SAMPOERNA UNIVERSITY

MECHANICAL ENGINEERING DEGREE PLAN

YEAR 1, SEMESTER 1		
CODES	**COURSE TITLES**	**UNITS**
GMAT 1504	Calculus & Analytical Geometry I	5
GNGR 1301	Introduction to Engineering	3
GREL 1301	World Religions	3
GCHM 1301	General Chemistry I	3
GCHM 1101	General Chemistry I Lab	1
GENG 1301	Composition I	3
Total		18

YEAR 1, SEMESTER 2		
CODES	**COURSE TITLES**	**UNITS**
GMAT 2505	Calculus & Analytical Geometry II	5
GPHY 1401	General Physics with Calculus I	4
GPHY 1101	General Physics with Calculus I Lab	1
ENGR 1302	Introduction to Computer Programming	3
ENGR 1303	MATLAB I	1
ENGR 1304	Engineering Graphics	3
GENG 1302	Composition II	3
Total		20

YEAR 2, SEMESTER 3		
CODES	**COURSE TITLES**	**UNITS**
GMAT 2506	Calculus & Analytical Geometry III	5
GPHY 2402	General Physics with Calculus II	4
GPHY 2102	General Physics with Calculus II Lab	1
IENG 2303	Engineering Economics	3
ENGR 2101	MATLAB II	1
ENGR 2302	Statics	3
SPC 1608	Introduction to Public Speaking	3
Total		20

YEAR 2, SEMESTER 4		
CODES	**COURSE TITLES**	**UNITS**
GMAT 2307	Differential Equations	3
MECH 2301	Dynamics	3
MECH 2302	Thermodynamics	3
ENGR 2303	Electrical Circuits & Electronics	3
	General Education	3
ENC 2210	Professional & Technical Writing	3
Total		18

YEAR 3, SEMESTER 5		
CODES	**COURSE TITLES**	**UNITS**
MECH 3301	Engineering Analysis	3
MECH 3302	Fluid Mechanics	3
MECH 3303	System Dynamics and Modeling	3
MECH 3304	Strength of Materials	3
MECH 3105	Mechanical Engr.Design Lab	1
	General Education	3
GHUM 1301	Indonesian Language	3
Total		19

YEAR 3, SEMESTER 6		
CODES	**COURSE TITLES**	**UNITS**
MECH 3306	Numerical Methods	3
MECH 3307	Instrumentation & Measurement	3
ENGR 3301	Intro. to Materials Science	3
ENGR 3301L	Intro. to Materials Science Lab	1
MECH 3308	Machine Design	3
MECH 3399	Internship	3
	General Education	3
Total		19

YEAR 4, SEMESTER 7		
CODES	**COURSE TITLES**	**UNITS**
MECH 4398	Senior Capstone I	3
MECH 4201	Senior Mech. Laboratory	2
MECH 4102	Colloquium	1
MECH 4303	Heat Transfer	3
	Technical Elective	3
	General Education	3
GHUM 1301	Pancasila/Civic	3
Total		18

YEAR 4, SEMESTER 8		
CODES	**COURSE TITLES**	**UNITS**
MECH 4399	Senior Capstone II	3
MECH 4304	Mechanical Control Systems	3
	General Education	3
	Technical Elective (MECH 43XX)	3
	Technical Elective (MECH 43XX)	3
	Technical Elective (MECH 43XX)	3
Total		18

Total Credit Hours for Mechanical Engineering: 150 hours.

Course Descriptions:

The course descriptions below are for Mechanical Engineering (ME) courses only. For General Education courses, please refer to SUAC course descriptions.

1st SEMESTER

GMAT 1504 – Calculus & Analytical Geometry I (5 Credit Hours)

Introduction to calculus with an emphasis on understanding and problem solving. Concepts are presented graphically and numerically as well as algebraically. Elementary functions, their properties and uses in modeling; the key concepts of derivative and definite integral; techniques of differentiation, using the derivative to understand the behavior of functions; applications to optimization problems in physics, biology and economics. A graphing calculator is required for this course. We recommend the TI-83 or TI-84 models. Calculators that perform symbolic manipulations, such as the TI-89, NSpire CAS, or HP50g, cannot be used. Except as per University policy on repeating a course, credit will not be given for this course if the student has credit in a higher level math course. Such students may be dropped from the course. Examinations are proctored. Prerequisite(s): Math Placement.

