

BSc (Hons) Sustainable Product Design- (E304)

1. Introduction

Sustainable development, resource-efficient products and services and transition to a low-carbon economy is strategic for small island states like Mauritius. Mauritius has limited natural capital (fresh water, land, and forests), fragile ecosystems and significantly unique biodiversity. The unchecked erosion or degradation of the natural capital would be irreversible with potentially unknown risks and damaging consequences.

*'Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs'**. Sustainable development therefore requires that each generation should pass on to the next generation at least as large a productive base as it inherited. Resource-constrained states should formulate policy and act now before the costs of sustainable development become unaffordable.

Sustainable design is a key component of sustainable development. Worldwide there are intense social, economic and environmental concerns with respect to the broad manufacturing and service sectors as globalised supply chains; fast commoditisation, higher disposable incomes and rampant consumerism drastically inflate the carbon footprint of these sectors. There is thus a critical need to integrate relevant technology, best practices and the human element that would lead to the emergence of an ethical and sustainable manufacturing and services sector in Mauritius. Moreover, Mauritius is regarded as a high-end tourist destination and eco-tourism is, therefore, a potential growth area. Mauritius lies almost at the centre of the trade corridor between Africa and Asia. It has the opportunity to position itself as an ethical, fair and sustainable supplier of goods and services, mainly focusing on the fundamental 'customer-service' part of the value-chain.

The programme will therefore equip potential students with knowledge, insights and future strategies in the broad area of social, ethical, environmental and economic sustainability.

*The Brundtland Commission Report, 1987.

2. Scope

While there is no clear demarcation between design-driven versus functionality-driven consumer goods, for the purpose of this programme of study and research/students' projects the following largely design-driven products would be considered:

Textiles, clothing, leather and footwear products, sports goods, toys, interior products made of different materials such as decorative furniture/objects, floor, wall and window coverings, kitchen ware, glassware and spectacles, watches, jewellery, bags & accessories as well as the design oriented packaging of these products. Primarily function-driven consumer goods categories such as motor vehicles, consumer electronics or white goods **will not be considered** although these do rely on design to add value and achieve competitive advantage/differentiation.

3. Employability

Nowadays, it is considered that the human resource is the most valuable asset of any successful organisation. However, the current lack of trained personnel with a holistic background in the field of sustainability is strongly being felt by many authorities worldwide. This programme will, therefore, attempt to fill this gap by providing potential students with a sound academic and practical understanding of the technological, managerial, financial and social dimensions of sustainability. Such graduates will be able to integrate the line management and middle management levels of both manufacturing and service companies directly or indirectly related to the design industry. They will be able to assist relevant institutions and contribute intensively in policy-making, planning, implementation and forecasting from a 'sustainability' perspective. Furthermore, they will constitute a pool of qualified persons who may readily cope and keep pace with the continuous and rapid evolution of sustainability issues in the various sectors of the industry. The graduates will be expected to find entry in the job market as trainee managers, technologists, sustainability executives, product designers, merchandisers, planning and marketing officers, corporate social responsibility officers, and other related positions.

4. Aim

The aim of this programme is to produce graduates with a sound understanding of sustainability concepts, their implications and practical applications in the field of product design.

The objectives of this programme are:

- to introduce interdisciplinary concepts and tools that would holistically address issues such as sustainable development, sustainable wealth creation, climate change, biodiversity, corporate social responsibility, etc;
- to introduce applied sustainability concepts in product design, product life cycles, technology integration, sustainable materials and packaging, recycling, and waste management, with a view to reduce the carbon footprint of industry and associated services;
- to highlight the concepts of energy efficiency, energy conservation, and integration of renewable energies in the manufacturing and services sector;
- to introduce concepts of optimisation in logistics such as distribution routes, fuel-efficient transportation and the reduction of logistics packaging materials;
- to consolidate and increase awareness of social, ethical and environmental standards in manufacturing and services.

5. General Entry Requirements

As per General Entry Requirements for admission to the University for Undergraduate Degrees

6. Programme Requirements

Five credits at SC/ 'O' Level, including Mathematics.

