

Message from the Director:

To our students...

Thank you for considering Marbella Institute of Technology as your career investment. Being Finland my place of birth, values are set towards peace, respect for nature and service to the community.

I have also been a student...In my first memories, I member Swans Primary School. Learning about the environment and cultural diversity...Aloha College shaping my general education and responsibility level. It was the opportunity trampoline which catapulted me into Columbus International College, a place where I studied courses to gain credits for transferring them into Embry-Riddle Aeronautical University, FL. After returning to Spain I graduated in Solar Energy Project Design and Installation thru CENSOLAR, Seville. I continued to be active in technical research and technology.

One of my most enriching experience was to join the eCars Now team in Finland that worked simultaneously on several electric vehicles, towards the Helsinki Motor Show. show. Often the world can drag us with its distractions but a few times in life we will come across those marvelous opportunities, where we can step up from where we used to be. What would be of our lives if we took consecutive steps towards success? History has proven that knowledge makes the difference between failure and success. Are you ready to conquer these educational opportunities for your personal success?

MITEC is innovative technical education because we have not started from old standards. We have developed new educational programs from scratch, reviewed all the leading text books, selected the best ones according to content richness, accuracy and clarity. We selected the sequence of courses to suit tomorrow's most demanded opportunities and applied realistic practice methods that guide the students into achieving a professional performance in technical jobs. We have considered four major areas of study that will be highly compatible to one another. Whether the student wants to change specialization at a later date or add to the specialization obtained. These education programs make excellent candidates for technologically advanced positions. My goal is to provide you with quality programs, faculty, responsive and caring student services. The courses include projects where you will work with others as a team to solve real-world challenges. MiTEC keeps up with technology trends, and offers all courses in English language to position the students internationally with recognition. MiTEC's commitment is to teach research, and serve the community with advanced technology resources and professionals.

Welcome to the MITEC experience!

Alexandro I. Basualdo

C.E.O. and founder of MITEC

(Bachelor of Science) Technical Engineer in Airframe Structures and Powerplants

(Diplomat) Solar Energy Design and Installations

Founder of ELECTROPROPLSION, SELFPOWER and representative of eCarsNow (Spain)

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About MiTEC

What is MiTEC?

A modern technology institute that applies innovation as the key element for education and research.

Where is MiTEC?

**C/Finlandia N°10
POLIGONO INDUSTRIAL
29670 San Pedro de Alcántara
Málaga
SPAIN**



Orientation programs for all new MiTEC students are planned, scheduled, and conducted before classes start. A special orientation program for new international students is held prior to the general orientation required for all new students. New students will receive information regarding the date, time, and place of orientation activities from the Admissions department, approximately 30 calendar days prior to the activities.

In compliance with laws and regulations, MiTEC does not discriminate on the basis of race, color, gender, creed, national and ethnic origin, age, or disability in any of its policies, procedures, or practices. An Equal Opportunity institution, neither discriminates in the recruitment and admission of students, in the recruitment and employment of faculty and staff or in the operations of any programs and activities.

Designed for use during the period stated on the cover, this catalog gives a general description of MiTEC and provides detailed information regarding the departments in the institution and curricula offered by the Institute. The online edition of this catalog will be considered to be the official version reflecting any addendums or corrections to the publication. The provisions of the catalog do not constitute a contract between the student and the Institute. The faculty and trustees of MiTEC reserve the right to change, without prior notice, any provision, offering, or requirement in the catalog. This includes the right to adjust tuition and fees, as necessary. The Institute further reserves the right at all times to require a student to withdraw for improper behaviour.

Official MiTEC Photography

MiTEC reserves the right to photograph members of the Institute's community, including, but not the image of the academic institution, and to publish likenesses in MiTEC publications, videos or other recruitment or promotional materials. However, the institution will, to the extent feasible, honor requests of constituents who do not wish their images to be photographed or published.

Our Mission

At MiTEC, our mission is to educate students in how to master the science, practice and business of modern technology. We prepare students for productive careers and leadership roles in service around the world.

The Institute is technologically rich, and its environment emphasizes learning through collaboration and teamwork, concern for ethical and responsible behavior, cultivation of analytical and management abilities, and a focus on the development of the professional skills needed for participation in a global community. We believe a vibrant future for advanced technology rests in the success of our students. Toward this end, MiTEC is committed to providing a climate that facilitates the highest standards of academic achievement and knowledge thru discovery, in an interpersonal environment that supports the unique needs of each individual.

The Marbella Institute of Technology education is an independent, student oriented, culturally diverse institution providing quality education and research in electro-propulsion, robotics, renewable energy, welding, design and related fields leading to job positions that require technical knowledge and skills.

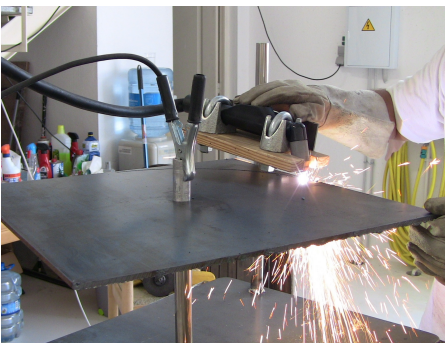
Our Vision

MiTEC will be one the world's top sources for innovation and excellence in advanced technology and applied research.

Our Values

The strength of our Institute is firmly rooted in our values. We expect that our students, faculty and staff share and demonstrate the values of student success, a positive learning environment and mind-set, safety first in all situations, personal growth, integrity, honesty, trust, diversity, open communication, teamwork, character, change for progress, fiscal soundness, healthy investments, and a can-do attitude.

“The strength of our Institute is firmly rooted in our values”



MARBELLA INSTITUTE OF TECHNOLOGY
ACADEMIC YEAR 2016



| ELECTROPROPULSION TECHNOLOGY | SUSTAINABLE ENERGY | ROBOTICS | GRAPHIC DESIGN |
|-------------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| Engineering English Vocabulary | Engineering English Vocabulary | Engineering English Vocabulary | Engineering English Vocabulary |
| Engineering English Communication | Engineering English Communication | Engineering English Communication | Engineering English Communication |
| OFFICE 2015 | OFFICE 2015 | OFFICE 2015 | OFFICE 2015 |
| Engineering Graphics | Engineering Graphics | Engineering Graphics | Engineering Graphics |
| Metal Structures | Metal Structures | Metal Structures | Vector Graphics |
| Welding | Welding | Welding | Web Design |
| Composite Technology | Composite technology | Composite Technology | Sign Production |
| Electropropulsion Systems | P.V. Systems | Automation Systems | Merchandising |
| Automotive Systems | Thermal Engineering | Basic Electronics | Publishing |
| Electropropulsion Assembly | Wind Power | Arduino Programming | Media |

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STUDYING AT MITEC

We live in a world with rapid changes in nature and technology. Both have been through victories and defeats in a civilization that learns the causes and effects of its actions.

As nature and technology reveal notorious changes, so does the need to educate in these areas, retuning a positive effect on human wellbeing. Technology needs raw materials to be developed. A wise use of nature is the available key to avoid shortage. Nature benefits from the technological advances when knowledge is used in behalf of its preservation. This knowledge is the focus of our education.

These major study areas create business because they are and will be highly useful in world development, preservation and human well-being. MITEC is proud to present education in selected areas which have an increasing demand for such professionals.

The selected major areas of study at Marbella Institute of Technology are:

ELECTROPROPULSION TECHNOLOGY

SUSTAINABLE ENERGY

ROBOTICS

DESIGN



Each area of study contains foundation courses. They are a solid base and common to all the four areas of study. Then there are more technical but still common courses to the major areas of study. Finally, technical specialization courses top up the student's knowledge and skills in the chosen major area of study.

The courses have been programmed to make a smooth transition between the generic and the higher specialization courses, adding skill, knowledge and self-confidence. This system allows the students to observe, evaluate and become familiar with the major areas of study before they select the most suitable one.

The courses also offer flexibility. Most of the courses are common to all majors, so, if someone wishes to study a different major, only the highly specialized courses need to be completed.

Each subject has a two or three letter identifier followed by a three number code. Foundation courses (AAA-1XX) are expected to be completed first, then common, then specialized. When the student already shows competence, the administration may accept simultaneous higher level courses, after reviewing the performance.

Courses have an approximate duration of 3 months. After the foundation, students engage in practical experience through laboratory projects. Proper clothing, safety gear and tools are required. Please contact the administration and receive a copy of the minimum requirement list.

Text books are revised and may change from time to time so be sure to be informed of the current one's in use. All the machinery and equipment is new and ready for use.

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Engineering English Vocabulary

(EEV-104)

MARBELLA INSTITUTE OF TECHNOLOGY

Course Utility

TOTAL HOURS: 30

CREDITS: 3

Engineering English Vocabulary is for engineering students and engineers who need to use English at work.

Suitable for Intermediate to Upper Intermediate level learners of English (CEF B1-B2), gaining proficiency thru practice and exercises in technical fields.

Course Purpose

Engineering English Vocabulary provides vocabulary reference and practice, covering the essential technical English that all engineers need, as well as high-priority terminology for mechanical, civil and electrical engineering. Topics include Design, Materials Technology, Manufacturing and assembly and dynamic principles.

Method of study

Learn new words and expressions by taking part in activities that develop understanding of technical language.

Practice the vocabulary and expressions that you learn and relate the to your own work or studies.

We use authentic texts, real companies and credible scenarios to present the vocabulary, which ensures maximum practicality for engineers.

Periodical valuation tests will monitor the progress of each student.

Text Book

'*Cambridge Professional English in Use*' is authored by a qualified engineer with professional experience in both engineering and English language teaching. You can trust this book to provide the specialist vocabulary that engineers really need.

