beams and slabs, precast concrete components and precast beam and slab drawings.

#### Steel Structure Detailing and Design

On completion of the module, students should be able to create 3D steel structure models using BIM software and to produce steel structure working drawings with detailed connections of steel members.

#### Industry Attachment

Students will be attached to local companies to gain professional and relevant working experience.

#### Electives (Course Specific)

##### Elementary Quantities

On completion of the module, students should be able to calculate and prepare the bill of quantities for simple building work in accordance with Civil Engineering Standard Method of Measurement Code.

##### Model Making

On completion of the module, students should be able to construct a scaled model of a structural frame.

##### Land Surveying

On completion of the module, students should be able to perform simple levelling work, set out horizontal angles and calculate reduced levels from field bookings.

##### Electives (General)

As reflected on pages 276-277.

##### Life Skills Modules

As reflected on page 281.

## HIGHER NITEC IN ELECTRICAL ENGINEERING

### COURSE SYNOPSIS

On completion of the course, students should be able to

- Perform maintenance, coordination and supervision of electrical installations, equipment and systems in buildings.
- Perform maintenance, coordination and supervision of electrical power distribution systems.
- Perform maintenance, coordination and supervision of DC and AC electrical machines and related control systems.
- Perform maintenance, coordination and supervision of intelligent building control systems.
- Perform maintenance, coordination and supervision of instrumentation and process control systems.

### JOB OPPORTUNITIES

*Higher Nitec* in Electrical Engineering graduates are employed by government departments, statutory boards and private companies. They perform a crucial role of ensuring that electrical installations, equipment and systems are operational. Some of the job titles held by Higher Nitec in Electrical Engineering graduates include Electrical Maintenance Technical Officer or Supervisor, Electrical Engineering Technician, Electrical Power Technician, Engineering Assistant, Instrumentation Technician, Electrical & Electronics Marketing Executive and Production Supervisor. There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge by continual learning and taking up higher-level courses.

### CERTIFICATION

Credits required for certification:

Core Modules	:	53
Life Skills Modules	:	12
Elective Modules	:	4
<b>Total</b>	:	<b>69</b>

### COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Electrotechnology and Motor Control	7
Electrical Installations and Design	6
Industrial Systems and Network Cabling	5
Electrical Equipment Maintenance	6
Intelligent Control Systems and programming	6
Electrical Machines and Drives	7
Instrumentation and Control Systems	5
Electrical Power Systems	7
Project	4
<b>ELECTIVES (COURSE-SPECIFIC)</b>	
Sensor Technology	2
Lighting Effects and Applications	2
Clean Energy System	2
SCADA	2
Structured Cabling	2
Applied Pneumatic Control	2
Power Quality	2
Electrical Drafting	2
<b>ELECTIVES (JOINT ITE-INDUSTRY)</b>	
PLC Control Builder	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 276-277	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### Electrotechnology and Motor Control

On completion of the module, students should be able to connect, test and analyse DC and AC circuits and networks, electromagnetic circuits, electrical motors and motor control circuits.

#### Electrical Installations and Design

On completion of the module, students should be able to install, control and maintain domestic, commercial, industrial as well as special electrical installations, design and produce electrical drawings and diagrams in compliance with the relevant codes of practice.

#### Industrial Systems and Network Cabling

On completion of the module, students should be able to program PLCs for industrial system applications and also install, test and carry out basic maintenance on telephone wiring and IT infrastructure cabling systems in compliance with statutory requirements and industry standards.

#### Electrical Equipment Maintenance

On completion of the module, students should be able to should be able to maintain electronics equipment and systems, diagnose and troubleshoot faults in electrical appliances and maintain and test low voltage (LV) electrical switchboards in accordance with codes of practice.

#### Intelligent Control Systems and Programming

On completion of the module, students should be able to program, test and commissioning an open protocol system for residential, commercial and industrial control and automation applications and write simple computer programs to solve engineering problems.

#### Electrical Machines and Drives

On completion of the module, students should be able to start up, operate, test and/or control the speed of DC and AC machines and electrical equipment, explain their construction, principles of operation, operating characteristics and applications.

#### Instrumentation and Control Systems

On completion of the module, students should be able to operate and calibrate process instruments and equipment and maintain process control and field bus equipment.

#### Electrical Power Systems

On completion of the module, students should be able to operate and maintain electrical power systems and equipment, including power factor correction equipment, motor control centres, electrical switchboards, protective relays, switchgears, power cables, standby generators and uninterruptible power supplies.

#### Project

On completion of the module, students should be able to integrate and apply a cluster of key technical, social and methodological competencies in carrying out a project related to their field of study.

#### Electives (Course Specific)

##### Sensor Technology

On completion of the module, students should be able to explain the principles of operation, characteristics and applications of various sensors in industrial and electrical engineering works.

##### Lighting Effects and Applications

On completion of the module, students should be able to apply the principles of lighting effects to install and maintain lighting schemes for different client requirements.

##### Clean Energy System

On completion of the module, students should be able to design and install various basic photovoltaic systems.

##### SCADA

On completion of the module, students should be able to explain the basic configuration and provide an overview of a SCADA system. They are also trained to explain the techniques and methods used on data acquisition, the control of the field devices, communication, applications and operation of the system.

##### Structured Cabling

On completion of the module, students should be able to explain the principles of structured cabling and install a standard cabling system accordingly to the relevant standard. They also should be able to perform testing and trouble-shooting and certify the quality of structured cabling installations with both copper and fibre-optic cables.

### Applied Pneumatic Control

On completion of the module, students should be able to develop control circuits based on knowledge of the construction, principles of operation and application of the various components and equipment in electromechanical, pneumatic and electro-pneumatic control systems.

### Power Quality

On completion of the module, students should be able to use monitoring tools to measure power quality (PQ) in an electrical power installation. They should also be able to explain the various sources of power quality problems and their mitigation techniques.

### Electrical Drafting

On completion of the module, students should be able to use CAD software to produce electrical drawings and diagrams in compliance with regulations and codes of practice.

### Electives (Joint ITE-Industry)

#### PLC Control Builder

On completion of the module, students should be able to use PLC engineering tool to configure projects based on IEC61131-3 standard with one or several applications running in PLC.

#### Electives (General)

As reflected on pages 276-277.

#### Life Skills Modules

As reflected on page 281.

# HIGHER NITEC IN ENGINEERING WITH BUSINESS

## COURSE SYNOPSIS

On completion of the course, students should be able to

- Troubleshoot problems in manufacturing processes.
- Design jigs and fixtures for manufacturing.
- Initiate continuous work improvement activities to manufacturing processes.
- Perform production scheduling and material requirement planning for manufacturing processes.
- Maintain quality assurance system for manufacturing.
- Prepare necessary documents for manufacturing and assembly.
- Perform technical marketing, sales and services.

## JOB OPPORTUNITIES

*Higher Nitec* in Engineering with Business graduates are employed by high value manufacturing industries in consumer electronics, precision engineering and equipment/products/components manufacturing companies. Some of the job titles held by graduates include Engineering Assistant, Manufacturing Engineering Technician, Production Supervisor and Quality Assurance Technician. They are also suitable to be employed as Sales Executives and Assistant Sales Engineers. There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge by taking up higher-level courses.

## CERTIFICATION

Credits required for certification:

Core Modules	:	51
Life Skills Modules	:	12
Elective Modules	:	4
<u>Total</u>	:	<u>67</u>

## COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Mathematics and Engineering Systems	7
CAD and Engineering Design	6
Quality Engineering	7
Engineering Materials and Mechanics	7
Elements of Business Practice	3
Manufacturing Processes and Prototyping	6
Manufacturing Engineering	6
Fundamentals of Marketing	5
Industry Attachment	4
<b>ELECTIVES (COURSE-SPECIFIC)</b>	
Conventional Machining	2
Jig and Fixture Design	2
Product Prototyping	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 276-277	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### Mathematics and Engineering Systems

On completion of the module, students should be able to solve engineering problems involving algebra, indices, graphs, trigonometry and statistics, and to perform electrical installation as well as connect pneumatic and hydraulic systems.

#### CAD and Engineering Design

On completion of the module, students should be able to create 2D drawings of engineering components using a CAD system as well as produce 3D solid models and also to design a mechanical system comprising various machine elements.

#### Quality Engineering

On completion of the module, students should be able to interpret the Workshop Safety and Health (WSH) regulations, the requirements of ISO 9001 and 14001 under Quality Management System, Lean Six Sigma, and apply fundamental quality tools and techniques for problem solving and quality inspection, and also the use of precision measuring tools with statistical process control capabilities.

#### Engineering Materials and Mechanics

On completion of the module, students should be able to classify engineering materials, conduct destructive and non-destructive testing and also able to apply the laws and principles of statics and dynamics to design engineering systems.

#### Elements of Business Practice

On completion of the module, students should be able to perform effective business communications, comply with business ethics and practices, and conduct technical sales.

#### Manufacturing Processes and Prototyping

On completion of the module, students should be able to perform rapid prototyping, verify and troubleshoot machine parameters and perform part programming using CAD/CAM software, and also carry out study of equipment layout and process flow in a manufacturing environment.

#### Manufacturing Engineering

On completion of the module, students should be able to conduct work study, perform process planning, carry out productivity improvement activities, perform manufacturing resources planning and conduct risk assessment for the workplace.

#### Fundamentals of Marketing

On completion of the module, students should be able to carry out technical marketing, logistics administration, sales and services in the business set up.

#### Industry Attachment

On completion of the module, students should be able to acquire and apply a cluster of key technical, social and methodological competencies in their occupation.

#### Electives (Course Specific)

##### Conventional Machining

On completion of the module, students should be able to perform machining operations on conventional lathe and milling machines.

##### Jig and Fixture Design

On completion of the module, students should be able to design and draw a drill jig, turning and milling fixture using CAD software.

##### Product Prototyping

On completion of the module, students should be able to create simple design of a product using 3-D CAD software and produce a 3-D model of it using basic prototyping devices.

#### Electives (General)

As reflected on pages 276-277.

#### Life Skills Modules

As reflected on page 281.

# HIGHER NITEC IN FACILITY MANAGEMENT

## COURSE SYNOPSIS

On completion of the course, students should be able to

- Supervise and coordinate building maintenance work such as air-conditioning, electrical, mechanical, fire protection, building, plumbing and sanitary systems, and general services.
- Supervise fire-safety related tasks assigned by Fire Safety Manager to ensure safe and efficient operations of buildings and facilities.
- Assign and manage subordinates in the execution of FM (facility management) activities.
- Perform maintenance duties as and when needed.

## JOB OPPORTUNITIES

*Higher Nitec* in Facility Management graduates could be employed directly by large establishments who manage their own facility or indirectly via facility management companies. They will be able to take on jobs as Facility Maintenance Technical Officer, Facility Maintenance Supervisor and Facility Maintenance Executive. They can also take up the additional role of fire safety manager if they have passed the Fire Safety Management elective module accredited by SCDF.

## CERTIFICATION

Credits required for certification:

Core Modules	:	48
Life Skills Modules	:	12
Elective Modules	:	6
<b>Total</b>	:	<b>66</b>

## COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Mechanical Systems and Services	6
Electrical Systems and Services	7
Air-Conditioning Systems	7
Building Management System	6
Workplace Safety and Health Management	5
Building Services Systems Analysis and Management	8
Project Management and Supervision	5
Industry Attachment	4
<b>ELECTIVES (COURSE-SPECIFIC)</b>	
Water Efficiency in Building	2
Energy Audit and Management	4
Green Building Technology	2
<b>ELECTIVES (JOINT-ITE INDUSTRY)</b>	
Fire Safety Management	6
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 276-277	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### Mechanical Systems and Services

On completion of the module, students should be able to interpret building system plan, verify parts replacement, maintain standby generators and pumps, and operate and maintain fire-fighting equipment such as fire-alarm systems, hose-reel installations, sprinkler systems, fire-fighting hydrants, portable fire extinguishers, emergency voice communication systems and fire suppression systems in the industrial, commercial and residential buildings.

#### Electrical Systems and Services

On completion of the module, students should be able to interpret electrical circuit diagrams, conduct insulation resistance and continuity tests, coordinate installation of conduits and trunkings, and maintain power and lighting circuits, standby generators and emergency lightings and audio visual system.

#### Air-Conditioning Systems

On completion of the module, students should be able to supervise the installation, maintenance and first line troubleshooting of unitary-type and split-type residential air-conditioning units, packaged units, air-cooled and water-cooled centralized air-conditioning system and cold room.

#### Building Management System

On completion of the module, students should be able to interpret the various types of control systems linked to Building Management System (BMS), conduct wellness check, operate the BMS, identify the common causes of faults, and compile system reports.

#### Workplace Safety and Health Management

On completion of the module, students should be familiar with hazard identification, risk assessment, implementation and establishment of control measures, performing hazard communication, and managing risks at the workplace.

#### Building Services Systems Analysis and Management

On completion of the module, students should be able to interpret architectural and structural drawings, maintenance of masonry work, inspection of painting work and drains for stagnant water, identification of faulty fittings and fixtures, and water-proofing breaches, monitoring the installation, maintenance and repair work of water supply, plumbing and sanitary systems, and supervision of pest control, landscaping and cleaning activities.

#### Project Management and Supervision

On completion of the module, students should be able to plan for resource deployment and work schedule, supervise project activities, resolve site issues and conflicts, ensure compliance to safety, security and statutory requirements and communicate with stakeholders to ensure co-operation among stakeholders for smooth completion of project.

#### Industry Attachment

Students will be attached to local or overseas companies or organizations to gain professional and relevant working experience.

#### Electives (Course Specific)

##### Water Efficiency in Building

On completion of the module, students should be able to conduct water audit and apply water efficiency measures to reduce water consumption in commercial/residential buildings.

##### Energy Audit and Management

On completion of the module, students should be able to conduct on-site energy audit using appropriate measuring instruments and tools, and recommend corrective measures for energy savings.

##### Green Building Technology

On completion of the module, students should be able to assist engineers to carry out design, fabrication, modification and commissioning of Green facilities and assist engineers in the operation, management and services related to Green facilities.

#### Electives (Joint ITE-Industry)

##### Fire Safety Management

On completion of the module, students should be familiar with the basic working knowledge on fire science and fire safety engineering, the various types of fire protection installations, operation and maintenance, and the means to respond to fire alarm activation, fight incipient fire, and performing rescue and evacuation exercises. In addition, they should be equipped with the basic knowledge of first aid, the basic requirement of fire safety installations and maintenance including building inspection and testing of fire protection system, and the requirements of roles and responsibilities of Fire Safety Managers.

#### Electives (General)

As reflected on pages 276-277.

#### Life Skills Modules

As reflected on page 281.

# HIGHER NITEC IN FACILITY SYSTEMS DESIGN

## COURSE SYNOPSIS

On completion of the course, students should be able to prepare working drawings and assist in the design of the following building facility systems with application software:

- Air-conditioning and ventilation systems
- Electrical installation and control systems
- Fire protection and fighting systems
- Water supply and sanitary systems

## JOB OPPORTUNITIES

*Higher Nitec* in Facility Systems Design graduates are employed by companies in the building industry. These include companies providing engineering consultancy services involved in building services such as electrical installations, air-conditioning ducting, fire protection, water supply and sanitary plumbing. Some of the job titles held by graduates include Facility Systems CADD Specialist, Facility Systems Assistant Designer and Mechanical & Electrical Draughtsman. There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge by taking up higher-level courses.

## CERTIFICATION

Credits required for certification:

Core Modules	:	53
Life Skills Modules	:	12
Elective Modules	:	4
<u>Total</u>	:	<u>69</u>

## COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Engineering Graphics	6
Engineering Mathematics and Statics	8
Building Information Modelling	7
Air Conditioning and Ventilation System Design	8
Electrical System Design	8
Plumbing and Fire Protection System Design	8
Industry Attachment	8
<b>ELECTIVES (COURSE-SPECIFIC)</b>	
Green Building Technology	4
<b>ELECTIVES (INTER-DISCIPLINARY)</b>	
Engineering Project Management	2
Land Surveying	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 276-277	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### Engineering Graphics

On completion of the module, students should be able to produce technical sketches, engineering detailed drawings, 3D solid modelling, assembly drawings in accordance with ISO standards.

