Short Syllabus of Mechanical Engineering (131) Curriculum

MA1122, Calculus I (4 SKS)

Short Syllabus
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Related Courses
1. MA1123 Elementary Calculus I, Prohibited.

Bibliography
1. Purcell, E.J. dan D. Varberg (Alih bhs: I Susila), 2003, Kalkulus dan Geometri Analitik Jilid 1 dan 2, Erlangga
2. Purcell, E.J. and D. Varberg, 2000, Calculus with Analytic Geometry, 8 Edition, Prentice Hall
3. Stewart, J. (Alih bhs: I N. Susila; H. Gunawan), 2000, Kalkulus Jilid 1 dan 2, Erlangga

MA1222, Calculus II (4 SKS)

Short Syllabus
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Related Courses
1. MA1122 Calculus I, Prerequisited.
2. MA1223 Elementary Calculus II, Prohibited.

Bibliography
1. Purcell, E.J. dan D. Varberg (Alih bhs: I Susila), 2003, Kalkulus dan Geometri Analitik Jilid 1 dan 2, Erlangga
2. Purcell, E.J. and D. Varberg, 2000, Calculus with Analytic Geometry, 8 Edition, Prentice Hall
3. Stewart, J. (Alih bhs: I N. Susila; H. Gunawan), 2000, Kalkulus Jilid 1 dan 2, Erlangga

MA2121, Engineering Mathematics I (3 SKS)

Short Syllabus
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Related Courses
1. MA1122 Calculus I, Prerequisited.
2. MA1222 Calculus II, Prerequisited.

Bibliography

1. Anton, H and C. Rorres, 2000, Elementary Linear Algebra with Applications, 8 Edition, John Wiley
2. Marsden, J.E., A.J. Tromba and A. Weinstein, 1993, Basic Multivariable Calculus, Springer-Verlag
3. Kreyzig, E., 1999, Advanced Engineering Mathematics, 8 Edition, John Wiley

MA2221, Engineering Mathematics II (3 SKS)

Short Syllabus

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Related Courses

1. MA1122 Calculus I, Prerequisited.
2. MA1222 Calculus II, Prerequisited.

Bibliography

1. Kreyzig, E., 1999, Advanced Engineering Mathematics, 8 Edition, John Wiley
2. Spiegel, M.R., 1974, Theory and Problems of Fourier Analysis with Applications to Boundary Value Problems, Mc Graw Hill
3. Paliouras, J.D, 1975, Complex Variables for Scientists and Engineers, Macmillan Publishing Co., Inc

BI1001, Environmental Science (2 SKS)

Short Syllabus

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Related Courses

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Bibliography

1. Cunningham, W.P. & B.W. Saigo, 1999, Environmental science: a global concern, 5 Edition, McGraw-Hill, Boston
2. Miller, G. Tyler, Jr, 2002, Living in the environment: Principles, connections, and solutions., Brooks/Cole Publishing Company, Pacific Grove, CA
3. Kupchella, C.E. & M.C. Hyland, 1993, Environmental science: living within the system of nature., Prentice-Hall International, New Jersey

FI1102, Elementary Physics IB (3 SKS)

Short Syllabus

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Related Courses
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Bibliography
1. Giancoli, D, C., 2001, Physics. Principles with Applications, Prentice Hall
2. Cutnell, J. D, 2001, Physics, John Wiley & Sons

KI1111, Basic Chemistry I A (3 SKS)

Short Syllabus
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Related Courses
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Bibliography
1. Chang, R., 2000, Essential Chemistry, 2nd Edition, McGraw Hill, New York
2. Brady J.E., and J. Holum R., 1996, Chemistry, the study of Matter and its changes., 2nd Edition, John Wiley, New York
3. Achmad, H., 1992, Seri Penuntun Belajar Kimia Dasar, Citra Aditya Bakti, Bandung

FI1202, Elementary Physics IIB (3 SKS)

Short Syllabus
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Related Courses
1. FI1102 Elementary Physics IB, Prerequisited.

Bibliography
1. Giancoli, D, C., 2001, Physics. Principles with Applications, Prentice Hall
2. Beisser, A., 1991, Physics, Addison wesley
3. Cutnell, J.D., 2001, Physics, John Wiley & sons

KI1212, Basic Chemistry II B (2 SKS)

Short Syllabus
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Related Courses
1. KI1112 Basic Chemistry I B, Prerequisited.

Bibliography
1. Chang, R., 2000, Essential Chemistry, 2nd Edition, McGraw Hill, New York

2. Brady J.E., and J. Holum R., 1996, Chemistry, the study of Matter and its changes., 2nd Edition, John Wiley, New York
3. Achmad H. dan E. Ratnaningsih, Kimia Organik, Ilmu Kimia dan Ilmu Kimia Lingkungan, Koordinator Kimia TPB, Jurusan Kimia FMIPA, ITB

EP3042, Electrical Power Engineering (2 SKS)

Short Syllabus

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Related Courses

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Bibliography

1. Theodore Wildi, Electrical Machines, Drives, and Power Systems, Prentiec-Hall International, Inc. 1977
2. Stephen J. Chapman, Electric Machinery Fundamentals, Mc Graw-Hill, 1991
3. Zuhal, Dasar Tenaga Elektrik & Elektronika Daya, Penerbit ITB, 1995

MS10T1, Concepts of Technology (2 SKS)

Short Syllabus

This course deals with basic concepts of engineering, such as units, kinematics degree of freedom, measurement concept, control, and problem solving. It is intended to cultivate first year student toward the mechanical engineering discipline and to train basic skills such as conversion of units, system diagram, and also general knowledge with regard to the way sensors and control equipments work.

Related Courses

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Bibliography

1. Pan, D., 2000, The Effective Student - A guide to higher education at NUS, 7 Edition, Grenadier Press Pte Ltd.
2. Dieter, G.E., 1999, Engineering Design - A Materials and Processing Approach, 3 Edition, McGraw-Hill
3. Bolton, W., 1996, Mechatronics - Electronic Control Systems in Mechanical Engineering, Longman

MS1100, Intro. to Mechanical Engineering (1 SKS)

Short Syllabus

This introductory course elaborates all aspects related to the discipline of Mechanical Engineering. The syllabus includes descriptions of “who are mechanical engineers” and "what do they do”. It is intended to attract students, cultivate their interests, excite them with a view of what to expect later in their program of study, and provide them with a

knowledge of mechanical engineering profession and products.

Related Courses
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Bibliography
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MS1200, Mechanical Drawing (3 SKS)

Short Syllabus
Introduction to mechanical drawing, standards (ISO), drawing tools, synthesis of geometry, types of lines and usage, projection (isometric, American system, European system), sketches, auxiliary view, sectioning, dimensioning and tolerance, simplified drawing of machine elements (bolts, threads, gears, etc.), assembly drawing, exploded view, drawing symbols. In addition to class room instructions, students have to complete laboratory drawing assignments consisting of manual drawing (using traditional drawing machine) and computer aided drawing.

Related Courses
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Bibliography
1. Giesecke, F.E., et al., 1993, Engineering Graphics, 5 Edition, Prentice Hall
2. Sato, G.T., dan Hartanto, N.S., 1981, Menggambar Mesin Menurut Standar ISO, 1 Edition, PT Pradnya Paramita

MS1210, Statics (3 SKS)

Short Syllabus
This course concerns with basic laws of mechanics and its applications in structural analysis. The descriptions includes unit systems and conversions, Newton's laws, force system, resultant, free body diagram, equilibrium, simple structure analysis, truss, frame, distributed forces, internal forces, friction, and principle of virtual work.

Related Courses
1. FI1102 Elementary Physics IB, Prerequisited.
2. MA1122 Calculus I, Prerequisited.

Bibliography
1. Meriam, J.L., dan Kraige, L.G., 1988, Mekanika Teknik - Statika, Jilid I, Versi SI, 1 Edition, Erlangga
2. Beer, F.P., dan Johnston, E.R., Jr., 1991, Mekanika untuk Insinyur: Statika, 4 Edition, Erlangga
3. Popov, E.P., 1993, Mekanika Teknik (Mechanics of Materials), Erlangga

MS2100, Numerical Analysis & Programming (3 SKS)

Short Syllabus
This course deals with the numerical solution to mathematical problems. Course description includes computer hardware and software, basic programming (Basic, C, etc.), approximation and round-off errors, truncation error and Taylor series, roots calculation, regression and interpolation of functions, matrix and linear algebra, numerical integration, ordinary and partial differential equation.

Related Courses
1. MA1222 Calculus II, Prerequisited.

Bibliography
1. Chapra, S.C., and Canale, R.P., 2002, Numerical Method for Engineers, 4 Edition, McGraw-Hill

MS2101, Computer Aided Drafting (1 SKS)

Short Syllabus
This course provides students with basic skills in computer aided drawing using licensed software (Autodesk Inventor). Course description includes introduction to geometrical modeling, introduction to Computer Aided Design (CAD), and computer laboratory drawing assignments.

Related Courses
1. MS1200 Mechanical Drawing, Prerequisited.