COURSE OUTLINE

Design

Class

- 1 Drawings
- 2 Design development
- 3 Design solutions

Measurement

Class

- 4 Horizontal and vertical measurements
- 5 Locating and setting out
- 6 Dimensions of circles
- 7 Dimensional accuracy
- 8 Numbers and calculations
- 9 Area, size and mass
- 10 Measurable parameters

Materials Technology

Class

- 11 Material types
- 12 Steel
- 13 Non-ferrous metals
- 14 Polymers
- 15 Minerals and ceramics
- 16 Concrete
- 17 Wood
- 18 Material properties 1
- 19 Material properties 2
- 20 Forming, working and heat-treating metal
- 21 Material Formats

Manufacturing and assembly

Class

- 22 3D component features
- 23 Machining 1
- 24 Machining 2
- 25 Interconnection
- 26 Mechanical fasteners 1
- 27 Mechanical fasteners 2
- 28 Non mechanical joints 1
- 29 Non Mechanical joints 2

Static and dynamic principles

Class

- 30 Load, stress and strain
- 31 Force, deformation and failure
- 32 Structural mechanics
- 33 Motion and simple machines
- 34 Moving parts

Energy and temperature

Class

- 35 Energy
- 36 Heat and temperature

Fluids

Class

- 37 Fluid containment
- 38 Fluid pressure
- 39 Fluid dynamics

Mechanisms

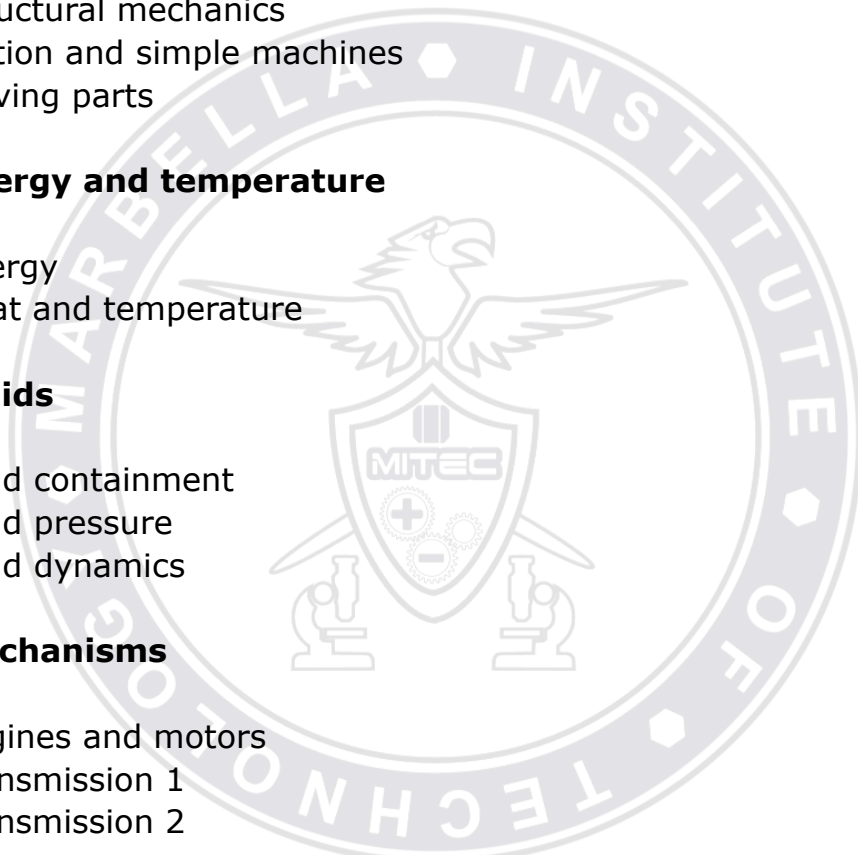
Class

- 40 Engines and motors
- 41 Transmission 1
- 42 Transmission 2

Electricity

Class

- 43 Current, voltage and resistance
- 44 Electrical supply
- 45 Circuits and components



Engineering English Communication

(EEC-105)

MARBELLA INSTITUTE OF TECHNOLOGY

Course Utility

TOTAL HOURS: 30

CREDITS: 3

Engineering English Communication is for intermediate to upper-intermediate level (B1 -B2) learners of English who need to use English in an engineering environment. The course is particularly suitable for civil, mechanical and electrical engineers and can be used in the classroom or for self-study.

Course Purpose

Engineering English Communication is designed to improve communication skills and specialist language knowledge of engineers, enabling them to work more confidently and effectively. With an emphasis on listening and speaking, the ten standalone units cover topics common to all fields of engineering such as monitoring and control, procedures and precautions, and engineering design. Authentic activities based on everyday engineering situations - from describing technical problems and solutions to working with drawings - make the course practical and motivating.

Text Book

The course text book '*Cambridge English for Engineering*' has been written for professionals by professionals. It combines the best in English language learning techniques methodology with real professional practice.

COURSE OUTLINE

UNIT 1 **Technology in use**

Class

- 1 Describing technical functions and applications
- 2 Explaining how technology works
- 3 Emphasizing technical advantages
- 4 Simplifying and illustrating technical explanations

UNIT 2 **Materials technology**

Class

- 5 Describing specific materials
- 6 Categorising materials
- 7 Specifying and describing properties
- 8 Discussing Quality issues

UNIT 3 **Components and assemblies**

Class

- 9 Describing component shape and features
- 10 Explaining and assessing manufacturing techniques
- 11 Explaining jointing and fixing techniques
- 12 Describing positions of assembled components

UNIT 4 **Engineering design**

Class

- 13 Working with drawings
- 14 Discussing dimensions and precision
- 15 Describing design phases and procedures
- 16 Resolving design problems

UNIT 5 **Breaking point**

Class

- 17 Describing Types of technical problem
- 18 Assessing and interpreting faults
- 19 Describing the causes of faults
- 20 Discussing repairs and maintenance

UNIT 6 **Technical development**

Class

- 21 Discussing technical requirements
- 22 Suggesting ideas and solutions
- 23 Assessing feasibility
- 24 Describing improvements and redesigns

UNIT 7 **Procedures and Precautions**

Class

- 25 Describing health and safety precautions
- 26 Emphasizing the importance of precautions
- 27 Discussing regulations and standards
- 28 Working with written instructions and notices

UNIT 8 **Monitoring and control**

Class

- 29 Describing automated systems
- 30 Referring to measurable parameters
- 31 Discussing readings and trends
- 32 Giving approximate figures

UNIT 9 **Theory and practice**

Class

- 33 Explaining tests and experiments
- 34 Exchanging views on predictions and theories
- 35 Comparing results with expectations
- 36 Discussing causes and effects

UNIT 10 **Pushing the boundaries**

Class

- 37 Discussing performance and suitability
- 38 Describing physical forces
- 39 Discussing relative performance
- 40 Describing capabilities and limitations

MICROSOFT OFFICE 2013
(OFI-106)
MARBELLA INSTITUTE OF TECHNOLOGY

Course Utility

TOTAL HOURS: 30

CREDITS: 3

Microsoft Office 2013 covers the software tools that increase the performance in common office tasks, such as: creating professional letters, automated balance sheets, professional invoices, modern presentations and outstanding handouts. Make the best use of the Office 2013 software pack, adding value to your products, services and customers.

Course Purpose

Microsoft Office 2013 points out the steps that will increase the overall effectiveness of your business. Confidence is gained through the practice of sample projects. Special care is taken in identifying which tools lead to the best outcome. A basic introduction to learn Office 2013 quickly, easily, and in full color.

Text Book

Office 2013 has new features and tools to master, and whether you're upgrading from an earlier version or using the Office applications for the first time, you'll appreciate this simplified approach. Offering a clear, visual style of learning, this book provides you with concise, step-by-step instructions and full-color screen shots that walk you through the applications in the Microsoft.

Key features:

- Shows you how to tackle dozens of Office 2013 tasks.
- Shares practical examples and beneficial advice to guide you through each application.
- Focuses on visual learners, with step-by-step instructions illustrated with full-color screen shots throughout.
- Office 2013 Simplified makes the new Office suite easy to understand, even if you are new to the software.

COURSE OUTLINE

UNIT 1 **OFFICE**

- DAY 1 Office Basics
- DAY 2 Working with Files
- DAY 3 Office Graphics Tools
- DAY 4 Working with Office Files Online

UNIT 2 **WORD**

- DAY 5 Adding Text
- DAY 6 Formatting Text
- DAY 7 Adding Extra Touches
- DAY 8 Reviewing Documents

UNIT 3 **EXCEL**

- DAY 9 Building Spreadsheets
- DAY 10 Worksheet Basics
- DAY 11 Working with Formulas and Functions
- DAY 12 Working with Charts

UNIT 4 **POWERPOINT**

- DAY 13 Creating a Presentation
- DAY 14 Populating Presentation Slides
- DAY 15 Assembling and Presenting a Slide Show

UNIT 5 **ACCESS**

- DAY 16 Database Basics
- DAY 17 Adding, Finding, and Querying Data

UNIT 6 **OUTLOOK**

- DAY 18 Organizing with Outlook
- DAY 19 E-Mailing with Outlook

UNIT 7 **PUBLISHER**

- DAY 18 Publisher Basics
- DAY 19 Fine-Tuning a Publication

UNIT 8 **ONENOTE**

- DAY 20 Taking Notes with OneNote
- DAY 21 Organizing and Sharing Notes

ENGINEERING GRAPHICS

(EEC-107)
MARBELLA INSTITUTE OF TECHNOLOGY

Course Utility

TOTAL HOURS: 30

CREDITS: 3

Engineering Graphics covers the software tool that increases the performance in design tasks, such as: creating simple sketches, complex 2D and 3D plans, and realistic models. Presentations become fast, accurate and attractive. Make the best use of the Sketchup 2015 software, to enhance your products, services and customer's expectations.

Course Purpose

Engineering Graphics reveals the tool that will increase the overall competitiveness of your business. Recognition is gained thru more professional presentations. Presenting designed models ahead of time avoids misunderstandings, design faults and even possible failures.

Productivity with a design is a plus from the manufacturer to the end user. Position yourself ahead in the understanding and use of highly productive design software.

Text Book

'SketchUp 2015 Hands-On: Student Coursebook' is a complete manual to learn SketchUp 2015 in a simplified, step-by-step, organized manner to make the learning process fun and easy.

The text book is the essential guide for engineers, woodworkers, carpenters architects, contractors, builders and designers who wish to take advantage of the wide span of possibilities that can be created with SketchUp 2015.

Designed for the use in classroom setting, this book is based on the exercises of pro-level SketchUp books. Numerous illustrated hands-on exercises boost up your abilities, which are later tested on the 50 independent projects to be used as classwork or homework assignments.

COURSE OUTLINE

UNIT 1 The Basics

UNIT 2 Making Multiple Copies

UNIT 3 Intersect Faces and Follow Me

UNIT 4 Working with Roofs

UNIT 5 Groups and Components

UNIT 6 Painting, Materials and Textures

UNIT 7 Working with Digital Images

UNIT 8 Adding Text and Dimensions

UNIT 9 Modeling in Context with Google Earth

UNIT 10 3D Warehouse

UNIT 11 Sandbox Tools

UNIT 12 Sectioning

UNIT 13 Solid Tools

UNIT 14 Styles and Sketchy Edges

UNIT 15 Presentation and Animation

UNIT 16 Dynamic Components

UNIT 17 Extensions (Plugins)

Metal Structures

(MS-202)

MARBELLA INSTITUTE OF TECHNOLOGY

TOTAL HOURS: 60

CREDITS: 6

Course Utility

IN LAB: 30

Sheet Metal Fabrication issues the knowledge base and skill required to work, maintain and repair sheet metal structures to a professional level. A wide selection of metal-working processes are explained in detail. They uncover the best techniques used by experienced technicians in the field.