#### Engineering Mathematics and Statics

On completion of the module, students should be able to apply knowledge of mathematics to solve engineering problems involving the use of algebra, indices, logarithms, trigonometry and statistics. Students would also be equipped with the fundamental knowledge of statics, and be able to solve engineering problems involving equilibrium of bodies subjected to forces.

#### Building Information Modelling

On completion of the module, students should be able to create 3D models, extract information, perform taking-off from BIM model and produce BIM components.

#### Electrical System Design

On completion of the module, students should be able to perform design on electrical system for buildings, and prepare the drawings in accordance to the standard codes of practice and government regulations.

#### Air Conditioning and Ventilation System Design

On completion of the module, students should be able to estimate the cooling load of a building, create 3D models and perform design on air-conditioning ducting, and prepare working drawings for ducting layouts and related pipework using catalogues and in accordance to the standard codes of practice and government regulations.

#### Plumbing and Fire Protection System Design

On completion of the module, students should be able to produce piping layouts and prepare drawings on plumbing system, sanitary system and sprinkler system in accordance to the standard codes of practice and government regulations.

#### Industry Attachment

Students will be attached to M&E consultant companies to complement and reinforce the skills and knowledge acquired at ITE and to develop competencies in other specialized areas.

#### Electives (Course Specific)

##### Green Building Technology

On completion of the module, students would be equipped with the fundamental skills and knowledge of green building technologies and design, and incorporate environment-friendly features in building facility design.

##### Electives (Inter-disciplinary)

##### Engineering Project Management

On completion of the module, students should be able to apply the tools and techniques that enable the project team to organize and manage their project work to meet requirements and challenges.

##### Land Surveying

On completion of the module, students should be able to perform simple levelling work, set out horizontal angles and calculate reduced levels from field bookings.

##### Electives (General)

As reflected on pages 276-277.

##### Life Skills Modules

As reflected on page 281.

# HIGHER NITEC IN MARINE ENGINEERING

## COURSE SYNOPSIS

On completion of the course, students should be able to

- Perform alignment of marine machinery.
- Perform maintenance of marine control circuits.
- Perform installation and repair of marine machinery.
- Perform supervision work on machining work.
- Perform defect diagnosis of marine systems.
- Assist to execute commissioning and testing activities.
- Perform verification of measuring instruments.
- Perform design and fabrication of jigs and fixtures.
- Perform quality control and assurance.
- Perform inspection of ship systems and machinery components.
- Perform basic maintenance of electrical equipment.

## JOB OPPORTUNITIES

*Higher Nitec* in Marine Engineering graduates are employed by the marine and offshore industry such as marine services contractors, marine equipment manufacturers and suppliers, marine fleet operators and the shipyards. These graduates can provide services such as maintenance and repair of marine systems, assist in executing, commissioning and testing activities, calibration and instrumentation work, quality control and assurance, inspection of ship systems and machinery components. Some of the job titles held by graduates include Marine Supervisor (Mechanical) and Foreman (Mechanical). There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge by taking up higher-level courses.

## CERTIFICATION

Credits required for certification:

Core Modules	:	55
Life Skills Modules	:	12
Elective Modules	:	4
<u>Total</u>	:	<u>71</u>

## COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
CAD and Engineering Mathematics	7
Electrotechnology and Controls	6
Quality Engineering	7
Ship Systems	6
Marine Propulsion System	6
Marine Auxiliary Systems	6
Marine Control Systems and Instrumentation	7
Marine Workshop Technology	6
Project	4
<b>ELECTIVES (COURSE-SPECIFIC)</b>	
Basic Naval Architecture	3
Ship and Offshore Survey	3
Project Management	2
Engineering Watchkeeping	2
Shipboard Legislation and Resource Management	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 276-277	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### CAD and Engineering Mathematics

On completion of the module, students should be able to produce basic marine engineering drawings and diagrams in compliance with regulations and codes of practice, and apply mathematical techniques in solving engineering problems.

#### Electrotechnology and Controls

On completion of the module, students should be able to test and maintain electrical DC and AC equipment and basic pneumatic, hydraulic and electro-pneumatic control circuits and systems.

#### Quality Engineering

On completion of the module, students should be able to maintain safety and health of the individual, conduct preliminary safety inspection and risk assessment, perform checks on general arrangement drawings, monitor quality control systems, perform inspection work on brazed joints, heat treatment of materials, pump alignment, and dimensional checks of engineering components.

#### Ship Systems

On completion of the module, students should be able to service, maintain propulsion components system, pneumatic and hydraulic systems components and perform inspection work on deck machinery and alignment of marine machinery.

#### Marine Propulsion System

On completion of the module, students should be able to recondition various engine components, perform defect diagnosis and rectification works of marine systems.

#### Marine Auxiliary Systems

On completion of the module, students should be able to inspect, troubleshoot and rectify ship systems, machinery components and conduct dynamic balancing test of rotating elements.

#### Marine Control Systems and Instrumentation

On completion of the module, students should be able to set timing of engine valve, fuel pump, governor timing, perform system measurements and troubleshoot the control systems.

#### Marine Workshop Technology

On completion of the module, students should be able to perform basic arc welding, gas cutting, machine screw threads and components most commonly used in shipboard repairs, and design, modify and fabricate jigs and fixtures.

#### Project

On completion of the module, students should be able to apply and integrate the technical, social and methodological competencies in carrying out a project related to their field of study.

#### Electives (Course Specific)

##### Basic Naval Architecture

On completion of the module, students should be able to produce line plans drawings from offset tables, and perform ship form calculations and stability calculations.

##### Ship and Offshore Survey

On completion of the module, students should be able to co-ordinate vessel survey activities, perform preliminary survey on steel structures, marine propulsion components, electrical installations, and prepare report on survey recommendations of rectified works.

##### Project Management

On completion of the module, students should be able to plan, track and monitor projects using project management software.

##### Engineering Watchkeeping

On completion of the module, students should be able to maintain a safe engineering watch and seaworthiness of the ship, operate main and auxiliary marine machinery and control systems, operate marine electrical power distribution ensure compliance with marine pollution prevention requirements.

##### Shipboard Legislation and Resource Management

On completion of the module, students should be able to maintain operational and maintenance documentation, monitor compliance with maritime legislative requirements, manage human factor errors and practice good leadership and teamwork on board ships.

##### Electives (General)

As reflected on pages 276-277.

##### Life Skills Modules

As reflected on page 281.

# HIGHER NITEC IN MARINE & OFFSHORE TECHNOLOGY

## COURSE SYNOPSIS

On completion of the course, students should be able to

- Interpret general arrangement drawings, pipe and instrument drawings, welding procedure specifications, and test procedures.
- Perform preliminary design of pipe routing plan.
- Perform non-destructive tests on weld metals.
- Perform inspection on brazed joints, pre-welding and post-welding, and alignment of pumps.
- Assist in system testing and commissioning of marine auxiliary system and drilling system.
- Perform planning of work activities such as lifting, erection of supports for assembly works, manpower deployment and work schedule.
- Perform supervision on fabrication and welding.
- Perform quality control checks of welding, painting and blasting, insulation, machinery and electrical installations.

## JOB OPPORTUNITIES

*Higher Nitec* in Marine & Offshore Technology graduates can be employed by shipyards, and other supporting companies which provide services on the repair, fabrication, refurbishment of all types of vessels, offshore structures in the marine and offshore industry. Some of the job titles held by graduates include Assistant Supervisor, Trainee Supervisor, Assistant Marine Supervisor and Foreman. There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge by taking up higher-level courses.

## CERTIFICATION

Credits required for certification:

Core Modules	:	59
Life Skills Modules	:	12
Elective Modules	:	4
<u>Total</u>	:	<u>75</u>

## COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
CAD and Engineering Mathematics	7
Electrotechnology and Controls	6
Quality Engineering	7
Ship Systems	6
Welding Technology	6
Pipe Design and Systems	6
Fabrication Technology	6
Offshore Technology	7
Industry Attachment	8
<b>ELECTIVES (COURSE-SPECIFIC)</b>	
Basic Naval Architecture	3
Ship and Offshore Survey	3
Project Management	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 276-277	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### CAD and Engineering Mathematics

On completion of the module, students should be able to produce basic marine engineering drawings and diagrams in compliance with regulations and codes of practice, and apply mathematical techniques in solving engineering problems.

#### Electrotechnology and Controls

On completion of the module, students should be able to test and maintain electrical DC and AC equipment and basic pneumatic, hydraulic and electro-pneumatic control circuits and systems.

#### Quality Engineering

On completion of the module, students should be able to maintain safety and health of the individual, conduct preliminary safety inspection and risk assessment, perform checks on general arrangement drawings, monitor quality control systems, perform inspection work on brazed joints, heat treatment of materials, pump alignment, and dimensional checks of engineering components.

#### Ship Systems

On completion of the module, students should be able to service, maintain propulsion components system, pneumatic and hydraulic systems components and perform inspection work on deck machinery and alignment of marine machinery.

#### Welding Technology

On completion of the module, students should be able to perform butt, fillet, groove weld joints using submerged arc welding, shielded metal arc welding, flux-cored arc welding, gas tungsten arc welding in flat, horizontal and vertical positions, rectify weld defects, and perform non-destructive tests on weld metals.

#### Pipe Design and Systems

On completion of the module, students should be able to perform preliminary design of pipe routing plan, pipe cutting plan, pipe spool assembly, leak tests on piping systems, dimension checks on bended pipes, and produce drawings of piping systems using computer-aided drafting.

#### Fabrication Technology

On completion of the module, students should be able to perform structural markings, line plan drawings, markings and development of plates and pipes, material surface inspection, material nesting and take-off, and co-ordination work for lifting, and plan manpower deployment and work schedule.

#### Offshore Technology

On completion of the module, students should be able to perform dimension control and level checks of structures, co-ordinate the erection of temporary supports, perform leak test on tanks and pipes, and assist in system testing and system commissioning.

#### Industry Attachment

Students will be attached to local companies to gain professional and relevant working experiences.

#### Electives (Course Specific)

##### Basic Naval Architecture

On completion of the module, students should be able to produce line plans drawings from offset tables, and perform ship form calculations and stability calculations.

##### Ship and Offshore Survey

On completion of the module, students should be able to co-ordinate vessel survey activities, perform preliminary survey on steel structures, marine propulsion components, electrical installations, and prepare report on survey recommendations of rectified works.

##### Project Management

On completion of the module, students should be able to plan, track and monitor projects using project management software.

##### Electives (General)

As reflected on pages 276-277.

##### Life Skills Modules

As reflected on page 281.

# HIGHER NITEC IN MECHANICAL ENGINEERING

## COURSE SYNOPSIS

On completion of the course, students should be able to

- Set up machines, equipment and systems.
- Provide support in product improvements.
- Conduct quality assurance functions on products and systems.
- Perform fault diagnosis and maintenance of instrumentation and control equipment.
- Perform sub-system and PLC integration.
- Perform support functions in engineering design and development.

## JOB OPPORTUNITIES

*Higher Nitec* in Mechanical Engineering graduates can be employed by mechanical engineering and precision engineering firms and companies that provide engineering services from front-end engineering design, systems development to maintenance of mechanical equipment and instruments. Some of the job titles held by graduates include Engineering Assistant, Mechanical Engineering Technician, Maintenance Supervisor, Quality Assurance Technician and Quality Process Technician. There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge by taking up higher-level courses.

## CERTIFICATION

Credits required for certification:

Core Modules	:	54
Life Skills Modules	:	12
Elective Modules	:	4
<u>Total</u>	:	<u>70</u>

## COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Mathematics and Engineering Systems	7
CAD and Engineering Design	6
Quality Engineering	7
Engineering Materials and Mechanics	7
Instrumentation and Controls	7
Engineering Development and Applications	6
System Integration	6
Project	8
<b>ELECTIVES (COURSE SPECIFIC)</b>	
Conventional Machining	2
Jig and Fixture Design	2
Product Prototyping	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 276-277	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### Mathematics and Engineering Systems

On completion of the module, students should be able to solve engineering problems involving algebra, indices, graphs, trigonometry and statistics, and to perform electric installations as well as connect pneumatic and hydraulic systems.

#### CAD and Engineering Design

On completion of the module, students should be able to create 2D drawings of engineering components using a CAD system as well as produce 3D solid models and also to design a mechanical system comprising various machine elements.

#### Quality Engineering

On completion of the module, students should be able to interpret the Workshop Safety and Health (WSH) regulations, the requirements of ISO 9001 and 14001 under Quality Management System, Lean Six Sigma, and apply fundamental quality tools and techniques for problem solving and quality inspection, and also the use of precision measuring tools with statistical process control capabilities.

#### Engineering Materials and Mechanics

On completion of the module, students should be able to classify engineering materials, conduct destructive and non-destructive testing and also able to apply the laws and principles of statics and dynamics to design engineering systems.

#### Instrumentation and Controls

On completion of the module, students should be able to perform testing, calibration, fault diagnosis and maintenance of instrumentation and control equipment, and to perform sizing and selection of components for fluid systems.

#### Engineering Development and Applications

On completion of the module, students should be able to carry out design and development activities including application of design concepts for a sustainable environment, verify product design, perform rapid prototyping, as well as carry out product design change process and enhancement of product design.

#### System Integration

On completion of the module, students should be able to program PLC system, interface engineering components and sub-systems, design part feeding system and install electrical drive systems.

#### Project

On completion of the module, students should be able to apply and integrate the technical, social and methodological competencies in carrying out a project related to their field of study.

#### Electives (Course Specific)

##### Conventional Machining

On completion of the module, students should be able to perform machining operations on conventional lathe and milling machines.

##### Jig and Fixture Design

On completion of the module, students should be able to design and draw a drill jig, turning and milling fixture using CAD software.

##### Product Prototyping

On completion of the module, students should be able to create simple design of a product using 3-D CAD software and produce a 3-D model of it using basic prototyping devices.

##### Electives (General)

As reflected on pages 276-277.

##### Life Skills Modules

As reflected on page 281.

# HIGHER NITEC IN MECHATRONICS ENGINEERING

## COURSE SYNOPSIS

On completion of the course, students should be able to

- Install, maintain and service pneumatic and electro-pneumatic controlled systems.
- Construct and assemble mechanical support.
- Prepare and interpret electrical and mechanical drawings.
- Install and test electrical systems.
- Install and test peripheral devices and microcomputer controlled systems.
- Troubleshoot electronics systems.
- Set up industrial automation systems, modifies PLC program and troubleshoot a simple automated production system at module level.
- Set up automated manufacturing systems, autovision systems and communication networks.
- Set up and test-run industrial robot with written test program.
- Set up precision motion control systems.

## JOB OPPORTUNITIES

*Higher Nitec* in Mechatronics Engineering graduates are employed by engineering and manufacturing firms using sophisticated equipment and automated machinery. Some of the job titles held by graduates include Automation Technician, Engineering Assistant, Industrial Engineering Technician, Mechatronics Technician, Plant Maintenance Technician and Production Supervisor. There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge by taking up higher-level courses.

## CERTIFICATION

Credits required for certification:

Core Modules	:	56
Life Skills Modules	:	12
Elective Modules	:	4
<b>Total</b>	:	<b>72</b>

## COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
CAD and Electro-Mechanical Practices	6
Industrial Electronics	7
Pneumatics and Automation	6
PLC and Motor Control	6
Flexible Manufacturing System	7
Robotics and Mechanics	8
Microcontroller and Computing	6
Project	10
<b>ELECTIVES (COURSE SPECIFIC)</b>	
Hydraulics	3
Single Board Micro-controller Applications	2
Lean Manufacturing	2
Industry Attachment	2
Industry Attachment	3
<b>ELECTIVES (JOINT ITE-INDUSTRY)</b>	
Integration of Vision with Servo Control	2
Robot Palletizing Operations and Programming	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 276-277	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

**MODULE OBJECTIVES****Core Modules****CAD and Electro-Mechanical Practices**

On completion of the module, students should be able to read, interpret and produce common geometrical and mechanical drawings using Computer-Aided Drafting (CAD) software; use common tools and equipment to fabricate and service simple mechanical elements and assemble aluminium profile structures; interpret electrical diagrams, wire up simple electrical control and power circuits and apply the basic laws, theorems and concepts of electrical engineering to electrical work.