Any 2 GCE ‘A’ Level Passes. A Foundation in Art, Design & Technology or in a design-related subject awarded by a recognised awarding body is also acceptable as NQF level 5.

OR alternative qualifications acceptable to the UoM

In case of a tie between applicants’ grades, preference will be given to candidates having studied design-related subjects at ‘A’ level, such as Design and Technology.

7. (i) **Minimum Requirements for Degree Award** – 103 credits

(ii) **Minimum Requirements for Diploma Award** – 60 credits

A student may exit with a Diploma provided s/he satisfies the following minimum requirements, Table hereunder. The request for exit at the Diploma level should be made in writing to the Dean of Faculty. A Diploma project is compulsory and would normally be of 12 weeks duration, commensurate with work input of at least 90 contact hours. Diploma Project carries 5 credits.

Minimum Credits Required for the Award

MODULES	Minimum Credits Required	
	Degree	Diploma
GEM	3	3
Humanities & Management	15	9
Technology & Engineering	15	9
Departmental	70	39
TOTAL	103	60

8. **Programme Duration : Full-Time**

	Normal (Years)	Maximum (Years)
Degree:	3	5

9. **Credits per Year**

Minimum 6, Maximum 48, subject to Regulations 7 & 8 above.

10. **Assessment**

Examinable Modules

A given module can either be taught in semester 1 only or in semester 2 only or throughout the two semesters.

Assessment will be based on a written examination of 2 to 3-hour duration (normally a paper of 2-hour duration for modules carrying less or equal to 3.5 credits and a 3-hour paper for modules carrying five or more credits) and on continuous assessment carried out during the semester or year.

Written examinations for all yearly modules will be carried out at the end of the academic year. Written examinations for semester modules will be carried out at the end of each respective semester.

The continuous assessment will count for 20-40% of the overall percentage mark of the module(s), except for a Programme where the structure makes for other specific provision(s). Continuous assessment may be based on laboratory work, seminars and at least 2 assignments/tests per year per module.

There will be a compulsory class test for all modules at the end of the semester/academic year, unless otherwise stated in the programme structure.

An overall total of 40% for combined continuous assessment and written examination components would be required to pass the module, without any minimum thresholds within the individual continuous assessment and written examination. The same criterion will apply for modules being assessed jointly.

Special examinations (e.g. class tests) will be arranged at the end of semester 1 or semester 2 for exchange students who have registered only for one semester. In case of yearly modules, credits will be assigned on a pro-rata basis.

The following modules will be assessed as specified hereunder:

DASE 1103Y(3), DASE 1101Y(3), DASE 1201(3), CSE 2014Y(3) & DASE 2102Y(3)

There will be a minimum of 3 assignments and 1 mini-project per yearly module, and/or a minimum of 1 assignment and/or 1 mini-project per semester module, which will account for 60% of total marks. A final assessment based on 40% of total marks will be conducted at the end of the semester/academic year by the resource person concerned under examination conditions.

11. GEMs

GEMs are 'General Education Modules'. Students are allowed to choose any GEM on offer, at the start of the semester.

12. List of Modules – BSc (Hons) Sustainable Product Design

CORE MODULES

Code	Module Name	Hrs/Wk L+P	Credits
Humanities & Management			
COMS 1010(1)	Communication Skills	D.E.	3
MGT 1102(1)	Fundamentals of Entrepreneurship	3+0	3
MGT 2088(3)	Business Planning and Development	3+0	3
Technology & Engineering			
DASE 1104(1)	Computer Applications for Designers	2+2	3
CSE 1242 (1)	Human Computer Interaction	3+0	3
CSE 2014Y(3)	Graphic Design	1+4	6
Departmental			
DASE 1101Y(1)	Applied Drawing Techniques	1+4	6
DASE 1102Y(1)	Materials I	3+2	8
DASE 1202(1)	Biodiversity & Climate Change	3+0	3
DASE 1103Y(3)	Fundamentals of Design	1+4	6
DASE 2001(1)	Philosophy of Design	3+0	3
DASE 2100Y(3)	Materials II	3+2	8
DASE 2101Y(3)	Sustainable Business Practices	3+0	6
DASE 2102Y(3)	Sustainable Product Design & Prototyping	1+4	6
DASE 3010Y(5)	Sustainability Standards & Auditing	3+0	6
DASE 1200	Industrial Placement I	8 weeks	0
DASE 2200	Industrial Placement II	8 weeks	0
DASE 3000Y(5)	Sustainable Design Project	0+12	6
DASE 3001Y(5)	Dissertation	-	9
GEM		3+0	3
TOTAL (Departmental)			67

