THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CB301T	Formal Language and Automata Theory	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
The course is intended 1.To provide introduction of fundamental concepts of formal languages, grammars and automata theory. 3.To Classify automata by their power to recognize formal languages. 3. To understand deterministic and non-deterministic machines. 4. To study basic computational function related to finite automata	Student will be able to 1. Understand fundamentals of the automata and their power to recognize the formal Languages. 2. Design finite state machine for regular expression and vice versa 3. Design context free grammars for formal language and apply push down automata to solve problems. 4. Design Turing Machine & its various representation. 5. Solve computational problems regarding their decidability, computability and complexity

Unit I	[4Hrs]
Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy of languages.	

Unit II	[10Hrs]
Regular languages and finite automata: Regular expressions and languages, deterministic finite automata (DFA) and equivalence with regular expressions, nondeterministic finite automata (NFA) and equivalence with DFA, regular grammars and equivalence with finite automata, properties of regular languages, Kleene's theorem, pumping lemma for regular languages, Myhill-Nerode theorem and its uses, minimization of finite automata.	

Unit III	[10Hrs]
Context-free grammars (CFG) and languages (CFL), Chomsky and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic pushdown automata, closure properties of CFLs.	

Unit IV	[8Hrs]
Context-sensitive languages: Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG. **Turing machines**: The basic model for Turing machines (TM), Turing recognizable(recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs, unrestricted grammars and equivalence with Turing machines, Tms as enumerators.	

Unit V	[8Hrs]
Undecidability: Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice s theorem, undecidable problems about languages. Basic Introduction to Complexity: Introductory ideas on Time complexity of deterministic and nondeterministic Turing machines, P and NP, NP- completeness, Cook's Theorem, other NP - Complete problems.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Introduction to Automata Theory, Languages, and Computation	John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman.	3rd	Pearson Education India

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Elements of the Theory of Computation,	Harry R. Lewis and Christos H. Papadimitriou	2nd	Prentice Hall
2	Automata and Computability,	Dexter C. Kozen.	2nd	Springer
3	Introduction to the Theory of Computation,	Michael Sipser.	2nd	Course Technology
4	Introduction to Languages and the Theory of Computation,	John Martin	3rd	McGraw-Hill
5	Computers and Intractability: A Guide to the Theory of NP Completeness,	M. R. Garey and D. S. Johnson.	2nd	W. H. Freeman

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						MST	ESE	Total
23CB302T	Computer Organization & Architecture	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
1 To recognize the basic structure of a digital computer and representation of nonnumeric data. 2 To learn different arithmetic operations and organization of control unit. 3 To study different ways of communication with I/O devices, concept of pipelining and its impact in processor design and parallel processors.	1. Discuss the functionalities of various blocks of a digital computer and express the data representation. [2. Apply the concept of Arithmetic and Logic Unit. 3. Infer the concepts of memory system, concurrence access in parallel processors and classify the approaches for I/O communication. 4. Identify hazards in pipelining and outline its impact in the performance of the processors. 5. Compare various types of I/O mapping techniques

Unit I Data representation	[8Hrs]

Revision of basics in Boolean logic and Combinational/Sequential Circuits.
Functional blocks of a computer: CPU, memory, input-output subsystems, control unit.
Instruction set architecture of a CPU: Registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Outlining instruction sets of some common CPUs.
Data representation: Signed number representation, fixed and floating point representations, character representation.

Unit II Computer arithmetic:	[8Hrs]

Integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and-add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic, IEEE 754 format.

Unit III Introduction to x86 architecture.	[8Hrs]

CPU control unit design: Hardwired and micro-programmed design approaches, design of a simple hypothetical CPU.
Memory system design: Semiconductor memory technologies, memory organization.
Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCII, USB

Unit IV Pipelining	[8Hrs]

: Basic concepts of pipelining, throughput and speedup, pipeline hazards.
Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.