Bibliography
1. F.E. Giesecke, et al., 1993, Engineering Graphics, 5 Edition, Prentice Hall
2. I. Zeid, CAD/CAM Theory and Practice, 1 Edition, McGraw-Hill

MS2102, Mechatronics I (2 SKS)

Short Syllabus
This course builds the basic of mechatronics. Course syllabus includes semiconductors, diode, operational amplifier, number systems, binary mathematics, Boolean algebra, analog and digital systems, data acquisition and conversion, logic hardware, microprocessors, and programmable logic controllers.

Related Courses
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Bibliography
1. Kartidjo, M, dan Djodikusumo, I., 1986, Mekatronika, Departemen Teknik Mesin,

FTI-ITB
2. Charles A. Schuler, William L. McNAMEE, 1988, Industrial Eletronics and Robotics, 2 Edition, McGraw-Hill International Editions
3. Bolton, W., 1996, Mechatronics - Electronic Control Systems in Mechanical Engineering, Longman

MS2111, Strength of Materials (3 SKS)

Short Syllabus
This course discusses stress calculation due to loads. Description includes stress-strain concept, tensile test, stress and strain due to axial loading, statically indeterminate case related to axial loading, introduction to plasticity and residual stress, stress and strain due other loads, such as torsion, bending moment, and shear force, Mohr's circle of stress, failure theory, deflection, statically indeterminate structures, and energy method.

Related Courses
1. MS1210 Statics, Prerequisited.

Bibliography
1. Popov, E.P., 1993, Mekanika Teknik (Mechanics of Materials), Erlangga
2. Popov, E.P., 1990, Engineering Mechanics of Solids, Prentice Hall

MS2112, Kinematics (2 SKS)

Short Syllabus
Basic of mechanisms. Course syllabus includes mobility (kinematics degree of freedom, kinematics diagram, instantaneous pole of velocity, transmission ration, graphical method of velocity analysis (velocity polygon), auxiliary point, acceleration analysis, complex method, rolling, and equivalent mechanisms.

Related Courses
1. FI1102 Elementary Physics IB, Prerequisited.
2. MA1122 Calculus I, Prerequisited.

Bibliography
1. Holowenko, A.R., 1995, Dynamics of Machinery, John Wiley
2. Mabie, H.H., and Reinholtz, C.F., 1996, Mechanisms and Dynamics of Machinery, John Wiley
3. R.T.Hinkle, 1960, Kinematics of Machines, Prentice Hall

MS2130, Engineering Materials (2 SKS)

Short Syllabus
This course develops the basic of engineering materials and standards of materials,

products, and material testing. The syllabus includes: classification of materials, material properties: mechanical, physical, chemical, technological, material standards, product standards, testing of materials: mechanical testing and its interpretation, tensile, impact, hardness, fatigue, torsion, creep, atomic bonding, basic of crystallography, metal bonding, alloying, ferrous alloys, Fe-Fe3C diagram, phase transformation, non-ferrous alloys, strengthening methods: strengthening by alloying, heat treatment, precipitation hardening, strain hardening, etc. polymers, ceramic, composite: classification, properties, etc.

Related Courses
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Bibliography
1. Callister, W. D., 1991, Material Science and Engineering, An Introduction, 2 Edition, Wiley
2. Smith, W. F., 1993, Foundations of Materials Science and Engineering, 2 Edition, McGraw-Hill
3. Wulff et al., 1965, Structure and Properties of Materials, Vol I, II and III, Wiley

MS2140, Engineering Thermodynamics I (2 SKS)

Short Syllabus
This course deals with basic concepts of thermodynamics and its applications in the analysis of simple thermodynamics systems. Coverage include definition and basic concepts of thermodynamics, energy definition and the first law, p-v-T relationship and properties of simple compressible pure substance, ideal gas concept, incompressible substance, energy analysis for mass and control volume, entropy definition and the second law, exergy definition and exergy balance in thermomechanical systems.

Related Courses
1. FI1202 Elementary Physics IIB, Prerequisited.
2. KI1212 Basic Chemistry II B, Prerequisited.
3. MA1222 Calculus II, Prerequisited.

Bibliography
1. Moran, M.J., and Shapiro, H.N., 2000, Fundamentals of Engineering Thermodynamics, 4 Edition, Wiley

MS2213, Dynamics of Machineries (3 SKS)

Short Syllabus
This course in the continuation of MS2112, Kinematics, and it discusses forces in mechanisms, unbalance, and application of gyroscope and flywheel. The coverage includes static force analysis (free body diagram method, transmission ratio and translation radius method), dynamic forces, kinetostatics, balancing of rotating

machineries, balancing of reciprocating machineries, gyroscope, and flywheel.

Related Courses
1. MS2112 Kinematics, Prerequisited.

Bibliography
1. Holowenko, A.R., 1995, Dynamics of Machinery, John Wiley
2. R.L. Norton, Design of Machinery, McGraw-Hill International Edition, 2nd Edition
3. Mabie, H.H., and Reinholtz, C.F., 1996, Mechanisms and Dynamics of Machinery, John Wiley

MS2214, Design of Machine Elements I (3 SKS)

Short Syllabus
This course deals with the introduction of machine elements (bolts, nuts, gears, couplings, etc.), selection, and sizing to satisfy a certain requirement. The syllabus includes design process, review of stress analysis, failure analysis, safety factor, design of shaft, connection: pin, spline shaft, key, fixed coupling, bolted, riveted, and welded joints, bearing: roller bearing, bearing housing, journal bearing, springs: coil and leaf springs, flexible transmission elements: belt and chain.

Related Courses
1. MS2111 Strength of Materials, Prerequisited.
2. MS2130 Engineering Materials, Prerequisited.

Bibliography
1. Shigley, J.E., Mischke, C.R., Mechanical Engineering Design, McGraw-Hill
2. Niemann, Machine Elements, Volume 1 dan Volume 2, Springer Verlag
3. Norton, R.L., Machine Design: An Integrated Approach, Prentice Hall

MS2231, Material Testing Laboratory (1 SKS)

Short Syllabus
This laboratory class introduces students to material testing and product quality control. Coverage includes tensile, hardness, torsion, fatigue, impact, and non-destructive tests.

Related Courses
1. MS2130 Engineering Materials, Prerequisited.

Bibliography
1. Callister, W.D., Materials Science and Engineering Materials - an Introduction, 2 Edition, Wiley
2. , ASM Handbook Vol.8, American Society for Metals

3. Askeland, D.R., The Science and Engineering of Materials, Brooks/Cole Engineering Division of Wadsworth Inc

MS2232, Structure & Properties of Materials (2 SKS)

Short Syllabus
This class is the continuation of MS2130, Engineering Materials, and it deals with more advanced topics on engineering materials. The syllabus covers properties of engineering materials and their relations to microstructure, deformation of metals, polymers, and ceramics, effects of loading (tension, creep, impact, and dynamic) to materials, and embrittlement due to environmental or service conditions.

Related Courses
1. MS2130 Engineering Materials, Prerequisited.

Bibliography
1. Hertzberg, R. W., 1989, Deformation and Fracture Mechanics of Engineering Materials, 3 Edition, John Wiley
2. Dieter, G. E., Mechanical Metallurgy, McGraw-Hill
3. Ashby, M.F., and Jones, D., Engineering Materials I, Pergamon Press

MS2241, Engineering Thermodynamics II (2 SKS)

Short Syllabus
This class is the continuation of MS21400, Engineering Thermodynamics I, and it deals with more advanced topics on thermodynamics and its applications. The syllabus includes vapor power system, power of gas, refrigeration and heat pump, thermodynamics relations for simple compressible substance, non-reacting ideal gas mixture, psychrometric chart, reacting mixture and combustion, chemical exergy concept, and phase and chemical balance.

Related Courses
1. MS2140 Engineering Thermodynamics I, Prerequisited.

Bibliography
1. Moran, M.J., and Shapiro, H.N., 2000, Fundamentals of Engineering Thermodynamics, 4 Edition, Wiley

MS2242, Fluid Mechanics I (2 SKS)

Short Syllabus
This course lays the basic of fluid mechanics and its applications. Coverage includes continuum hypothesis, properties of fluids, fluid statics (hydrostatic pressure, measuring method, forces due to pressure, fluid in moving rigid container), fluid dynamics (basic

concepts: fluid kinematics, differential analysis, volume control analysis, basic laws of fluid flow: differential and integral forms of continuity equation, Euler, Bernoulli, Cauchy, Navier-Stokes equations, Reynolds transport theorem, linear momentum, angular momentum, energy equation, dimensional analysis, Pi-Buckingham theorem, non-dimensional parameters, model and similarity analysis.

Related Courses
1. MS2140 Engineering Thermodynamics I, Prerequisited.

Bibliography
1. Munson, B.R., Young, D.F., and Okiishi, T.H., Fundamentals of Fluid Mechanics, 3 Edition, John Wiley & Sons
2. Dougherty, R. L., Fluid Mechanics with Engineering Applications, McGraw-Hill
3. Gerhart, P.M. and Gross, R.J., Fundamentals of Fluid Mechanics, Addison-Wesley

MS3100, Engineering Measurements (2 SKS)

Short Syllabus
This course deals with measurement techniques ranging from the basic principles, sensors, up until data acquisition. Coverage includes definition/terminologies, calibration, standards, static and dynamic signal analysis, data representation in the frequency domain, sampling theorem and aliasing, digital data acquisition, dynamic response of instruments, step response of first and second order systems, statistical analysis, measurements of temperature, strain, flow, pressure, velocity, and displacement.

