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**DR. A P J ABDUL KALAM UNIVERSITY,
INDORE**

SYLLABUS

For

DIPLOMA in AUTOMOBILE ENGINEERING

(PART TIME)

(Second Year, 4th SEM)

College of Polytechnic Engineering

Dr. A P J Abdul Kalam University, Indore

DR. A P J ABDUL KALAM UNIVERSITY, INDORE

Syllabus for Diploma in Automobile Engineering (Part Time)

List of Subject (First Year, 4th Sem)

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Unit 1: BASIC CONCEPT OF THERMODYNAMICS:

Introduction, System, Surrounding & Universe, Working substance, Thermodynamic Equilibrium, Heat, Work, Reversible & Irreversible Process. First law of Thermodynamics its Application and Limitations, Need of Second Law of Thermodynamics, Heat engine & Heat Pump. Representation of Basic Thermodynamic processes on PV & TS Plane & calculation of Heat Transfer & Work done for these processes. Air standard Otto cycle, its air standard efficiency & mean effective pressure, effect of compression ratio on Otto cycle efficiency, actual cycle for petrol engines.

Unit 2: ENGINE CONSTRUCTION AND OPERATION:

Four stroke and two stroke petrol engine- working principle, construction and operation. Scavenging, comparison of four stroke and two stroke engine operation, firing order and its significance. Port Timing & Valve Timing diagram of petrol engines. Comparison of two & four stroke petrol engine.

Unit 3: COOLING AND LUBRICATION SYSTEM:

Need for cooling system, Study of cooling system components, Types of cooling system: air cooling system, liquid cooling system, and pressurized cooling system, antifreeze mixture. Need of Lubrication system, properties of lubricating oil, additives, Types of lubrication system: pressure lubrication system, dry &, wet sump lubrication system.

Unit 4: SI ENGINE FUEL SYSTEM:

Properties of Ideal gasoline, Fuel feed systems; mechanical and electrical fuel feed pumps. Carburetor Function & working principle, starting, idling, acceleration and normal circuits of carburetors. Study of Solex, S.U, Amal Carburetors. Concept of Petrol injection, MPFI.

Unit 5: COMBUSTION AND COMBUSTION CHAMBERS:

Combustion in SI engine; stages of combustion, flame propagation, rate of pressure rise, delay period, abnormal combustion, Pre-ignition, knocking, Octane number, effect of engine variables on knocking, Fuel additives. Combustion chambers for petrol engines & its different types.

Unit 6: DATABASE:

Introduction – need, Characteristics and terminologies of database, Types of database – relational, Hierarchical and Network, Basic entities – Tables, records, Data types, Data Validation and constraints, keys relation between tables, Query – Select, Insert, Update, and Delete. Forms – Creating forms, Forms controls, Report Designer- Customize formats, grouping reports.

Unit 7: COMPUTER COMMUNICATION & NETWORKS

Information Networks - The Technology of Workgroup Computing Types of network, Network topology, Network components

Data Communication - Introduction to Data Communication, Types of Data, Transmission media Internet and E-mail Internet Basics

Websites- Applications, terminologies, naming conventions.

Web Browsers- Types, Navigation and tools

E-mail – concept, terminologies, mailing services provider, advantages comparison with Conventional mailing, Search engine – concept, search engine websites, searching methods.

LIST OF EXPERIMENTS

1. Study of two stroke petrol engine.
2. Study of four stroke petrol engine.
3. Study of fuel feed system of petrol engine.
4. Study of lubrication system at petrol engine.
5. Study of cooling system of petrol engine.
6. To draw valve timing and port timing diagram.
7. Dismantling and assembling of multi cylinder engine.
8. To draw sketches of major components.
9. To study working of major components of the engine.
10. To open the oil pump, sketch and identify the components and assemble them.
11. To open the fuel pump, sketch and identify the components and assembly.
12. To open the carburetor, sketch and identify the components and assemble.