Unit V Memory organization:	[8Hrs]

Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Computer System Architecture	M. M. Mano	3rd	Prentice Hall of India, New Delhi, 1993
2	Computer Organization and Design: The Hardware/Software Interface	David A. Patterson and John L. Hennessy		Morgan Kauffmann

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Computer Architecture and Organization	John P. Hayes		
2	Computer Organization and Architecture: Designing for Performance	William Stallings		Pearson
3	Computer System Design and Architecture	Vincent P. Heuring and Harry F. Jordan		

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CB303T	**Object Oriented Programming**	**3**	**-**	**-**	**3**	30	70	100

Course Objectives	Course Outcomes
1. To provide students with a strong foundation in procedural programming using C 2. To introduce C vs. C++ differences: syntax, type checking, references, operator overloading. 3. To provide deep understanding of OOP: data hiding, encapsulation, procedural abstraction. 4. To extend students' knowledge of C++ to include more advanced OOP features 5. To introduce students to generic programming concepts in C++	1. Write, debug C programs, define, use data types, control structures, handle errors effectively 2. To distinguish between C and C++ programming constructs 3. Understand OOP principles, importance of abstraction and encapsulation, and use classes/objects effectively. 4. Design classes, use access specifiers, and handle errors with exceptions. 5. To create generic classes and functions using templates

Unit I : **Procedural programming, An Overview of C and Some difference between C and C++**	**[8Hrs]**

Types Operator and Expressions, Scope and Lifetime, Constants, Pointers, Arrays, and References, Control Flow, Functions and Program Structure, Namespaces, error handling, Input and Output (C-way), Library Functions (string, math, stdlib), Command line arguments, Pre-processor directive.

Single line comments, Local variable declaration within function scope, function declaration, function overloading, stronger type checking, Reference variable, parameter passing – value vs reference, passing pointer by value or reference, Operator new and delete, the typecasting operator, Inline Functions in contrast to macro, default arguments

Unit II : **The Fundamentals of Object Oriented Programming**	**[8Hrs]**

Necessity for OOP, Data Hiding, Data Abstraction, Encapsulation, Procedural Abstraction, Class and Object.

Unit III : **More extensions to C in C++ to provide OOP Facilities:**	**[8Hrs]**

Scope of Class and Scope Resolution Operator, Member Function of a Class, private, protected and public Access Specifier, this Keyword, Constructors and Destructors, friend class, error handling (exception)

Unit IV : **Essentials of Object Oriented Programming**	**[6Hrs]**

Operator overloading, Inheritance – Single and Multiple, Class Hierarchy, Pointers to Objects, Assignment of an Object to another Object, Polymorphism through dynamic binding, Virtual Functions, Overloading, overriding and hiding, Error Handling

Unit V : **Generic Programming & Input and Output:**	**[6Hrs]**

Template concept, class template, function template, template specialization, I/O Streams, Files, Library functions, formatted output

Text Books

S.N	Title	Authors	Edition	Publisher
1	The C++ Programming Language	Bjarne Stroustrup		Addison Wesley
2	C++ and Object-Oriented Programming Paradigm	Debasish Jana		PHI Learning Pvt. Ltd.

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Programming – Principles and Practice Using C++	Bjarne Stroustrup		Addison Wesley
2	The Design and Evolution of C++,	Bjarne Stroustrup		Addison Wesley

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CB303P	Object Oriented Programming Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
1 To provide students with a strong foundation in procedural programming using C 2. To introduce C vs. C++ differences: syntax, type checking, references, operator overloading. 3. To provide deep understanding of OOP: data hiding, encapsulation, procedural abstraction. 4. To extend students' knowledge of C++ to include more advanced OOP features 5. To introduce students to generic programming concepts in C++	1. Write, debug C programs, define, use data types, control structures, handle errors effectively 2. To distinguish between C and C++ programming constructs 3. Understand OOP principles, importance of abstraction and en capsulation, and use classes/objects effectively. 4 .Design classes, use access specifiers, and handle errors with exceptions. 5.To create generic classes and functions using templates

Expt. No.	Title of the experiment
1	Implement the concept of Inline Function.
2	Write a program for parameter passing in c++.
3	Implement the Concept of Classes and Objects in c++.
4	Write a program in c++ to implement the code of local variables and global variables.
5	Write a menu driven Program in c++ with the help of arithmatic operator in order to perform operation of addition, multiplication, division and substraction.
6	Write a program in c++ to Illustrate the concept of parameterized and Copy Constructor in C++.
7	Write a Program in c++ for This Keyword and Friend class.
8	Write a program in C++ For Multiple Inheritance.
9	Demonstrate the concept of Exception Handling in c++.
10	Write a program in C++ for Operator Overloading and Function Overloading in c++.