Related Courses
1. MS2102 Mechatronics I, Prerequisited.

Bibliography
1. Johnson, C.D., 1997, Process Control Instrumentation Technology, Prentice-Hall
2. J. P. Bentley, Principles of Measurement Systems, Longman Scientific&Technical
3. Beckwith, T.G., Marangoni, R.D., and Lienhard, V, 1993, Mechanical Measurements, 5 Edition, Addison-Wesley

MS3115, Mechanical Design Project I (1 SKS)

Short Syllabus
This design class provides students with a first exposure to real world problems. In this class, students are expected to complete the design of simple mechanical systems. In completing the assignment, students have to integrate and implement the accumulated knowledge from previous classes such as how to design shaft, power screw, joins (bolted, welded, etc.), springs, bearings, and flexible power transmission elements. Each student will complete the design assignment under the supervision of an advisor.

Related Courses
1. MS2101 Computer Aided Drafting, Prerequisited.
2. MS2214 Design of Machine Elements I, Prerequisited.

Bibliography
1. Niemann, Machine Elements, Volume 1 dan Volume 2, Springer Verlag
2. Spotts, M. F., 1985, Design of Machine Elements, 6th Ed., Prentice-Hall
3. Norton, 1996, Machine Design: An Integrated Approach, Prentice Hall

MS3116, Design of Machine Elements II (3 SKS)

Short Syllabus
This course discusses more complex machine elements with regard to selection and sizing. The coverage includes elements such as brakes, clutches, friction disks, gear systems, gear geometry, involute, spur, helical, bevel, and worm gears.

Related Courses
1. MS2214 Design of Machine Elements I, Prerequisited.

Bibliography
1. Juvinal, R. C., 1983, Fundamentals of Machine Component Design, John Wiley
2. Shigley, J. E., Mischke, C.R., 1997, Mechanical Engineering Design, McGraw-Hill
3. Niemann, 1978, Machine Elements, Vol. 2 dan 3, Springer Verlag

MS3117, Basic Mechanical Vibration (2 SKS)

Short Syllabus
This course lays the foundation in mechanical vibration by discussing the theory and some relevant engineering applications. The coverage includes classification of vibration, single degree of freedom (d.o.f.) undamped free vibration, damped vibration, single d.o.f. forced vibration, resonance, vibration sensors, transient vibration (Laplace transform), and two d.o.f vibration systems.

Related Courses
1. MA2221 Engineering Mathematics II, Prerequisited.
2. MS2213 Dynamics of Machineries, Prerequisited.

Bibliography
1. Thomson, W. T., 1993, Theory of Vibration with Applications, Pren Hall
2. Dimarogonas, A. D, 1992, Vibration for Engineers, Prentice Hall
3. Meirovitch, L., 1975, Elemens of Vibration Analysis, McGraw-Hill

MS3120, Manufacturing Processes I + Labs. (3 SKS)

Short Syllabus
This course discusses various manufacturing processes and forms basic skills in the operation of standard machine tools and manufacturing processes. The in class instructional part include introduction to manufacturing, metal processing, casting and related processes, metal forming and sheet metal working, conventional and non-conventional machining. In addition, students have to perform laboratory assignments in which they would operate standard machines such as lathe, planning, milling, grinding, and also learn how to use electric resistance welding equipment, arc (SMAW) welding equipment, and sand casting.

Related Courses
1. MS2101 Computer Aided Drafting, Prerequisited.
2. MS2232 Structure & Properties of Materials, Prerequisited.

Bibliography
1. Kalpakjian, S;, Manufacturing Engineering and Technology, Addison-Wesley Publishing Co
2. E. Paul De Garmo, J. Temple Black, Ronald A. Kohse, Materials and Processes in Manufacturing, MaxWell MacMillan
3. B.H. Amstead, Phillip F. Ostwald, Myron L. Begeman, Manufacturing Processes, John Wiley & Sons

MS3121, Industrial Metrology & Statistics (3 SKS)

Short Syllabus
This course discusses the basic of geometrical measurement in relation to manufacturing. The scope includes classification and principles of geometrical measurement, definition of accuracy, precision, resolution, statistical analysis, linear (length) measurement, angle, flatness, metrology of thread, gears, roundness, geometric inaccuracies, quality control technology, basic of probability, qualitative and quantitative control charts, and sampling method.

Related Courses
1. MS2101 Computer Aided Drafting, Prerequisited.
2. MS3116 Design of Machine Elements II, Co-requisited.
3. MS3120 Manufacturing Processes I + Labs., Co-requisited.

Bibliography
1. Rochim. T, Wirjomartono, S.H.;, 1985, Spesifikasi, Metrologi, dan Kontrol Kualitas Geometrik, (Modul 0 s.d. 4), Jurusan Mesin ITB,

MS3133, Structure & Properties of Mat. Lab. (1 SKS)

Short Syllabus
This laboratory class provides hands on experience in microstructure analysis of materials. Among the modules are specimen preparations, microstructure analysis using microscope, reinforcement of strain hardening through wire drawing experiment, cold rolling analysis, heat treatment, etc.

Related Courses
1. MS2130 Engineering Materials, Prerequisited.
2. MS2232 Structure & Properties of Materials, Prerequisited.

Bibliography
1. Hertzberg, R. W., 1989, Deformation and Fracture Mechanics of Engineering Materials, 3 Edition, John Wiley
2. Dieter, G. E., 1986, Mechanical Metallurgy, McGraw-Hill
3. Callister, W. D, 1991, Materials Science and Engineering, an Introduction 2nd ed., 2 Edition, John Wiley & Son

MS3143, Fluid Mechanics II (2 SKS)

Short Syllabus
This class concerns with a more advanced topics in fluid mechanics and its applications. Syllabus includes: viscous flow in ducts (internal flow), flow in pipes, laminar, turbulent, transition, fully-developed flow concept, Moody diagram, minor losses, flow in non-circular ducts, flow measurements, external flow, characteristics, lift and drag, boundary layer theory, Prandtl/Blassius solution, momentum integral approach to boundary layer equation, potential flow, incompressible flow analysis, ideal gas, Mach number, isentropic and non-isentropic flow, and introduction to turbomachineries.

Related Courses
1. MS2242 Fluid Mechanics I, Prerequisited.

Bibliography
1. White, F.M., Fluid Mechanics, McGraw-Hill
2. Gerhart, Gross, 1985, Fundamentals of Fluid Mechanics, Addison-Wesley, USA
3. Dougherty, R. L., Fluid Mechanics with Engineering Applications, McGraw-Hill

MS3144, Heat Transfer I (2 SKS)

Short Syllabus
This class forms basic understanding in heat transfer and its applications. Coverage includes heat transfer analysis, thermal properties of materials, steady one-dimensional heat conduction in flat plate and radial systems, conduction with heat source, heat transfer from fins, analytical solution of steady two-dimensional conduction, graphical and finite difference solutions, transient conduction on flat wall, radial system, semi-

infinite solid, three-dimensional objects, convection boundary layer, convection in laminar and turbulent flows, convection equation, approximation method, similarity of boundary layer, non-dimensional parameters, and Reynolds analogy.

Related Courses
1. EL2201 Engineering Mathematics I, Prerequisited.
2. MS2242 Fluid Mechanics I, Prerequisited.

Bibliography
1. Incropera, F.P., and David, P.D., 1996, Introduction to Heat Transfer, 3 Edition, Wiley

MS3200, Introduction to Control System (3 SKS)

Short Syllabus
This class discusses the basic of control theory and its applications. The syllabus includes examples of control application in our daily life and in the industry, on-off controller, proportional control, PID controller, mathematical model of control systems, block diagram formulation and simplifications, system stability, transient and steady state response, root locus analysis, Bode and Nyquist diagrams, and compensation design.

Related Courses
1. EP3042 Electrical Power Engineering, Prerequisited.
2. MS2102 Mechatronics I, Prerequisited.
3. MS3117 Basic Mechanical Vibration, Prerequisited.
4. MS3201 Mechatronics II, Co-requisited.

Bibliography
1. Dorf, R. C., 1995, Modern Control Systems, Addison-Wesley
2. Raven, F. H., 1995, Automatic Control Engineering, 5th Ed., 5 Edition, McGraw Hill

MS3201, Mechatronics II (2 SKS)

Short Syllabus
This course is the continuation of MS2101, Mechatronics I. It discusses the advanced aspects of mechatronics and its applications in machineries. The syllabus includes application of basic control theory, integration of sensors and transducers with control system, control of mechanical systems using microprocessor or computer, data acquisition technique.

Related Courses
1. MS3100 Engineering Measurements, Prerequisited.

Bibliography

1. Kartidjo, M, dan Djodikusumo, I., 1986, Mekatronika, Departemen Teknik Mesin, FTI-ITB
2. Deppert, Stoll, Pneumatische Toepasingen, Mestdaght BV
3. W. Bolton, Mechatronics, Electronic Control Systems in Mechanical Engineering, Longman

MS3218, Mechanical Design Project II (1 SKS)

Short Syllabus
This design class provides students with practical experience in which they are expected to complete the prototype of an equipment or device. In completing the assignment, students have to integrate and implement the accumulated knowledge from previous classes. The form of the prototyping object might be water rocket, home/kitchen appliance, sport equipment, etc. The design theme will be changed annually. Each student or group of students will work under the supervision of an advisor.