**Industrial Electronics**

On completion of the module, students should be able to interpret, design, construct, test and troubleshoot electronic circuits which include analogue and digital components such as diodes, bipolar transistors, logic gates, counters, shift registers and other integrated circuits.

**Pneumatics and Automation**

On completion of the module, students should be able to apply electro-mechanical control systems, including common input/output devices, pneumatics and electro-pneumatics systems in industrial automation.

**PLC and Motor Control**

On completion of the module, students should be able to apply Programmable Logic Controller (PLC) programming to interface and control PLC-controlled applications and to use advanced PLC instructions to program PLC intelligent modules for industrial automations.

**Flexible Manufacturing System**

On completion of the module, students should be able to troubleshoot and maintain the sub-systems associated with a Flexible Manufacturing System, such as machine vision, automated guided vehicle, automatic storage and retrieval, conveyor, industrial communications and vision.

**Robotics and Mechanics**

On completion of the module, students should be able to program, operate, troubleshoot and maintain a robotic system, and solve engineering problems involving statistics, dynamics and strength of materials.

**Microcontroller and Computing**

On completion of the module, students should be able to apply microcontroller programming concepts used in control circuits of microcontroller-based equipment and apply the concepts of computer programming and write simple program.

**Project**

On completion of the module, students should be able to work in groups to design, develop and fabricate and commission a suitable mechatronics project.

**Electives (Course Specific)****Hydraulics**

On completion of the module, students should be able to maintain hydraulic systems in industrial automation.

**Single Board Micro-controller Applications**

On completion of the module, students should be able to write structured programs to interface with peripheral devices and solve simple problems using single board micro-controller.

**Lean Manufacturing**

On completion of the module, students should be able to work effectively as a team member to support lean manufacturing and process improvement in the industries and apply PDCA in continuous process improvement to increase productivity.

**Industry Attachment**

On completion of the module, students should be able to acquire and apply a cluster of key technical, social and methodological competencies in the occupation.

**Electives (Joint ITE-Industry)****Integration of Vision with Servo Control**

On completion of the module, students should be able to implement a vision inspection system, perform servo motor control and interface vision system with servo motor control for inspection process.

**Robot Palletizing Operations and Programming**

On completion of the module, students should be able to operate the palletizing robot system, including editing and modifying programs for different palletizing operations.

**Electives (General)**

As reflected on pages 276-277.

**Life Skills Modules**

As reflected on page 281.

## HIGHER NITEC IN OFFSHORE & MARINE ENGINEERING DESIGN

### COURSE SYNOPSIS

On completion of the course, students should be able to prepare working drawings and assist in the offshore and marine engineering design with application software for the following areas:

- Offshore and marine accommodation.
- Offshore and marine life savings and fire fighting appliances.
- Offshore and marine structure.
- Offshore and marine piping system including piping for fuel oil, lubrication, engine exhaust, hydraulics, pneumatics and water supply.
- Offshore and marine electrical system and controls.
- Offshore and marine heating, ventilation and air-conditioning (HVAC) systems.

### JOB OPPORTUNITIES

*Higher Nitec* in Offshore & Marine Engineering Design graduates are employed by shipyards and other supporting companies which design and provide services on the repair, fabrication, refurbishment of all types of vessels, offshore structures in the marine and offshore industry. Some of the job titles held by graduates include Offshore & Marine Engineering CADD Specialist, Offshore & Marine Engineering Assistant Designer and Offshore & Marine Structure Draughtsman. There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge by taking up higher-level courses.

### CERTIFICATION

Credits required for certification:

Core Modules	:	50
Life Skills Modules	:	12
Elective Modules	:	4
Total	:	66

### COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Engineering Graphics	6
Engineering Mathematics and Statics	8
Offshore and Marine Structure Design	8
Offshore and Marine Electrical System Design	6
Offshore and Marine Piping System Design	8
Offshore and Marine HVAC System Design	6
Industry Attachment	8
<b>ELECTIVES (COURSE SPECIFIC)</b>	
Solid Modelling	2
Engineering Project Management	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 276-277	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### Engineering Graphics

On completion of the module, students should be able to produce technical sketches, engineering detailed drawings, 3D solid modeling and assembly drawings in accordance with ISO standards.

#### Engineering Mathematics and Statics

On completion of the module, students should be able to apply knowledge of mathematics to solve engineering problems involving the use of algebra, indices, logarithms, trigonometry and basic statistics. Students would also be equipped with the fundamental knowledge of statics and be able to solve engineering problems involving equilibrium of bodies subjected to forces.

#### Offshore and Marine Structure Design

On completion of the module, students should be able to use the latest 3D CAD software to perform offshore and marine initial design and to prepare general arrangement and structural drawings in accordance to the standards and classification society requirements.

#### Offshore and Marine Electrical System Design

On completion of the module, students should be able to use the latest 3D CAD software to design electrical system of a ship, including control and communication system, and to prepare the drawings in accordance to the standards and classification society requirements.

#### Offshore and Marine Piping System Design

On completion of the module, students should be able to use the latest 3D CAD software to design mechanical piping, marine system, life safety and fire fighting appliance of a ship, and to prepare drawings in accordance to the standards, classification society, Safety of Life at Sea (SOLAS) and International Organization (IMO) requirements.

#### Offshore and Marine HVAC System Design

On completion of the module, students should be able to estimate the cooling load of a ship, use the latest 3D CAD software to design air-conditioning and mechanical ventilation ducting, heating system and to prepare working drawings for ducting layouts and related pipe work in accordance to the standards and classification society requirements.

#### Industry Attachment

Students will be attached to local companies to gain professional and relevant working experience.

#### Electives (Course Specific)

##### Solid Modelling

On completion of the module, students would be able to appreciate the benefits of parametric modelling and be able to use the 3D modelling software to perform mechanical design and prepare working and presentation drawings.

##### Engineering Project Management

On completion of the module, students should be able to apply the tools and techniques that enable the project team to organize and manage their project work to meet requirements and challenges.

##### Electives (General)

As reflected on pages 276-277.

##### Life Skills Modules

As reflected on page 281.

## HIGHER NITEC IN PRECISION ENGINEERING

### COURSE SYNOPSIS

On completion of the course, students should be able to

- Prepare job requirements.
- Create, interpret and edit CNC part program.
- Perform tooling setup.
- Perform CNC machining to produce precise parts.
- Troubleshoot machining faults.

### JOB OPPORTUNITIES

*Higher Nitec* in Precision Engineering graduates are employed as technical specialist by a wide range of niche manufacturing industries, in particular the Aerospace, Semiconductor, Oil & Gas, Medical Technologies, as well as Precision Modules and Components, and Machinery and Systems sectors. There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading and deepening their technical skills and knowledge by taking up higher-level courses.

### CERTIFICATION

Credits required for certification:

Core Modules	:	49
Life Skills Modules	:	12
Elective Modules	:	4
<b>Total</b>	:	<b>65</b>

### COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
CNC Machining (Turning)	7
CNC Machining (Milling)	7
CAD/CAM for Machining	7
Quality Engineering	7
Advanced Materials & Metrology	6
Advanced Machining & Tool Management	7
Industry Attachment	8
<b>ELECTIVES (INTER-DISCIPLINARY)</b>	
Product Prototyping	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 276-277	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### CNC Machining (Turning)

On completion of the module, students should be able to interpret blueprint drawings, set up and operate CNC lathes to produce components in accordance with given specifications.

#### CNC Machining (Milling)

On completion of the module, students should be able to interpret blueprint drawings, set up and operate CNC milling machines to produce components in accordance with given specifications.

#### CAD/CAM for Machining

On completion of the module, students should be able to interpret product blueprints, create 2D drawings and create 3D solid models using CAD modeling and be able to generate CNC part programs via post processing using a CAM system.

#### Quality Engineering

On completion of the module, students should be able to interpret the Workshop Safety and Health (WSH) regulations, requirements of ISO 9001 and 14001 under Quality Management System, Lean Six Sigma, and apply fundamental quality tools and techniques for problem solving and quality inspection. They should also be able to analyze and monitor process capabilities, apply autonomous maintenance, develop standard work flow, write simple operating procedures, and conduct risk assessment at the work place.

#### Advanced Materials & Metrology

On completion of the module, students should be able to describe the properties and applications of engineering plastics, metals and non-metals, alloys, and exotic materials, and applications of various heat treatment and surface treatment processes. They should also be able to interpret geometrical dimensioning & tolerances, perform measurement of parts with geometrical form and feature using gauges and complex measuring instruments including CMM, and generate quality control reports.

#### Advanced Machining & Tool Management

On completion of the module, students should be able to interpret blueprint drawings, create CNC part programs using CAM system, perform tooling setup, perform process planning, optimize CNC machining processes and machining parameters involving tool management, produce precise parts to specifications using CNC machines, and troubleshoot machining faults. They should also be able to select appropriate cutting tools for machining different materials, and perform inspection on machined parts using appropriate measuring tools.

#### Industry Attachment

On completion of the module, students should be able to acquire and apply a cluster of key technical, social and methodological competencies in their occupation.

#### Electives (Inter-disciplinary)

##### Product Prototyping

On completion of the module, students should be able to create simple design of a product using 3D CAD software and produce a 3D model of it using basic prototyping devices.

##### Electives (General)

As reflected on pages 276-277.

##### Life Skills Module

As reflected on page 281.

## HIGHER NITEC IN PROCESS PLANT DESIGN

### COURSE SYNOPSIS

On completion of the course, students should be able to prepare working drawings and assist in the design of process plants with application software for the following areas:

- Process piping system including P & ID (Process and Instrumentation) diagrams, piping layouts and details, tanks and vessels.
- Process plant mechanical components and assembly.
- Process plant structures including steel frame structures and civil foundation.
- Process plant piping support.

### JOB OPPORTUNITIES

*Higher Nitec* in Process Plant Design graduates are employed by companies involved in Front End Engineering Design (FEED), Engineering, Procurement, Construction/Design (EPC/EPCD) for the Oil and Gas, Petrochemical and Pharmaceutical Industries. Some of the job titles held by graduates include Process Plant CADD Specialist, Process Plant Assistant Designer and Process Piping Draughtsman. There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge by taking up higher-level courses.

### CERTIFICATION

Credits required for certification:

Core Modules	:	50
Life Skills Modules	:	12
Elective Modules	:	4
<u>Total</u>	:	<u>66</u>

### COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Engineering Graphics	6
Engineering Mathematics and Statics	8
Plant Equipment Design	6
Piping and Plant Layout Design	8
Piping Support and Structural Design	6
Plant System Modelling	8
Industry Attachment	8
<b>ELECTIVES (INTER-DISCIPLINARY)</b>	
Engineering Project Management	2
Solid Modelling	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 276-277	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### Engineering Graphics

On completion of the module, students should be able to produce technical sketches, engineering detailed drawings, 3D solid modelling, assembly drawings in accordance with ISO standards.

#### Engineering Mathematics and Statics

On completion of the module, students should be able to apply knowledge of mathematics to solve engineering problems involving the use of algebra, indices, logarithms, trigonometry and statistics. Students would also be equipped with the fundamental knowledge of statics, and be able to solve engineering problems involving equilibrium of bodies subjected to forces.

#### Plant Equipment Design

On completion of the module, students should be able to use the latest 3D CAD software to design process and mechanical equipment, plant facilities and prepare equipment layouts in accordance to the standards and classification society requirements.

#### Piping and Plant Layout Design

On completion of the module, students should be able to use the latest 3D CAD software to design piping layouts, piping components and prepare flow diagrams and piping details with material-take-off in accordance to the standards and classification society requirements.

#### Piping Support and Structural Design

On completion of the module, students should be able to use the latest 3D CAD software to design pipe support and prepare piping support detail drawings and structural drawings in accordance to the standards and classification society requirements.

#### Plant System Modelling

On completion of the module, students should be able to use the latest 3D CAD software to create Petroleum and Petrochemical plant models and verify the integrity of the plant models by performing clash and data consistency checks.

#### Industry Attachment

Students will be attached to Oil and Gas and Petrochemical companies to complement and reinforce the skills and knowledge acquired at ITE and to develop competencies in other specialized areas.

#### Electives (Inter-disciplinary)

##### Engineering Project Management

On completion of the module, students should be able to apply the tools and techniques that enable the project team to organize and manage their project work to meet requirements and challenges.

##### Solid Modelling

On completion of the module, students should be able to appreciate the benefits of parametric modelling and should be able to use the 3D modelling software to perform mechanical design and prepare working and presentation drawings.

##### Electives (General)

As reflected on pages 276-277.

##### Life Skills Modules

As reflected on page 281.

## HIGHER NITEC IN RAPID TRANSIT ENGINEERING

### COURSE SYNOPSIS

On completion of the course, students would be able to

- Maintain rapid transit communication systems.
- Maintain rapid transit signaling systems.
- Maintain rapid transit integrated supervisory control system.

### JOB OPPORTUNITIES

*Higher Nitec* in Rapid Transit Engineering graduates, with their breadth and depth of skills and knowledge in a wide range of rapid transit technologies and systems, would be able to find attractive employment opportunities with mass rapid transit operators (SMRT, SBS Transit), Land Transport Authority, Government planning agencies as well as companies dealing in high tech systems and equipment for the rail industry. Some of the job titles would include Rapid Transit Technical Officer in the areas of Trains, Rolling Stock, Permanent Way, Electrical Systems, Communications, Signaling and Supervisory Control.

There are excellent opportunities for career advancement to supervisory and senior engineering positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge by continual learning and taking up higher-level courses.

### CERTIFICATION

Credits required for certification:

Core Modules	:	53
Life Skills Modules	:	12
Elective Modules	:	4
<b>Total</b>	<b>:</b>	<b>69</b>

### COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Engineering Fundamentals and Rail Tracks	7
Rapid Transit Power Distribution System	7
Electronics and Sensor Technology	7
Rapid Transit Control and Rolling Stock	7
Rapid Transit Signaling Systems	7
Rapid Transit Communications Systems	7
Rapid Transit Integrated Supervisory Control System	7
Industry Attachment	4
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 276-277	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### Engineering Fundamentals and Rail Tracks

On completion of the module, students should be able to explain the details and operation of the rail network and infrastructure in Singapore; interpret railway engineering and blueprint drawings and also perform and/or supervise the maintenance of rail tracks and rail engineering components in accordance with railway industry standards and workplace safety regulations.

#### Rapid Transit Power Distribution System

On completion of the module, students should be able to explain the principles, operation and also perform and/or supervise the maintenance of electrical circuits, machines, installations, equipment and rapid transit electrical power distribution system in accordance with the relevant codes of practice and railway industry standards and regulations.

#### Electronics and Sensor Technology

On completion of the module, students should be able to explain the principles, operation, applications and also perform and/or supervise the maintenance of electronics components, logic circuits, electro-mechanical devices, operational amplifiers, power rectification, oscillators, pulse width modulation circuits, encoders and decoders and sensors and transducers in accordance with the railway industry standards and regulations.

#### Rapid Transit Control and Rolling Stock

On completion of the module, students should be able to explain the principles, operation, applications and also perform and/or supervise the maintenance of pneumatic and electro-pneumatic, building automation, fire protection and PLC systems, rolling stock equipment and train equipment in accordance with railway industry standards and regulations.

#### Rapid Transit Signaling Systems

On completion of the module, students should be able to explain the principles, operation and perform and/or supervise the maintenance of rapid transit signaling devices, circuits and systems in accordance with railway industry standards and regulations.

#### Rapid Transit Communication Systems

On completion of the module, students should be able to explain the principles, operation and perform and/or supervise the maintenance of rapid transit communication devices, circuits and systems in accordance with railway industry standards and regulations.