Text Books

S.N	Title	Authors	Edition	Publisher
1	The C++ Programming Language	Bjarne Stroustrup		Addison Wesley
2	C++ and Object-Oriented Programming Paradigm	Debasish Jana		PHI Learning Pvt. Ltd.

S.N	Title	Authors	Edition	Publisher
1	Programming – Principles and Practice Using C++	Bjarne Stroustrup		Addison Wesley
2	The Design and Evolution of C++,	Bjarne Stroustrup		Addison Wesley

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THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CB304T	**Computational Statistics**	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
1. To understand the main features of multivariate data. 2. To be able to use exploratory and confirmatory multivariate statistical methods effectively 3. To have insights in to various cluster analysis methods 4. To use Factor analysis and Principal component analysis to identify patterns in the correlations between variables 5. To apply multivariate statistical techniques efficiently using statistical software such as python.	1. Apply multivariate normal distributions for parameter estimation. 2. Describe multiple linear regression model based on diagnostic measures including identifying collinearity, outliers and non-normality. 3. Apply the Discriminate analysis between groups and classify new observations. 4. Explain groupings and associations using cluster and correspondence analysis. 5. Apply and interpret the results of multivariate regression

Unit I : Multivariate Normal Distribution:	**[6Hrs]**

Multivariate Normal Distribution Functions, Conditional Distribution and its relation to regression model, Estimation of parameters.

Unit II : Discriminant Analysis:	**[8Hrs]**

Statistical background, linear discriminant function analysis, Estimating linear discriminant functions and their properties.

Unit III : Principal Component Analysis:	**[8Hrs]**

Principal components, Algorithm for conducting principal component analysis, deciding on how many principal components to retain, H-plot.

Unit IV : Factor Analysis:	**[8Hrs]**

Factor analysis model, Extracting common factors, determining number of factors, Transformation of factor analysis solutions, Factor scores.

Unit V : Clustering:	**[8Hrs]**

Introduction, Types of clustering, Correlations and distances, clustering by partitioning methods, hierarchical clustering, overlapping clustering, K-Means Clustering-Profiling and Interpreting Clusters

Text Books

S.N	Title	Authors	Edition	Publisher
1	An Introduction to Multivariate Statistical Analysis	T.W. Anderson	First	Wiley Publication
2	Applied Multivariate Data Analysis	J.D. Jobson	Illustrated	Springer Media

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Statistical Tests for Multivariate Analysis	H. Kris.	3, Illustrated	Wiley Publication

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
23CB304P	**Computational Statistics Lab**	-	-	2	1	**CA**	**ESE**	**Total**
						25	25	50

Course Objectives	Course Outcomes
1. This Course introduces basic idea of how to solve given problem within computational statistics construct. 2. Focuses of paradigms of programming language. 3. Aims at learning python as programming language for computational statistics.	1. Analyze and understand fundamental programming constructs. 2. Develop an understanding of basics of python programming such as dictionaries, functions, recursion and working of libraries. 3. Solve basic programming problems within computational statistics construct.

Expt. No.	Title of the experiment
1	Write a program in python to demonstrate the use of if else statement.
2	Write a program in python to demonstrate execution of loops.
3	Implementing functions in Python.
4	Implementing Lists and Tuples in Python.
5	Implementing Sets and Dictionaries in Python.
6	Implementing Numpy and Matplotlib library in Python
7	Developing program for Scatter, Bar and Pie plot in Python
8	Developing program for Regression and Clustering in Python

Text Books

S.N	Title	Authors	Edition	Publisher
1	Python 3 for Absolute Beginners,	Tim Hall and J-P Stacey.	2010	Prentice Hall
2	Beginning Python: From Novice to Professional	Magnus Lie	2005	Hetland

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Python for Data Analysis	Wes Mc Kinney	3rd Edition	O'Reilly Media, Inc.

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						MSE	ESE	Total
23CB305T	Software Engineering	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
1 .To provide the idea of decomposing the given problem into Analysis, Desining ,Implementation, Testing and Maintenance phases. 2. To provide an idea of using various process models in the software industry according to given circumstances. 3. To gain the knowledge of how Analysis, Design, Implementation, Testing and Maintenance processes are conducted in a software project.	CO1: .Students will be able to decompose the given project in various phases of a lifecycle. CO2.Students will be able to choose appropriate process model depending on the user requirements. CO3.Students will be able perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance. CO4.Students will be able to know various processes used in all the phases of the product. CO5.Students can apply the knowledge, techniques, and skills in the development of a software product.