Course Purpose

Sheet Metal Fabrication educates the student thru sequenced steps, working with different metallic structures, materials, dimensions and thicknesses. Confidence is gained thru the experience of applying the theory into selected projects that are conducted in the LAB. Special care is taken in safety, tolerances and finish qualities of the work.

Text Book

The course text book '*Professional Sheet Metal Fabrication*' has been written by Ed Barr, a BA degree from the University of South Sewanee (Tennessee) and MA from the University of Kansas.

In 2007 he earned his Bachelor of Science degree in Automotive Restoration Technology thru the McPherson College, where he currently teaches sheet metal restoration and the history of automotive design.

COURSE OUTLINE

UNIT 1 **Metal working basics**

Class

- 1 Safety and hand tools
- 2 Sheet metal machinery
- 3 Techniques for welding sheet metal
- 4 Brazing
- 5 Soldering
- 6 Riveting
- 7 Oxy-acetylene cutting
- 8 Plasma cutting

UNIT 3 **Transforming raw materials**

Class

- 9 Beginning sheet metal shaping
- 10 The small gas tank project
- 11 Advanced sheet metal shaping
- 12 Building a fender from concept to completion

UNIT 4 **Quality Tips**

Class

- 13 Straightening
- 14 Grinding
- 15 Surface finishing
- 16 Building a custom pedal car

UNIT 5 **Sheet metal design**

Class

- 17 Floor plans
- 18 Rocker panels
- 19 Rear quarter panels

Unit 6 **Repair processes**

Class

- 20 Repairing doors
- 21 Repairing Fenders
- 22 Repairing Hoods
- 23 Repairing Trunk lids

WELDING
(WG-203)
MARBELLA INSTITUTE OF TECHNOLOGY

TOTAL HOURS: 60

CREDITS: 6

IN LAB: 30

EWF/IIW Welding Diploma

An internationally recognized qualification supported by the International Institute of Welding (IIW) and the European Federation for Welding, Joining and Cutting (EWF) for assessing the competence of tasks and responsibilities during welding coordination (BS EN ISO 14731).

BS EN ISO 14731:2006 Welding Coordination - Tasks and responsibilities, specifies that responsible welding coordination personnel shall be able to demonstrate adequate general and specific knowledge in welding and allied processes to perform these tasks. Such knowledge must be the result of a combination of theory, training and experience.

Personnel holding EWF/IIW Diploma are qualified to perform welding coordination activities as described in ISO 14731, whose compliance is required by BS EN ISO 3834 (Quality requirements for fusion welding of metallic materials).

In its Part 1 - Criteria for the selection of the appropriate level of quality requirements), BS EN ISO 3834 states that in order 'to ensure sound and effective manufacturing, management needs to understand and appreciate the sources of potential trouble and to implement appropriate procedures for their control' (1).

This standard identifies measures applicable in different circumstances, being two of the most representative contractual situations and assessment of welding quality performance between customers, manufacturers, third parties etc. In consequence, the compliance of 14731 and 3834 are priorities in the success of any metallic welding related business.

The EWF/IIW Welding Diploma consists of three different levels: Specialist (IS), Technologist (IWT) and Engineer (IWE). Although the topics covered in each level are similar, the depth and breadth are increased as progress is made towards the engineering level. The goals of each level are in line with the responsibilities outlined in BS EN ISO 14731 and quality requirements of BS EN ISO 3834.

COURSE OUTLINE

MODULE 1 - Welding processes and equipment

- General introduction to welding technology
- Oxy-gas welding and related processes
- Electrotechnics - a review
- The arc
- Power sources for arc welding
- Introduction to gas shielded arc welding
- Tig welding
- MIG/MAG and flux cored arc welding
- MMA welding
- Submerged-arc welding
- Resistance welding
- Other welding processes (laser, electron beam, plasma)
- Cutting and other edge preparation processes
- Joining processes for plastics
- Joining processes for ceramics and composites
- Consumables

MODULE 2 -Material and their behavior during welding

- Manufacture and designation of steels
- Testing materials
- Structure and properties of pure metals
- Alloys and phase diagrams
- Heat treatment
- Structure of the welded joint
- Steels: plain carbon, carbon-manganese steels, fine grained, low alloy, high alloy etc.
- Cracking phenomena in welded joints
- Introduction to corrosion
- High alloy creep resistant and heat resistant steels
- Cast irons and steels
- Non ferrous metals and alloys

MODULE 3 - Construction and design

- Basic theory of structural systems
- Fundamentals of the strength of materials
- Welded joint design
- Basics of weld design
- Behavior of welded structured under different types of loading
- Design of welded structures with predominantly static loading
- Behavior of welded structures under dynamic loading
- Design of dynamically loaded welded structures
- Design of welded pressure equipment
- Design of aluminum alloys structures
- Reinforcing-steel welded joints

MODULE 4 - Fabrication, applications engineering

- Introduction to quality assurance in welded fabrication
- Quality control during manufacture
- Residual stresses and distortion
- Plant facilities, welding jigs and fixtures
- Health and safety
- Measurement, control and recording in welding
- Non destructive testing
- Economics
- Repair welding
- Fitness-for-purpose
- Case studies
- Welding qualifications and procedures

Composite Technology

(CS-212)
MARBELLA INSTITUTE OF TECHNOLOGY

HOURS: 40

CREDITS: 4

Course Utility

IN LAB: 20

Composite Technology is crucial to aerospace and aviation applications, as well as many other industries, because of the advantage of composite materials: their properties of strength and stiffness combined with their light weight. It is a constantly changing field with new developments daily, yet the basics needed to successfully design, fabricate and repair composite structures remain the same. Essentials of Advanced Composite Fabrication and Repair is a comprehensive and thorough primer for beginners to this technology, yet also works as an excellent resource for long-time composites professionals.

Course Purpose

Composite Technology transmits the expert's knowledge by studying the the different processes used in the design, fabrication and repair of composite structures. The knowledge is strengthened by executing relevant projects in the LAB hours. Close observation is given to the structural strength and finished quality of the product.

Text Book

The textbook teaches concepts and methods in a simple and straightforward manner for a wide array of composites fundamentals, including fiber and matrix selection, curing and achieving desired properties, tooling design and use, testing and nondestructive inspection, step-by-step repair instructions and troubleshooting, and also covering the key environmental, health and safety issues that affect the industry.

COURSE OUTLINE

UNIT 1 **Composite Technology Overview**

Class

- 1 Composites vs. Advanced Composites
- 2 Examples of Typical Applications
- 3 Advantages of Composites
- 4 Disadvantages of Composites
- 5 Composites Development Timeline

UNIT 2 **Matrix Technology**

Class

- 6 Matrix Systems Overview
- 7 Thermosets
- 8 Thermoplastics
- 9 Other Metric Materials
- 10 Liquid Resins
- 11 Prepregs

UNIT 3 **Fiber Reinforcements**

Class

- 12 Introduction to Fiber Reinforcements
- 13 Fiber Types and Properties
- 14 Forms of Reinforcement
- 15 Layup Technology

UNIT 4 **Basic Design Considerations**

Class

- 16 Composite Structural Design
- 17 Resin to Fiber Ratio
- 18 Service Life Considerations

Unit 5 **Molding Methods and Practices**

Class

- 19 Overview of Molding Methods and Practices
- 20 Semi-Permanent Mold Release Agents
- 21 Vacuum Bagging
- 22 Hand Layup-Wet Layup
- 23 Vacuum Infusion
- 24 Hand Layup - Prepreg
- 25 Oven and Autoclave Equipment
- 26 Filament Winding
- 27 Automated Tape Laying and Automated Fiber Placement
- 28 Resin Transfer Molding
- 29 Pultrusion
- 30 Thermoforming
- 31 Compression Molding

UNIT 6 **Core Materials**

CLASS

- 32 Why Use Sandwich Construction?
- 33 Balsa Core
- 34 Foam Cores
- 35 Honeycomb Cores
- 36 Other Core Types
- 37 Design and Analysis
- 38 General Design Criteria
- 39 Fabrication
- 40 In-Service Use

UNIT 7 **Introduction to Tooling**

CLASS

- 41 Key Factors
- 42 Metal vs. Composite Tooling
- 43 Tooling for Thermoplastics

UNIT 8 **Inspection and Test Methods**

CLASS

- 44 Destructive Coupon Testing
- 45 Resin, Fiber and/or Void Content
- 46 Fire, Smoke and Toxicity (FST) Requirements and Heat
- 47 Non Destructive Testing

UNIT 9 Adhesive Bonding and Fastening

CLASS

- 48 Adhesive bonding vs. Fastening Composites
- 49 Bonding Methods
- 50 Types of Adhesives
- 51 Surface Preparation
- 52 Cleaning
- 53 Bonding to Core Materials
- 54 Bonding Thermoplastic Composites
- 55 Joint Design
- 56 Drilling and Fastening

UNIT 10 Repair of Composite Structures

CLASS

- 57 Types of Damage
- 58 Damage Detection
- 59 Component Identification
- 60 Paint Removal
- 61 Damage Removal
- 62 Repair Design
- 63 Vacuum Bagging Materials for Composite Repair
- 64 Repair Instructions
- 65 Drilling and Fastening



ELECTROPROPULSION SYSTEMS

(EP-201)

MARBELLA INSTITUTE OF TECHNOLOGY

TOTAL HOURS: 40

CREDITS: 4

COURSE OUTLINE

IN LAB: 20

The *Electropulsion Systems* course is intended for people who wish to work in the fields of electric vehicle manufacturing, maintenance or sales. It clarifies what is needed to perform in a safe, efficient and effective way, which are top qualities of a professional in the Electropulsion Technology field.

It also creates understanding of other areas where the same type of components are needed, like in automation, solar energy, wind power, marine transport, robotics, energy back-up systems, ventilation and other industrial and house-hold professions.

This course covers the systems found in electric cars. The flow of energy from a source, going thru the charger, batteries, power cables, protections fuses, current limiters, contactors, controller, all the way to the electric motor.