REFERENCES

1. Heldt P.M., "High Speed Combustion Engines", Oxford IBH Publishing Co., Calcutta,
2. Obert E.F., "Internal Combustion Engines Analysis and Practice", International Text Books Co., Scranton, Pennsylvania -
3. William H.Crouse, "Automotive Engines", McGraw-Hill Publishers,
4. Ellinger H.E., "Automotive Engines", Prentice Hall Publishers,
5. John B.Heywood, "Internal Combustion Engine Fundamental", McGraw-Hill, Pulkrabek "Engineering Fundamentals of the Internal Combustion Engines", Practice Hall of India,
6. Ganesan.V. "Internal Combustion Engines", Tata McGraw-Hill Publishing Co., New Delhi, M.L.Mathur and R.P.Sharma, "A course in Internal combustion engines", Dhanpat Rai & Sons Publications, New Delhi,
7. K.K.Ramalingam, "Internal Combustion Engines", Scitech Publications, Chennai

Unit 1: Projection and multi view Representation:

Projection orthographic projection. First and third angle projection, superfluous view, choice of views, auxillary views- views -full and partial, conversion of pictorial views in to orthographic views, conventional representation as per IS: 696.

Unit 2: Sectional Views:

Full section, half section, partial or broken section, revolved section, removed section, offset section. Sectioning conventions, section lines. Hatching procedure for different materials as per IS code 686 1972. Sectional views of assembled parts. Choosing from IC engine parts, couplings, clutches, brackets, bearing etc. (Use 1st and 3rd angle projections both)

Unit 3: Dimensioning Tolerance, Machining And Welding Symbols :

Types of dimensions (size and location) dimensioning terms and notations. (use of I.S.Code 696 &2709) general rules for dimensioning and practical hints on dimensioning systems of dimensioning. Dimension of cylinder holes arcs of circle narrow space, angles, counter sunk hole, screw threads taper etc. Application of tolerances. (Use I.S. Code 696) Machining marks, finish marks, countersinking, counter boring spot facing, figures and notes for same. Representation of characteristics machining (circularity, Angularity etc.) (Ref IS 969) Representation of welded joints, welding symbols, tolerance of forms and positions. Procedure of drawing fits, limits, size, tolerance, clearance etc.

Unit 4: Production Drawing:

Detailed drawing, assembly drawing, scale, finish tolerances, notes etc. Title block, tool list, gauge list. Preparation of production drawing for pattern shop. Forging shop, machine shop, preparation of assembly drawing from detailed drawing. exploded views, sectional pictorial views, assembly drawing of nut and bolt, plummer block, flange coupling, stepped pulleys, foot step bearing, Universal coupling, connecting rod, piston of I.C. engines, cotter joint, Knuckle joint. Preparation of detailed drawing from assembly drawings and assembled pictorial views, Interpretation of production drawing.

Unit 5: Introduction to Auto CAD:

Coordinate system. Draw commandline, arc, circle rectangle, polygon, point, ellipse, hatch, table. Modify commands-erase, copy, offset, array, trim, extend, break, join, chamfer, fillet, move, rotate, scale, stretch, lengthen. Dimensioning Tray settings: snap, grid, ortho, polar, osnap Format commands: line type, point style, units, layers, drawing limit, dimension style

Unit 6: Application of Auto CAD:

Practice of assembly drawings using Auto CAD

Unit 7: Presentation:

Block, creating layout, insert layout, plotting/printing

Unit 8: Pipe Drafting:

Various symbols used in pipe line work as per IS code of Practice, C.I. flanged joint, socket and spigot joint, gland and stuffing box, expansion joint, pipe fitting typical pipe bends, pipe supports and accessories.

Unit 9: Gear Drawing:

Gear terminology such as pitch, pitch circle diameter module, addendum, root circle diameter, hole depth, blank diameter etc. construction of cycloidal, involute teeth profiles, pinion and rack meshing, spur gear meshing.

Unit 10: Graph and Charts:

Introduction, Classification of chart, graphs and diagrams, quantitative and qualitative charts and graphs, Drawing and curve titles, legends notes etc. procedure for making a graphical representation in ink. Logarithmic graphs, semi logarithmic graphs, bar charts area (Percentage) charts, pie chart, alignment charts (Nomo graphs) Forms and construction, construction of functional scale, parallel scale charts for equations of the form $[f(t) + f(u) + f(v), (f(t) \cdot f(u) = f(v)]$ three scale alignment chart, graphical construction of a Z- chart, four variable relationship parallel scale alignment chart.