GNGR 1301 – Introduction to Engineering (3 Credit Hours)

Engineering design, effective team participation and career preparation. Students are expected to participate in hands-on design projects, develop education/career plans and initiate development of the personal and management skills necessary for life long learning. Prerequisite(s): Concurrent enrollment or completion of GMAT 1504.

GCHM 1301 + GCHM 1101 – General Chemistry I + Lab (3 + 1 Credit Hours)

Integrated lecture-lab course designed to develop a basic understanding of the central principles of chemistry that are useful to explain and predict the properties of chemical substances based on their atomic and molecular structure. Additionally, students will be introduced to modern laboratory techniques and participate in experimental activities that promote the development of basic and advanced science-process skills. The course is designed for students who require a strong foundation in general chemistry, such as science and engineering majors, pre-medical and pre-pharmacy students. Prerequisite(s): none.

GENG 1301 – Composition (3 Credit Hours)

Exposition, emphasis on essays. Prerequisite(s): none.

GREL 1301 – World Religions (3 Credit Hours)

2nd SEMESTER

GMAT 2505 – Calculus & Analytical Geometry II (5 Credit Hours)

Continuation of MAC 2311. Techniques of symbolic and numerical integration, applications of the definite integral to geometry, physics, economics, and probability; differential equations from a numerical, graphical, and algebraic point of view; modeling using differential equations, approximations by Taylor series. A graphing calculator is required for this course. We recommend the TI-83 or TI-84 models. Calculators that perform symbolic manipulations, such as the TI-89, NSpire CAS, or HP50g, cannot be used. Examinations are proctored. Prerequisite(s): GMAT 1504.

GPHY 1401 + GPHY 1101 – General Physics with Calculus I + Lab (4 + 1 Credit Hours)

A first course in Newtonian mechanics; introduces freshman-level students to the statics and dynamics of point particles, rigid bodies, and fluids. Topics include vector algebra, projectile and circular motion, Newton's Laws, conservation of energy, collisions and conservation of momentum, rotational dynamics and conservation of angular momentum, statics, harmonic oscillators and pendulums, gravitation and Kepler's Laws, fluid statics and dynamics. Prerequisite(s): GMAT 1504 & concurrent enrollment or completion of GMAT 2505.

ENGR 1302 – Introduction to Computer Programming (3 Credit Hours)
Fundamentals of C, complexity and efficiency analysis, numerical precision and representations, intro to data structures, structured program design, application to solving engineering problems. Prerequisite(s): Concurrent enrollment or completion of GMAT 1504.

ENGR 1303 – MATLAB I (1 Credit Hour)
The MATLAB programming environment, arrays, creating and running script files, 2D plotting features, functions, programming elements, polynomials, curve fitting, and interpolation. Prerequisite(s): GMAT 1504.

ENGR 1304 – Engineering Graphics (3 Credit Hours)
Representations and analysis of systems of orthographic projection and graphical methods used in engineering design and production, correlated with technical sketching. Laboratory required. Prerequisite(s): None.

GENG 1302 –Composition II (3 Credit Hours)
Critical papers on selected subjects. Prerequisite(s): GENG 1301.

3rd SEMESTER

GMAT 2506 – Calculus & Analytical Geometry III (5 Credit Hours)
Vectors, differential and integral calculus of several variables. Examinations are proctored. Prerequisite(s): GMAT 2505 with C or better.

GPHY 2402 + GPHY 2102 – General Physics with Calculus II + Lab (4 + 1 Credit Hours)
A first course in electromagnetic fields and their applications. Coulomb's and Gauss' Law, electric fields and potentials, electrical and magnetic properties of matter, Ampere's and Faraday's laws, elementary DC and AC circuits, Maxwell's equations. Prerequisite(s): GPHY 1401 + GPHY 1101 & GMAT 2505.