Practical lab time is included in the course, where students can be involved in the design, manufacturing installing and testing of components.

Its purpose is to give advice and uncover the key secrets for building an electric vehicle, or to convert an ordinary car into an electric car. Troubleshoot complementary systems like contact power, dc-dc converters, power brakes, power steering, air heating and refrigeration.

Learn to optimize in battery type, size, aerodynamics and power, so that your vehicle becomes the ideal prototype.

COURSE OUTLINE

Electric vehicle components

Operation of an electric vehicle

UNIT

- 1 The charger - Types and how to charge batteries.
- 2 Lead acid batteries - Properties of batteries.
- 3 The art of selecting batteries.
- 4 Wiring - Wiring tables, precautions.
- 5 Fuse protection, circuit breaker and contactor.
- 6 Controller - The art of selecting a controller.
- 7 Potentiometer - Adjustments and measurements.
- 8 Electric motor - Searching for the right motor.
- 9 Key switch input (KSI)
DC-DC converter
Power brakes
Power steering
- 10 Heater
Air conditioning
- 11 Lithium batteries
Battery Pack construction
BMS system
- 12 **Theory of electric propulsion**

Aerodynamics
Rolling resistance
Mechanical Power
Range
- 13 **European legislation concerning electric vehicles**

Field of application
Definitions
Conformity request application
Conformity
Specifications and rehearsals
Modifications and extensions to conformity of vehicle type
Conformity of production
Relevant addresses

AUTOMOTIVE SYSTEMS

(EP-201)
MARBELLA INSTITUTE OF TECHNOLOGY

Course Utility

TOTAL HOURS: 30

CREDITS: 3

Automotive Systems is for the applicants of the automotive industry, as technicians who seek work in vehicle repair or spare parts shops.

It is specially ideal for the electric vehicle expert, that wants to gain a deep understanding in the operation of automotive parts, components and systems resulting in an all-purpose technician, competitive in today's automotive industry.

Course Purpose

Automotive Systems analyzes the different components of a vehicle and their parts, revealing the interactions with other systems and components.

This method is used to expose what does what and when, focusing on what is expected to make quick and accurate evaluations of malfunctions.

Text Material

Automotive Systems has selected class handouts that describe clearly the systems with crucial information for the technician to assemble maintain and repair the vehicle component or part.

Cutouts show the interior of parts that cannot be seen, schematic diagrams back up the troubleshooting with common problems and solutions. Key points are noted to show the functioning of parts and components.

COURSE OUTLINE

ELECTRICAL SYSTEMS I

UNIT

- 1 Electrical Circuits I
- 2 Electrical Circuits II
- 3 Understanding logic gates
- 4 The Battery
- 5 Battery Concepts
- 6 Testing the Battery
- 7 Battery Service
- 8 Charging Systems I
- 9 Alternator
- 10 Circuit Protection
- 11 Understanding Relays
- 12 Control Systems
- 13 Circuit diagrams I
- 14 Diagnostic Tools I
- 15 Chassis Electrical Failure
- 16 Semiconductors
- 17 Transistors
- 18 Computers and Logic Circuits
- 19 Sensors and Switches
- 20 Electronic Control Transmission
- 21 Diagnostic of Electronic Transmission Control
- 22 Automatic Transmission Link

ELECTRICAL SYSTEMS II

UNIT

- 23 Automotive Electricity
- 24 Diagnostics of Chassis Faults
- 25 Electrical Circuit Theory
- 26 Diagnostic Tools II
- 27 Electrical signals
- 28 ECU
- 29 Troubleshooting
- 30 Starting Systems
- 31 Circuit diagrams II
- 32 CARGO SYSTEMS II
- 33 SYMBOLS OF SCHEMES

HYBRID SYSTEMS

UNIT

- 34 Hybrid System Components
- 35 High-voltage batteries
- 36 Ideal chassis for Hybrids I
- 37 Hybrid Engine
- 38 Hybrid System Operation
- 39 Summary

HYBRID DIAGNOSTIC SYSTEMS

UNIT

- 40 Hybrid Battery Control Systems
- 41 Hybrid Brake System
- 42 Hybrid System components II
- 43 Hybrid Steering Systems
- 44 Hybrid Engine Control Systems
- 45 Hybrid Principles of operation
- 46 Hybrid Vehicle Control Systems
- 47 Hybrid Engine Operating Conditions

COMBUSTION ENGINES I

UNIT

- 48 Electronic Admission Systems
- 49 Electronic Injection Control I
- 50 Electronic Ignition System
- 51 Summary
- 52 Diagnosis of Motor Controls
- 53 Idle Control
- 54 Input sensors
- 55 Output sensors

EXPLOSION ENGINES II

UNIT

- 56 Air Flow Sensors
- 57 Catalytic Converters
- 58 Injection Stabilizers
- 59 Catalytic Return
- 60 Combustion chemistry

UNIT

- 61 Emission Analysis
- 62 Electronic Injection Control II
- 63 Ignition advance
- 64 Engine Subsystems
- 65 Evaporative Emissions Control
- 66 Emission Recirculation
- 67 Fuel Systems
- 68 Ignition Process
- 69 Ignition Duration and Controls
- 70 Ignition Sensor
- 71 Position Sensors
- 72 Onboard Diagnostics System (PBX)
- 73 Fuel & oxygen Sensors
- 74 Position Sensors
- 75 Engine Oil Reservoir Ventilation
- 76 Pressure Sensors
- 77 Secondary Air Injection
- 78 Series Data
- 79 Serial Data Interpretation
- 80 Ignition Advance Control
- 81 Speed Sensor
- 82 Thermistors

AUTOMATIC TRANSMISSION I

UNIT

- 83 A340H Transfer
- 84 Automatic Transmission Fluids
- 85 Electrical Control
- 86 Fundamentals of Automatic Transmissions I
- 87 Selection and Operation
- 88 Start-up and Operating Selector
- 89 Simpson Planetary Gear
- 90 Torque Converters
- 91 Checking, adjustment and diagnosis of Transmissions
- 92 Automatic Transmission Pump
- 93 Valve Circuits I

AUTOMATIC TRANSMISSION II

UNIT

- 94 Fundamentals of Automatic Transmissions II
- 95 Diagnostic Procedures
- 96 Diagnostic Tester
- 97 Electronic Control System
- 98 Rebuilt Transmissions
- 99 U Series Hubs
- 100 Valve Circuits II

BRAKE SYSTEMS

UNIT

- 101 Disk Brakes
- 102 Brake Drum
- 103 Brake System Diagnosis
- 104 Hydraulic Brake Control
- 105 Traction Control
- 106 Parking Brake

TESTS

- Circuit Diagnostics I
- Circuit Diagnostics II
- Basic Electricity
- Basic Electronics
- Electronic Sensors
- Charging System
- Diagnostic equipment
- Instruments, Indicators and Warning Devices
- Diagnostic Scanning Tool I
- Diagnostic Scanning Tool II
- Lead Acid Batteries
- Semiconductors
- Starting System
- Airbags
- Wiring Repair
- Wiring Schematics

ARDUINO PROGRAMMING

(AR-302)

MARBELLA INSTITUTE OF TECHNOLOGY

Course Utility

TOTAL HOURS: 60

CREDITS: 6

Arduino programming is the set of instructions that manage microcontrollers. Arduino has proved to be one of the most successful microcontroller family ever made, and promises to continue being strong in the future in the use of robotics, domotics and automation devices. This is due to its flexibility in adapting specific purpose shields like wifi, bluetooth, radio, and combining them with sound sensors, motion detectors, audio and video input/outputs.

A large array of sensors are compatible, like g-force sensors, pressure, temperature, humidity, position, light sensors, etc...Size is not an issue when relays are used to control large machines.

Course Purpose

Arduino Programming is a course where you will learn how to attach an Arduino board to your computer, program it, and connect electronics to it to create your own useful devices. The instructions are written in C and C++, becoming useful tool in the learning, implementation and troubleshooting of similar sort programs.

Text Book

'*30 Arduino Projects for the Evil Genius*' is the coursebook for Arduino Programming. Excellent introductory book for the Arduino Controller, the book starts with the basics and shows how to program the device using Windows, Mac or Linux platforms.

This book covers the basics of the controller and the programming language used. Experience the latest Arduino boards and support components.

The projects start from the very basic blinking LED projects, to more detailed LED projects, including seven segment displays, LED matrices and also Character LCD's. Sensor projects are also covered with keypad data entry, temperature measuring and USB Data Recording. Power projects include driving servo motors and fans, as well as interesting infrared remote project. This book is ideal for those starting with the Arduino Controller and covers the basics as well as the theory behind the code and the circuits provided.

- Step by Step programming guide for the device.
- Detailed projects including schematics, parts and code.
- Includes light, sound and sensor projects.
- Plenty of code examples that can be used with other projects.
- Plenty of code examples that can be used with other projects.

COURSE OUTLINE

UNIT 1

Quickstart

Powering up
Installing the software
Configuring your Arduino environment
Downloading the project software

Project 1 - Flashlight LED

Breadboard
Summary

UNIT 2

A tour of Arduino

Microcontrollers
What 's on an Arduino Board
The Arduino Family
The C Language
Summary

UNIT 3

LED Projects

Project 2 - Morse code flasher

Loops

Arrays

Project 3 - Morse code translator

Summary

UNIT 4

More LED Projects

Digital inputs and outputs

Project 5 - Model traffic signal

Project 6 - Strobe light

Project 7 - SAD light

Project 8 - High powered strobe light

Random number generation

Project 9 - LED Dice

Summary

Unit 5

Sensor Projects

Project 10 - Keypad Security Code

Rotary encoders

Project 11 - Model traffic signal using a rotary encoder

Sensing Light

Project 12 - Pulse Rate Monitor

Measuring temperature

Project 13 - USB Temperature Logger

Summary

UNIT 6 **Light Projects**

Project 14 - Multicolor light display

Seven-Segment Led's

Project 15 - Seven-segment LED double dice

Project 16 - LED array

Project 17 - USB Message board

Summary

UNIT 7 **Sound Projects**

Project 18 - Oscilloscope sound generation

Project 19 - Tune player

Project 20 - Light harp

Project 21 - VU Meter

Summary

UNIT 8 **Power Projects**

Project 22 - LCD Thermostat

Project 23 - Computer controlled fan
H-Bridge controllers

Project 24 - Hypnotizer

Servo Motors

Project 25 - Servo-controlled laser

Summary

UNIT 9 **Miscellaneous Projects**

Project 26 - Lie detector

Project 27 - Magnetic door lock

Project 28 - Infrared Remote

Project 29 - Lilypad Clock

Project 30 - Evil Genius Countdown Timer

Summary

UNIT 10 **USB Projects with the Leonardo**

Project 31 - Keyboard Prank

Project 32 - Automatic password typer

Project 33 - Accelerometer Mouse

Summary

UNIT 11 **Your Projects**

Circuits

Components

Tools

Project ideas

Visual Studio

(VS-303)

MARBELLA INSTITUTE OF TECHNOLOGY

Course Utility

TOTAL HOURS: 60

CREDITS: 6

Visual Studio is an integrated development environment from Microsoft. It is used to develop computer programs for Microsoft Windows, and also websites, web applications and web services. Visual Studio uses Microsoft software development platforms such as API, Forms, Presentation Foundation, Store and Silverlight. It is a simple and intuitive code editor that allows for the creation of programs and applications in a more simple and organized way. Productivity is enhanced and errors minimized, making Visual Studio one of the most powerful resources within IT departments of successful companies.