Related Courses
1. MS3115 Mechanical Design Project I, Prerequisited.
2. MS3116 Design of Machine Elements II, Prerequisited.

Bibliography
1. Juvinal, R. C., 1983, Fundamentals of Machine Component Design, John Wiley
2. Niemann, 1983, Machine Elements, Volume 2 dan Volume 3, Springer Verlag
3. Norton, 1996, Machine Design: An Integrated Approach, Prentice Hall

MS3221, Manufacturing Processes II + Labs (2 SKS)

Short Syllabus
This class is the complement of MS3120, Manufacturing Processes I. It forms basic knowledge and skills in joining processes, fabrication, assembling, surface treatment, automation, and other production systems that support manufacturing.

Related Courses
1. MS3120 Manufacturing Processes I + Labs., Prerequisited.

Bibliography
1. Kalpakjian, S;, Manufacturing Engineering and Technology, Addison-Wesley Publishing Co
2. E. Paul De Garmo, J. Temple Black, Ronald A. Kohse, Materials and Processes in Manufacturing, MaxWell MacMillan
3. B.H. Amstead, Phillip F. Ostwald, Myron L. Begeman, Manufacturing Processes, John Wiley & Sons

MS3222, Industrial Metrology Lab. (1 SKS)

Short Syllabus
This laboratory class provides student with basic training on the operation of various geometry measuring tools and its analysis. Among the modules are linear and angular geometrical measurement, calibration, quality inspection, data processing, and measurement data analysis.

Related Courses
1. MS3121 Industrial Metrology & Statistics, Prerequisited.

Bibliography
1. Rochim. T, Wirjomartono, S.H.;, 1985, Spesifikasi, Metrologi, dan Kontrol Kualitas Geometrik, (Modul 0 s.d. 4), Jurusan Mesin ITB,

MS3245, Heat Transfer II (2 SKS)

Short Syllabus
This course discusses more advanced topics in heat transfer and its applications. The coverage includes basic of convection, velocity and thermal boundary layers, internal and external flow convection, free convection, boiling and condensation, heat exchangers, radiation process and its properties, and radiation exchange between surfaces.

Related Courses
1. EL2100 Engineering Mathematics II, Prerequisited.
2. MS3144 Heat Transfer I, Prerequisited.

Bibliography
1. Incropera, F.P., and David, P.D., 1996, Introduction to Heat Transfer, 3 Edition, Wiley

MS3246, Energy Convension Machineries I (2 SKS)

Short Syllabus
This course discusses energy conversion processes in boilers, internal combustion engines, refrigeration systems, pumps, and volumetric compressors. Coverage includes among others review of various definitions and relevant basic laws in energy conversion, boilers, internal combustion engines (Otto or gasoline and diesel engines), refrigeration system and machineries, pumps, and compressors.

Related Courses
1. MS3245 Heat Transfer II, Prerequisited.

Bibliography
1. Arismunandar, W., 2002, Penggerak Mula - Motor Bakar Torak, Penerbit ITB
2. John B. Heywood;, Internal Combustion Engines Fundamentals, McGraw-Hill Book

Company
3. Heisler, H., 1995, Advanced Engine Technology, Edward Arnold

MS40K0, Practical Training (1 SKS)

Short Syllabus
This one semester hour course provides students with an opportunity to work as an apprentice in the industry. In order to complete the course, students have to work for at least one month in companies whose scope is relevant to mechanical engineering. In addition to learn about the working environment, students have to find and solve a specific case study. The case study might be analysis, synthesis, programming, etc., as long as it is relevant to the mechanical engineering field. Students have to write a short report and pass an oral review in front of the practical job committee.

Related Courses
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Bibliography
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MS40Z0, Final Project I (2 SKS)

Short Syllabus
The final project is the capstone course of the undergraduate program where students have the opportunity to integrate and apply skills and knowledge acquired in various academic activities in a design project, manufacturing of tools or design experiment in a research project or theoretical investigation of a specific problem.

Related Courses
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Bibliography
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MS40Z1, Final Project II & Seminar (3 SKS)

Short Syllabus
The final project is the capstone course of the undergraduate program where students have the opportunity to integrate and apply skills and knowledge acquired in various academic activities in a design project, manufacturing of tools or design experiment in a research project or theoretical investigation of a specific problem. Students have to present their findings or results in a Undergraduate Seminar and final oral examination as a requirement for the undergraduate (Sarjana Teknik) degree.

Related Courses
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Bibliography
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MS4100, Mechanical Engineering Lab I (1 SKS)

Short Syllabus
This laboratory class is intended to review and reinforce student understanding of basic concepts in strength of materials, dynamics, thermodynamics, fluid mechanics, heat transfer, control, and measurement techniques. Among the modules are continuous beam, buckling, free and forced vibrations, gyroscope, governor, heat conduction, forced convection, stress and strain measurement using electrical strain gages, journal bearing, head loss in internal flow, heating or calorific value measurement, and vapor enthalpy and quality measurements.

Related Courses
1. MS3100 Engineering Measurements, Prerequisited.
2. MS3117 Basic Mechanical Vibration, Prerequisited.
3. MS3121 Industrial Metrology & Statistics, Prerequisited.
4. MS3245 Heat Transfer II, Prerequisited.

Bibliography
1. Nurprasetio, I. P. dan Tandian, N. P., 2003, Panduan Praktikum Fenomena Dasar Mesin, Departemen Teknik Mesin, FTI-ITB

MS4101, Design for Manufacturability (3 SKS)

Short Syllabus
Design philosophy, relationship of design, materials, and manufacturing, cost calculation and reliability, case studies, design projects. Students have to work in groups and complete a design project that implement the theory explained in the class.

Related Courses
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Bibliography
1. Dieter, G., 1991, Engineering Design: A Materials and Processing Approach, McGraw-Hill
2. Suh, N.P., 1990, The Principles of Design, Oxford University Press

MS4102, Mechanical Maintenance (3 SKS)

Short Syllabus
This compulsory course forms basic understanding of mechanical maintenance. Coverage includes, among others, classification of maintenance, maintenance management and

organization, Weibull diagram (bath-tub curve), repair complexity and critical path method, inventory, total productive maintenance, reliability centered maintenance, new paradigms in maintenance, vibration based predictive maintenance, and diagnostic tools.

Related Courses
1. MS2231 Material Testing Laboratory, Prerequisited.
2. MS3116 Design of Machine Elements II, Prerequisited.
3. MS3117 Basic Mechanical Vibration, Prerequisited.
4. MS3120 Manufacturing Processes I + Labs., Prerequisited.
5. MS4147 Energy Conversion Machineries II, Co-requisited.

Bibliography
1. Corder, A.S., Maintenance Management, McGraw Hill, London
2. Makajima, S., Introduction to Total Predictive Maintenance, Productivity Press, Cambrige, MA-USA
3. Garg, H.P., Industrial Maintenance, Chand & Co. Ltd., New Delhi

MS4110, Theory of Ground Vehicles (3 SKS)

Short Syllabus
Railway vehicles: contact between wheel and rail, sine motion, bogie, car structure, and connecting elements, primary and secondary suspensions, traction force, traction curve (traction force versus velocity diagram), rolling resistance, vibration. Automotive or ground vehicles: tire characteristics, ride and handling, performance, suspension design, transmission, body and structure design considerations, and recent developments in engines (such as VVTI, hybrid cars, electric vehicle, etc.)

Related Courses
1. MS3116 Design of Machine Elements II, Prerequisited.

Bibliography
1. Partosiswojo, Diktat Teknik Rel, Departemen Teknik Mesin, FTI-ITB
2. Suganda, H., 1971, Mekanika Automobil, Departemen Teknik Mesin, FTI-ITB

MS4120, Machining Processes (3 SKS)

Short Syllabus
Classification of machining processes, basic elements of machining processes, tool geometry, empirical derivation of tool life time, empirical cutting force, tool materials, tooling system, machining cost, optimization, grinding process: classification, grinding wheels, chip size equivalent, grinding diagram, optimization of the grinding process, coolants, and utilization of machining processes.

Related Courses

1. MS3221 Manufacturing Processes II + Labs, Prerequisited.
2. MS3222 Industrial Metrology Lab., Prerequisited.

Bibliography

1. Rochim, T., 1986, Teori dan Teknologi Proses Pemesinan Departemen Teknik Mesin ITB, Departemen Teknik Mesin, FTI-ITB

MS4130, Foundry Technology (3 SKS)

Short Syllabus

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Related Courses

1. MS2232 Structure & Properties of Materials, Prerequisited.
2. MS3221 Manufacturing Processes II + Labs, Prerequisited.