ELECTIVES

Code	Module Name	Hrs/Wk L+P	Credits
Humanities & Management			
DASE 1100Y(1)	Business Language	3+0	6
MGT 1067Y(1)	Principles and Practice of Management	3+0	6
MGT 2083Y(3)	Brand Management	3+0	6
Technology & Engineering			
DASE 1201(3)	Creativity and Innovation	2+2	3
DASE 2201(3)	Quality Concepts	3+0	3
Departmental			
ECON 2191(3)	Economics of Sustainability	3+0	3
DASE 2103Y(3)	Low Carbon Logistics & Supply Chain Management	3+0	6
DASE 3100(3)	Consumer Education & Empowerment	3+0	3

YEAR 1							
Semester 1				Semester 2			
Code	Module Name	Hrs/ Wk L+P	Credits	Code	Module Name	Hrs/ Wk L+P	Credits
SEMESTER CORE MODULES							
GEM		3+0	3				
DASE 1104(1)	Computer Applications for Designers	2+2	3	DASE 1202(1)	Biodiversity & Climate Change	3+0	3
COMS 1010(1)	Communication Skills	D.E.	3	DASE 1200	Industrial Training 1	8 wks	0
MGT 1102(1)	Fundamentals of Entrepreneurship	3+0	3				
YEARLY CORE MODULES							
DASE 1101Y (1)	Applied Drawing Techniques					1+4	6
DASE 1102Y(1)	Materials I					3+2	8
DASE 1103Y(3)	Fundamentals of Design					1+4	6
YEARLY ELECTIVE MODULE							
DASE 1100Y(1)	Business Language					3+0	6
MGT 1067Y(1)	Principles & Practice of Management					3+0	6
SEMESTER ELECTIVE MODULE							
				DASE 1201(3)	Creativity & Innovation	2+2	3
YEAR 2							
Semester 1				Semester 2			
Code	Module Name	Hrs/Wk L+P	Credits	Code	Module Name	Hrs/Wk L+P	Credits
SEMESTER CORE MODULES							
DASE 2001(1)	Philosophy of Design	3+0	3	DASE 2200	Industrial Training 2	8 wks	0
MGT 2088(3)	Business Planning and Development	3+0	3	CSE 1242 (1)	Human Computer Interaction	3+0	3
YEARLY CORE MODULES							
DASE 2100Y(3)	Materials II					3+2	8
DASE 2101Y(3)	Sustainable Business Practices					3+0	6
CSE 2014Y(3)	Graphic Design					1+4	6
DASE 2102Y(3)	Sustainable Product Design & Prototyping					1+4	6
YEARLY ELECTIVE MODULE							
DASE 2103Y(3)	Low Carbon Logistics & Supply Chain Management					3+0	6
SEMESTER ELECTIVE MODULE							
ECON 2191(3)	Economics of Sustainability	3+0	3	DASE 2201 (3)	Quality Concepts	3+0	3

YEAR 3							
Semester 1				Semester 2			
Code	Module Name	Hrs/ Wk L+P	Credits	Code	Module Name	Hrs/Wk L+P	Credits
YEARLY CORE MODULES							
DASE 3010Y(5)	Sustainability Standards & Auditing					3+0	6
DASE 3000Y(5)	Sustainable Design Project					0+12	6
DASE 3001Y(5)	Final Year Dissertation					-	9
YEARLY ELECTIVE MODULE							
MGT 2083Y(3)	Brand Management					3+0	6
SEMESTER ELECTIVE MODULE							
DASE 3100(3)	Consumer Education & Empowerment	3+0	3				

13. OUTLINE SYLLABUS

This outline syllabus is not prescriptive and is intended to serve as a guide only.