Course Purpose

Visual Studio transmits the understanding for creating and enhancing modern applications such as word, excel, access, PowerPoint, paint, outlook, and similar type, even leaving open the possibility of creating a totally new applications due to the powerful versatility of its GUI.

The instructions are written in C and C++, becoming a useful tool in the learning, implementation and troubleshooting of similar sort programs.

Text Book

In just 24 sessions of one hour or less, you'll learn how to build complete, reliable, and modern Windows applications with Microsoft® Visual Basic® 2015. Using a straightforward, step-by-step approach, each lesson builds on what you've already learned, giving you a strong foundation for success with every aspect of VB 2015 development.

- Notes present interesting pieces of information.
- Tips offer advice or teach an easier way to do something.
- Cautions advise you about potential problems and help you steer clear of disaster.

Learning objectives:

- * Master VB 2015 by building a complete feature-rich application
- * Navigate VB 2015 and discover its new shortcuts
- * Work with objects, collections, and events
- * Build attractive, highly-functional user interfaces
- * Make the most of forms, controls, modules, and procedures
- * Efficiently store data and program databases
- * Make decisions in code
- * Use powerful object-oriented techniques
- * Work with graphics and text files
- * Manipulate file systems and the Registry
- * Add email support
- * Create efficient modules and reusable procedures
- * Interact effectively with users
- * Write code to preview and print documents
- * Debug with VB 2015's improved breakpoint features
- * Distribute your software

COURSE OUTLINE

UNIT 1 **The Visual Basic 2015 Environment**

- 1 Jumping in with both feet: VB 2015 programming tour
- 2 Navigating
- 3 Objects and Collections
- 4 Events

UNIT 2 **Building a User Interface**

- 5 Forms - The basics
- 6 Forms - Advanced techniques
- 7 Traditional controls
- 8 Advanced controls
- 9 Adding menus and toolbars to Forms

UNIT 3 **Programming**

- 10 Code procedures
- 11 Constants, data types, variables and arrays
- 12 Adjustments: Arithmetic, string manipulation and date/time
- 13 Decisions in VB code
- 14 Looping for efficiency
- 15 Debugging
- 16 Designing objects with classes
- 17 Interacting with user
- 18 Graphics

UNIT 4 **Data**

- 19 File operations
- 20 Registry and text files
- 21 A database
- 22 Printing
- 23 Sending emails

UNIT 5 **Deploying Solutions and Beyond**

- 24 Deploying Applications

PHOTOVOLTAIC SYSTEMS

(PV-201)

MARBELLA INSTITUTE OF TECHNOLOGY

TOTAL HOURS: 60

CREDITS: 6

Course Utility

IN LAB: 30

Photovoltaic Systems is a response to the growing demand for PV technicians. Producing energy from the sun has become a major industry worldwide. Designing, installing and maintaining such systems requires knowledge and training.

Course Purpose

Photovoltaic Systems reveals the critical information to successfully design, install and maintain PV systems. Practical work confirms the student's knowledge resulting in confidence while performing professional results in the field.

Text Book

'Solar Electric Handbook' is the fundamental tool to understand photovoltaic systems and practice with common scenarios which are seen in pv systems. The book contains an overview of photovoltaic electricity, and a detailed description of PV system components, including PV modules, batteries, controllers and inverters. It also includes chapters on sizing photovoltaic systems, analyzing sites and PV systems, as well as detailed appendices on PV system maintenance, troubleshooting, and solar insolation data for over 300 sites around the world.

The book is written by Solar Energy International, a worldwide recognized institute, where professors and experts in the PV world have collaborated to its publication. It is one of the best text books for PV instruction. Includes exercises, color diagrams, on-site photographs and easy to follow guides for technical procedures.

COURSE OUTLINE

UNIT

- 1 **Overview of Renewable Energy and the Solar Industry**
 - The Case for Renewable Energy
 - An Overview of Photovoltaics and the Solar Industry
- 2 **Electricity and Components**
- 3 Basics of Electricity
- 3 Components
- 3 **Modules, Series and Parallel, and Meters**
 - Photovoltaic (PV) Modules
 - Series and Parallel Connections with Modules
 - Testing Modules with a Multimeter
- 4 **Solar Site Analysis and Mounting**
 - Solar Site Analysis
 - Mounting
 - Roofing Systems
- 5 **Grid-Direct System Sizing**
 - Implementing Efficiency
 - Grid-Direct Inverters
 - System Sizing
- 6 **Grounding, Wiring, and Over current Protection**
 - Grounding
 - Wiring
 - Disconnects, Over current Protection, and Series Fusing
 - Basics of Service Panel Connections
- 7 **Safely Installing, Commissioning, and Decommissioning Grid-Direct Systems**
 - Jobsite Safety
 - Safe Procedures for Installation and Commissioning
 - Battery-Based Systems
 - Introduction to Battery-Based Systems
 - Sizing Battery-Based Systems
- 9 **Solar Business and Finance**
 - Entering the PV Industry
 - Marketing and Sales for Solar Integration Businesses
 - Electricity Rates, Savings, and Incentive Structures
 - Financial Benefit Analysis and Financing Options

THERMAL ENGINEERING

(TE-202)
MARBELLA INSTITUTE OF TECHNOLOGY

TOTAL HOURS: 60

CREDITS 6

Course Utility

IN LAB: 30

Thermal Engineering is a response to the need for solar heat energy technicians, who plan, design, install and maintain solar water heating systems and components.

Course Purpose

Thermal Engineering uncovers rich detailed knowledge about solar thermal energy. Clear theory is backed by specific practical work that advances the student from an entry level to a professional understanding and high skill level, in order to perform professionally in the field.

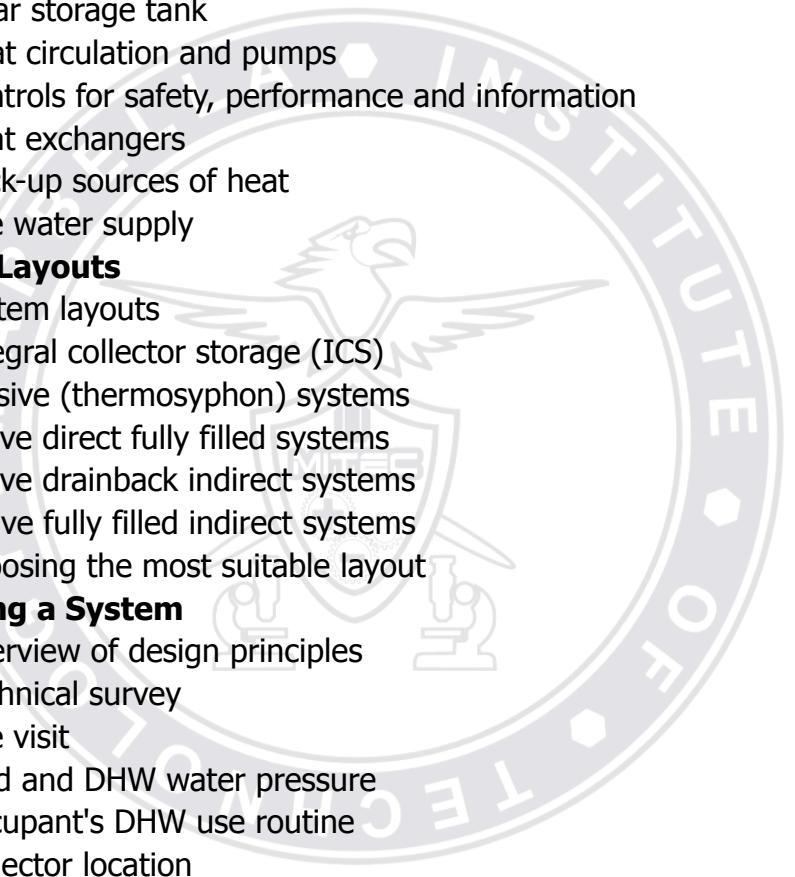
Text Book

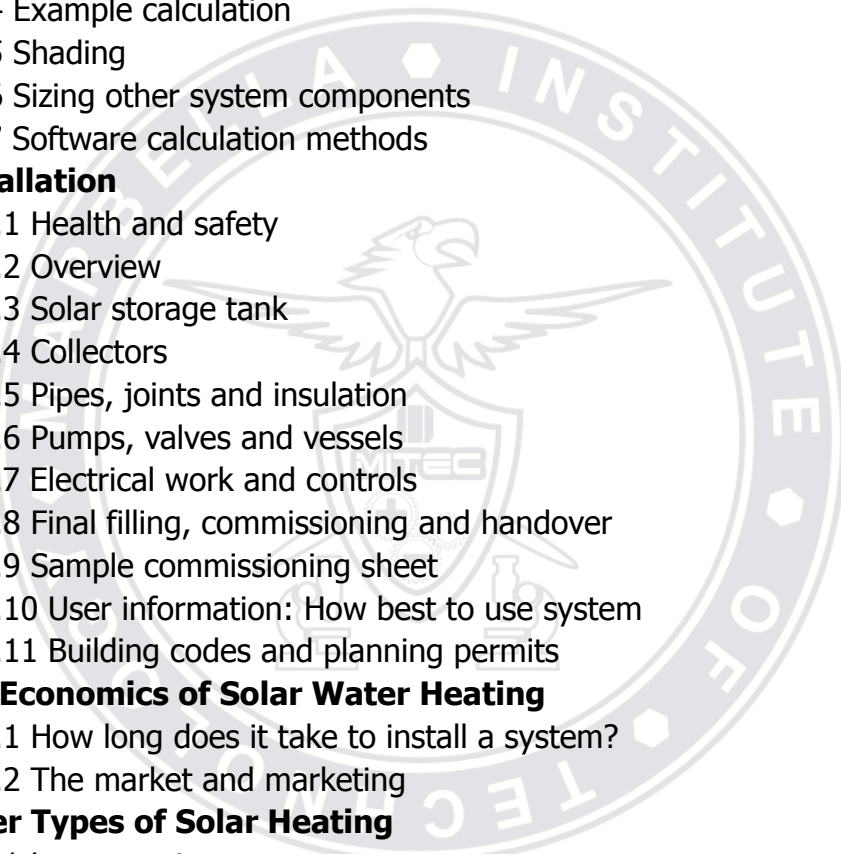
'*Solar Domestic Water Heating*' is a comprehensive introduction to all aspects of solar domestic water heating systems. As fossil fuel prices continue to rise and awareness of climate change grows, interest in domestic solar water heating is expanding. Solar water heating technology is the most environmentally-friendly way to heat water. This fully-illustrated and easy-to-follow guide shows how domestic solar water heating systems work, the different types of systems, types of collectors, both flat plate and evacuated tube, types of storage tanks and other accessories. It also shows how systems are installed and explains how solar water heating can be integrated into existing water heating systems. Numerous examples from around the world have been included. The ideal guide for plumbers, heating engineers, builders and architects, housing and property developers, home owners and DIY enthusiasts, and anyone who needs a clear introduction to solar water heating technology.