SUGGESTED TERMS –WORK

- 1 Projection and multi views representation .
- 2 Sectional views .
- 3 Dimensioning, tolerance, machining and welding symbols .
- 4 Production drawing .
- 5 Pipe drafting .
- 6 Gear Drawing .
- 7 Graphs and charts .
- 8 Computer graphics.

REFERENCE BOOKS

- 1 Fundamentals of Engineering Drawing by Warren J. Luzadder (Prentice-Hall).
 - 2 Mechanical Drawing by Giesecke, Mic- hell Specer, Hill. (Collier Macmillan Internal Edition)
 - 3 Engineering Graphics by Giesecke/Mitchell/ Spencer/ Hill/ Loving (Macmillan) .
 - 4 Mechanical Drawing By N.D.Bhatt
 - 5 Mechanical Drawing By P.S.Gill
 - 6 Mechanical Drawing By R.K.Dhawan
 - 7 Inside AUTO CAD by Daniel Raker and Harbest Rice(BPB Publisher)
 - 8 Computer Graphics and CAD Fundamentals By Noel M Morries(Wheeler)
- PDF created

Unit 1: Simple stresses and strains:

Introduction, types of load and deformation types of stresses and strains, Hooke's law Elastic limit, Poisson's ratio, Modulus of Elasticity, Modulus of rigidity, Bulk Modulus, modular ratio, temperature stresses, Hoop stress, State of simple shear, Relation between the Elastic constants, Volumetric strain, Rectangular block subjected to normal stresses. Strain energy of resilience, proof resilience modulus of resilience, types of loading, strain energy stored due to gradual, sudden and impact load.

Unit 2: Shear force and bending moment of beams:

Types of beams types of loading, shear force, bending moment, relation between shear forces, and bending moment at section. Sign convention, shear force and bending moment diagrams for cantilever, simply supported and over hanging beam under concentrated load and uniformly distributed load point of contra flexure.

Unit 3: Theory of simple bending:

Assumption, Bending stress, and bending equation, Natural layer, Neutral axis, moment of resistance and section modulus modulus of rupture, slope curvature and collection of beams, beams of uniform strength, solve simple problems of bending.

Unit 4: Torsion of circular shaft:

Torsion of shaft, torsion Equation (without proof) solid and hollow circular shafts, problems on design of shafts subjected to pure torsion and combined bending and torsion.

Unit 5: Simple Mechanisms.:

Introduction to mechanics of machine, definitions of kinematics, Dynamic, statics and kinetics, link, Kinematic pair, kinematic chain, mechanism machine, Inversion, Difference between mechanism and machine.

Unit 6: Transmission of power:

Introduction, Drives types of drives, belt rope chain and gear drives, relative merit and demerits of different drives. a) Belt drives: - Types of belts, Types of flat belt drive, belt material, and length of the belt calculation for open and cross belt drives. M.P. Transmitted effect of centrifugal force Centrifugal tension simple problems on velocity ratio b) Chain Drive: -Classification of chain and their applications. c) Gear Drive:- Classification types of gears and its application spur gear terminology, Interference, function of idler Lewis equation (without proof) problems on finding number of teeth, exact centre distance and power transmitted by gear drives.

Unit 7: Crank Effort Diagram and Flywheel:

Dynamic of reciprocating engine mechanism, Inertia force due to reciprocating mass, piston effort, crank effort, and turning moment of crank shaft. Fluctuation of energy, Coefficient of fluctuation of energy and speed flywheel and its functional calculation of moment of inertia and weight of flywheel for I.C. engine.

Unit 8: Crank Effort Diagram and Flywheel:

Dynamic of reciprocating engine mechanism, Inertia force due to reciprocating mass, piston effort, crank effort, and turning moment of crank shaft. Fluctuation of energy, Coefficient of fluctuation of energy and speed flywheel and its functional calculation of moment of inertia and weight of flywheel for I.C. engine

Reference book:

- 1 Strength of Materials. by B.C. Punmia.
- 2 Strength of Materials. by R. S. Khurmi.
- 3 Strength of Materials by Sadhu Singh.
- 4 Strength of Materials by K. D. Sexena.
- 5 Strength of Materials by S. Ramamuruthan.
- 6 Strength of Materials by I. B. Prasad.
- 7 Strength of Materials by G. H. Ryder.
- 8 Strength of Materials by Timoshenko & Young
- 9 Laboratory Experiments in Strength of Materials by B.D. Sharma.
- 10 Theory of machine by R.S.Khurmi
- 11 Theory of machine by S.S.Ratan
- 12 Dravya Samarthya (Hindi) by K. D. Saxena (Deepak Prakashan, Morar Gwalior)

Unit1: Introduction to Manufacturing Processes :

Definition, classification of basic manufacturing processes i.e, mechanical working, casting, metal joining processes, metal cutting process, press working . Examples of each of the above listed manufacturing processes, factors which influence selection of manufacturing process for a particular application.