COMS 1010(1) - COMMUNICATION SKILLS

Writing skills, non-verbal communication, modes of speech delivery and presentation aids, speeches, perception and listening skills, business and technical writing

DASE 1104(1) – COMPUTER APPLICATIONS FOR DESIGNERS

Basic concepts in computer methods: Simple Algorithms, Flowcharts and Pseudo-codes. Application software for designers: e.g. SolidWorks, Eco-design software, Autodesk Maya. CAD/CAM applications in the design industry, 3D Printing.

CSE 1242(1) – HUMAN COMPUTER INTERACTION

Introduction to HCI, Human Characteristics, The Computer and I/O Devices Capabilities, Principles of Good Screen Design, Development of System Menus and Navigation Schemes, Interaction Styles, Characteristics of Graphical and Web User Interfaces, HCI in the Software Process, Implementation Support, Evaluation Techniques, Cognitive Models, Tasks Analysis, UI and Data Visualisation, Designing User Interfaces for Embedded Devices.

DASE 1100Y(1) BUSINESS LANGUAGE

In a given academic year, students would be required to register for ONE business language amongst Mandarin, Spanish and German. However, the offer of this elective module would depend on a critical mass of students registering for this module.

DASE 1101Y(1) APPLIED DRAWING TECHNIQUES

Introduction to drawing practice and basic standards. Freehand sketching: Drawing of 3D objects, shapes, human body and character. Proportions. Perspective drawing. Use of different pencil types and colouring and inking. Geometrical constructions; curves, blending of curves; locus, ellipse. True lengths & true shapes. Introduction to development (prisms, cylinders and truncated parts); Systems of projection; auxiliary views. Basic dimensioning. Sections of 3D object of different materials and sectional views. Scales. Introduction to AutoCAD 2008: Basic draw commands, View commands, modify & construct commands, text, object snap, layer creation and management, hatching, dimensioning.

DASE1102Y(1) MATERIALS I

This module covers the production, structure, properties and applications of fibrous polymeric materials such as cellulosic, protein fibres, plant fibres and their organic counterparts. Fair-trade materials. Sustainable materials. Man-made and wood fibres. Bagasse. Aramid, carbon, alginate and silica glass fibres. Engineered fibrous assemblies. Glass, recyclable glass. Paper and board, carton board, corrugated board. Clays. Metals. Recycling.

DASE 1103Y(3) FUNDAMENTALS OF DESIGN

A study of the basic elements and principles of design such as line, shape, space, texture, value and colour, as well as describing the principles of design which are movement, emphasis, balance and unity and understand how they are applied to product design; the relation of colour in all aspects of design with its multitude of definitions, concepts and design applications; the definitions and study of colour harmony and formulas, colour schemes; colour psychology and philosophy in design and how it conveys meanings; natural associations and psychological symbolism; design requirement and awareness of colour and its communicating aspects; colour therapy in design; work supported by mini-projects.

DASE 2001(1) PHILOSOPHY OF DESIGN

The design process: complexities and uncertainties; originality, functionality, usability. Case studies of philosophies that have guided well known contemporary designers through their different schools of thought and influences in the era they lived in: e.g. Yasuo Kuroki, Sony Corporation; Sir Alec Issigonis: The Mini. Cradle to grave and cradle to cradle. Designers as agents of change: intellectual stimulation, approaches, meanings, purposes and concepts.

DASE 1201(3) CREATIVITY & INNOVATION

Processes of original and creative thinking; lateral thinking; generation of innovative ideas/concepts and their manifestation from thought into reality; use of experiential methods (meaning from direct experience) including case studies and team projects to demonstrate the process of creative thinking and generation of innovative ideas. The module focuses on stimulating creativity in individuals and helping students to identify factors that promote and inhibit creativity & innovation. Studio-based assignments

DASE 1202(1) BIODIVERSITY & CLIMATE CHANGE

Introduction to the causes and adverse effects of climate change and adaptation strategies. The value of biodiversity to mankind and ecosystems. The importance of functioning of ecosystems. Knock-on effects of the loss of biodiversity from rainforests through indigenous species to fish stocks. Biodiversity profiles of Mauritius, Rodrigues and Australia. Endemic species. Restoration of dying rivers and seas. Profit, greed and multinationals. Sustainable development: the triple bottom line. Case studies.