COURSE OUTLINE

UNIT

- 1 **What is Solar Heating?**
 - 1.1 What solar water heating is about
 - 1.2 A short history of solar water heating
 - 1.3 What do solar water heating systems look like?
 - 1.4 What the technology can achieve
 - 1.5 Other solar technologies
 - 1.6 Energy supply issues, peak oil, resources depletion
 - 1.7 Climate change and CO₂ emissions
 - 1.8 Purchasing a solar heating system
- 2 **Solar Radiation and Resources**
 - 2.1 Solar radiation and the solar resource
 - 2.2 Quantifying solar energy
 - 2.3 Solar geometry, angles and orientation
- 3 **How Solar DHW Works**
 - 3.1 How solar domestic hot water systems work
 - 3.2 Main system components and their functions
 - 3.3 Energy and mass flows
- 4 **Solar Collectors**
 - 4.1 Solar collector absorbers
 - 4.2 Flat plate collectors
 - 4.3 Evacuated tube collectors
 - 4.4 Collector components
 - 4.5 Self-build collectors
 - 4.6 Unglazed collectors
 - 4.7 Collector performance
 - 4.8 Using collector performance test reports
 - 4.9 Typical collector performances values
- 5 **Solar Heating Systems**
 - 5.1 System performance
 - 5.2 Typical system performance values
 - 5.3 Reduction of fuel bills and pollution
 - 5.4 Measuring solar contribution
 - 5.5 Required DHW temperature
 - 5.6 Using system performance test reports
 - 5.7 Collector and system selection

- 
- 6 **Additional Components**
- 6.1 Main system components
 - 6.2 Heat transfer fluids (HTFs)
 - 6.3 Pipes and pipe fittings
 - 6.4 Solar storage tank
 - 6.5 Heat circulation and pumps
 - 6.6 Controls for safety, performance and information
 - 6.7 Heat exchangers
 - 6.8 Back-up sources of heat
 - 6.9 The water supply
- 7 **System Layouts**
- 7.1 System layouts
 - 7.2 Integral collector storage (ICS)
 - 7.3 Passive (thermosyphon) systems
 - 7.3 Active direct fully filled systems
 - 7.4 Active drainback indirect systems
 - 7.5 Active fully filled indirect systems
 - 7.6 Choosing the most suitable layout
- 8 **Designing a System**
- 8.1 Overview of design principles
 - 8.2 Technical survey
 - 8.3 Site visit
 - 8.4 Cold and DHW water pressure
 - 8.5 Occupant's DHW use routine
 - 8.6 Collector location
 - 8.7 Solar storage tank and other equipment
 - 8.8 Roof coverings
 - 8.9 Collector orientation, angles and shading
 - 8.10 Distances between components
 - 8.11 Retention of the building's insulated structure
 - 8.12 Circulation pumps and circulation rates
 - 8.13 Expansion or explosion of components
 - 8.14 Steam or scalding water
 - 8.15 Bacteria
 - 8.16 Freeze damage
 - 8.17 Mineral deposits, silt and other debris from water supplies
 - 8.18 Loss of cold drinking water quality
 - 8.19 Loss of hot water quality
 - 8.20 Future plumbing and electrical system maintenance issues
 - 8.21 Indication of correct operation
 - 8.22 Animal and insects
 - 8.23 Ultraviolet, heat and vibration degradation
 - 8.24 Other issues

- 
- 9 **Sizing System Components**
- 9.1 System sizing
 - 9.2 Manual sizing method for collector and storage tank using data table
 - 9.3 Estimating collector area based on DHW use and annual irradiation
 - 9.4 Example calculation
 - 9.5 Shading
 - 9.6 Sizing other system components
 - 9.7 Software calculation methods
- 10 **Installation**
- 10.1 Health and safety
 - 10.2 Overview
 - 10.3 Solar storage tank
 - 10.4 Collectors
 - 10.5 Pipes, joints and insulation
 - 10.6 Pumps, valves and vessels
 - 10.7 Electrical work and controls
 - 10.8 Final filling, commissioning and handover
 - 10.9 Sample commissioning sheet
 - 10.10 User information: How best to use system
 - 10.11 Building codes and planning permits
- 11 **The Economics of Solar Water Heating**
- 11.1 How long does it take to install a system?
 - 11.2 The market and marketing
- 12 **Other Types of Solar Heating**
- 12.1 Larger systems
 - 12.2 Solar air collectors assisting space heating
 - 12.3 Swimming pools
 - 12.4 Solar cooling
- 13 **Case Studies**

WIND POWER

(WP203)
MARBELLA INSTITUTE OF TECHNOLOGY

TOTAL HOURS: 60

CREDITS: 6

Course Utility

IN LAB: 30

Wind Power is a response to the need for wind power technicians, who plan, design, install and maintain wind power systems and components. Government pollution treaties shows us that there is a growing market with many possibilities for the professional wind power technicians.

Course Purpose

Wind Power covers the different types of turbines , their operation and typical set-ups. The student learns about prediction formulas to estimate the yields and operation of the different types of wind turbines. Theory is put into practice in the lab, where the student gains skill to build, and maintain wind power systems.

Text Book

'*Wind Energy: An Introduction*' covers wind energy system types, operation, modeling, analysis, integration, and control. Beginning with a history of the development of wind energy, this comprehensive book:

- Explains the aerodynamic theories that govern the operation of wind turbines
- Presents wind energy statistics to address the stochastic nature of wind speed
- Employs the statistical modeling of wind speed to evaluate sites for wind energy generation
- Highlights the differences between the most common types of wind turbines
- Analyzes the main power electronic circuits used in wind energy
- Details the induction, synchronous, and permanent magnet generators from the basic principle of induced voltage to the steady-state and dynamic models
- Explores the operation, stability, control, and protection of type 1, 2, 3, and 4 wind turbines
- Discusses the main integration challenges of wind energy systems with electric utility systems
- Features numerous models, illustrations, real-world examples, and exercise problem
- Includes a solutions manual and figure slides with qualifying course adoption

COURSE OUTLINE

UNIT

Author

List of Variables

1 **History of the Wind Energy Development**

1.1 Wind Turbines

1.2 Offshore Wind Turbines

Exercise

2 **Aerodynamics of Wind Turbines**

2.1 Wind Speed

2.1.1 Impact of Friction and Height on Wind Speed

2.1.2 Air Density

2.2 WT Blades

2.2.1 Angle of Attack

2.2.2 Relative Wind Speed

2.2.3 Pitch Angle

2.3 Coefficient of Performance

23.1 Tip Speed Ratio

23.2 Blade Power

2.4 Separation of WTs

Exercise

3 **Wind Statistics**

3.1 Average Variance and Standard Deviation

3.2 Cumulative Distribution Function

3.3 Probability Density Function

33.1 Weibull Distribution Function

33.2 Rayleigh Distribution Function

3.4 Dependency and Repeatability

34.1 Cross-Correlation

34.2 Repeatability

Exercise

4 **Overview of Wind Turbines**

4.1 Classification of Wind Turbines

4.1.1 Alignment of Rotating Axis

4.1.2 Types of Generators

4.1.3 Speed of Rotation

4.1.3.1 Fixed-Speed Wind Turbine

4.1.3.2 Variable-Speed Wind Turbine

4.1.3.3 Assessment of FSWT and VSWT

4.1.4 Power Conversion

4.1.5 Control Actions

4.1.5.1 Soft Starting

4.1.5.2 Generation Control

4.1.5.3 Reactive Power Control

- 4.1.5.4 Stability Control
- 4.1.5.5 Ramping Control
- 4.2 Types of Wind Turbines
 - 4.2.1 Type 1 Wind Turbine
 - 4.2.2 Type 2 Wind Turbine
 - 4.2.3 Type 3 Wind Turbine
 - 4.2.4 Type 4 Wind Turbine
 - 4.2.5 Type 5 Wind Turbine
- Exercise

5 **Solid-State Converters**

- 5.1 AC/DC Converters with Resistive Load
 - 5.1.1 Rectifier Circuits
 - 5.1.2 Voltage-Controlled Circuits
 - 5.1.3 Three-Phase Circuits
- 5.2 AC/DC Converters with Inductive Load
 - 5.2.1 Current Calculations
 - 5.2.2 Voltage Calculations
 - 5.2.3 Freewheeling Diodes
- 5.3 DC/DC Converters
 - 5.3.1 Buck Converter
 - 5.3.2 Boost Converter
 - 5.3.3 Buck-Boost Converter
- 5.4 DC/AC Converters
 - 5.4.1 Three-Phase DC/AC Converter
 - 5.4.2 Pulse Width Modulation
- 5.5 AC/AC Converters
- Exercise

6 **Induction Generator**

- 6.1 Description of Induction Machine
- 6.2 Representation of Induction Machine
 - 6.2.1 Flux Linkage
 - 6.2.2 Balanced System
 - 6.2.3 Rotating Reference Frame
- 6.3 Park's Equations
 - 6.3.1 Steady-State Model
 - 6.3.1.1 Root Mean Square Values
 - 6.3.1.2 Real and Reactive Powers
 - 6.3.1.3 General Equivalent Circuit
 - 6.3.1.4 Torque
 - 6.3.2 Dynamic Model of Induction Generator
 - 6.3.2.1 Dynamics of Electrical Mode
 - 6.3.2.2 Rotor Dynamics
- Exercise