Unit 2: Metal Casting :

Introduction , advantages and limitations of casting as production process. **Pattern Making** Definition of pattern, types of patterns and their details, materials, allowances, tools required, colour code for patterns. **Moulding** : Definition, moulding methods and types of moulds, moulding materials, moulding sand and its composition, sand properties, testing parameters of sand, and their effects, sand preparations, sand conditioning, characteristics and defects of moulds. Function of runners, risers and gate. Cores and core making, core boxes. Cleaning of casting, Special casting methods, need for special casting methods, die casting, centrifugal casting, investment (lost wax) casting, casting defects, causes and analysis, area of application of casting process. Furnaces : Cupola ,crucible, pit and electric arc furnaces, induction furnace , their salient features, safety aspects.

Unit 3: Press Working:

Introduction of press working of metals, principle of press working , description of a simple press working unit, press working operations : punching, shearing, drawing, bending, slitting, knurling, notching, trimming, piercing etc. Double action press, description and its field of application, die and punch, types of dies, specifications of a press, safety precautions to be observed while working on a press.

Unit 4: Mechanical Working:

Introduction - hot and cold working Principle of recrystallization. **Metal Rolling** : Principle of metal rolling , basic components of a simple rolling process equipment. Types of deformation during rolling. roller material, selection and desirable properties, principles of thread rolling description with sketches, manufacture of seamless tubes by rolling. types of rolling mill. Rolling defects **Metal Drawing** : Basic Principle of drawing of metals, differentiate between the drawing and deep drawing of metals, principle of wire drawing and example. **Extrusion** : Definition, Classify the methods of extrusion, their limitations, advantage and disadvantage. Tube extrusion, impactextrusion, application of extrusion processes. Extrusion defects . **Forging** : Types of forging, Die forging, differentiate between the cold die and hot die forging , advantage of forming by forging, common defects and their reasons. Limitations of forging, press forging, drop forging, upset forging, die material , applications of forging processes in engineering.

Unit 5: Metal Joining:

Introduction, Classification of metal joining processes **Welding** :-classification, Plastic, fusion and forge welding, Weldability of metals, metallurgy of welding

Resistance welding : Spot, seam, butt, projection, percussion techniques. **Gas welding and gas cutting** : Principle of operation and technique, gas cutting. **Arc Welding** : Carbon arc, TIG, MIG, Submerged arc , Atomic hydrogen, Eletro-slag, Plasma arc welding processes, Electrodestypes and selection , flux and their uses. Special welding techniques-Welding of different metals. Defects in welds, testing and inspection. Accident prevention in gas and arc welding Equipments & tools used in metal arc welding, specification and functions.Soldering, Brazing and Adhesive bonding.

LIST OF EXPERIMENTS

- 1 Making a split/solid pattern from wood. Making a core box.
- 2 Tempering of sand, practice of green and dry sand making.
- 3 Practice of core making and baking
- 4 Practice of open mould in a two boxes, using split pattern and solid pattern, Locating the core .
- 5 Demonstration of metal melting in pit furnace& casting process.
- 6 Simple forming practice (Making a square bar out of a given round bar, making of a chisel and bolt)
- 7 Practice of upsetting of a round on power hammer.
- 8 Practice of sheet cutting with the help of straight and bent snips. Making small rectangular prism and cylinder.
- 9 Practice of making of washer of any size on a flypress.
- 10 Practice of piercing, notching and circle cutting with the help of Metal master machine.
- 11 Practice of piercing, notching and circle cutting with the help of Metal master machine.
- 12 Practice of piercing, notching and circle cutting with the help of Metal master machine.
- 13 Practice of edge preparation for welding.
- 14 Demonstration and practice of bead laying (Welding) on a Flat pieces
- 15 Practice of Welding of corner, edge and Tee joint
- 16 Welding ' V' butt joint.
- 17 Practice of joining wires and rods of different size on spot welding machine.
- 18 Practice of making gas flames with nozzles and making simple joints.