#### Rapid Transit Integrated Supervisory Control System

On completion of the module, students should be able to explain the principles, operation and perform and/or supervise the inspection and maintenance of rapid transit supervisory control and station equipment in accordance with railway industry standards and regulations.

#### Industry Attachment

Students will undergo 3 months attachment during which they will be immersed in an authentic real work environment and be provided with the opportunity to integrate and apply a cluster of key technical, social and methodological competencies in performing structured work under supervision in one or more of the following areas, namely track, rolling stock, electrical systems, electronics, communication systems, signaling systems, supervisory control systems and station equipment.

#### Electives (General)

As reflected on pages 276-277.

#### Life Skills Modules

As reflected on page 281.

# NITEC IN AEROSPACE AVIONICS

## COURSE SYNOPSIS

On completion of the course, students would be able to

- Maintain electrical wiring looms and related systems.
- Perform maintenance of electrical/electronics system.
- Assist to perform operational tests on the instrumentation system.
- Assist to perform operational tests on the radio system.
- Perform general aircraft general maintenance.

## JOB OPPORTUNITIES

*Nitec* in Aerospace Avionics graduates are employed by aerospace companies, which maintain and repair aircraft instrumentation, radio system and avionic system. Some of the job titles held by graduates include Aircraft Technician (Avionics Trade), Aircraft Maintenance Technician and Avionics Technician. There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge by taking up higher-level courses.

## CERTIFICATION

Credits required for certification:

Core Modules	:	57
Life Skills Modules	:	12
Elective Modules	:	6
<b>Total</b>	:	<b>75</b>

## COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Aircraft General Maintenance	9
Human Factors and Air Legislation	6
Aircraft Electrical and Electronics Systems	8
Aircraft Instrumentation System	8
Aircraft Materials and Structures	8
Aircraft Communication and Navigation Systems	10
Aircraft Maintenance Practice	8
<b>ELECTIVES (COURSE SPECIFIC)</b>	
Aviation Mathematics and Physics	2
Aircraft Propeller System	2
Gas Turbine Engine	2
<b>ELECTIVES (INTER-DISCIPLINARY)</b>	
TIG Welding	2
Non-Destructive Testing	2
Basic Principle of Helicopter	2
Metrology	2
Composite Structure Repairs	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 278-280	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### Aircraft General Maintenance

On completion of the module, students should be able to perform aircraft general maintenance such as fastening, wire-locking, sealant application, general corrosion control and plumbing; interpret aircraft blueprint drawings, aircraft manuals and catalogues.

#### Human Factors and Air Legislation

On completion of the module, students should be able to carry out Work[place, Safety and Health concepts in aircraft maintenance works and to prevent and minimise human-factor related errors in aircraft maintenance, update maintenance records and documentation and to apply the regulatory framework of local air transport operations and governing system adopted by Civil Aviation Authority of Singapore.

#### Aircraft Electrical and Electronics System

On completion of the module, students should be able service, maintain and troubleshoot different types of aircraft electrical system and devices.

#### Aircraft Instrumentation System

On completion of the module, students should be able service, maintain and troubleshoot aircraft instrumentation system.

#### Aircraft Materials and Structures

On completion of the module, students should be able to repair minor surface aircraft structure defects and apply basic Aerodynamic and Theory of Flight.

#### Aircraft Radio Communication and Navigation Systems

On completion of the module, students should be able to service, maintain and troubleshoot aircraft communication and navigation systems.

#### Aircraft Maintenance Practice

Students will undergo a 6-month On-the-Job Training (OJT) course with aerospace industry to reinforce the skills and knowledge acquired at the training institute and to develop competencies in other specialized areas.

### Electives (Course Specific)

#### Aviation Mathematics and Physics

On completion of the module, students should be able to solve problems using mathematical principles of arithmetic, algebra, geometry, trigonometry, principles of kinetics, fluid dynamics and thermodynamics.

#### Aviation Propeller System

On completion of the module, students should be able to assist in performing maintenance and periodic inspection on an aircraft propeller system.

#### Gas Turbine Engine

On completion of the module, students should be able to assist in performing maintenance and periodic inspection on an aircraft gas turbine engine.

### Electives (Inter-disciplinary)

#### TIG Welding

On completion of the module, students should be able to join sheet metal and rebuild metal using TIG welding process.

#### Non Destructive Testing

On completion of the module, students should be able to understand the working principles of non-destructive testing (NDT) methods used for detecting defects in the aircraft components/structures.

#### Basic Principle of Helicopter

On completion of the module, students should be able to understand the basic principles of aerodynamics in helicopters and the various types of rotors used to achieve lift. They should also be able to identify the various parts of the helicopter and mechanism and controls used in changing of blade pitch.

#### Metrology

On completion of the module, students should be able to inspect, verify and measure engineering components according to technical drawing using appropriate tools.

#### Composite Structure Repairs

On completion of the module, students should be able to perform cold and hot bonding on honeycomb structures using fibreglass wet and epoxy resin material (cold bonding) and wet layup pre-preg, metal skin materials and foam core material. Students will also be trained on inspection of damaged structures and post bonding inspection and testing.

### Electives (General)

As reflected on pages 278-280.

### Life Skills Modules

As reflected on page 281.

# NITEC IN AEROSPACE MACHINING TECHNOLOGY

## COURSE SYNOPSIS

On completion of the course, students would be able to

- Generate CNC part-program using CAD/CAM system.
- Set up multi-axis CNC machining centres.
- Operate and monitor precision machining operations.
- Manufacture aerospace components.
- Perform quality checks.

## JOB OPPORTUNITIES

*Nitec* in Aerospace Machining Technology graduates are employed as manufacturing specialist by high value manufacturing industries, in particular the Aerospace, Oil and Gas, Precision Modules and Components, Medical Technology, Transport Engineering, and Machinery and Systems sectors. There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge by taking up higher-level courses.

## CERTIFICATION

Credits required for certification:

Core Modules	:	46
Life Skills Modules	:	12
Elective Modules	:	4
<b>Total</b>	:	<b>62</b>

## COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Engineering Drawing and Inspection Techniques	6
Engineering Process (Turning)	6
Engineering Process (Milling)	6
3D CAD/CAM Applications	6
Aerospace Machining	6
Multi-Axis Programming and Machining	6
Industry Attachment	10
<b>ELECTIVES (COURSE SPECIFIC)</b>	
Assembly Skills	2
Co-ordinate Measuring Techniques	2
Grinding	2
CNC EDM (Die-sink & Wire-cut)	2
<b>ELECTIVES (INTER-DISCIPLINARY)</b>	
Design Conceptualization and Rapid Prototyping	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 278-280	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### Engineering Drawing and Inspection Techniques

On completion of the module, students should be able to interpret technical drawings and perform dimensional inspections for the machined components in accordance with ISO standards.

#### Engineering Process (Turning)

On completion of the module, students should be able to set up and operate centre lathes and CNC lathes to produce components in accordance with given specifications.

#### Engineering Process (Milling)

On completion of the module, students should be able to set up and operate conventional milling machines and CNC milling machines to produce components in accordance with given specifications.

#### 3D CAD/CAM Applications

On completion of the module, students should be able to interpret engineering drawings, create 3D CAD models and, generate and verify CNC part programs using a CAD/CAM system for CNC lathes and CNC milling machines.

#### Aerospace Machining

On completion of the module, students should be able to develop part program for aerospace parts, set up and operate CNC high speed machining centres to manufacture engine and structural aerospace parts and components.

#### Multi-axis Programming and Machining

On completion of the module, students should be able to develop multi-axis part program, set up and operate 5-axis CNC universal machining centres to manufacture components in a single set up for the aerospace and oil & gas industries.

#### Industry Attachment

On completion of the module, students should be able to acquire and apply a cluster of key technical, social and methodological competencies in their occupation.

### Electives (Course Specific)

#### Assembly Skills

On completion of the module, students should be able to select and use the correct hand tools for assembly and dismantle of mechanical components.

#### Co-ordinate Measuring Techniques

On completion of the module, students should be able to understand the fundamentals of co-ordinate measuring techniques. They will be able to operate and apply the application to perform mathematical alignment of various simple geometrical components and obtain the measured results as required.

#### Grinding

On completion of the module, students should be able to interpret technical drawings, grind components safely using a surface grinder and cylindrical grinder and supporting tools in accordance with given specific.

#### CNC EDM (Die-sink & Wire-cut)

On completion of the module, students should be able to interpret technical drawings, produce components safely using a CNC EDM Die-sink machine and CNC EDM Wire-cut machine and supporting tools in accordance with given specific.

### Electives (Inter-disciplinary)

#### Design Conceptualization and Rapid Prototyping

On completion of the module, students should be able to create a 3D solid model using CAD software and to operate the rapid prototyping printing machine to generate the 3D model.

### Electives (General)

As reflected on pages 278-280.

### Life Skills Module

As reflected on page 281.

# NITEC IN AEROSPACE TECHNOLOGY

## COURSE SYNOPSIS

This is a Singapore Airworthiness Requirements Part-147 (SAR-147) course approved by the Civil Aviation Authority of Singapore (CAAS). Students will receive an additional Certificate of Recognition (COR) when they complete the course with a minimum attendance of 85% and 70% score for all examinable modules. Students with the COR are eligible for an exemption of the 2 years industry relevant experience required before they can take the CAAS SAR-66 examinations.

On completion of the course, students should be able to

- Maintain aircraft hydraulic system.
- Maintain aircraft and engine pneumatic systems.
- Maintain aircraft and engine electrical systems.
- Maintain aircraft flight control system.
- Maintain aircraft and engine fuel systems.
- Maintain aircraft environmental control system.
- Maintain aircraft landing gear system.
- Perform maintenance and periodic inspection on aircraft and engines.
- Repair aircraft damaged skin and structural members.
- Repair non-metallic material such as composites.
- Assist in aircraft towing.
- Operate aircraft support equipment.
- Assist to prepare aircraft and engine for engine ground runs.

## JOB OPPORTUNITIES

Nitec in Aerospace Technology graduates are employed by aerospace companies, which involved airframe maintenance, engine maintenance and structural system repair. Some of the job titles held by graduates include Aircraft Technician, Aircraft Engine Technician, Aircraft Structural Repair Technician and Aircraft Sheet Metal Technician. There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge through higher-level courses.

## CERTIFICATION

Credits required for certification:

Core Modules	: 56
Life Skills Modules	: 12
Elective Modules	: 8
<b>Total</b>	<b>: 76</b>

## COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Aircraft General Maintenance	9
Aircraft Electrical System Maintenance	5
Airframe Maintenance	11
Human Factors and Air Legislation	6
Aircraft System Maintenance	10
Aircraft Propulsion Maintenance	7
Aircraft Maintenance Practice	8
<b>ELECTIVES (COURSE SPECIFIC)</b>	
TIG Welding	2
Metrology	2
Non Destructive Testing	2
Basic Principle of Helicopter	2
Composite Structure Repairs	2
Applied Aviation Science and Mathematics	4
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 278-280	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### Aircraft General Maintenance

On completion of the module, students should be able to perform aircraft general maintenance such as fastening, wire-locking, sealant application, general corrosion control and plumbing, interpret aircraft blueprint drawings, aircraft manuals and catalogues.

#### Aircraft Electrical System Maintenance

On completion of the module, students should be able to carry out electrical crimping, splicing and terminating electrical wires, use and calibrate measuring and testing instruments, handle Electrostatic Discharge Sensitive (EDS) devices, perform soldering of electrical and electronic components and inspect fibre-optics cables.

#### Airframe Maintenance

On completion of the module, students should be able to repair minor surface defects of aircraft sheet metal, corroded sheet metal, aircraft structural materials, composite structure, parts components and fibre-glass materials. They are also trained to perform cold and hot bonding, basic repair of cabin interiors, and riveting and blasting on sheet metal.

#### Human Factors and Air Legislation

On completion of the module, students should be able to carry out Workplace Safety and Health practices during aircraft maintenance works and prevent and minimise human-factor related errors in aircraft maintenance. They are also trained to update maintenance records and documentation, and to apply the regulatory framework of local air transport operations and governing system from Civil Aviation Authority of Singapore.

#### Aircraft System Maintenance

On completion of the module, students should be able to perform general maintenance and lubrication on aircraft components, prepare aircraft for towing and jacking, inspect structural defects and damage, and maintain aircraft pneumatics, hydraulics, flight controls, fuel, landing gear, environment control systems, emergency equipment and fire protection system.

#### Aircraft Propulsion Maintenance

On completion of the module, students should be able to assist in rigging and trimming of engine in test-cell environment, carry out of periodic inspections and maintenance on aircraft engines and propellers, and prepare aircraft for engine test run.

#### Aircraft Maintenance Practice

Students will undergo 6 months Industry Attachment programme in the aerospace industry to reinforce the skills and knowledge acquired at the training institute and develop competencies in other specialized areas.

#### Electives (Course Specific)

##### TIG Welding

On completion of the module, students should be able to join sheetmetal and rebuild metal using TIG welding process.

##### Non Destructive Testing

On completion of the module, students should be able to apply the working principles of non-destructive testing (NDT) methods used for detecting defects in the aircraft components/structures.

##### Basic Principle of Helicopter

On completion of the module, students should be able to interpret the basic principles of aerodynamics in helicopters and the various types of rotors used to achieve lift. They should also be able to identify the various parts of the helicopter and mechanism and controls used in changing of blade pitch.

##### Metrology

On completion of the module, students should be able to inspect, verify and measure engineering components according to technical drawing using appropriate tools.

##### Composite Structure Repairs

On completion of the module, students should be able to perform cold and hot bonding on honeycomb structures using fibreglass wet and epoxy resin material (cold bonding) and wet lay up pre-preg, metal skin materials and foam core material. Students will also be trained on inspection of damaged structures and post bonding inspection and testing.

##### Applied Aviation Science and Mathematics

On completion of the module, students should be able to apply fundamentals of mathematics, law of physics and basic aerodynamics principles to solve engineering related problems which are applicable to aircraft flight and ground operations.

##### Electives (General)

As reflected on pages 278-280.

##### Life Skills Modules

As reflected on page 281.

## NITEC IN AUTOMOTIVE TECHNOLOGY (HEAVY VEHICLES)

### COURSE SYNOPSIS

On completion of the course, students should be able to maintain, service, repair and troubleshoot the following systems in a heavy vehicle:

- Engine mechanical and management systems
- Suspension and steering systems
- Brake system
- Drivetrain system
- Electrical system
- Air-conditioning system

### JOB OPPORTUNITIES

*Nitec* in Automotive Technology (Heavy Vehicles) graduates are employed by fleet maintenance workshops, public transport companies, distributors of heavy diesel plant and vehicles, service garages and government agencies. Some of the job titles held by graduates include Truck or Bus Service Technician and Diesel Engine Service Technician. There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge by taking up higher-level courses.

### CERTIFICATION

Credits required for certification:

Core Modules	:	48
Life Skills Modules	:	12
Elective Modules	:	4
<b>Total</b>	:	<b>64</b>

### COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Automotive Principles and Systems	4
Basic Chassis and Drive Train Technology	8
Basic Engine Technology	4
Autotronics	8
Chassis and Drivetrain Technology (Heavy Vehicles)	8
Engine Technology and Powertrain Management (Heavy Vehicles)	8
Industry Attachment	8
<b>ELECTIVES (COURSE SPECIFIC)</b>	
Basic Electro-Pneumatics and Hydraulics	2
Workshop Supervision and Customer Reception	2
Vehicle and Motorcycle Inspection	2
<b>ELECTIVES (INTER-DISCIPLINARY)</b>	
Project Management	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 278-280	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### Automotive Principles and Systems

On completion of the module, students should be able to observe workplace health and safety, extract technical information, select and use lifting equipment and hand tools to disassemble and reassemble automotive components as well as the proper disposal of automotive wastes.

#### Basic Chassis and Drivetrain Technology

On completion of the module, students should be able to service and replace automotive drivetrain and chassis components like manual transmission clutch and brakes.