Bibliography

1. Flinn, 1963, Fundamentals of Metal Casting, Addison Wesley
2. Surdia, T., Chijiwa, K., 1986, Teknik Pengecoran Logam, Pradnya Paramita
3. Beeley, 1982, Foundry Technology, Butterworths

MS4147, Energy Conversion Machineries II (3 SKS)

Short Syllabus

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Related Courses

1. MS3245 Heat Transfer II, Prerequisited.

Bibliography

1. Heisler, H., 1995, Advanced Engine Technology, Edward Arnold
2. Cohen, H., Rogers, GFC., Saravanamuttoo, HIH, 1991, Gas Turbine Theory, Longman Scientific & Technical
3. Traupel, W., Turbomaschinen, Springer Verlag

MS4141, Thermal Syst. Design & Optimization (3 SKS)

Short Syllabus

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Related Courses

1. MS3245 Heat Transfer II, Prerequisited.

Bibliography

1. Stoecker, W.F., 1989, Design of Thermal Systems, 3 Edition, McGraw-Hill
2. Warwick, 1984, User Guide on Process Integration for the Efficient Use of Energy, The Institution of Chemical Engineers

MS4200, Engineering Management & Economics (2 SKS)

Short Syllabus

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Related Courses

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Bibliography

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MS4211, Hoisting & Heavy Equipment (3 SKS)

Short Syllabus

This class is intended as an elective for final year students. Coverage includes wire rope hoist, overhead crane, belt conveyors, tractors, and other material handling equipments.

Related Courses

1. MS3116 Design of Machine Elements II, Prerequisited.

Bibliography

1. N. Rudenko, Materials Handling, Peace Publishers, Moscow
2. Has-Juraen Zebisch, 1980, Fordertechnik 1 & 2, Vogel-Verlag

MS4210, Process Industries Equipment (3 SKS)

Short Syllabus

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Related Courses

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Bibliography

1. Austin, G.T, 1984, Shreve's Chemical Process Industries, 5th ed., 5 Edition, McGraw-Hill
2. Mc. Cabe, Smith, and Harriott, 2001, Unit Operations of Chemical Engineering, McGraw-Hill
3. Walas, S.M., 1988, Chemical Process Equipment – Selection and Design, Butterworth-Heinemann

MS4220, Production System (3 SKS)

Short Syllabus

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Related Courses

1. MS3121 Industrial Metrology & Statistics, Prerequisited.

Bibliography

1. K.Hitomi, 1979, Manufacturing Systems Engineering, Taylor & Francis Ltd
2. Yatna Yuwana M, Modul-modul kuliah Sistem Produksi, Dept. Teknik Mesin ITB,

MS4221, Machine Tools Technology (3 SKS)

Short Syllabus

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Related Courses

1. MS3121 Industrial Metrology & Statistics, Prerequisited.
2. MS3221 Manufacturing Processes II + Labs, Prerequisited.
3. MS4120 Machining Processes, Prerequisited.

Bibliography

1. Manfred Weck, 1984, Handbook of Machine Tools Volume 1, Types of Machines, Forms of Construction and Applications, John Wiley & Sons
2. Manfred Weck, 1984, Handbook of Machine Tools Volume 2, Construction and Mathematical Analysis, John Wiley & Sons

MS4231, Welding Technology (3 SKS)

Short Syllabus

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Related Courses

1. MS2232 Structure & Properties of Materials, Prerequisited.
2. MS3221 Manufacturing Processes II + Labs, Prerequisited.

Bibliography

1. Wiryosumarto, H., Okumura, T., 1981, Teknologi Pengelasan Logam, Pradnya Paramita
2. Folkhard, E., Welding Metallurgy of Stainless Steel, Springer Verlag
3. Easterling, K., 1985, Introduction to the Physical Metallurgy of Welding, Butterworths

MS4230, Metal Forming (3 SKS)

Short Syllabus
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Related Courses
1. MS3221 Manufacturing Processes II + Labs, Prerequisited.

Bibliography
1. Dieter, G. E., 1986, Mechanical Metallurgy, 3 Edition, McGraw-Hill
2. Siswosuwarno, M., 1986, Teknik Pembentukan Logam, Jurusan Teknik Mesin ITB,
3. Hosford, W. F., Caddell, R, M., 1983, Metal Forming: Mechanics and Metallurgy, Prentice-Hall

MS4240, Mechanical Engineering Lab II (1 SKS)

Short Syllabus
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Related Courses
1. MS4100 Mechanical Engineering Lab I, Prerequisited.
2. MS4147 Energy Conversion Machineries II, Prerequisited.

Bibliography
1. Arismunandar, W., 2002, Penggerak Mula - Motor Bakar Torak, Penerbit ITB
2. Stoecker, W.F dan Jones, J.W., Refrigeration and Air Conditioning, McGraw Hill, Singapore
3. Arismunandar, W., 1997, Penggerak Mula - Turbin, Penerbit ITB

MS4241, Mechanical Eng. Environment Aspects (3 SKS)

Short Syllabus
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Related Courses
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Bibliography
1. Hardianto, Aspek Polutan Gas Buang dari Proses Pembakaran terhadap Lingkungan, Diktat kuliah,
2. Buomicore dan Davis, Air Polution Engineering Manual, Van Nostrand
3. Strauss W, Air Polution Control, John Wiley & Sons

MS5012, Machinery Vibration (3 SKS)

Short Syllabus
Rotating machinery and reciprocating engines. Rotor dynamics: shaft, discs and bearings. Gyroscopic effects. Finite element model. Natural frequency and modes, dynamic response, critical speed. Dynamic response due to ubalance mass and harmonic excitation. Whirling phenomenon. Industrial application. Reciprocating engine dynamic model, rotating mass, reciprocating mass. Experimental and Maintenance aspects.

Related Courses
1. MS2213 Dynamics of Machineries, Prerequisited.
2. MS3117 Basic Mechanical Vibration, Prerequisited.

Bibliography
1. Andrew D. Dimarogonas, Sam Haddad, 1992, Vibration for Engineers, Prentice Hall, New Jersey
2. John M. Vance, 1988, Rotordynamics of Turbomachinery, John Wiley & Sons, Inc., New York
3. Michel Lalanne, Guy Ferraris, 1990, Rotordynamics Prediction in Engineering, John Wiley & Sons, Inc., New York

MS5011, Special Topics in Construction B (3 SKS)

Short Syllabus
This course is offered to accommodate special topics in the area of Design and Mechanical Construction not included in the regularly listed courses. The syllabus is determined by the topics offered.

Related Courses
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Bibliography
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MS5010, Special Topics in Construction A (3 SKS)

Short Syllabus
This course is offered to accommodate special topics in the area of Design and Mechanical Construction not included in the regularly listed courses. The syllabus is determined by the topics offered.

Related Courses
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Bibliography
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MS5013, Creativity (3 SKS)

Short Syllabus
This course builds basic understanding of creativity and creative stimulation techniques. Coverage includes: Creativity: definition, creative process and development. Different way of thinking: divergent, convergent, lateral, critical, and creative thinking. Factors that influence creativity. Development of ideas, invention, innovative products. Problem solving method. Brainstorming, affinity analysis, fishbone diagram, why-why, how-how, decision matrix, mind map, etc. Combination of analytical and operational methods. Discussion and case studies.

Related Courses
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Bibliography
1. Sternberg, R.J., 1989, A three-facet model of creativity, Research Report, Dept. of Psychology, Yale Univers
2. Jerome W. Blood (ed.), Optimum Use of Engineering Talent, D.B., Taraporevala Sons & Co., Private Ltd., Bombay
3. Karl Albrecht and Steven Albrecht, 1987, The Creative Corporation, Dow Jones-Irwin

MS5014, Fatigue Criteria in Design (3 SKS)

Short Syllabus
Fatigue fracture, dynamic load. Fatigue testing and standard specimen, -N curve and specimen fatigue strength. Fatigue strength of machine components due to uniaxilal load. Factors influencing fatigue strength. Stress concentration and sensitivity. Variable load, biaxial load. High- and low-cycle fatigue. Estimation of component life. Strain based-fatigue and -N curve.

Related Courses
1. MS2111 Strength of Materials, Prerequisited.
2. MS2130 Engineering Materials, Prerequisited.

Bibliography
1. Juvinall, R.C., 1967, Stress, Strain and Strength Consideration in Design, McGraw Hill
2. Peterson, R.E., Stress Concentration Factors, McGrawHill
3. Dowling, N.E., 1999, Mechanical Behavior of Materials, Prentice Hall

MS5015, Geometrical Modeling & Geom. Data (2 SKS)

Short Syllabus
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Related Courses

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Bibliography
1. Kunwoo Lee:, 1999, Principles of CAD/CAM/CAE System, Addison-Wesley
2. Ibrahim Zeid:, 1991, CAD/CAM Theory and Practice, McGraw-Hill
3. Chris McMahon dan Jimmie Browne:, 1998, CAD/CAM: Principles, Practice and Manufacturing Management, Addison-Wesley

MS5016, Design of Machineries (3 SKS)

Short Syllabus
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Related Courses
1. MS3116 Design of Machine Elements II, Prerequisited.
2. MS3221 Manufacturing Processes II + Labs, Prerequisited.