References

1. Process And Materials of Manufacture by Lindberg.
2. Workshop Technology by Hazara & Choudhary.
3. Materials And Manufacturing process by Dalela.
4. Manufacturing Processes by Yankee.
5. Manufacturing Process by S.E. Rusinof
6. Welding Engineering by B.E. Rossi.
7. Production Engineering – P.C. Sharma
8. Manufacturing Technology- P.N. Rao
9. Production Technology- R.K. Jain
10. Foundry Engineering by P.L. jain.
11. Nirman Prakram (Hindi) by P.N. Vijayvargiya. (Deepak Prakashan, Morar, Gwalior)

OBJECTIVES:

THE STUDENTS WILL BE ABLE TO:

1. Developing working in teams
2. Apply problem solving skills for a given situation
3. Use effective presentation techniques
4. Apply techniques of effective time management
5. Apply task management techniques for given projects
6. Enhance leadership traits
7. Resolve conflict by appropriate method
8. Survive self in today's competitive world
9. Face interview without fear
10. Follow moral and ethics
11. Convince people to avoid frustration

1 SOCIAL SKILLS

SOCIETY, SOCIAL STRUCTURE, DEVELOP SYMPATHY AND EMPATHY

2 Swot Analysis – Concept, How to make use of SWOT

3 Inter personal Relation- Sources of conflict, Resolution of conflict , Ways to enhance interpersonal relations.

4 Problem Solving

I) STEPS IN PROBLEM SOLVING- identify and clarify the problem, information gathering related to problem, evaluate the evidence, consider alternative solutions and their implications, choose and implement the best alternative, review

II) Problem solving technique.(any one technique may be considered)

- 1) Trial and error, 2) Brain storming, 3) Lateral thinking

5 Presentation Skills

Body language -- Dress like the audience, Posture, Gestures, Eye contact and facial expression.

Presentation Skill- Stage Fright, Voice and language – Volume, Pitch, Inflection, Speed, Pause Pronunciation, Articulation, Language, Practice of speech. Use of aids –OHP,LCD projector, white board

6 Industrial Visits Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form a part of the term work. **TWO** industrial visits may be arranged in the following areas / industries :

- i) Manufacturing organizations for observing various manufacturing processes including heat treatment ii) Material testing laboratories in industries or reputed organizations iii) Auto workshop / Garage iv) Plastic material processing unit v) ST workshop / City transport workshop
- ii)

7 Lectures by Professional / Industrial Expert be organized from Any

Three of the following areas : i) Use of a plastics in automobiles. ii) Nonferrous Metals and alloys for engineering applications iii) Surface Treatment Processes like electroplating, powder coating etc. iv) Selection of electric motors. v) Computer aided drafting. vi) Industrial hygiene. vii) Composite Materials. viii) Heat treatment processes. ix) Ceramics

8 Individual Assignments :

Any two from the list suggested

a) Process sequence of any two machine components. b) Write material specifications for any two composite jobs. c) Collection of samples of different plastic material or cutting tools with properties , specifications and applications. d) Preparing models using development of surfaces. e) Assignments on bending moment , sheer forces , deflection of beams and torsion chapters of strength of material. f) Select different materials with specifications for at least 10 different machine components and list the important material properties desirable. g) Select 5 different carbon steels and alloy steels used in mechanical engineering applications and specify heat treatment processes employed for improving the properties. Also give brief description of the heat treatment processes. h) List the various properties and applications of following materials – a.Ceramics b. fiber reinforcement plastics c. thermo plastic plastics d. thermo setting plastics e. rubbers.

OR

Conduct **ANY ONE** of the following activities through active participation of students and write report

- i) Rally for energy conservation / tree plantation.
- ii) Survey for local social problems such as mal nutrition, unemployment, cleanliness, illiteracy etc.
- iii) Conduct aptitude , general knowledge test , IQ test
- iv) Arrange **any one** training in the following areas : a) Yoga. B) Use of fire fighting equipment and First aid Maintenance of Domestic appliances.