#### Basic Engine Technology

On completion of the module, students should be able to service engine system components of spark ignition and compression ignition engines.

#### Autotronics

On completion of the module, students should be able to interpret, measure, diagnose and rectify faults in vehicle electrical systems, electronic circuits and air-conditioning systems.

#### Chassis and Drivetrain Technology (Heavy Vehicles)

On completion of the module, students should be able to diagnose and rectify faults in steering, suspension, braking systems as well as driveline system components.

#### Engine Technology and Powertrain Management (Heavy Vehicles)

On completion of the module, students should be able to diagnose and rectify faults in engine and powertrain management systems.

#### Industry Attachment

On completion of the module, students should be able acquire and apply a cluster of key technical, social and methodological competencies in their occupation.

### Electives (Course Specific)

#### Basic Electro-Pneumatics and Hydraulics

On completion of the module, students should be able to assemble, perform fault diagnosis and rectification of basic electro-pneumatic and electro-hydraulic circuits used on heavy vehicles.

#### Workshop Supervision and Customer Reception

On completion of the module, students should be able to supervise servicing jobs and communicate to customers using good customer service skills.

#### Vehicle and Motorcycle Inspection

On completion of the module, students should be able to perform roadworthiness inspection and tests on vehicles and motorcycles.

### Electives (Inter-disciplinary)

#### Project Management

On completion of the module, students should be able to use a software application for planning and managing projects.

### Electives (General)

As reflected on pages 278-280.

### Life Skills Modules

As reflected on page 281.

## NITEC IN AUTOMOTIVE TECHNOLOGY (LIGHT VEHICLES)

### COURSE SYNOPSIS

On completion of the course, students should be able to maintain, service, repair and troubleshoot the following systems in a light vehicle:

- Engine mechanical system
- Spark ignition and compression ignition engine management systems
- Suspension and steering systems
- Brake system
- Transmission system
- Electrical system
- Air-conditioning system
- Supplemental restraint system (SRS)

### JOB OPPORTUNITIES

Nitec in Automotive Technology (Light Vehicles) graduates are employed by fleet maintenance workshops, service garages, franchised motor dealers, vehicle inspection centres and government agencies. Some of the job titles held by graduates include Motor Vehicle Service Technician, Service Adviser and Vehicle Inspector. There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge by taking up higher-level courses.

### CERTIFICATION

Credits required for certification:

Core Modules	:	48
Life Skills Modules	:	12
Elective Modules	:	4
<b>Total</b>	:	<b>64</b>

### COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Automotive Principles and Systems	4
Basic Chassis and Drive Train Technology	8
Basic Engine Technology	4
Autotronics	8
Chassis and Drivetrain Technology (Light Vehicles)	8
Engine Technology and Powertrain Management (Light Vehicles)	8
Industry Attachment	8
<b>ELECTIVES (COURSE SPECIFIC)</b>	
Basic Electro-Pneumatics and Hydraulics	2
Workshop Supervision and Customer Reception	2
Vehicle and Motorcycle Inspection	2
<b>ELECTIVES (INTER-DISCIPLINARY)</b>	
Project Management	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 278-280	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

**MODULE OBJECTIVES****Core Modules****Automotive Principles and Systems**

On completion of the module, students should be able to observe workplace health and safety, extract technical information, select and use lifting equipment and hand tools to disassemble and reassemble automotive components as well as the proper disposal of automotive wastes.

**Basic Chassis and Drivetrain Technology**

On completion of the module, students should be able to service and replace automotive drivetrain and chassis components like manual transmission clutch and brakes.

**Basic Engine Technology**

On completion of the module, students should be able to service engine system components of spark ignition and compression ignition engines.

**Autotronics**

On completion of the module, students should be able to interpret measure, diagnose and rectify faults in vehicle electrical systems, electronic circuits and air-conditioning systems.

**Chassis and Drivetrain Technology (Light Vehicles)**

On completion of the module, students should be able to diagnose and rectify faults in steering, suspension, braking systems as well as driveline system components.

**Engine Technology and Powertrain Management (Light Vehicles)**

On completion of the module, students should be able to diagnose and rectify faults in engine and powertrain management systems.

**Industry Attachment**

On completion of the module, students should be able acquire and apply a cluster of key technical, social and methodological competencies in their occupation.

**Electives (Course Specific)****Basic Electro-Pneumatics and Hydraulics**

On completion of the module, students should be able to assemble, perform fault diagnosis and rectification of basic electro-pneumatic and electro-hydraulic circuits used on heavy vehicles.

**Workshop Supervision and Customer Reception**

On completion of the module, students should be able to supervise servicing jobs and communicate to customers using good customer service skills.

**Vehicle and Motorcycle Inspection**

On completion of the module, students should be able to perform roadworthiness inspection and tests on vehicles and motorcycles.

**Electives (Inter-disciplinary)****Project Management**

On completion of the module, students should be able to use a software application for planning and managing projects.

**Electives (General)**

As reflected on pages 278-280.

**Life Skills Modules**

As reflected on page 281.

## NITEC IN ELECTRICAL TECHNOLOGY (LIGHTING & SOUND)

### COURSE SYNOPSIS

On completion of the course, students should be able to

- Liaise and coordinate with clients relating to the requirements of video, lighting and sound systems.
- Read and interpret drawings and diagrams of video, lighting and sound systems.
- Supervise packing, safe transportation and unpacking of video, lighting and sound equipment.
- Set up, install and check scaffold, rigging, truss equipment and systems.
- Set up, install, test, operate and maintain video equipment and systems.
- Set up, install, test, operate and maintain lighting equipment and systems.
- Set up, install, test, operate and maintain sound equipment and systems
- Implement on-site safety programmes and ensure that lighting, sound and other systems for events and performances comply with regulations and requirements.

### JOB OPPORTUNITIES

*Nitec* in Electrical Technology (Lighting & Sound) graduates are employed by manufacturers and companies dealing in audio and visual, lighting and sound systems that are required for both outdoor and indoor events in the creative and performing arts industry. In addition, it is expected their skills and knowledge would be highly sought after in the MICE and hospitality sectors. Some of the job titles held by graduates include Electrical, Lighting & Sound Technician, Theatre Technician, Studio Technician, AV Specialist, Stage Technician, Rigging & Trussing Specialist, AV Technician. There are excellent opportunities for career advancement to higher-level positions such as Lighting & Sound Designer and Consultant.

### CERTIFICATION

Credits required for certification:

Core Modules	:	51
Life Skills Modules	:	12
Elective Modules	:	4
<b>Total</b>	:	<b>67</b>

### COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Electrical Circuits and Principles	7
Electrical Installations and Testing	6
Electrical Machines and Control	5
Electrical Drafting and Design	5
Lighting Equipment and Control	6
Audio System and Control	6
Video and Special Effects	6
Event Organisation and Management	10
<b>ELECTIVES (COURSE SPECIFIC)</b>	
Smart Home	2
PLC Applications and Networking	2
Entertainment Lighting Design	2
<b>ELECTIVES (INTER-DISCIPLINARY)</b>	
Sensor Technology	2
SCADA	2
Structured Cabling	2
Applied Pneumatic Control	2
<b>ELECTIVES (JOINT ITE-INDUSTRY)</b>	
PCL Control Builder	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 278-280	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### Electrical Circuits and Principles

On completion of the module, students should be able to explain the basic principles of electricity, connect simple electrical circuits and use electrical test instruments to measure and monitor electrical quantities.

#### Electrical Installations and Testing

On completion of the module, students should be able to install and test electrical wiring systems in residential premises, commercial and industrial buildings in compliance with relevant local standards, regulations and codes of practice.

#### Electrical Machines and Control

On completion of the module, students should be able to inspect, operate, maintain and service electrical motors including installations of various starters for electrical rotating machines and also connect, troubleshoot and rectify faults in motor control circuits.

#### Electrical Drafting and Design

On completion of the module, students should be able to design and draw electrical layout and single line diagrams for electrical installations in accordance with local standards, regulations and code of practice.

#### Lighting Equipment and Control

On completion of the module, students should be able to install, test and operate lighting equipment and systems used in the entertainment and performing arts industry.

#### Audio System and Control

On completion of the module, students should be able to plan, install, test and maintain sound equipment and systems used in the entertainment and performing arts industry.

#### Video and Special Effects

On completion of the module, students should be able to install, test and operate video equipment and systems in the entertainment and performing arts industry.

#### Event Organisation and Management

On completion of the module, students should be able to work in teams to plan and implement video, lighting and sound projects for theatre/stage production, concerts, conferences, festivals, trade shows, exhibitions, conventions and social functions in accordance with clients' requirements.

#### Electives (Course Specific)

##### Smart Home

On completion of the module, students should be able to program a smart home system for controlling lighting in a house.

#### PLC Applications and Networking

On completion of the module, students should be able to set up, configure and test a PLC network for an industrial automation system.

#### Entertainment Lighting Design

On completion of the module, students should be able to apply the knowledge of basic lighting design principles and techniques in producing a small entertainment show using lighting visualization software.

#### Electives (Inter-disciplinary)

##### Sensor Technology

On completion of the module, students should be able to install and test sensor for industrial and electrical engineering applications.

##### SCADA

On completion of the module, students should be able to explain the basic configuration and provide an overview of a SCADA system. They are also trained to explain the techniques and methods used on data acquisition, the control of the field devices, communication, applications and operation of the system.

##### Structured Cabling

On completion of the module, students should be able to explain the principle of structured cabling and install a standard cabling system according to the relevant standard. They should also be able to perform testing and trouble-shooting and certify the quality of structured cabling installations with copper and fibre-optics cables.

##### Applied Pneumatic Control

On completion of the module, students should be able to develop control circuits based on knowledge of the construction, principles of operation and application of the various components and equipment in electromechanical, pneumatic and electro-pneumatic control systems.

#### Electives (Joint ITE-Industry)

##### PCL Control Builder

On completion of the module, students should be able to use PLC engineering tool to configure projects based on IEC 61131-3 Standard with one or several applications running in PLC.

#### Electives (General)

As reflected on pages 278-280.

#### Life Skills Modules

As reflected on page 281.

# NITEC IN ELECTRICAL TECHNOLOGY (POWER & CONTROL)

## COURSE SYNOPSIS

On completion of the course, students should be able to

- Design, install, repair, maintain, operate, inspect and test electrical or supply installations where the operating voltage and approved load do not exceed 1,000 volts and 45 kVA respectively.
- Install and maintain electrical switchboards.
- Maintain electrical installations in compliance with relevant codes of practice for electrical installations and other related statutory requirements.
- Produce electrical installation layout and single-line diagrams
- Prepare and endorse on single-line diagrams for electrical installations.
- Install and program PLC for industrial control applications.
- Install and maintain electrical rotating machines, associated control circuits and equipment.
- Install and maintain telecommunication and data wiring systems.

Remarks:

*Graduates who have acquired two years of relevant experience in the work performed by a licensed electrical worker would be eligible to apply to Energy Market Authority (EMA) to sit for the test leading to the award of an Electrician Licence issued by EMA.*

## JOB OPPORTUNITIES

Nitec in Electrical Technology (Power & Control) graduates are employed by government departments, statutory boards, electricity generation, transmission and distribution companies, manufacturing plants, and companies dealing in M & E consultancy services, electrical engineering works and building services. Some of the job titles held by graduates include Electrical Technician, Electrical Installation Technician, Electrical Power Technician, Electrical Equipment Manufacturing Technician and Electrical Draughtsman. There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge by taking up higher-level courses.

## CERTIFICATION

Credits required for certification:

Core Modules	:	50
Life Skills Modules	:	12
Elective Modules	:	4
<b>Total</b>	:	<b>66</b>

## COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Electrical Circuits and Principles	7
Electrical Installations and Testing	6
Electrical Machines and Control	5
Electrical Drafting and Design	5
Special Installations and Equipment Maintenance	6
Electrical Power and Switchboards	6
Telecommunication Distribution Systems	6
Industrial Control and Automation Project	4
<b>ELECTIVES (COURSE SPECIFIC)</b>	
Smart Home	2
PLC Applications and Networking	2
Entertainment Lighting Design	2
<b>ELECTIVES (INTER-DISCIPLINARY)</b>	
Sensor Technology	2
SCADA	2
Structured Cabling	2
Applied Pneumatic Control	2
<b>ELECTIVES (JOINT ITE-INDUSTRY)</b>	
PCL Control Builder	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 278-280	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### Electrical Circuits and Principles

On completion of the module, students should be able to explain the basic principles of electricity, connect simple electrical circuits and use electrical test instruments to measure and monitor electrical quantities.

#### Electrical Installations and Testing

On completion of the module, students should be able to install and test electrical wiring systems in residential premises, commercial and industrial buildings in compliance with relevant local standards, regulations and codes of practice.

#### Electrical Machines and Control

On completion of the module, students should be able to inspect, operate, maintain and service electrical motors including installations of various starters for electrical rotating machines and also connect, troubleshoot and rectify faults in motor control circuits.

#### Electrical Drafting and Design

On completion of the module, students should be able to design and draw electrical layout and single line diagrams for electrical installations in accordance with local standards, regulations and code of practice.

#### Special Installations and Equipment Maintenance

On completion of the module, students should be able to diagnose and troubleshoot faults in electrical appliances and equipment, install and maintain temporary and special electrical installations in accordance with codes of practice.

#### Electrical Power and Switchboards

On completion of the module, students should be able to install, test and maintain low voltage (LV) electrical switchboards and electrical equipment.

#### Telecommunication Distribution Systems

On completion of the module, students should be able to install, test and carry out basic maintenance on telephone wiring and IT infrastructure cabling systems in compliance with statutory requirements and industry standards.

#### Industrial Control and Automation

On completion of the module, students should be able to install, test and maintain PLC systems for industrial control and automation applications.

#### Project

On completion of the module, students should be able to integrate and apply a cluster of key technical, social and methodological competencies in carrying out a project related to their field of study.

#### Electives (Course Specific)

##### Smart Home

On completion of the module, students should be able to program a smart home system for controlling lighting in a house.

##### PLC Applications and Networking

On completion of the module, students should be able to set up, configure and test a PLC network system for an industrial automation system.

##### Entertainment Lighting Design

On completion of the module, students should be able to apply the knowledge of basic lighting design principles and techniques in producing a small entertainment show using lighting visualization software.

#### Electives (Inter-disciplinary)

##### Sensor Technology

On completion of the module, students should be able to install and test sensor for industrial and electrical engineering applications.

##### SCADA

On completion of the module, students should be able to explain the basic configuration and provide an overview of a SCADA system. They are also trained to explain the techniques and methods used on data acquisition, the control of the field devices, communication, applications and operation of the system.

##### Structured Cabling

On completion of the module, students should be able to explain the principle of structured cabling and install a standard cabling system according to the relevant standard. They should also be able to perform testing and trouble-shooting and certify the quality of structured cabling installations with copper and fibre-optics cables.

### Applied Pneumatic Control

On completion of the module, students should be able to develop control circuits based on knowledge of the construction, principles of operation and application of the various components and equipment in electromechanical, pneumatic and electro-pneumatic control systems.

### Electives (Joint ITE-Industry)

#### PLC Control Builder

On completion of the module, students should be able to use PLC engineering tool to configure projects based on IE1131-3 Standard with one or several applications running in PLC.

### Electives (General)

As reflected on pages 278-280.

### Life Skills Modules

As reflected on page 281.

## NITEC IN FACILITY TECHNOLOGY (AIR-CONDITIONING & REFRIGERATION)

### COURSE SYNOPSIS

On completion of the course, students should be able to:

- Service, diagnose and rectify faulty electrical and mechanical components and air-conditioning equipment.
- Install, service and perform routine maintenance and parts replacement of air-conditioning and refrigeration systems.
- Install, service and repair defective components of water supply and water pumping systems.
- Troubleshoot and rectify electrical faults in central air-conditioning equipment.
- Install, diagnose and service control circuits of chilled water system, induction motors, air-handling control system and direct digital controllers.
- Maintain and repair cooling tower assembly.
- Install, service and repair air-cooled and water-cooled air-conditioning system.
- Install and carry out performance test on commercial air-conditioning and refrigeration systems.
- Replace faulty electrical components in air-conditioning and refrigeration equipment.
- Repair air handling unit assembly and air distribution system.
- Measure indoor air quality.