MGT 1067Y(3) PRINCIPLES & PRACTICE OF MANAGEMENT

Part 1: The study of organizations; The environment of Organizations; Evolution of Management theory; Management concepts; Functional Areas of Management: Production, Finance, HR and Marketing, The Managerial functions of Planning, Leading, Organising, Controlling; Managerial Skills. Part 2: Managing individuals in organisations: Managing differences; Motivation, Managing Groups and Teams: Group behaviour; Conflict and co-operation; Power and Politics; Leadership; Social Responsibility. Part 3: Managing Structure and processes: Organisational structure; Job design; Restructuring, Communications, Careers, Change; Diversity; Knowledge Management. Part 4: Evolution of Marketing, Marketing Mix, 4 Ps of marketing.

DASE 2100Y(3) MATERIALS II

This module covers the production, structure, properties and applications of these materials: Plastics (PET & HDPE, rPET, rHDPE). Polylactic Acid (PLA), thermoplastic starch materials (TSM), Polyglycolide Acid (PGA), Polycaprolactone (PCL). Conductive polymers. Adhesives, coatings and laminates. Biodegradable and compostable packaging. Introduction to composites. Fibres as re-inforcements for composite materials. Introduction to biomaterials and their applications.

P.S. Semiconductors and electronic materials will not be covered.

DASE 2101Y(3) SUSTAINABLE BUSINESS PRACTICES

This module will be broad based and will look at sustainable business practices in a number of key sectors of the Mauritian economy, from manufacturing through agriculture to luxury hotels. The triple bottom line: economic, social and environmental activities and their interactions. Rainwater harvesting (water positive), Reforestation (carbon positive). Initiatives for reducing emissions and achieving carbon neutrality. Cleaner production technologies. ISO 14000 Standards; Environmental Management Systems (EMS)/Environmental Auditing. Re-use, reduce, recycling. Renewable energies. Smart electricity grids.

DASE 2102Y(3) SUSTAINABLE PRODUCT DESIGN AND PROTOTYPING

The 5E's of sustainable product design: Equality, Economy, Ecology, Elegance and Enjoyment. The `MET Matrix. Biomimicry. Product lifecycle analysis: potential for carbon reduction starting from sourcing of raw materials, through manufacturing, packaging, distribution, customer use and end-of-life disposal. Kinds of ecological impacts, and methodologies for comparing them. Key assumptions for an LCA. Interpreting LCA results, sensitivity analysis, software tools, energy effectiveness, reducing material use through engineering. Durability, and expandability. 'Demanufacturing' through take-backs and product-service systems. Design for recyclability & reusability.

DASE 2103Y(3) LOW CARBON LOGISTICS & SUPPLY CHAIN MANAGEMENT

Concepts and tools for understanding a supply chain. Suppliers: risk assessment and opportunities; Transportation, packaging and logistics. Identifying issues of concern and opportunity related to sustainability; Supply chain audits and supplier partnerships: what works well and what are the dark areas for staff time and costs, waste, energy and carbon footprint: finding and reducing each while recovering the economic savings.

Carbon emissions-data, information, and knowledge management. Brokers, agents, logistics providers and other potential external barriers to maximizing value. Specification sheets, service level agreement, cost breakdown sheets and other internal barriers to integrating sustainability. Concerns and steps to bring environmental and social considerations into material, process and purchasing decisions. Reverse logistics.

CSE 2014Y(3) – GRAPHIC DESIGN

Fundamentals of digital design; overview of graphic systems, computer graphics, colour schemes in computer graphics; introduction to basic graphic design software: illumination and shading models, rendering techniques for shaded images, CAD, drawing, editing and presentation; a brief introduction to web design; use of colour in interactive design and animation; communication of digital design ideas using colour. New technological developments. Lab-based assignments.