IENG 2304 – Engineering Economics (3 Credit Hours)
Methods and modern techniques of engineering management analysis for financial decision making. Development of income, cash flow, and balance sheet statements. Topics include time value of money, valuation techniques, replacement analysis, and project acceptance criteria. Prerequisite(s): GNGR 1301 & GMAT 2505.

ENGR 2101 – MATLAB II (1 Credit Hour)
Two-dimensional arrays, manipulation of arrays, plots with special graphics, 3D plots, inline functions, solving a nonlinear equation with one variable, finding the maximum or minimum of a function. Prerequisite(s): ENGR 1303.

ENGR 2302 – Statics (3 Credit Hours)

Equilibrium of a particle, equivalent and resultant force systems, equilibrium, geometric properties of areas and solids, trusses, frames and machines, shear force and bending moments, friction. Honors section is available. Prerequisite(s): GPHY 1401 + GPHY 1101 & GMAT 2505.

SPC 1608 – Introduction to Public Speaking (3 Credit Hours)
This course is designed to provide students with fundamental training and practical experience for speaking in public, business, and professional situations. Topics include: audience analysis, speech anxiety, critical listening, and preparation and delivery of speeches in various cultural contexts. Students will also learn to effectively incorporate audio and visual aids/technologies for effective speeches. This is an International/Intercultural competency course. Prerequisite(s): GENG 1302.

4th SEMESTER

GMAT 2307 –Differential Equations (3 Credit Hours)
Solution methods for ordinary differential equations, qualitative techniques; includes matrix methods approach to systems of linear equations and series solutions. Examinations are proctored. Prerequisite(s): GMAT 2506 with C or better.

MECH 2301 – Dynamics (3 Credit Hours)
Dynamics of particles and rigid bodies as applied to mechanical systems. Prerequisite(s): CE 214. Prerequisite or concurrent enrollment in GMAT 2307.

MECH 2302 – Thermodynamics (3 Credit Hours)
Basic laws and examples of engineering applications of macroscopic thermodynamics; equations of state; reversible and irreversible processes. Prerequisite(s): GPHY 1401 + GPHY 1101.

ENGR 2303– Electrical Circuits & Electronics (3 Credit Hours)
Current and voltage dividers. Resistors, capacitors, inductors. Node voltage and mesh current analysis of circuits. Thevenin and Norton equivalents. AC circuits, phasors, impedance. Electromagnetic fields, electric power, transformers, magnetic materials, generators and motors. Operational amplifiers, Elements of digital circuits. Sensors and measurements of physical quantities. Prerequisite(s): GPHY 2402 + GPHY 2102.

ENC 2210 – Technical Writing (3 Credit Hours)
Analysis and presentation of scientific and technical information. Prerequisite(s): GENG 1302.

General Education (3 Credit Hours)

5th SEMESTER

MECH 3301– Engineering Analysis (3 Credit Hours)
Linear algebra, matrix eigenvalue problems, Fourier series, eigenfunctions, Laplace and Fourier transforms, and applications to ordinary and partial differential equations. Prerequisite(s): GMAT 2307.

MECH 3302 – Fluid Mechanics (3 Credit Hours)

Fundamentals of fluid mechanics covering properties of fluids, fluid statics, dynamics of incompressible viscous and inviscid flows, control volume formulations of continuity, momentum and energy equations, dimensional analysis, viscous pipe flow, boundary layers and drag. Prerequisite(s): MECH 2301, MECH 2302, and GMAT 2307.

MECH 3303 – System Dynamics and Modeling (3 Credit Hours)
Analysis of motions and forces in machines, design exercises. Prerequisite(s): MECH 2301.

MECH 3304 – Strength of Materials (3 Credit Hours)
Introduction to engineering solid materials; concepts of strain, stress, equilibrium; material/structural responses to applied loading/deflection; analysis of engineering components, e.g., beams, plates, thin-walled structures, axisymmetric elements; introduction to structural stability. Prerequisite(s): ENGR 2302.