7 **Synchronous Generator**

- 7.1 Description of Synchronous Generator
- 7.2 Salient Pole Synchronous Generator

- 72.1 Rotating Reference Frame
- 7.2.2 Parks Equations
- 7.2.3 Steady-State Model
 - 7.2.3.1 Root Mean Square Values
 - 7.2.3.2 Real and Reactive Powers
- 7.3 Cylindrical Rotor Synchronous Generator
- 7.4 Dynamic Model of Synchronous Generator
- 74.1 Dynamics of Rotating Mass
- 74.2 Dynamics of Electrical Modes
 - 7.4.2.1 Field Dynamics
 - 7.4.2.2 Terminal Voltage Dynamics
 - 7.4.23 Electric Torque Dynamics
- 7.4.3 Block Diagram of Synchronous Generator
- Exercise

8 Type 1 Wind Turbine System

- 8.1 Equivalent Circuit for the Squirrel-Cage Induction Generator
 - 8.1.1 Power Flow
 - 8.1.2 Electric Torque
 - 8.1.3 Maximum Power
 - 8.1.4 Maximum Torque
- 8.2 Assessment of Type 1 System
- 8.3 Control and Protection of Type 1 System
- 83.1 Reactive Power of Type 1 System
- 8.3.2 Inrush Current
- 83.3 Turbine Stability
- Exercise

9 Type 2 Wind Turbine System

- 9.1 Equivalent Circuit of Type 2 Generator
- 9.2 Real Power
- 9.3 Electric Torque
- 9.4 Assessment of Type 2 System
- 9.5 Control and Protection of Type 2 System
 - 9.5.1 Inrush Current
 - 95.2 Turbine Stability
- Exercise

10 Type 3 Wind Turbine System

- 10.1 Equivalent Circuit
- 10.2 Simplified Model
- 10.3 Power Flow
 - 10.3.1 Apparent Power Flow through RS
 - 10.3.2 Apparent Power Flow through GS
- 10.4 Speed Control
- 105 Protection of type 3 Systems
 - 10.5.1 Electrical Protection
 - 10.5.1.1 Crowbar System
 - 10.5.1.2 Chopper System

- 10.5.2 Electromechanical Protection
- 10.5.2.1 Stator Dynamic Resistance
- 10.5.2.2 Rotor Dynamic Resistance
- Exercise

11 **Type 4 Wind Turbine**

- 11.1 Full Converter
- 11.2 Power Flow
- 11.3 Real Power Control
- 11.4 Reactive Power Control
- 11.5 Protection
- 11.5.1 Chopper System
- 11.5.2 Dynamic Resistance
- Exercise

12 **Grid Integration**

- 12.1.1 Stability of Synchronous Generator
- 12.1.2 Stability of the Induction Generator
- 12.1.3 System wide Stability
- 12.2 Fault Ride-Through, Low-Voltage Ride-Through
- 12.2.1 Impact of Fault on WTs
- 12.2.1.1 Current
- 12.2.1.2 Reactive Power
- 12.2.1.3 Mechanical Stress
- 12.2.2 LVRT Requirements
- 12.2.3 LVRT Compliance Techniques
- 12.2.3.1 Ramping Control
- 12.2.3.2 Dynamic Braking
- 12.2.3.3 Dynamic Voltage Restorer
- 12.3 Variability of the Wind Power Production
- 12.3.1 Uncertainty of Wind Speed
- 12.3.1 Variability of Wind Power Output
- 12.3.3 Balancing Wind Energy
- 12.3.3.1 Energy Storage
- 12.3.3.2 Load Management
- 12.4 *Reactive Power*
- 12.4.1 Turbine Reactive Power Control
- 12.4.2 Static VAR Compensator
- 12.4.2.1 Thyristor-Controlled Reactor
- 12.4.2.2 Thyristor-Switched Capacitor
- 12.4.2.3 TSR-TSC
- 12.4.2.4 Static Compensator
- 12.4.3 Synchronous Condenser
- Exercise

Index

VECTOR GRAPHICS

(VG-401)

MARBELLA INSTITUTE OF TECHNOLOGY

Course Utility

TOTAL HOURS: 20

CREDITS: 2

Vector Graphics is for the designer of professional illustrations, being drawings or text presentations with high degree of variables, finishes and definition. No matter how large the output is in printer, plotter, vinyl cutter or CNC router the definition is never pixelated because the graphics are stored in coordinates. This becomes very useful in quality work for sign production, and the advantage of simplicity and high speed at which professional work can be created and executed.

Course Purpose

Master the use of Vector Graphics by experiencing parameters of the program thru projects, from simple to more complex, increasing your abilities and obtain the best results in graphic design speed, quality and presentation.

Text Book

'Inkscape: Guide to a Vector Drawing Program, 4th Edition': the best guide for the course to learn about Inkscape With coverage of versions 0.47 and 0.48.

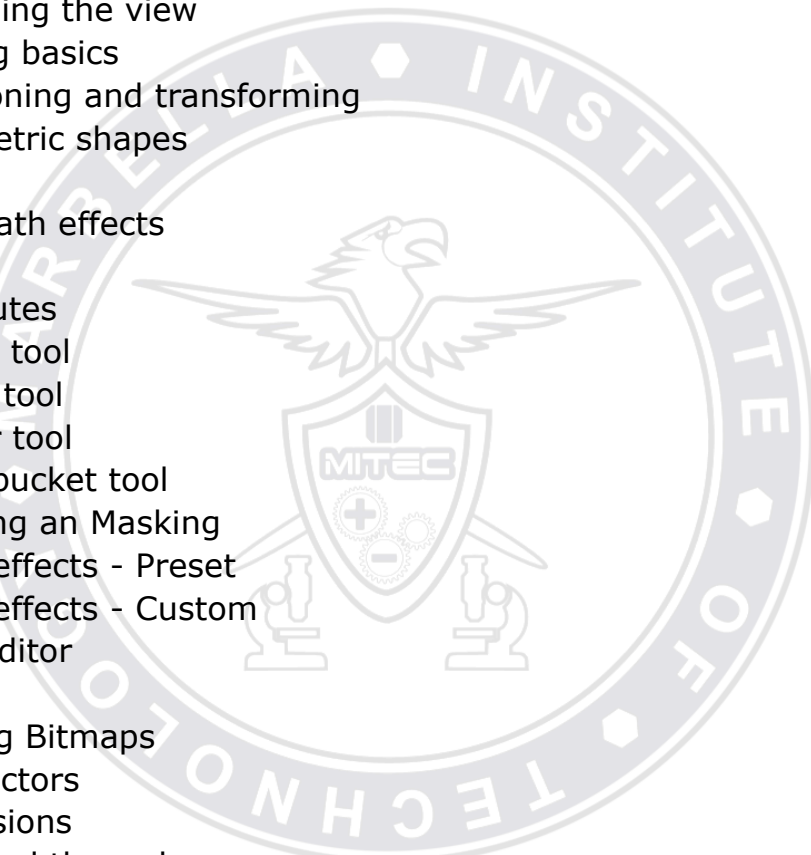
The book is an ideal introduction and reference. Features hundreds of useful illustrations. Using Inkscape, you can produce a wide variety of art, from photorealistic drawings to organizational charts. Inkscape uses SVG, a powerful vector-based drawing language and W3C web standard, as its native format. SVG drawings can be viewed directly in browsers such as Firefox, Opera, Chrome, Safari, and Internet Explorer 9. A subset of SVG has been adopted by the mobile phone market.

Systematic coverage of the entire Inkscape program begins with twelve tutorials ranging in difficulty from very basic to highly complex. A new tutorial introduces the use of interactive SVG in HTML5. The remainder of the book covers each facet of Inkscape in detail, with an emphasis on practical solutions for common problems. The book is filled with valuable tips and warnings about the use of Inkscape and SVG.

Inkscape is available free for Windows, Macintosh, and Linux operating systems. Thus, the most used and powerful choice for vector graphics today.

COURSE OUTLINE

- UNIT 1 Quickstart - Basics with examples
- UNIT 2 Files
- UNIT 3 Changing the view
- UNIT 4 Editing basics
- UNIT 5 Positioning and transforming
- UNIT 6 Geometric shapes
- UNIT 7 Paths
- UNIT 8 Live path effects
- UNIT 9 Text
- UNIT 10 Attributes
- UNIT 11 Tweak tool
- UNIT 12 Spray tool
- UNIT 13 Eraser tool
- UNIT 14 Paint bucket tool
- UNIT 15 Clipping and Masking
- UNIT 16 Filter effects - Preset
- UNIT 17 Filter effects - Custom
- UNIT 18 XML Editor
- UNIT 19 Tiling
- UNIT20 Tracing Bitmaps
- UNIT 21 Connectors
- UNIT 22 Extensions
- UNIT 23 SVG and the web
- UNIT 24 Customization
- UNIT 25 Using the command line
- UNIT 26 Challenges
- UNIT 27 Inkview
- UNIT 28 File format
- UNIT 29 Spheres
- UNIT 30 Solutions for challenges
- UNIT 31 List of dialogs
- UNIT 32 Tips for Illustrator converts



WEB DESIGN

(WD-42)

MARBELLA INSTITUTE OF TECHNOLOGY

Course Utility

TOTAL HOURS: 20

CREDITS: 2

Web Design covers web site production with one of the most valued software available: Web Plus X6.

Web Plus X6 is the quick and easy way for businesses, clubs, or anyone to create and publish eye-catching desktop and mobile sites, without having to use any code. Whether using stylish templates or designing from scratch, X6 lets regular computer users add advanced features to unique sites with drag-and-drop simplicity. The choice for Web Plus X6 is due to its balance between wide range of controls, and low cost to acquire. Hence, being one of the preferred software for web design.

Course Purpose

It's ideal for creating pages optimized for any device, and has all the power and flexibility you need to make a professional website. If you need a website, but don't want the expense and hassle of hiring a web designer, use Web Plus X6 and find out how easy it is to create something you'll be proud of.

Dominate the use of *Web Plus X6* thru exercises that test the parameters, following an organized sequence to experience the full variety of possibilities in web production. Learn to modify, edit and publish easily with this professional tool, and stay ahead of other competitors in cost savings, speed of page creation and versatility with the highest quality assets available for you.