### JOB OPPORTUNITIES

*Nitec* in Facility Technology (Air-Conditioning & Refrigeration) graduates are employed by companies manufacturing air-conditioning and refrigeration equipment or offering mechanical consultancy services. Graduates are also employed by companies involved in the maintenance of air-conditioning in residences, offices, hotels and factories, food processing plants as well as domestic refrigerators. Some of the job titles held by graduates include Air-Conditioning Engineering Technician, Air-Conditioning and Refrigeration Engineering Technician, Refrigeration Engineering Technician, Air-Conditioning and Refrigeration Plant Installer, and Air-Conditioning and Refrigeration Equipment Installer. There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge by taking up higher-level courses.

### CERTIFICATION

Credits required for certification:

Core Modules	:	28
Specialisation Modules	:	26
Life Skills Modules	:	12
Elective Modules	:	4
<b>Total</b>	:	<b>70</b>

### COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Electrical Services	7
Mechanical Services	7
Residential Air-Conditioning Services	7
Piping and Plumbing Services	7
<b>SPECIALISATION MODULES</b>	
Integrated Building Management Systems	7
Commercial Air-Conditioning Systems	4
Air-Conditioning Distribution Systems	4
Commercial Refrigeration Systems	6
Project	5
<b>ELECTIVES (COURSE SPECIFIC)</b>	
Cleanroom Technology	2
Energy Audit	2
Air-Conditioning and Building Management System	2
Building Fire-Fighting and Protection Systems	2
Floral Design	2
<b>ELECTIVES (INTER-DISCIPLINARY)</b>	
Engineering Mathematics	2
<b>ELECTIVES (JOINT ITE-INDUSTRY)</b>	
Swimming Pool Maintenance	2
Pest Management	2

COURSE STRUCTURE	
Modules Title	Credits
<b>ELECTIVES (GENERAL)</b> Refer to pages 278-280	
<b>LIFE SKILLS MODULES</b> Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### Electrical Services

On completion of the module, students should be able to interpret electrical circuit diagrams, install lightings and power circuits with conduits and trunkings, replace lightings and accessories, rectify faults in lighting and power circuits, conduct insulation resistance and continuity tests and inspect lighting protection system.

#### Mechanical Services

On completion of the module, students should be able to interpret blueprint drawings, carry out bench-fitting work, fabricate and repair metal components, perform shielded metal arc welding up to horizontal welding position (2G), carry out preventive maintenance of machinery and engines, small diesel-driven generators and pumps.

#### Residential Air-Conditioning Services

On completion of the module, students should be able to fabricate refrigeration piping; perform leak testing, evacuation and charging of refrigeration system; routine maintenance, parts replacement, install and test residential air-conditioning units; perform preventive maintenance for water cooler and dehumidifier; troubleshoot, repair and service air-cooled air-conditioning equipment.

#### Piping and Plumbing Services

On completion of the module, students should be able to maintain, troubleshoot, service, repair and fabricate domestic and industrial piping system; replace plumbing and sanitary appliances, fittings, heaters (instant and storage type); and prepare piping layout and landscape irrigation drawings.

### Specialisation Modules

#### Integrated Building Management Systems

On completion of the module, students should be able to install, diagnose and service the control circuits of chilled water systems, induction motors, air-handling units, Direct Digital Controllers (DDC) and other related components; troubleshoot and repair defective components of water cooled air-conditioning equipment and chilled water control system; and maintain cooling tower. They are also trained to operate and monitor the Building Automation Systems.

#### Commercial Air-Conditioning Systems

On completion of the module, students should be able to install, maintain, service and repair air-cooled and water-cooled air-conditioning system for commercial applications including system using variable refrigerant volume; repair cooling tower assembly; interpret refrigeration piping and wiring circuits; replace faulty components; and perform routine and predictive maintenance for air-conditioning equipment.

#### Air-Conditioning Distribution Systems

On completion of the module, students should be able to interpret the air distribution, ducting and piping layout diagrams for air-conditioning systems including duct and pipe sizing; installation of centrifugal pumps and piping; balancing of air and water; production of the working drawings; repair air handling unit assembly and air distribution system; and measure indoor air quality.

#### Commercial Refrigeration Systems

On completion of the module, students should be able to troubleshoot faults in refrigeration equipment; install refrigeration systems for cold storage applications including refrigeration compressors and evaporators, capacity controls, operation of commercial refrigeration system, piping arrangement, defrosting methods and electrical control; and replace faulty components of commercial refrigeration equipment.

#### Project

On completion of the module, students should be able to plan and manage a project, and to apply the skills and knowledge acquired in the course of learning in carrying out a project related to their field of study.

**Electives (Course Specific)****Cleanroom Technology**

On completion of the module, students should be able to interpret and maintain the air-conditioning system in the cleanroom according to the specification. The training covers the skills and knowledge pertaining to particle counting, classification of cleanroom, maintaining air-conditioning system, filter replacing and interpreting the schematic drawing.

**Energy Audit**

On completion of the module, students should be able to conduct on-site energy audit using the appropriate measuring instruments and tools; and recommend corrective measures for energy savings.

**Air-Conditioning and Building Management System**

On completion of the module, students should be able to maintain and perform first line troubleshooting of packaged units, air-cooled and water-cooled centralized air-conditioning system.

**Building Fire-Fighting and Protection Systems**

On completion of the module, students should be able to service fire alarm and detection system, inspect one and two-ways emergency voice communication systems, automated sprinkler system, fire fighting hydrants, hose reel system, fire suppression system and inspect portable types of fire extinguishers.

**Floral Design**

On completion of the module, students should be able to identify, select, design and arrange suitable flora and fauna schemes to meet different client requirements during different occasions.

**Electives (Inter-disciplinary)****Engineering Mathematics**

On completion of the module, students should be able to solve engineering problems involving indices, logarithms, algebra, graphs, trigonometry, complex numbers and basic statistics.

**Electives (Joint ITE-Industry)****Swimming Pool Maintenance**

On completion of the module, students should be able to carry out servicing, maintenance, repairs on swimming pool filtration system, and its equipment including carrying out water quality checks.

**Pest Management**

On completion of the module, students should be able to carry out pest inspection work, prepare work site for pest management, use pesticides and pest management equipment, prepares pesticides and supervise pest control operations performed by workers hired by the company. Upon completion of the course, students will be qualified to be licensed as technicians under the Control of Vectors and Pesticides Act 1998.

**Electives (General)**

As reflected on pages 278-280.

**Life Skills Modules**

As reflected on page 281.

## NITEC IN FACILITY TECHNOLOGY (LANDSCAPING SERVICES)

### COURSE SYNOPSIS

On completion of the course, students should be able to:

- Install, troubleshoot and carry out simple alteration and amendment work of domestic electrical system, and inspect lighting protection system.
- Service and carry out preventive maintenance of machinery components, engines, small diesel-driven generators and pumps.
- Install and perform routine maintenance and parts replacements of residential air-conditioners.
- Install, service and repair defective components of water supply and water pumping systems.
- Supervise, co-ordinate and run daily operations of landscaping construction and maintenance inclusive of turf, trees and nursery.
- Install and maintain landscaped areas such as gardens, golf courses, turf/sport turf, parks and other landscaped environments.
- Prepare work schedules and implement best work practices.
- Identify common pests and diseases and perform preventive plant/turf health measures.
- Install, prune and remove trees, palms and shrubs.
- Maintain landscape related machinery and equipment.
- Maintain computerized/manual irrigation systems.
- Manage and assess turf machinery and equipment.
- Manage nursery inventory and procurement in Nursery sector only.

### JOB OPPORTUNITIES

*Nitec* in Facility Technology (Landscaping Services) graduates are employed as assistant or junior landscape supervisors in the landscaping construction and maintenance companies. Graduates could also work as senior nursery technicians, senior turf technicians, senior tree-care technicians and senior landscape technicians in the related landscaping sectors. In addition, they could be employed by the building maintenance companies. Some of the job titles held by graduates include Park Officer, Senior Floricultural Technician and Senior Interiorscapes Technician. There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge by taking up higher-level courses.

### CERTIFICATION

Credits required for certification:

Core Modules	:	28
Specialisation Modules	:	24
Life Skills Modules	:	12
Elective Modules	:	4
<b>Total</b>	:	<b>68</b>

### COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Electrical Services	7
Mechanical Services	7
Residential Air-Conditioning Services	7
Piping and Plumbing Services	7
<b>SPECIALISATION MODULES</b>	
Nursery Management and Maintenance	6
Arboriculture Management and Maintenance	6
Turf Management and Maintenance	4
Landscape Management and Maintenance	4
Industry Attachment	4
<b>ELECTIVES (COURSE SPECIFIC)</b>	
Cleanroom Technology	2
Energy Audit	2
Air-Conditioning and Building Management System	2
Building Fire-Fighting and Protection Systems	2
Floral Design	2
<b>ELECTIVES (INTER-DISCIPLINARY)</b>	
Engineering Mathematics	3

COURSE STRUCTURE	
Modules Title	Credits
<b>ELECTIVES (JOINT ITE-INDUSTRY)</b>	
Swimming Pool Maintenance	2
Pest Management	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 278-280	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### Electrical Services

On completion of the module, students should be able to interpret electrical circuit diagrams, install lightings and power circuits with conduits and trunkings, replace lightings and accessories, rectify faults in lighting and power circuits, conduct insulation resistance and continuity tests and inspect lighting protection system.

#### Mechanical Services

On completion of the module, students should be able to interpret blueprint drawings, carry out bench-fitting work, fabricate and repair metal components, perform shielded metal arc welding up to horizontal welding position (2G), carry out preventive maintenance of machinery and engines, small diesel-driven generators and pumps.

#### Residential Air-Conditioning Services

On completion of the module, students should be able to fabricate refrigeration piping; perform leak testing, evacuation and charging of refrigeration system; routine maintenance, parts replacement, install and test residential air-conditioning units; perform preventive maintenance for water cooler and dehumidifier; troubleshoot, repair and service air-cooled air-conditioning equipment.

#### Piping and Plumbing Services

On completion of the module, students should be able to maintain, troubleshoot, service, repair and fabricate domestic and industrial piping system; replace plumbing and sanitary appliances, fittings, heaters (instant and storage type); and prepare piping layout and landscape irrigation drawings.

#### Specialisation Modules

##### Nursery Management and Maintenance

On completion of the module, students should be able to propagate ornamental plants in nurseries; maintain nursery facilities and worksite; coordinate nursery operations, transportation of nursery products and crop harvesting; supervise and coordinate the post-harvest operations and nursery production program; recognise and control the pests, diseases and weed; provide sales support of nursery products and services; perform point of sales operations; and record and update stock.

##### Arboriculture Management and Maintenance

On completion of the module, students should be able to install, prune, transplant and remove trees and palms; perform tree access, visual tree assessment, tree protection and tree health maintenance; and maintain arboriculture equipment.

##### Turf Management and Maintenance

On completion of the module, students should be able to supervise the installation and maintenance of subsoil drainage and irrigation system; maintain golf courses, turf or sport turf such as mowing, vertical cutting, fertilizing, topdressing, aeration, rolling and thatch control, pest and weed control, and marking; monitor turf health; repair damaged turf; manage and assess turf machinery and equipment; perform IPM program and soil testing in the field and in the laboratory.

##### Landscaping Management and Maintenance

On completion of the module, students should be able to prepare landscape project work plan; maintain softscapes and hardscapes; prepare and apply chemicals and fertilizer; supervise the installation of landscape structure and facilities, implementation of landscape works; and maintain landscape equipment and machinery.

### Industry Attachment

Students will undergo a 3-month On-the-Job Training (OJT) programme in landscape industry to reinforce the skills and knowledge that they have learned in the institute at actual workplace via attachment and industry projects. A task list will be developed to guide the companies in providing relevant training to the students.

### Electives (Course Specific)

#### Cleanroom Technology

On completion of the module, students should be able to interpret and maintain the air-conditioning system in the cleanroom according to the specification. The training covers the skills and knowledge pertaining to particle counting, classification of cleanroom, maintaining air-conditioning system, filter replacing and interpreting the schematic drawing.

#### Energy Audit

On completion of the module, students should be able to conduct on-site energy audit using the appropriate measuring instruments and tools and recommend corrective measures for energy savings.

#### Air-Conditioning and Building Management System

On completion of the module, students should be able to maintain and perform first line troubleshooting of packaged units, air-cooled and water-cooled centralized air-conditioning system.

#### Building Fire-Fighting and Protection Systems

On completion of the module, students should be able to service fire alarm and detection system, inspect one and two-ways emergency voice communication systems, automated sprinkler system, fire fighting hydrants, hose reel system, fire suppression system and inspect portable types of fire extinguishers.

### Floral Design

On completion of the module, students should be able to identify, select, design and arrange suitable flora and fauna schemes to meet different client requirements during different occasions.

### Electives (Inter-disciplinary)

#### Engineering Mathematics

On completion of the module, students should be able to solve engineering problems involving indices, logarithms, algebra, graphs, trigonometry, complex numbers and basic statistics.

### Electives (Joint ITE-Industry)

#### Swimming Pool Maintenance

On completion of the module, students should be able to carry out servicing, maintenance, repairs on swimming pool filtration system, and its equipment including carrying out water quality checks.

### Pest Management

On completion of the module, students should be able to carry out pest inspection work, prepare work site for pest management, use pesticides and pest management equipment, prepares pesticides and supervise pest control operations performed by workers hired by the company. Upon completion of the course, students will be qualified to be licensed as technicians under the Control of Vectors and Pesticides Act 1998.

### Electives (General)

As reflected on pages 278-280.

### Life Skills Modules

As reflected on page 281.

## NITEC IN FACILITY TECHNOLOGY (MECHANICAL & ELECTRICAL SERVICES)

### COURSE SYNOPSIS

On completion of the course, students should be able to:

- Install, troubleshoot and carry out simple alteration and amendment work of domestic electrical system, and inspect lighting protection system.
- Service and carry out preventive maintenance of machinery components, engines, small diesel-driven generators and pumps.
- Install and perform routine maintenance and parts replacements of residential air-conditioners.
- Install, service and repair defective components of water supply and water pumping systems.
- Troubleshoot and rectify electrical faults in central air-conditioning equipment.
- Operate and monitor Building Automation System.
- Maintain mechanical recirculating cooling tower.
- Service and maintain fire-fighting equipment and fire suppression system.
- Perform routine maintenance for emergency power supply system.
- Conduct routine check on security system such as CCTV and Access Control System.
- Replace and repair wooden fixtures and masonry of building, and service auto door.
- Set up and maintain audio visual and public address systems.

### JOB OPPORTUNITIES

*Nitec* in Facility Technology (Mechanical & Electrical Services) graduates are employed by companies providing building management and maintenance services. Some of the job titles held by graduates include Building Maintenance Technician, Facilities Services Technician and Air-Conditioning Engineering Technician. There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge by taking up higher-level courses.

### CERTIFICATION

Credits required for certification:

Core Modules	:	28
Specialisation Modules	:	25
Life Skills Modules	:	12
Elective Modules	:	4
<b>Total</b>	:	<b>69</b>

### COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Electrical Services	7
Mechanical Services	7
Residential Air-Conditioning Services	7
Piping and Plumbing Services	7
<b>SPECIALISATION MODULES</b>	
Integrated Building Management Systems	7
Fire Detection and Protection Systems	6
Facility and System Maintenance	7
Project	5
<b>ELECTIVES (COURSE SPECIFIC)</b>	
Cleanroom Technology	2
Energy Audit	2
Air-Conditioning and Building Management System	2
Building Fire-Fighting and Protection Systems	2
Floral Design	2
<b>ELECTIVES (INTER-DISCIPLINARY)</b>	
Engineering Mathematics	3

COURSE STRUCTURE	
Modules Title	Credits
<b>ELECTIVES (JOINT ITE-INDUSTRY)</b>	
Swimming Pool Maintenance	2
Pest Management	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 278-280	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### Electrical Services

On completion of the module, students should be able to interpret electrical circuit diagrams, install lightings and power circuits with conduits and trunkings, replace lightings and accessories, rectify faults in lighting and power circuits, conduct insulation resistance and continuity tests and inspect lighting protection system.