Bibliography
1. Yotaro Hatamura dan Yoshio Yamamoto:, 1999, The Practice of Machine Design, Clarendon Press-Oxford
2. Clive L. Dyn dan Patrick Little, 2000, Engineering Design, A Project-based Introduction, John Wiley & Sons, Inc
3. David G. Ullman, 2003, The Mechanical Design Process, McGraw-Hill

MS5017, Piping System (3 SKS)

Short Syllabus
Piping design code and standards: ASME B31 and B31.3, industrial examples, input data, condition and design criteria, pipe system components, pressure design, thermal stress, flexibility analysis, supports, category-M pipe, and high pressure pipes.

Related Courses
1. MS1210 Statics, Prerequisited.
2. MS2111 Strength of Materials, Prerequisited.
3. MS2130 Engineering Materials, Prerequisited.

Bibliography
1. , Process Piping, ASME Code B31.3

MS5018, Design of Pressure Vessels (3 SKS)

Short Syllabus
ASME Boiler and Pressure Vessel Code, section VIII, Division I: load calculations, design load, materials, allowable stress, cylindrical and spherical vessels with internal

and external pressures, hemispherical ends, ellipsoid, conical, and flat ends, openings, flange, skirt and leg supports, local stresses, thermal stresses, welded vessels.

Related Courses
1. MS1210 Statics, Prerequisited.
2. MS2111 Strength of Materials, Prerequisited.
3. MS2130 Engineering Materials, Prerequisited.

Bibliography
1. , 2001, ASME Pressure Vessel Code, Section VIII Division 1,
2. Bednar, H.H., Pressure Vessel Design Handbook, Van Nostrand
3. Jawad, M.H. and J.R. Farr, 1989, Structural Analysis and Design of Process Equipment, J. Wiley and Sons

MS5019, Finite Elements Method (3 SKS)

Short Syllabus
Discretization, development of basic equations, numerical solution, interpretation of calculation results, and solution of more complex problems. The class will be complemented with training in finite element software and computer exercises.

Related Courses
1. MS2111 Strength of Materials, Prerequisited.
2. MS2130 Engineering Materials, Prerequisited.
3. MS3117 Basic Mechanical Vibration, Prerequisited.

Bibliography
1. D. Harsokoeseomo dan S.S. Brodjonegoro, Metode Elemen Hingga, Diktat Kuliah, Departemen Mesin ITB,
2. P.E.Funk, and R.R.:White, 2000, Finite Element Analysis, ASME International
3. Y.W.Kwon and H. Bang, 2000, The Finite Element Method Using MATLAB, 2nd edition, 2 Edition, CRC Press

MS5020, Special Topics in Production A (3 SKS)

Short Syllabus
This course is offered to accommodate special topics in the area of Production Engineering not included in the regularly listed courses. The syllabus is determined by the topics offered.

Related Courses
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Bibliography
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MS5021, Special Topics in Production B (3 SKS)

Short Syllabus
This course is offered to accommodate special topics in the area of Production Engineering not included in the regularly listed courses. The syllabus is determined by the topics offered.

Related Courses
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Bibliography
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MS5022, Advanced Machining (3 SKS)

Short Syllabus
Machining processes classification. Machining process basics. Tools geometry, empirical tools service-life, empirical cutting-force, tools materials. Tooling systems, machining cost, optimization of machining process. Grinding process: classification, grinding tools, chips thickness, grinding diagram, and grinding process optimization, coolant. Application of machining process.

Related Courses
1. MS3221 Manufacturing Processes II + Labs, Prerequisited.
2. MS3222 Industrial Metrology Lab., Prerequisited.

Bibliography
1. Rochim, T., 1986, Teori dan Teknologi Proses Pemesinan Departemen Teknik Mesin ITB, Departemen Teknik Mesin, FTI-ITB

MS5023, Advanced Machine Tools (3 SKS)

Short Syllabus
Types of machine tools, construction and application, standard equipment and accessories, machine frame and components, installation and foundation, slideways and bearings, types of driver.

Related Courses
1. MS3121 Industrial Metrology & Statistics, Prerequisited.
2. MS3221 Manufacturing Processes II + Labs, Prerequisited.
3. MS4120 Machining Processes, Prerequisited.

Bibliography

1. Manfred Weck, 1984, Handbook of Machine Tools Volume 1, Types of Machines, Forms of Construction and Applications, John Wiley & Sons
2. Manfred Weck, 1984, Handbook of Machine Tools Volume 2, Construction and Mathematical Analysis, John Wiley & Sons

MS5024, Non-conventional Machining (3 SKS)

Short Syllabus

Classification of non-conventional machining process, mechanical non-conventional process: AJM and USM, electrical-thermal non-conventional process: EDM, EBM, LBM, IBM and PAM. Term project.

Related Courses

1. MS3120 Manufacturing Processes I + Labs., Prerequisited.

Bibliography

1. Bhattacharyya A., 1977, New Technology, The Institute of Engineers, India
2. Springborn R.K., 1967, Non-Traditional Machining Processes, American Society of Tool and Manufacturing Engineers, Dearborn, Michigan

MS5026, Tooling System (3 SKS)

Short Syllabus

Introduction to tooling systems design, location and fixturing, basic principles of fixturing, jigs & fixtures, welding accessories, cutting tools and accessories, economic analysis tooling.

Related Courses

1. MS2101 Computer Aided Drafting, Prerequisited.
2. MS2214 Design of Machine Elements I, Prerequisited.
3. MS3121 Industrial Metrology & Statistics, Prerequisited.
4. MS3221 Manufacturing Processes II + Labs, Prerequisited.

Bibliography

1. , 1995, Jig and Fixture, Carr Lane Mfg. Co.
2. Hiram E. Grant, Jig and Fixtures Non-Standard Clamping Device, Tata McGraw-Hill, New Delhi, India
3. Edward G. Hoffman, 1996, Jig and Fixture Design, 4th Edition, Delmar Publishers, USA

MS5027, Machine Tool Testings (3 SKS)

Short Syllabus
Geometrical test of machine tool. Testing concept and testing of main functions of NC and non-NC machine tool. Laser interferometer in positioning accuracy of NC machine tool, analysis and diagnostics of machine tools test results.

Related Courses
1. MS4221 Machine Tools Technology, Prerequisited.

Bibliography
1. Komang Bagiasna, 1992, Diktat Pengetesan ketelitian geometrik mesin perkakas, Dept. Mesin-ITB,
2. Kakino, Accuracy Inspection of NC Machine Tools by Double Ball Bar Method,
3. G.Schlesinger, 1978, Testing Machine Tools, 8 Edition,

MS5028, NC Programming (3 SKS)

Short Syllabus
Numerical control configuration in NC machines, control system and calibration, G code (ISO), for lathe and milling CNC, machining process parameters and complete examples of NC programming which includes tooling system and specimen setting.

Related Courses
1. MS3120 Manufacturing Processes I + Labs., Prerequisited.
2. MS4120 Machining Processes, Prerequisited.
3. MS4221 Machine Tools Technology, Prerequisited.

Bibliography
1. Rochim T., 1996, Pemrograman NC, Jurusan Teknik Mesin ITB,

MS5029, Object Oriented Programming (3 SKS)

Short Syllabus
Object oriented programming concepts. Abstraction process, encapsulation concept, modularity concept, hierarchical concept, class concept, and persistent concept. System requirements. Problem modelling, object orientation based decision making. UML modelling, object oriented programming language, term project, design and modelling of objects, and software development.

Related Courses
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Bibliography
1. Grady Booch, 2000, Object-oriented Analysis & Design with Applications, Addison-Wesley

2. James Rumbaugh, Ivar Jacobson, Grady Booch, 1999, The Unified Modeling Language Reference Manual, Addison-Wesley
3. Craig Larman, 1998, Applying UML and Patterns An Introduction to Object-Oriented Analysis and Design, Prentice Hall

MS5030, Special Topics in Material A (3 SKS)

Short Syllabus
This course is offered to accommodate special topics in the area of Materials science and engineering not included in the regularly listed courses. The syllabus is determined by the topics offered.

Related Courses
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Bibliography
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MS5031, Special Topics in Material B (3 SKS)

Short Syllabus
This course is offered to accommodate special topics in the area of Materials science and engineering not included in the regularly listed courses. The syllabus is determined by the topics offered.

Related Courses
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Bibliography
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MS5032, Corrosion and Controlling Methods (3 SKS)

Short Syllabus
Definition and description of corrosion as electro-chemical reaction, anodic and cathodic reactions, polarization curve, classification of corrosion and its mechanisms: surface, pitting, grain boundary, galvanic, erosion, etc., corrosion monitoring, corrosion control: cathodic, inverted current, anodic, coating, etc., material selection and design improvement to minimize corrosion.

Related Courses
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Bibliography
1. Pludek, 1977, Design and Corrosion Control, Macmillan Press
2. Jones, Denny A., Principle and Prevention of Corrosion, Macmillan Publishing

Company
3. ASM., 1994, Metals Handbook. Corrosion, Vol. 13,

MS5040, Special Topics in Conversion A (3 SKS)

Short Syllabus
This course is offered to accommodate special topics in the area of Energy Conversion not included in the regularly listed courses. The syllabus is determined by the topics offered.

Related Courses
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Bibliography
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MS5041, Special Topics in Conversion B (3 SKS)

Short Syllabus
This course is offered to accommodate special topics in the area of Energy Conversion not included in the regularly listed courses. The syllabus is determined by the topics offered.