Boost your productivity with Web Plus X6 and enjoy the highly intuitive user interface.

Text Book

'*Web Plus X6*' is the perfect reference tool to not miss out the basics of web production and transition from basic to advanced level projects.

- * Customize and create your own stylish website with no coding
- * Build sites optimized for smart phones, tablets, desktops, and laptops
- * Sell products online with trusted e-commerce providers
- * Drag and drop buttons, logos and more onto your pages
- * Add Facebook and Twitter feeds as well as other social media sharing buttons
- * Edit photos, create logos and colour schemes, design backgrounds and more
- * Create as many unique sites as you want, with no limits on pages or features

COURSE OUTLINE

UNIT 1 Setting up sites and pages

UNIT 2 Layout Items

UNIT 3 Navigation items

UNIT 4 Interactive objects

UNIT 5 External/Managed content

UNIT 6 Social media

UNIT 7 Media

UNIT 8 Forms

UNIT 9 E-Commerce Objects

UNIT 10 Text

UNIT 11 Assets for creativity

UNIT 12 Previewing and publishing

UNIT 13 Site validation and analysis

UNIT 14 Additional Information

UNIT 15 Index



PUBLISHING

(PB-405)

MARBELLA INSTITUTE OF TECHNOLOGY

Course Utility

TOTAL HOURS: 20

CREDITS: 2

'Publishing' prepares the student to produce high quality presentations with Page Plus. PagePlus is the easiest way to get superior publishing results, whether on your desktop or via professional printing. It's simple for anyone to create, publish and share their designs as outstanding printed documents, stunning PDFs, PDF slideshows, tables, charts, modern eBooks or via web page.

Course Purpose

To master the publishing skills thru powerful software that yields professional presentations while reducing the time of production. Step-by-step projects bring the student's confidence levels up to a professional publishing level.

Text Book

'Page Plus X7' from Serif comes with an impressive selection of design templates, creative content, and styles for you to use. As a result, publishing to a professional standard is easily achievable for experienced and inexperienced users alike.

You'll also be able to reuse existing content by importing PDF documents and word processing documents. On the flipside, you'll be able to export drawn objects to all the latest graphic file formats. Here are some of the powerful features of Page Plus X7:

- * Startup assistant
- * Fast intuitive creations
- * Attractive eye catching charts
- * Accelerated graphics technology
- * Helpful guidance with smart hints
- * Easy access to 2D/3D effects
- * Create as many unique sites as you want, with no limits on pages or features
- * CMYK color palette and multicoloring themes
- * Fills are solid, gradient or bitmap
- * Multiple objet blending
- * Radial, plasma, square three color and four color fills
- * Vector drawings (SMF, WMF, EMF or SVG)
- * Numerical cell formatting
- * Multiformat import and export (PDF, SVG, grayscale)
- * Page order thumbnails
- * Assigning of multiple master pages

CONTENTS:

UNIT

- 1 **Welcome**
 - Welcome!
 - New features
 - Installation
- 2 **Getting Started**
 - Startup Assistant
 - Creating a publication from a design template
 - Starting a new publication from scratch
 - Opening existing publications
 - Saving your publication
- 3 **Pages**
 - Setting up a publication
 - Adding, removing, and rearranging pages
 - Understanding master pages
 - Using page numbering
 - Navigating pages
 - Viewing pages
 - Working with layers
- 4 **Assets for Creativity**
 - Using assets
 - Browsing
 - Contents
- 5 **Manipulating Objects**
 - Selecting an object
 - Selecting multiple objects
 - Creating groups
 - Copying, pasting, and duplicating objects
 - Moving objects
 - Resizing objects
 - Ordering objects
 - Aligning and distributing objects
 - Rotating an object
 - Anchoring objects to text
 - Updating and saving defaults
- 6 **Text**
 - Understanding text frames
 - Fitting text to frames
 - Linking text frames
 - Using artistic text
 - Putting text on a path
 - Editing text on the page
 - Setting text properties

- Using fonts
- Using text styles
- Wrapping text
- Creating a bulleted or numbered list
- Inserting user details
- Contents
- 7 **Tables, Charts, and Calendars**
 - Creating tables
 - Flowing tables
 - Using charts
 - Inserting a calendar
- 8 **Pictures**
 - Adding picture frames
 - Adding pictures
 - Cropping pictures
 - Using Cutout Studio
 - Adjustments and effects
- 9 **Lines and Shapes**
 - Drawing and editing lines
 - Drawing and editing shapes
- 10 **Effects and Styles**
 - Applying effects
 - Using the Shadow Tool
 - Using object styles
- 11 **Color, Fills, and Transparency**
 - Applying solid fills
 - Using color schemes
 - Gradient and bitmap fills
 - Working with transparency
 - Understanding blend mode
 - Contents
- 12 **Publishing and Sharing**
 - Preflight check
 - Interactive Print/PDF Preview
 - Printing basics
 - Publishing PDF files
 - Creating a PDF bookmark list
 - Creating a PDF slideshow
 - Publishing as eBooks
 - Exporting as a picture
- 13 **Professional Publication**
 - Publish your own presentation

BASIC ELECTRONICS

(ES-301)

MARBELLA INSTITUTE OF TECHNOLOGY

Course Utility

TOTAL HOURS: 20

CREDITS: 2

Basic Electronics is a solid base for understanding of individual electronic components and how they can interact with each other for building utilities.

Course Purpose

Basic Electronics is for the student that initiates in electronics, and wants to gain confidence thru highly-practical projects. The projects are related to each-other, allowing progressive complexity. The students can test, monitor and control components, mostly with Arduino platforms which are the fastest developing and most versatile products of today's electronic market.

Text Book

This intuitive guide shows how to wire, disassemble, tweak, and re-purpose everyday devices quickly and easily. Packed with full-color illustrations, photos, and diagrams, *Hacking Electronics* teaches by doing--each topic features fun, easy-to-follow projects. Discover how to hack sensors, accelerometers, remote controllers, ultrasonic rangefinders, motors, stereo equipment, microphones, and FM transmitters. The final chapter contains useful information on getting the most out of cheap or free bench and software tools.

- Safely solder, join wires, and connect switches
- Identify components and read schematic diagrams
- Understand the how and why of electronics theory
- Work with transistors, LEDs, and laser diode modules
- Power your devices with a/c supplies, batteries, or solar panels
- Get up and running on Arduino boards and pre-made modules
- Use sensors to detect everything from noxious gas to acceleration
- Build and modify audio amps, microphones, and transmitters
- Fix gadgets and scavenge useful parts from dead equipment

COURSE OUTLINE

UNIT 1 **Getting Started**

Class

- 1 Getting stuff
- 2 How to strip a wire
- 3 How to join wires together by twisting
- 4 How to join wires by soldering
- 5 How to test a connection
- 6 How to hacking a computer fan to keep soldering fumes away

UNIT 2 **Theory Guides**

Class

- 7 How to assemble a starter kit of components
- 8 How to identify electronic components
- 9 What are current, resistance and voltage?
- 10 What is power?

UNIT 3 **Basics**

Class

- 11 How to make a resistor get hot
- 12 How to use resistors to divide a voltage
- 13 How to convert a resistance to a voltage
- 14 How to hack a push light to make it light sensing
- 15 How to choose a transistor
- 16 How to use a power MOSFET to control a motor
- 17 How to select the right switch

UNIT 4 **Led Hacks**

Class

- 18 How to stop an LED burning out
- 19 How to select the right LED for the job
- 20 How to use an LM317 to make a constant current driver
- 21 How to measure the forward voltage of an LED
- 22 How to power large numbers of LEDs
- 23 How to make LEDs flash
- 24 How to use strip board (LED flasher)
- 25 How to use a laser diode module
- 26 Hacking a slot car racer

Unit 5 **Batteries and Power**

Class

- 27 Select the right battery
- 28 Charging batteries (in general)
- 29 How to charge a NiMh Battery
- 30 How to charge a sealed lead acid battery
- 31 How to charge a LiPo Battery
- 32 Hacking a cell phone battery
- 33 Controlling the voltage from a battery
- 34 Boosting voltage
- 35 Calculating how long a battery will last
- 36 Battery backup
- 37 How to use solar cells

Unit 6 **Arduino Hacks**

Class

- 38 How to set up Arduino (and blink an LED)
- 39 How to make an Arduino control a relay
- 40 How to hack a toy for Arduino control
- 41 How to measure voltage with Arduino
- 42 How to use Arduino to control an LED
- 43 How to play a sound with an Arduino
- 44 How to use Arduino Shields
- 45 How to control a relay from a web page
- 46 How to use an Alphanumeric LCD shield with Arduino
- 47 How to drive a servo motor with an Arduino
- 48 How to Charlieplex LEDs
- 49 How to use a 7-segment display with an Arduino (I2C)
- 50 How to make an automatic password typer

Unit 7 **Module Hacks**

Class

- 51 How to use a PIR motion sensor module
- 52 How to use ultrasonic range finder modules
- 53 How to use a wireless remote module
- 54 How to use a wireless remote module with Arduino
- 55 How to control motor speed with power MOSFET
- 56 How to control motors with an H-bridge module
- 57 How to control a stepper motor with an H-bridge module
- 58 How to make a simple robot rover
- 59 How to use a 7-segment LED display module
- 60 How to use a real time clock module

Unit 8 **Hacking with sensors**

Class

- 61 How to detect noxious gas
- 62 How to measure something's color
- 63 How to detect vibration
- 64 How to measure temperature
- 65 How to use an accelerometer
- 66 How to sense magnetic fields

Unit 9 **Audio Hacks**

Class

- 67 Hacking audio leads
- 68 How to use a microphone module
- 69 How to make an FM bug
- 70 Selecting loudspeakers
- 71 How to make a 1W audio amplifier
- 72 How to generate tones with a 555 timer
- 73 How to make a USB music controller
- 74 How to make a software VU meter

Unit 10 **Take Electronic Devices Apart**

Class

- 75 How to avoid electrocution
- 76 How to take something apart AND put it back together again
- 77 How to check a fuse
- 78 How to test a battery
- 79 How to test a heating element
- 80 Finding and replacing failed components
- 81 How to scavenge useful components
- 82 How to reuse a cell phone power adapter

Unit 11 **Tools and Testing**

Class

- 83 How to use a multimeter (general)
- 84 How to use a multimeter to test a transistor
- 85 How to use a lab power supply
- 86 Introducing the oscilloscope
- 87 Software tools



COURSE CATALOG 2016



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