#### Mechanical Services

On completion of the module, students should be able to interpret blueprint drawings, carry out bench-fitting work, fabricate and repair metal components, perform shielded metal arc welding up to horizontal welding position (2G), carry out preventive maintenance of machinery and engines, small diesel-driven generators and pumps.

#### Residential Air-Conditioning Services

On completion of the module, students should be able to fabricate refrigeration piping; perform leak testing, evacuation and charging of refrigeration system; routine maintenance, parts replacement, install and test residential air-conditioning units; perform preventive maintenance for water cooler and dehumidifier; troubleshoot, repair and service air-cooled air-conditioning equipment.

#### Piping and Plumbing Services

On completion of the module, students should be able to maintain, troubleshoot, service, repair and fabricate domestic and industrial piping system; replace plumbing and sanitary appliances, fittings, heaters (instant and storage type); and prepare piping layout and landscape irrigation drawings.

#### Specialisation Modules

##### Integrated Building Management Systems

On completion of the module, students should be able to install, diagnose and service the control circuits of chilled water systems, induction motors, air-handling units, Direct Digital Controllers (DDC) and other related components; troubleshoot and repair defective components of water cooled air-conditioning equipment and chilled water control system; and maintain cooling tower. They are also trained to operate and monitor the Building Automation Systems.

##### Fire Detection and Protection Systems

On completion of the module, students should be able to service and maintain fire-fighting equipment such as fire-alarm and detection systems, hose-reel system, automated sprinkler systems, private hydrant systems and fire suppression systems; inspect portable fire extinguishers, one and two-ways emergency voice communication systems in the industrial, commercial and residential buildings.

##### Facility and System Maintenance

On completion of the module, students should be able to maintain various components in a facility such as water pumping control system, standby generators plus emergency lightings, audio visual system, public address system, closed circuit television system, access control system, auto door, door locks plus closers, painting and masonry works.

#### Project

On completion of the module, students should be able to plan and manage a project, and to apply the skills and knowledge acquired in the course of learning in carrying out a project related to their field of study.

#### Electives (Course Specific)

##### Cleanroom Technology

On completion of the module, students should be able to interpret and maintain the air-conditioning system in the cleanroom according to the specification. The training covers the skills and knowledge pertaining to particle counting, classification of cleanroom, maintaining air-conditioning system, filter replacing and interpreting the schematic drawing.

**Energy Audit**

On completion of the module, students should be able to conduct on-site energy audit using the appropriate measuring instruments and tools; and recommend corrective measures for energy savings.

**Air-Conditioning and Building Management System**

On completion of the module, students should be able to maintain and perform first line troubleshooting of packaged units, air-cooled and water-cooled centralized air-conditioning system.

**Building Fire-Fighting and Protection Systems**

On completion of the module, students should be able to service fire alarm and detection system, inspect one and two-ways emergency voice communication systems, automated sprinkler system, fire fighting hydrants, hose reel system, fire suppression system and inspect portable types of fire extinguishers.

**Floral Design**

On completion of the module, students should be able to identify, select, design and arrange suitable flora and fauna schemes to meet different client requirements during different occasions.

**Electives (Inter-disciplinary)****Engineering Mathematics**

On completion of the module, students should be able to solve engineering problems involving indices, logarithms, algebra, graphs, trigonometry, complex numbers and basic statistics.

**Electives (Joint ITE-Industry)****Swimming Pool Maintenance**

On completion of the module, students should be able to carry out servicing, maintenance, repairs on swimming pool filtration system, and its equipment including carrying out water quality checks.

**Pest Management**

On completion of the module, students should be able to carry out pest inspection work, prepare work site for pest management, use pesticides and pest management equipment, prepares pesticides and supervise pest control operations performed by workers hired by the company. Upon completion of the course, students will be qualified to be licensed as technicians under the Control of Vectors and Pesticides Act 1998.

**Electives (General)**

As reflected on pages 278-280.

**Life Skills Modules**

As reflected on page 281.

## NITEC IN FACILITY TECHNOLOGY (VERTICAL TRANSPORTATION)

### COURSE SYNOPSIS

On completion of the course, students should be able to

- Maintain and replace lift and escalator equipment.
- Perform lift and escalator routine and periodic maintenance works.
- Diagnose and troubleshoot defects and faults in lift and escalator installations, including performing lift rescue operations when required.
- Repair/replace faulty components and recommission lifts and escalators.
- Assist lift engineer in the installation, testing, adjustment and commissioning of lift and escalator systems and equipment.

### JOB OPPORTUNITIES

*Nitec* in Facility Technology (Vertical Transportation) graduates can be employed by companies that market, install and/or provide maintenance services for lifts and escalators. Some of the job titles that are held by graduates include Lift & Escalator Technician, Mechanical & Electrical Maintenance Technician and Building Maintenance Technician. There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge by continual learning and taking up higher-level courses.

### CERTIFICATION

Credits required for certification:

Core Modules	:	28
Specialisation Modules	:	26
Life Skills Modules	:	12
Elective Modules	:	4
<b>Total</b>	<b>:</b>	<b>70</b>

### COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Electrical Services	7
Mechanical Services	7
Residential Air-Conditioning Services	7
Piping and Plumbing Services	7
<b>SPECIALISATION MODULES</b>	
Lift & Escalator Systems and Equipment Maintenance	7
Lift & Escalator Power and Control Systems Maintenance	7
Lift Inspection and Commissioning	4
Lift Maintenance Management	4
Industry Attachment	4
<b>ELECTIVES (COURSE SPECIFIC)</b>	
Cleanroom Technology	2
Energy Audit	2
Air-Conditioning and Building Management System	2
Building Fire-Fighting and Protection Systems	2
Floral Design	2
<b>ELECTIVES (INTER-DISCIPLINARY)</b>	
Engineering Mathematics	3
<b>ELECTIVES (JOINT ITE-INDUSTRY)</b>	
Swimming Pool Maintenance	2
Pest Management	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 278-280	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### Electrical Services

On completion of the module, students should be able to interpret electrical circuit diagrams, install lightings and power circuits with conduits and trunkings, replace lightings and accessories, rectify faults in lighting and power circuits, conduct insulation resistance and continuity tests and inspect lighting protection system.

#### Mechanical Services

On completion of the module, students should be able to interpret blueprint drawings, carry out bench-fitting work, fabricate and repair metal components, perform shielded metal arc welding up to horizontal welding position (2G), carry out preventive maintenance of machinery and engines, small diesel-driven generators and pumps.

#### Residential Air-Conditioning Services

On completion of the module, students should be able to fabricate refrigeration piping; perform leak testing, evacuation and charging of refrigeration system; routine maintenance, parts replacement, install and test residential air-conditioning units; perform preventive maintenance for water cooler and dehumidifier; troubleshoot, repair and service air-cooled air-conditioning equipment.

#### Piping and Plumbing Services

On completion of the module, students should be able to maintain, troubleshoot, service, repair and fabricate domestic and industrial piping system; replace plumbing and sanitary appliances, fittings, heaters (instant and storage type); and prepare piping layout and landscape irrigation drawings.

### Specialisation Modules

#### Lift & Escalator Systems and Equipment Maintenance

On completion of the module, students should be able to identify and explain the operation, interpret lift drawings and, maintain, service and repair mechanical equipment and components of lift and escalator systems in accordance with lift engineering specifications and codes of practice.

#### Lift & Escalator Power and Control Systems Maintenance

On completion of the module, students should be able to maintain, service and repair lift controllers and electrical equipment, cables, components, safety switches of lift and escalator systems in accordance with lift engineering specifications and codes of practice.

#### Lift Inspection and Commissioning

On completion of the module, students should be able to inspect and evaluate the condition of a lift hoistway, oversee the correct installation of lift equipment and components and carry out heat run and commissioning tests on lift systems in accordance with lift engineering specifications and codes of practice.

#### Lift Maintenance Management

On completion of the module, students should be able to troubleshoot, adjust and carry out routine and periodic maintenance of lift systems and equipment and also identify and recommend upgrading and improvement works to clients.

#### Industry Attachment

Students will undergo a 3-month On-the-Job Training (OJT) programme in lift and escalator industry to reinforce the skills and knowledge that they have learned in the institute at actual workplace via attachment and industry projects. A task list will be developed to guide the companies in providing relevant training to the students.

### Electives (Course Specific)

#### Cleanroom Technology

On completion of the module, students should be able to interpret and maintain the air-conditioning system in the cleanroom according to the specification. The training covers the skills and knowledge pertaining to particle counting, classification of cleanroom, maintaining air-conditioning system, filter replacing and interpreting the schematic drawing.

#### Energy Audit

On completion of the module, students should be able to conduct on-site energy audit using the appropriate measuring instruments and tools and recommend corrective measures for energy savings.

#### Air-Conditioning and Building Management System

On completion of the module, students should be able to maintain and perform first line troubleshooting of packaged units, air-cooled and water-cooled centralized air-conditioning system.

#### Building Fire-Fighting and Protection System

On completion of the module, students should be able to service fire alarm and detection system, inspect one and two-ways emergency voice communication systems, automated sprinkler system, fire-fighting hydrants, hose reel system, fire suppression system and inspect portable types of fire extinguishers.

### Floral Design

On completion of the module, students should be able to identify, select, design and arrange suitable flora and fauna schemes to meet different client requirements during different occasions.

### Electives (Inter-disciplinary)

#### Engineering Mathematics

On completion of the module, students should be able to solve engineering problems involving indices, logarithms, algebra, graphs, trigonometry, complex numbers and basic statistics.

### Electives (Joint ITE-Industry)

#### Swimming Pool Maintenance

On completion of the module, students should be able to carry out servicing, maintenance, repairs on swimming pool filtration system, and its equipment including carrying out water quality checks.

### Pest Management

On completion of the module, students should be able to carry out pest inspection work, prepare work site for pest management, use pesticides and pest management equipment, prepares pesticides and supervise pest control operations performed by workers hired by the company. Upon completion of the course, students will be qualified to be licensed as technicians under the Control of Vectors and Pesticides Act 1998.

### Electives (General)

As reflected on pages 278-280.

### Life Skills Modules

As reflected on page 281.

## NITEC IN LASER & TOOLING TECHNOLOGY

### COURSE SYNOPSIS

On completion of the course, students should be able to:

- Develop stamping tools design using CAD/CAM system.
- Create CNC part program for CNC laser machining, turret punching and bending using CAD/CAM system.
- Set up and operate machine for CNC laser machining, turret punching and bending.
- Manufacture sheet metal components.
- Assemble stamping tools.
- Perform stamping tools setting and testing.
- Perform quality checks.

### JOB OPPORTUNITIES

*Nitec* in Laser & Tooling Technology graduates are employed as manufacturing specialist by high value manufacturing industries in particular the Semiconductor, Machinery and Systems, Precision Modules and Components, Medical Technology, Transport Engineering and Aerospace sectors. There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge by taking up higher-level courses.

### CERTIFICATION

Credits required for certification:

Core Modules	:	46
Life Skills Modules	:	12
Elective Modules	:	4
<b>Total</b>	:	<b>62</b>

### COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Engineering Drawing and Inspection Techniques	6
Engineering Process (Turning)	6
Engineering Process (Milling)	6
3D CAD/CAM Applications	6
CNC Sheetmetal Fabrication	6
Integrated Tooling Assembly and Design	6
Industry Attachment	10
<b>ELECTIVES (COURSE SPECIFIC)</b>	
Assembly Skills	2
Co-ordinate Measuring Techniques	2
Grinding	2
CNC EDM (Die-sink & Wire-cut)	2
<b>ELECTIVES (INTER-DISCIPLINARY)</b>	
Design Conceptualization and Rapid Prototyping	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 278-280	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### Engineering Drawing and Inspection Techniques

On completion of the module, students should be able to interpret technical drawings and perform dimensional inspections for the machined components in accordance with ISO standards.

#### Engineering Process (Turning)

On completion of the module, students should be able to set up and operate centre lathes and CNC lathes to produce components in accordance with given specifications.

#### Engineering Process (Milling)

On completion of the module, students should be able to set up and operate conventional milling machines and CNC milling machines to produce components in accordance with given specifications.

#### 3D CAD/CAM Applications

On completion of the module, students should be able to interpret engineering drawings, create 3D CAD models and, generate and verify CNC part programs using a CAD/CAM system for CNC lathes and CNC milling machines.

#### CNC Sheetmetal Fabrication

On completion of the module, students should be able to design the sheet-metal layout using Computer-Aided-Design system, set up and operate laser cutting and bending machines to fabricate sheet-metal components in accordance with given specifications.

#### Integrated Tooling Assembly and Design

On completion of the module, students should be able to assemble and set up toolings, carry out functional and acceptance tests on stamping press, produce design documentation and replacements of die components.

#### Industry Attachment

On completion of the module, students should be able to acquire and apply a cluster of key technical, social and methodological competencies in their occupation.

### Electives (Course Specific)

#### Assembly Skills

On completion of the module, students should be able to select and use the correct hand tools for assemble and dismantle of mechanical components.

#### Co-ordinate Measuring Techniques

On completion of the module, students should be able to understand the fundamentals of co-ordinate measuring techniques. They will be able to operate and apply the application to perform mathematical alignment of various simple geometrical components and obtain the measured results as required.

#### Grinding

On completion of the module, students should be able to interpret technical drawings, grind components safely using a surface grinder and cylindrical grinder and supporting tools in accordance with given specifications.

#### CNC EDM (Die-sink & Wire-cut)

On completion of the module, students should be able to interpret technical drawings, produce components safely using a CNC EDM Die-sink machine and CNC EDM Wire-cut machine and supporting tools in accordance with given specifications.

### Electives (Inter-disciplinary)

#### Design Conceptualization and Rapid Prototyping

On completion of the module, students should be able to create a 3D solid model using CAD software and to operate the rapid prototyping printing machine to generate the 3D model.

### Electives (General)

As reflected on pages 278-280.

### Life Skills Module

As reflected on page 281.

## NITEC IN MECHANICAL TECHNOLOGY

### COURSE SYNOPSIS

On completion of the course, students should be able to

- Interpret technical drawings and hydraulic/pneumatic circuit diagrams.
- Carry out preventive maintenance and inspection on machinery and equipment.
- Fabricate and re-condition machine parts using basic hand-tools and power hand-tools and drilling machines.
- Install, service, troubleshoot, repair and overhaul basic machine tools, pumps, valves, compressors and conveyor systems.
- Install, service, troubleshoot and repair basic hydraulic and pneumatic systems.
- Install pipework system.
- Rectify electrical faults of machinery.

### JOB OPPORTUNITIES

*Nitec* in Mechanical Technology graduates are employed by companies that manufacture metal and plastic products, and food and beverage items. Some of the job titles held by graduates include Maintenance Technician, Mechanical Engineering Technician and Industrial Machinery Technician. There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge by taking up higher-level courses.

### CERTIFICATION

Credits required for certification:

Core Modules	:	50
Life Skills Modules	:	12
Elective Modules	:	4
<u>Total</u>	:	<u>66</u>

### COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Mechanical Fabrication and Drafting	6
Industrial Piping and Valve System	6
Machinery Maintenance	6
Industrial Pneumatics and Hydraulics	6
Electro Pneumatics and Hydraulics	6
Machinery and Electrical System Maintenance	6
Plant Equipment Maintenance	6
Project	8
<b>ELECTIVES (COURSE SPECIFIC)</b>	
Metrology	2
CAD Modeling and Design	2
Basic Mechanics	2
Turning	2
<b>ELECTIVES (INTER-DISCIPLINARY)</b>	
Advanced PLC Applications	2
Microcontroller Applications	2
Plain Milling	3
Product Prototyping	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 278-280	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### Mechanical Fabrication and Drafting

On completion of the module, students should be able to fabricate and fit engineering components, by bench fitting and drilling operation according to the specifications in a working drawing. Students are also trained to interpret engineering blueprint drawings and draw simple engineering components using CAD system.