Related Courses
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Bibliography
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MS5042, Steam Generator System (3 SKS)

Short Syllabus
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Related Courses
1. MS3245 Heat Transfer II, Prerequisited.

Bibliography
1. M. M. El-Wakil, Powerplant Technology, McGraw–Hill, New York, 3rd. Ed
2. P. Shlyakhin, Steam Turbines Theory and Design, Foreign Languages Publishing House, Moscow
3. Babcock & Wilcock, Steam: It's Generation and Use, Babcock & Wilcock, New York

MS5043, Design of Fluid System (3 SKS)

Short Syllabus
Energy equation, major and minor losses (in valves, elbows, adaptors, tee-joints, etc), pipe system simulation, optimization in single or multiple loops using Hardy-Cross method, piping standard, pumps and compressors selection for liquid or gas, code and standards.

Related Courses
1. MS3143 Fluid Mechanics II, Prerequisited.

Bibliography
1. M. Mohitpour, 2000, Pipe Line Design, ASME Press
2. E. Benjamin Wylie, Fluid Transient, Mc Graw Hill

MS5044, Fluid Machineries (3 SKS)

Short Syllabus
Main parameters and basic characteristic of fluid machineries design, kinematics, dynamics, governing equation of motion, energy equation in absolute and relative systems, basic variables, energy analysis in inlet and outlet, pumps and turbines construction, numerical analysis, turbo-machinery design for incompressible and compressible substance.

Related Courses
1. MS2100 Numerical Analysis & Programming, Prerequisited.
2. MS4147 Energy Conversion Machineries II, Co-requisited.

Bibliography
1. Bruno Eckert, Axial und Radialkompressoren, Springer Verlag
2. Cohen, Gas Turbine Theory, Longman Scientific & Technical
3. Traupel, W., Thermische Turbomaschinen, Springer Verlag

MS5045, Piston Combustion Engine (3 SKS)

Short Syllabus
Otto (gasoline) and diesel engines. The influence of design and operation to performance and fuel consumption. Review of thermodynamics, fluid mechanics, combustion, heat transfer, friction, power losses, efficiency, and exhaust emission. Operation characteristics of various internal combustion engines, and new trends in gasoline and diesel engines.

Related Courses
1. MS4100 Mechanical Engineering Lab I, Prerequisited.
2. MS4147 Energy Conversion Machineries II, Prerequisited.
3. MS4240 Mechanical Engineering Lab II, Prerequisited.

Bibliography

1. Heywood, J.B, 1988, Internal Combustion Engine Fundamentals, McGraw Hill
2. Pischinger, R., Krasnik G., Taucar G., Sams Th.;, 1989, Thermodynamik der Verbrennungskraftmasschine;, Springer-Verlag
3. Murayama, T., Tsunemoto, H., 1999, Engineering of Automobile Engine, Sankai -do

MS5046, Gas Turbine (3 SKS)

Short Syllabus

Characteristics of gas turbines for industry, ground vehicles, ships, and aircrafts, design and construction of main components: intake, compressor, combustion chamber, turbine, nozzle, and exhaust, different types of motor and installation: turbojet, turbofan, turboprop, and turboshaft, operating regimes and disadvantages, fuels, lubricants, exhaust emission, ways of improving power and efficiency, noise and emission reduction, installation and foundation, operation and maintenance, problems, research and development topics, design and testing, quality improvement, environmental and cost considerations.

Related Courses

1. MS4147 Energy Conversion Machineries II, Prerequisited.

Bibliography

1. H. Cohen, G.F.C. Rogers, H.I.H. Ssaravanamuttoo, 1991, Gas Turbine Theory, 3 Edition, Loingman Scientific & Technical, London
2. J.L. Keerrebrock, Aircraft Engines and Gas Turbines, 2nd Edition, The MIT Press, Cambridge, Massachussets
3. D.G. Wilson, 1984, The Design of High Efficiency Turbomachinery and Gas Turbines, The MIT Press, Cambridge, Massachussets

MS5047, Rocket Engine (3 SKS)

Short Syllabus

Rockets with solid, liquid, and hybrid propellants, theory on propellants, igniter, inhibitor, and combustion, propellant injection system, heat transfer and cooling, performance and characteristics, multiple rockets, and safety system.

Related Courses

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Bibliography

1. G.P. Sutton, 1986, Rocket Propulsion Elements, John Wiley & Sons Inc, New York
2. M. Barriere, A. Jaumotte, B.F. de Veubeke, J. V, 1960, Rocket Propulsion, Elsevier Publishing Company, Amsterdam

3. J.W. Cornelisse, HFR Schoyer, K.F. Wakker, 1979, Rocket Propulsion and Space Flight Dynamics, Pitman, London

MS5048, Fuels and Combustion (3 SKS)

Short Syllabus
This class discusses combustion process in energy conversion machineries. Coverage includes combustion theory, types of fuels: solid, liquid, gas, application in common energy conversion machineries such as: internal combustion engines, gas turbine, burner, furnace, etc., combustion processes: internal, external, premixed flames, diffusion flames, detonation, fixed-bed, and fluidized-bed combustion.

Related Courses
1. MS3245 Heat Transfer II, Prerequisited.
2. MS4147 Energy Conversion Machineries II, Prerequisited.

Bibliography
1. G.L. Borman, K.W. Ragland, 1998, Combustion Engineering, McGraw Hill, International Editions, New York
2. J.B Heywood, 1988, Internal Combustion Engine Fundamentals, McGraw Hill, International Editions, New York

MS5049, Refrigeration & Cryogenics Systems (3 SKS)

Short Syllabus
Operating principles of various refrigeration and cryogenics systems, application of energy and exergy analysis, main components, system design and component selection, vapor compression refrigeration cycle, the use of halocarbon, hydrocarbon, and CO2 refrigerants, absorption refrigeration equipment, liquefaction, gas separation, and subzero refrigeration technique.

Related Courses
1. MS3245 Heat Transfer II, Prerequisited.

Bibliography
1. Stoecker, W.F., Jones, J.W., 1982, Refrigeration and Air Conditioning, Second Edition, 2 Edition, McGraw-Hill Inc
2. Pasek, A.D., Tandian, N.P, Suwono, A., Diktat Kuliah Teknik Refrigerasi dan Kriogenika,
3. Barron, R.F., 1985, Cryogenic System, Second Edition, 2 Edition, Oxford University Press

MS5060, Tribology (2 SKS)

Short Syllabus
Basic principles of friction, wear, and lubrication, examples of applications.

Related Courses
1. MS1210 Statics, Prerequisited.
2. MS2130 Engineering Materials, Prerequisited.
3. MS3245 Heat Transfer II, Prerequisited.

Bibliography
1. S.S.Brodjonegoro, 2002, Tribologi, Diktat Kuliah, Penerbit ITB
2. M.M. Khonsari & E.R. Booser, 2001, Applied Tribology, John Wiley & Sons Inc., New York

MS5061, Dynamic System Modeling (3 SKS)

Short Syllabus
Dynamic system modeling examples, modeling theory, generalized variables, Energy sources, energy storage, energy dissipators. Constitutive law, components in mechanical, electrical, fluids and thermal systems. Multi-port input systems, modeling methods: networking, variational and Bond Graph. Case studies.

Related Courses
1. MS6000 Engineering Analysis I, Co-requisited.

Bibliography
1. Wellstead, P.E.:, 1979, Introduction to Physical System Modelling, Academic Press

MS5062, Mechanical Signal Processing (3 SKS)

Short Syllabus
Continuous and discrete time linear system, time invariant linear system, Laplace transform, Fourier analysis, sampling theorem, correlation and power spectra, Z transform, filtering theory, filter design, random signal, independent study and term projects.

Related Courses
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Bibliography
1. Oppenheim, A.V., Willsky, A.S., and Young, I.T., 1983, Signal and Systems, Prentice Hall
2. Little, J., and Shure, L., 1988, Signal Processing Toolbox - for use with MATLAB, The MathWorks, Inc

3. Strum, R.D., and Kirk, D.E., 1994, 1994, Contemporary Linear Systems using MATLAB, PWS Publishing Company, Boston

MS5063, Motor Installation & Foundation (3 SKS)

Short Syllabus
Dynamic loading on internal combustion engines and turbines, dynamic response, specifications of vibration levels for various motors, motor installation, case studies in building, automotive, aircraft, ships, and portable units, vibration isolation, passive vibration control, types of isolation, soil characteristics and conventional motor foundation design, design of foundation using mass-spring model and finite element, finite element model for complex foundation, vibration measurement, and introduction to active vibration control.

Related Courses
1. MS3117 Basic Mechanical Vibration, Prerequisited.

Bibliography
1. Barkan, DD, 1962, Dynamics of Bases and Foundations, McGraw-Hill, New York
2. Crede, C.E., Vibration and Shock Isolation, John Wiley & Sons, Inc, New York
3. Bowles, J.E., 1962, Foundation Analysis and Design, 4th edition, 4 Edition, McGraw-Hill, New York

MS5064, Control Systems (3 SKS)

Short Syllabus
Considerations in implementing control, components of automatic control systems: actuators, motors, sensors, vision systems, analog control systems, digital control systems (PC-based, PLC programming), examples; robots, NC machines, etc, design of control systems, case studies.