DASE 2201(3) QUALITY CONCEPTS

Definition of Quality; Quality System Standards: ISO 9000. Quality gurus and quality concepts: Deming, Shewhart, Taguchi and Crosby. Quality control, Total Quality Management, Zero-defect concepts, six-sigma, statistical tools and analysis, Pareto Analysis, Cause and effect diagrams, Control charts, Process capability analysis. Quality Management in design and manufacturing processes; Quality costing.

ECON 2191(3) ECONOMICS OF SUSTAINABILITY

Externalities and market failures. Concepts of sustainable development: weak and strong sustainability. Economic measurement of environmental impacts, environmental accounting and valuation. Environmental policy instruments. Sustainability issues and competitive advantage, conservation-based green businesses. Environment and economic growth. Trade and sustainable development.

MGT 1102(1) - FUNDAMENTALS OF ENTREPRENEURSHIP

Concept of Entrepreneurship, Historical Evolution of Entrepreneurship, Overview of organizing, creating, developing and managing your own business, The Entrepreneurial Process, Definition of the Entrepreneur, Entrepreneurial traits, Entrepreneurship and SME, Entrepreneurships and large organizations, Challenges of Entrepreneurship

MGT 2088(3) --BUSINESS PLANNING AND DEVELOPMENT

Based on fundamentals of entrepreneurship and other management skills acquired in year 1, students will be expected to design and develop a business plan; Business Planning Process; Elements and Design of a

Business Plan; Synthesis of functions of the business (marketing, finance, accounting, legal etc) in a coherent format; Reflect on and apply the entrepreneurial process; team and networking strategies; personal development and self-directed learning; primary and secondary research; communication skills. The plan drawn can be for start up ventures or new projects launch within an existing business. This module will include 35 hours traditional face to face lecture and 10 hours practitioners' workshop.

DASE 3010Y(5) SUSTAINABILITY STANDARDS & AUDITING

An overview of national and international sustainability standards and auditing processes. Recent developments in Europe and US. European Union REACH legislation. Leadership in Energy and Environmental Design Certification (LEED); energy efficiency rating; Breeam (BRE Environmental Assessment Method); eco-efficient standards for lighting, heating, etc. Code of conduct for suppliers and manufacturers and sub-contractors; Corporate social responsibility; customer value-systems; empathetic communication; Inspiring real-world case studies and innovators.

DASE 3100(3) CONSUMER EDUCATION & EMPOWERMENT

Disseminate information and skills needed for finding practical solutions to environmental challenges. What is per capita ecological footprint: sensibilisation, education, reduction and management. Empower individuals and communities. Introduce practical topics such as building rainwater harvesting systems or building of low-cost solar heating systems. Energy consumption: washing, cooking lighting, commuting, etc. Impact of urbanisation & lifestyle choices. Waste to energy. Develop flexible, networked organisations for consumer education. The transition towards sustainability as a social learning process. Conceive systems that amplify feed-back and awareness and increase the system capability to learn from the experience and re-orient itself.

MGT 2083Y(3) BRAND MANAGEMENT

Introduction to branding, brand equity, customer based brand equity, identifying and establishing brand values, designing and managing brand elements, building brand image and customer loyalty, planning and implementing brand marketing programs, managing brand knowledge, measuring brand equity – qualitative and quantitative methods, brand management and new product development, the brand report card, brand architecture and extensions, branding and distribution and pricing policies, branding IMC and brand equity, measuring brand performance, brand differentiation and positioning, growing and sustaining brand equity, service branding, internet branding, global brands, managing brands overtime, brand rejuvenation – rebranding and repositioning.

DASE 3000Y (5) SUSTAINABLE DESIGN PROJECT

Students would be required to undertake a sustainable design project, work out a project proposal detailing the aim and objectives of the project. They would be encouraged to work in close collaboration with industry, civil society and relevant business sectors. Project exhibition and showcasing.

DASE 3001Y (5) FINAL YEAR DISSERTATION

Project related to sustainability, sustainable product design and related areas supported by a dissertation of about 8,000 to 12,000 words.