#### Industrial Piping and Valve System

On completion of the module, students should be able to carry out minor repair and replacement of fluid supply pipes and fittings and maintain, troubleshoot and repair industrial fluid valves.

#### Machinery Maintenance

On completion of the module, students should be able to carry out a preventive maintenance course, maintain and service bearings and basic engineering mechanisms, lubrication systems and mechanical transmission systems; lift and move heavy loads safely.

#### Industrial Pneumatics and Hydraulics

On completion of the module, students should be able to install, maintain and troubleshoot pneumatic and hydraulic systems in plant machinery and equipment.

#### Electro Pneumatics and Hydraulics

On completion of the module, students should be able to install, maintain and troubleshoot electro-pneumatic and electro-hydraulic systems in plant machinery and auxiliary equipment.

#### Machinery and Electrical System Maintenance

On completion of the module, students should be able to maintain, troubleshoot and repair machinery, equipment and electrical accessories, connect up simple electrical circuits and carry out a planned maintenance course.

#### Plant Equipment Maintenance

On completion of the module, students should be able to install, maintain, troubleshoot and repair air compressor system, mechanical conveyor system and industrial fluid pumps.

#### Project

On completion of the module, students should be able to apply and integrate the technical, social and methodological competencies in carrying out a project related to their field of study and to interpret the requirements of ISO 9001 and 14001 under Quality Management System, Lean Six Sigma, and apply fundamental quality tools and techniques for problem solving and quality inspection.

### Electives (Course Specific)

#### Metrology

On completion of the module, students should be able to understand the fundamentals of inspection and, verify and measure engineering components according to technical drawing using appropriate tools.

#### CAD Modeling and Design

On completion of the module, students should be able to produce 3D solid models and also design a mechanical system comprising various machine elements.

#### Basic Mechanics

On completion of the module, students should be able to explain and apply the laws and principles of statics and dynamics in engineering systems.

#### Turning

On completion of the module, students should be able to interpret engineering blueprint drawings, turn components safely using centre lathe to achieve a linear dimensional accuracy up to class IT11, an angular dimensional accuracy of  $\pm 30'$  and surface roughness between 1.6 to 3.2 microns.

### Electives (Inter-disciplinary)

#### Advanced PLC Applications

On completion of the module, students should be able to apply PLC instructions in the design of an industrial automation project and analogue-to-digital processing using windows-based PLC programming software.

#### Microcontroller Applications

On completion of the module, students should be able to design and write programs for simple microcontroller projects.

#### Plain Milling

On completion of the module, students should be able to interpret technical drawings, mill plain components safely, using a vertical milling machine and supporting tools, to achieve a linear dimensional accuracy of IT10, an angular dimensional accuracy of  $\pm 30'$  and a surface roughness between 1.6 to 3.2 microns.

#### Product Prototyping

On completion of the module, students should be able to create simple design of a product using 3D CAD software and produce a 3D model of it using basic prototyping devices.

### Electives (General)

As reflected on pages 278-280.

### Life Skills Modules

As reflected on page 281.

## NITEC IN MECHATRONICS

### COURSE SYNOPSIS

On completion of the course, students should be able to

- Install, maintain and service pneumatic and electro-pneumatic controlled systems.
- Construct and assemble mechanical support.
- Prepare and interpret electrical and mechanical drawings.
- Install and test electrical systems.
- Install and test peripheral devices and microcomputer controlled systems.
- Troubleshoot electronics systems.
- Set up industrial automation systems, modify PLC program and troubleshoot a simple automated production system at module level.

### JOB OPPORTUNITIES

*Nitec* in Mechatronics graduates are employed by companies in the high-technology manufacturing and servicing industries. Some of the job titles held by graduates include Automation Technician, Automated Equipment Maintenance Technician and Mechatronics Technician. There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge by taking up higher-level courses.

### CERTIFICATION

Credits required for certification:

Core Modules	:	50
Life Skills Modules	:	12
Elective Modules	:	4
<b>Total</b>	:	<b>66</b>

### COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Pneumatics	6
Electrical Installation	6
Electronics	6
CAD and Mechanical Technology	6
Drives and Motor Control	6
Automation and Basic Robotics	6
PLC and Sensors Technology	6
Project	8
<b>ELECTIVES (COURSE SPECIFIC)</b>	
Application Mathematics	3
Animatronics	2
PLC Applications	2
Microcontroller Applications	2
Production Control System and Applications	2
Industry Attachment	2
Industry Attachment	3
<b>ELECTIVES (INTER-DISCIPLINARY)</b>	
Hydraulics	3
Single Board Micro-controller Applications	2
Lean Manufacturing	2
<b>(ELECTIVES JOINT ITE-INDUSTRY)</b>	
Robot Palletizing Operations and Programming	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 278-280	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### Pneumatics

On completion of the module, students should be able to install, maintain and troubleshoot pneumatics and electro-pneumatic systems.

#### Electrical Installation

On completion of the module, students should be able to carry out installation and test of electrical trunking, and conduct system wiring of a machine control panel.

#### Electronics

On completion of the module, students should be able to check and test industrial electronic components and simple electronic circuits using common test instruments; and construct prototype electronic project on printed board.

#### CAD and Mechanical Technology

On completion of the module, students should be able to read, interpret and produce geometrical and mechanical drawing using Computer-Aided Drafting (CAD) software; and fabricate metal parts according to specifications in working drawing and work samples and carry out maintenance to service, adjust and align mechanical elements.

#### Drive and Motor Control

On completion of the module, students should be able to install, maintain, troubleshoot and modify AC and DC motor control circuits.

#### Automation and Basic Robotics

On completion of the module, students should be able to program a robot to carry out specific operations and maintain an automated control system.

#### PLC and Sensors Technology

On completion of the module, students should be able to carry out installations, operations and troubleshooting of programmable logic controller and sensors systems in an automated system.

#### Project

On completion of the module, students should be able to work in teams to design and fabricate and commission a suitably sized mechatronics project.

#### Electives (Course Specific)

##### Application Mathematics

On completion of the module, students should be able to apply the knowledge of mathematics to solve engineering related problems involving the use of basic arithmetic, algebra, graphs and trigonometry.

##### Animatronics

On completion of the module, students should be able to define type of animatronic components and controller as well as assemble and testing of animatronic character.

##### PLC Applications

On completion of the module, students should be able to install and troubleshoot a PLC-controlled production system.

##### Microcontroller Applications

On completion of the module, students should be able to program and interface microcontroller with external devices.

##### Production Control System and Applications

On completion of the module, students should be able to plan a simple production process, set up, install and troubleshoot an industrial production control system.

##### Industry Attachment

On completion of the module, students should be able to acquire and apply a cluster of key technical, social and methodological competencies in the occupation.

#### Electives (Inter-disciplinary)

##### Hydraulics

On completion of the module, students should be able to maintain hydraulic systems in industrial automation.

##### Single Board Micro-controller Applications

On completion of the module, students should be able to write structured programs to interface with peripheral devices and solve simple problems using single board micro-controller.

**Lean Manufacturing**

On completion of the module, students should be able to work effectively as a team member to support lean manufacturing and process improvement in the industries and apply PDCA in continuous process improvement to increase productivity.

**Electives (Joint ITE-Industry)****Robot Palletizing Operations and Programming**

On completion of the module, students should be able to operate the palletizing robot system, including editing and modifying programs for different palletizing operations.

**Electives (General)**

As reflected on pages 278-280.

**Life Skills Modules**

As reflected on page 281.

# NITEC IN MEDICAL MANUFACTURING TECHNOLOGY

## COURSE SYNOPSIS

On completion of the course, students should be able to

- Develop mould design using CAD/CAM system.
- Create multi-axis part program for Multi-axis Machining Centre and High Speed Milling Machine (HSM) using CAD/CAM system.
- Set up and operate Multi-axis Machining Centre and CNC High Speed Milling Machine.
- Manufacture medical components.
- Assemble injection mould.
- Perform mould setting and testing.
- Perform quality checks.

## JOB OPPORTUNITIES

*Nitec* in Medical Manufacturing Technology graduates are employed as manufacturing specialist by high value manufacturing industries in particular the Medical Technology, Precision Modules & Components, Aerospace, Machinery and Systems & Transport Engineering sectors. There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge by taking up higher-level courses.

## CERTIFICATION

Credits required for certification:

Core Modules	:	46
Life Skills Modules	:	12
Elective Modules	:	4
<b>Total</b>	:	<b>62</b>

## COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Engineering Drawing and Inspection Techniques	6
Engineering Process (Turning)	6
Engineering Process (Milling)	6
3D CAD/CAM Applications	6
Medical Machining	6
Mould Assembly and Design	6
Industry Attachment	10
<b>ELECTIVES (COURSE SPECIFIC)</b>	
Assembly Skills	2
Grinding	2
Design Conceptualization and Rapid Prototyping	2
CNC EDM (Die-sink & Wire-cut)	2
<b>ELECTIVES (INTER-DISCIPLINARY)</b>	
Co-ordinate Measuring Techniques	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 278-280	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### Engineering Drawing and Inspection Techniques

On completion of the module, students should be able to interpret technical drawings and perform dimensional inspections for the machined components in accordance with ISO standards.

#### Engineering Process (Turning)

On completion of the module, students should be able to set up and operate centre lathes and CNC lathes to produce components in accordance with given specifications.

#### Engineering Process (Milling)

On completion of the module, students should be able to set up and operate conventional milling machines and CNC milling machines to produce components in accordance with given specifications.

#### 3D CAD/CAM Applications

On completion of the module, students should be able to interpret engineering drawings, create 3D CAD models and, generate and verify CNC part programs using a CAD/CAM system for CNC lathes and CNC milling machines.

#### Medical Machining

On completion of the module, students should be able to develop part programs, set up and operate CNC multi-axis machine and CNC high speed milling machine to manufacture medical components.

#### Mould Assembly and Design

On completion of the module, students should be able to assemble and set up injection moulds on the plastic injection moulding machines, carry out functional and acceptance tests, produce design documentation and replacement of mould components.

#### Industry Attachment

On completion of the module, students should be able to acquire and apply a cluster of key technical, social and methodological competencies in their occupation.

### Electives (Course Specific)

#### Assembly Skills

On completion of the module, students should be able to select and use the correct hand tools for assembly and dismantle of mechanical components.

#### Grinding

On completion of the module, students should be able to interpret technical drawings, grind components safely using a surface grinder and cylindrical grinder and supporting tools in accordance with given specifications.

#### Design Conceptualization and Rapid Prototyping

On completion of the module, students should be able to create a 3D solid model using CAD software and to operate the rapid prototyping printing machine to generate the 3D model.

#### CNC EDM (Die-sink & Wire-cut)

On completion of the module, students should be able to interpret technical drawings, produce components safely using a CNC EDM Die-sink machine and CNC EDM Wire-cut machine and supporting tools in accordance with given specifications.

### Electives (Inter-disciplinary)

#### Co-ordinate Measuring Techniques

On completion of the module, students should be able to understand the fundamentals of co-ordinate measuring techniques. They will be able to operate and apply the application to perform mathematical alignment of various simple geometrical components and obtain the measured results as required.

### Electives (General)

As reflected on pages 278-280.

### Life Skills Modules

As reflected on page 281.

# NITEC IN RAPID TRANSIT TECHNOLOGY

## COURSE SYNOPSIS

On completion of the course, students would be able to

- Perform basic inspection of railway subsystems and facilities.
- Maintain railway electrical and electronics equipment and systems.
- Maintain railway mechanical and pneumatic equipment and systems.
- Maintain rolling stock systems and equipment.
- Maintain permanent way and tracks.
- Maintain engineering train equipment and systems.

## JOB OPPORTUNITIES

*Nitec* in Rapid Transit Technology graduates can be employed by mass rapid transit operators, Government transport planning agencies as well as companies in the rail equipment industry. Some of the job titles that are held by graduates include Rapid Transit Technical Officer, Trains and Rolling Stock Technician and Permanent Way Field Services Technician. There are excellent opportunities for career advancement to supervisory positions and beyond. The challenge is for students to prepare themselves by upgrading their technical skills and knowledge by continual learning and taking up higher-level courses.

## CERTIFICATION

Credits required for certification:

Core Modules	:	52
Life Skills Modules	:	12
Elective Modules	:	4
<b>Total</b>	:	<b>68</b>

## COURSE STRUCTURE

Modules Title	Credits
<b>CORE MODULES</b>	
Rapid Transit Systems and Operations	7
Rapid Transit Electrical Power System	7
Rapid Transit Electronics Control Systems	6
Rapid Transit Automation and Control Systems	7
Rapid Transit Engineering Trains Maintenance	7
Rolling Stock Systems and Equipment	7
Rapid Transit Permanent Way	7
Industry Attachment	4
<b>ELECTIVES (COURSE SPECIFIC)</b>	
Basic Fire Safety and Protection Systems	2
<b>ELECTIVES (INTER-DISCIPLINARY)</b>	
Video Surveillance System	2
Metrology	2
Bearing Maintenance Technology	2
<b>ELECTIVES (GENERAL)</b>	
Refer to pages 278-280	
<b>LIFE SKILLS MODULES</b>	
Refer to page 281	

*Note: The offer of electives is subject to the training schedule of respective ITE Colleges. Students are advised to check with their Class Advisors on the availability of the elective modules they intend to pursue.*

## MODULE OBJECTIVES

### Core Modules

#### Rapid Transit Systems and Operations

On completion of the module, students should be able to identify and explain the special features of driverless and driver-operated trains, railway engineering technologies, operation and facilities of rapid transit system in Singapore; interpret engineering blueprint drawings; produce, fabricate, repair and/or replace engineering components, pipes, seals, fittings, bearing and couplings in compliance with industry standards and workplace safety regulations.

#### Rapid Transit Electrical Power System

On completion of the module, students should be able to maintain electrical circuits and equipment, motors, motor control circuits, electrical wiring installations, earthing systems, lightning and surge protection equipment as well as building fire protection and alarm systems.

#### Rapid Transit Electronics Control Systems

On completion of the module, students should be able to maintain analogue and digital electronics equipment as well as electromechanical control systems.

#### Rapid Transit Automation and Control Systems

On completion of the module, students should be able to maintain pneumatic and electro-pneumatic, PLC and train fire protection systems.

#### Rapid Transit Engineering Trains Maintenance

On completion of the module, students should be able to maintain, troubleshoot, service and repair heavy duty diesel engine lubrication, cooling, air intake, exhaust and diesel fuel injection systems and components.

#### Rolling Stock Systems and Equipment

On completion of the module, students should be able to maintain train battery, airconditioning, ventilation, brakes, bogie and cabin equipment and door control systems.

#### Rapid Transit Permanent Way

On completion of the module, students should be able to maintain permanent way parts and tracks as well as third rail and current collection systems for trains.

#### Industry Attachment

Students will undergo 3 months attachment to integrate and apply a cluster of key technical, social and methodological competencies and gain exposure and experience in the rapid transit industry.

#### Electives (Course Specific)

##### Basic Fire Safety and Protection Systems

On completion of the module, students should be able to diagnose, service and maintain fire-fighting equipment such as fire-alarm systems, hose-reel installations, sprinkler systems, fire-fighting hydrants, potable fire extinguishers, one- and two-way emergency voice communication systems and fire suppression systems in the industrial, commercial and residential building.

#### Electives (Inter-disciplinary)

##### Video Surveillance System

On completion of the module, students should be able to install, test and operate the video surveillance systems and equipment.

#### Metrology

On completion of the module, students should be able to understand the fundamental of inspection and, verify and measure engineering components according to technical drawing using appropriate tools.

#### Bearing Maintenance Technology

On completion of the module, students should be able to apply the skills and knowledge to select, replace and diagnose anti-friction bearing faults.

#### Electives (General)

As reflected on page 278-280.

#### Life Skills Modules

As reflected on page 281.