Related Courses
1. EP3042 Electrical Power Engineering, Prerequisited.
2. MS3200 Introduction to Control System, Prerequisited.
3. MS3201 Mechatronics II, Prerequisited.

Bibliography
1. Morriss, S. B., 1995, Automated Manufacturing Systems, McGraw-Hill
2. Schuler, C. A., 1988, Industrial Electronics and Robotics, 2 Edition, Mc-Graw-Hill
3. Yeralan, S., 1993, Programming and Interfacing the 8051 Microcontroller,

MS5070, Robotics (3 SKS)

Short Syllabus
Homogeneous transform. Forward and inverse kinematics: work space, dexterity. Multi-body dynamics: Newton-Euler recursive formula, Lagrangian recursive formula, design consideration, linearization and simplification of robot dynamics. Path planning: straight motion, curve motion, path trajectory conversion, Cartesian motion. Static force, compliance, task planning.

Related Courses
1. MS3200 Introduction to Control System, Prerequisited.

Bibliography
1. Craig J.J., 1989, Introduction to Robotics, 2 Edition, Addison Wesley

MS5071, Computer Aided Control Syst. Design (3 SKS)

Short Syllabus
State-space model , pole placement, Linear Quadratic Regulator, Estimator design using pole placement, Kalman filter, compensator design, reference signal and integral control, sensitivity and robustness.

Related Courses
1. MS3200 Introduction to Control System, Prerequisited.

Bibliography
1. Franklin, G.F., Powell, J.D., and Workman, M.L., 1990, Digital Control of Dynamic Systems, 2 Edition, Addison Wesley
2. Doyle, J.C. and Francis, B.A., 1992, Tannenbaum A.R.Feedback Control Theory, MacMillan

MS5072, Artificial Int. for Eng. Appl. (3 SKS)

Short Syllabus
Introduction to Artificial Intelligence, stimulus-response agents. Neural Networks.Machine Evolution. State Machines. Robot Vision.

Related Courses
1. MS3200 Introduction to Control System, Prerequisited.

Bibliography
1. Kosko, B., 1992, Neural Networks and Fuzzy Systems, Prentice-Hall
2. Nilson, N.J., 1998, Artificial Intelligence - A New Systhesis, Morgan Kaufmann Pub. Inc.

MS5073, Production Management (3 SKS)

Short Syllabus
This class concentrates on the following objects: thinking framework that is centered around factory or production unit, development of working organization that emphasizes customer satisfaction, job and autonomy distribution to smaller working units, continuous development, and development of charts for performance monitoring.

Related Courses
1. MS3221 Manufacturing Processes II + Labs, Prerequisited.

Bibliography
1. Suzaki, K., 1993, The New Shop Floor Management Empowering People for Continuous Improvement, The Free Press
2. Ono, K., and Negoro, T., 1992, The Strategic Management of Manufacturing Businesses, 3A Corporation

MS5074, Production Control System (3 SKS)

Short Syllabus
Structure and organization of manufacturing firms, the purpose of planning and control, planning and control of production system in a computer integrated manufacturing (CIM) environment, management of job order, dispatching, production data acquisition, data base, CAD/CAM, statistics, examples of existing production systems, program structure, and implementation of production control system.

Related Courses
1. MS3221 Manufacturing Processes II + Labs, Prerequisited.

Bibliography
1. , System Integration of Manufacturing Application,
2. Hanser, 1994, Implementasi Sistem Kontrol Produksi di Negara Berkembang - sebagai Contoh Indonesia, Indra Djodikusumo
3. Djodi et.al., 1991, Functional Specification of Shop Floor Control System, Berlin

MS5090, Air Conditioning System (3 SKS)

Short Syllabus
Review of thermodynamics analysis of air conditioning system, air treatment, psychrometric chart, cooling load estimation, introduction to air conditioning equipments and selection, air distribution system, distribution of cool air, control system, psychrometric analysis, engineering economy of air conditioning system design.

Related Courses

1. MS3245 Heat Transfer II, Prerequisited.

Bibliography

1. Carrier, Handbook of Air Conditioning System,
2. Jan F Kreider and Ari Rabl, 1994, Heating and Cooling of Buildings, Design for Efficiency, McGraw Hill International
3. Stoeker WF and Jones JW, 1983, Refrigeration and Air Conditioning, McGraw Hill Publishing Company Ltd.

MS5091, Heat Exchangers (3 SKS)

Short Syllabus

Definitions, heat exchanger applications, classification of heat exchangers, basic theory, characteristics, types and selection, more detailed description of heat exchangers: double pipe, shell and tube, plate-fin, plate and frame, air cooled, boiler, evaporator, condenser, and water cooling tower, calculations of heat transfer capacity, overall heat transfer coefficient, heat transfer surface, pressure drop, effectiveness, codes and standards, design of heat exchangers. Students have to complete group term project and present the results.

Related Courses

1. MS3245 Heat Transfer II, Prerequisited.

Bibliography

1. G.F. Hewitt, G.L. Shires, T.R. Bo, 1994, Process Heat Transfer, CRC Press, Inc.
2. , Buku-buku Heat Exchanger lainnya,
3. , Buku Standard TEMA,

MS5092, Two Phase Flow and Heat Transfer (3 SKS)

Short Syllabus

This course deals mainly with two phase flows: mechanisms, modeling, basic principles of two phase flow and heat transfer, basic equation, data processing, utilization of empirical relations to accommodate pressure drop and heat flux. Discussion of flow and heat transfer of boiling process, subzero, saturated boiling, boiling film, critical heat flux, condensation. Two phase system with multiple components. Illustrated examples of implementation in real world problems.

Related Courses

1. EL2100 Engineering Mathematics II, Prerequisited.
2. MS3245 Heat Transfer II, Prerequisited.

Bibliography

1. J. G. Collier, 1989, Convective Boiling and Condensation, 3rd Edition, 3 Edition, McGraw-Hill
2. N. E. Todreas and M.S. Kazimi, 1990, Thermal Hydrolic Fundamentals, Publishing Corp

MS5093, Gas and Particle System (3 SKS)

Short Syllabus
Definition of solid/fluid particles in gaseous phase (aerosol). Size and particle characteristics while stationary or moving. Particle dynamics: Newton and Stokes laws, slip factor correction, settling rate. Particle separation: centrifuge, inertial impactor, cyclone. Aerosol filter: particle capturing mechanism, filter efficiency curve, particle testing. Electrostatic precipitator. Particle fluidization. Heat and mass transfer within fluidized particles and with its gaseous environment. Examples of industrial application: combustion of fluidized solid fuels, combustion interaction and other chemical reactions within aerosol.

Related Courses
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Bibliography
1. Soelaiman, T.A.F., 2001, Diktat Teknologi Aerosol, ITB
2. Reist, P. C., Aerosol Science and Technology, Second Edition, McGraw-Hill International Editions, Singapore
3. Svarovsky, L., Solid-Gas Separation, Elsevier Scientific Publishing Co., The Netherlan

MS5230, Failure Analysis: Methods & Cases (3 SKS)

Short Syllabus
Purpose of failure analysis; overview of failure modes. Yield criteria, initiation of plastic deformation. Stress concentration, static failure. Overview of fracture mechanics: fatigue fracture and creep. Embrittlement and corrosion. Failure analysis method and reporting.

Related Courses
1. MT5142 Fracture Mechanics, Co-requisited.

Bibliography
1. ASM Handbook, 1986, Failure Analysis and Prevention, 9 Edition, ASM

KU1011, Scientific Writing in Indonesian (2 SKS)

Short Syllabus
The subject is designed to equip the students with the knowledge and skills to express their ideas in scientific writing genre. The subject includes such teaching materials as spelling, word formation, grammar, logic, definition construction, paragraphs

construction, and scientific writing organization.

Related Courses
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Bibliography
1. Alwi Hasan.et.al., Tata Bahasa Baku Bahasa Indonesia., Jakarta : Balai Pustaka
2. Depdikbud RI., Pedoman Umum Ejaan Baku, Jakarta:Balai Pustaka
3. Keraf, Gorys, Komposisi ., Ende Flores : Nusa Indah

KU1131, Sport I (1 SKS)

Short Syllabus
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Related Courses
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Bibliography
1. Bompa. Tudor O, Theory and Methodology of Training, Kendal/Hunt Publishing Company
2. Harsono, Coaching dan Aspek-aspek Psikilogis Dalam Coaching, CV Tambak Kusuma
3. Lautan, Rusli, dkk., Manusia dan Olahraga. Kerjasama ITB dan FPOK IKIP Bandung, Penerbit ITB

KU2071, Pancasila and Civic Education (2 SKS)

Short Syllabus
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Related Courses
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Bibliography
1. Manheim, Karl , Ideologi dan Utopi: Menyingkap Kaitan Pikiran dan Politik, diterjemahkan oleh Drs. F. Budi Hardiman, Kanisius
2. Budiman, Arief, Teori Negara: Negara Kekuasaan dan Ideologi, PT. Gramedia Pustaka Utama, Jakarta
3. Amal Ichlasul & Armawi, Armaidy ;, Ketebukaan Informasi dan Ketahanan Nasional, Gajahmada University Press

KU4026, (2 SKS)

Short Syllabus
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Related Courses

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Bibliography

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