MECH 3105 –Mechanical Engineering Laboratory (1 Credit Hour)
This course is designed to teach students practical approaches and limitations of manufacturing with an emphasis on metal working processes. Students begin with instruction on shop safety practices which includes OSHA standards/industrial safety as well as machine-specific safety practices. The students are then introduced to basic metal working techniques such as layout, use of hand tools, as well as set-up and operation of manual metalworking equipment including the metal lathe and milling machine. The students are introduced to the limitations of metal working through a discussion of the material removal process. Prerequisite(s): Advanced Standing Engineering.

GHUM 1302 – Indonesian Language (3 Credit Hours)

General Education (3 Credit Hours)

6th SEMESTER

MECH 3306 – Numerical Methods (3 Credit Hours)
Introduction to linear algebra; solution of engineering problems based upon an integrated approach combining numerical analysis and the use of computers. Prerequisite(s): ENGR 2101, MECH 2301, and MECH 3301.

MECH 3307 – Instrumentation & Measurement (3 Credit Hours)
Basic principles of laboratory practice and instrumentation; statistical measurement theory including probability distributions, finite statistics, uncertainty analysis regression analysis dynamics of measurement systems; transducers and signal conditioning circuits. Experiments using basic laboratory instrumentation on the speed of sound, temperature measurements, and the dynamic response of first and second order systems. Prerequisite(s): ENGR 2303 and MECH 3302.

MECH 3308 – Machine Design (3 Credit Hours)
Application of failure analysis methods to the design of specific machine components such as shaft, gear sets, bolted/riveted/welded joints, spring and slender/thin-walled structures. Prerequisite(s): MECH 3304.

ENGR 3301 – Introduction to Materials Science (3 Credit Hours)
Principles which underlie and relate the behavior, properties and processing of materials to their engineering applications. Prerequisite(s): concurrent enrollment in ENGR 3301L.

ENGR 3301L – Introduction to Materials Science Lab (1 Credit Hour)
Characterization of engineering materials for stress-strain relations, deformation, hardness, strength, fracture, and cyclic fatigue. The course comprises of hands-on experience with instruments, specimens, recording and interpretation of data, and formal engineering report writing. Prerequisite(s): MECH 3304 or ENGR 3301.

MECH 3399 – Internship (3 Credit Hours)

General Education (3 Credit Hours)

7th SEMESTER

MECH 4398 – Senior Capstone (3 Credit Hours)
Students will work in cross-disciplinary teams to solve industry-sponsored real-world design problems using the design process. Teaming, design process, design concept, design proposal. MECH 4398 and MECH 4399 must be taken in consecutive semesters. Prerequisite(s): senior standing.

MECH 4201 – Senior Mechanical Laboratory (2 Credit Hours)
Investigations involving thermal power and mechanical systems. Prerequisite(s): MECH 3307 and Advanced Standing Engineering.

MECH 4102 – Colloquium (1 Credit Hour)
Course provides transition between the academic experience and the world of work. Lectures on interviewing, resume writing, becoming a registered PE, financial planning, and engineering ethics are presented. Recent graduates are invited to share their experiences. Prerequisite(s): senior standing.

MECH 4303 – Heat Transfer (3 Credit Hours)
Study of conduction, convection and radiation heat transfer, with applications to engineering problems. Prerequisite(s): MECH 3302 and MECH 3306.

Technical Elective (3 Credit Hours)
See major advisor for course approval.

Technical Elective (3 Credit Hours)
See major advisor for course approval.

GHUM 1301 – Pancasila/Civic (3 Credit Hours)

8th SEMESTER

MECH 4399 – Senior Capstone II (3 Credit Hours)
Students will work in cross-disciplinary teams to solve industry-sponsored real-world design problems using the design process. Construction, testing and evaluation of prototype design; design iteration to arrive at a final working system. Major design project. MECH 4398 and MECH 4399 must be taken in consecutive semesters. Prerequisite(s): MECH 4398.

MECH 4304 – Mechanical Control Systems (3 Credit Hours)

Mathematical modeling of dynamical systems, hardware and software issues; computer simulations; classical control methods including transient response, steady-state errors, bode diagrams, root locus and design of closed loop control systems; introduction to state feedback design and digital control. Prerequisite(s): MECH 3301 and MECH 3307.

General Education (3 Credit Hours)

Technical Elective (3 Credit Hours)
MECH 43XX. See major advisor for course approval.

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