9 Group discussion and Interview technique – Introduction to group discussion, Ways to carry out group discussion, Parameters— Contact, body language, analytical and logical thinking, decision making The students should discuss in a group of six to eight students and write a brief report on the same as a part of term work. Two topics for group discussions may be selected by the faculty members. Some of the suggested topics are - i) Sports ii) Current news items iii) Discipline and House Keeping iv) Current topics related to Electrical engineering field.

Interview Technique Necessity, Tips for Handling Common Questions

10 Working in Teams

Understand And Work Within The Dynamics of A Groups. Tips to Work Effectively In Teams, Establish Good Rapport, Interest with others and work, Effectively with Them to Meet Common objectives, Tips to Provide and Accept Feedback in A Constructive and Considerate Way, Leadership In Teams, Handling Frustrations in Group.

11 Task Management -Introduction, Task identification, Task planning, organizing and execution, Closing the task

Assignment: (Any Eight Assignments)

1) SWOT analysis: - Analyse yourself with respect to your strength and weaknesses, opportunities and threats. Following points will be useful for doing SWOT. a) Your past experiences, b) Achievements, c) Failures, d) Feedback from others etc. 2) undergo a test on reading skill/memory skill administered by your teacher. 3) Solve the puzzles. 4) Form a group of 5-10 students and do a work for social cause e.g. tree plantation, blood donation, environment protection, camps on awareness like importance of cleanliness in slump area, social activities like giving cloths to poor etc.(One activity per group) 5) Deliver a seminar for 10-12 minutes using presentation aids on the topic given by your teacher. 6) Watch/listen an informative session on social activities. Make a report on topic of your interest using audio/visual aids. Make a report on the programme.##### 7) Conduct an

interview of a personality and write a report on it. 8) Discuss a topic in a group and prepare minutes of discussion. Write thorough description of the topic discussed 9) Arrange an exhibition, displaying flow-charts, posters, paper cutting, photographs etc on the topic given by your teacher.

Note: - Please note that these are the suggested assignments on given contents/topic. These assignments are the guide lines to the subject teachers. However the subject teachers are free to design any assignment relevant to the topic. The **term work** will consist of any eight assignments.

MINI PROJECT ON - task management. Decide any task to be complete Stipulated time with the help of teacher. Write a report considering various steps in Task management.

Reference Books

- 1 Marshall Cooks Adams Time management Viva Books
- 2 E.H. Mc Grath , S.J. Basic Managerial Skills for All Pretice Hall of India, Pvt Ltd
- 3 Allen Pease Body Language Sudha Publications Pvt. Ltd.
- 4 Lowe and Phil Creativity and problem solving Kogan Page (I) P Ltd
- 5 by Adair, J Decision making & Problem Solving Orient Longman
- 6 Bishop , Sue Develop Your Assertiveness Kogan Page India
- 7 Marion E Haynes Make Every Minute Count Kogan page India
- 8 Steven L McShane and Mary Ann Glinow Organizational Behavior Tata McGraw Hill
- 9 Stephen P. Robbins Organizational Behavior Pretice Hall of India, Pvt Ltd
- 10 Michael Hatton Presentation Skills (Canada – India Project) ISTE New Delhi
- 11 Stress Management Through Yoga and Meditation Sterling Publisher Pvt Ltd
- 12 Richard Hale ,Peter Whilom Target setting and Goal Achievement Kogan page India
- 13 Chakravarty, Ajanta Time management Rupa and Company
- 14 Harding ham Working in Teams A Orient Longman

INTERNET ASSISTANCE

1. <http://www.mindtools.com>
2. <http://www.stress.org>
3. <http://www.ethics.com>
4. <http://www.coopcomm.org/workbook.htm>
5. <http://www.mapfornonprofits.org/>
6. <http://www.learningmeditation.com> <http://bbc.co.uk/learning/courses/>
7. <http://eqi.org/>
8. <http://www.abacon.com/commstudies/interpersonal/indisclosure.html>
9. <http://www.mapnp.org/library/ethics/ethxgde.htm>
10. http://www.mapnp.org/library/grp_cnfl/grp_cnfl.htm
11. <http://members.aol.com/nonverbal2/diction1.htm>
12. http://www.thomasarmstron.com/multiple_intelligences.htm
13. <http://snow.utoronto.ca/Learn2/modules.html>
14. <http://www.quickmba.com/strategy/swot/>