Unit I : Introduction to Software Engineering [7 Hrs]

Basic Concept of Life Cycle Models -Software Development Life Cycle (SDLC) , Different models and Milestone-Waterfall model ,V –model ,RAD model ,Spiral Model, Iterative model, Incremental model, Programming in the Small vs. programming in the large, Engineering approach to software development, ,role of Software Engineering towards successful Execution of large software projects, Emergence of Software engineeering as a discipline.

Unit II : Software project Management [7 Hrs]

software project planning – identification of activities and resources, concepts of feasibility study, software cost estimation models and concepts of software engineering economics, techniques of software project control and reporting, introduction to the concepts of risk and its mitigation

Unit III : Software Requirements Analysis [7 Hrs]

Introduction to Software Requirements Specifications (SRS) and requirement elicitation techniques; techniques for requirement modeling – decision tables, event tables, state transition tables
Software Quality and Reliability: Internal and external qualities; process and product quality; principles to achieve software quality.

Unit IV : Object Oriented Analysis, Design and Construction: [7 Hrs]

Concepts the principles of abstraction, modularity, specification, encapsulation and information hiding Class Responsibility Collaborator (CRC) model; quality of design; design measurements; concepts of design patterns

Unit V : Software Testing [7 Hrs]

Introduction to Faults and Failures, basic testing concepts, Concepts of Verification and validation
Black box and White Box tests, testing use cases; transaction based testing, testing for non-functional requirements – volume, performance and efficiency

Text Books

S.N	Title	Authors	Edition	Publisher
1	Software Engineering	Ian Sommerville	9th edition	Pearson

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Fundamentals of Software Engineering	Carlo Ghezzi, Jazayeri Mehdi, Mandrioli Dino	2nd edition	Pearson
2	Software Requirements and Specification: A Lexicon of Practice, Principles and Prejudices	Michael Jackson	1st edition	ACM Press/Addison-Wesley Publishing Co.

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						MSE	ESE	Total
23CB305P	Software Engineering Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
1 .To provide the idea of decomposing the given problem into Analysis, Desining ,Implementation, Testing and Maintenance phases. 2. To provide an idea of using various process models in the software industry according to given circumstances. 3. To gain the knowledge of how Analysis, Design, Implementation, Testing and Maintenance processes are conducted in a software project.	CO1: .Students will be able to decompose the given project in various phases of a lifecycle. CO2.Students will be able to choose appropriate process model depending on the user requirements. CO3.Students will be able perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance. CO4.Students will be able to know various processes used in all the phases of the product. CO5.Students can apply the knowledge, techniques, and skills in the development of a software product.

Expt. No.	Title of the experiment
1	To study and apply SDLC concepts to Library Management system.
2	To compare and understand implementation of both Black box and White Box techniques.
3	Create ERD and DFD on Library Management System using Lucid chart tool
4	Create ERD and DFD on Hospital Management System using Lucid chart tool.
5	Draw PERT chart using Aasana tool.
6	Draw Gantt chart using Aasana tool.
7	Create a Test case on the Hospital management system.
8	Create a Test case on Library management system

Text Books

S.N	Title	Authors	Edition	Publisher
1	Software Engineering	Ian Sommerville	9th edition	Pearson

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Fundamentals of Software Engineering	Carlo Ghezzi, Jazayeri Mehdi, Mandrioli Dino	2nd edition	Pearson
2	Software Requirements and Specification: A Lexicon of Practice, Principles and Prejudices	Michael Jackson	1st edition	ACM Press/Addison-Wesley Publishing Co.

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THIRD SEMESTER

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CB306T	**Financial Management**	**2**	**-**	**-**	**2**	15	35	50

Course Objectives	Course Outcomes
1. To make students aware about the various concepts of Financial Management. 2. To make students aware about the importance of working capital. 3. To make students aware about the working of Capital Budgeting.	At the end of the course students will be able to: 1. Understand the fundamental concepts of financial management 2. Appreciate basic concepts such as time value of money, cost of capital, risk and return, 3. Make aware the students about working capital management, capital budgeting etc. 4. Leverage the concept for deciding financial angle of IT projects

Unit I Introduction :	[4Hrs]

Introduction to Financial Management - Goals of the firm - Financial Environments; Time Value of Money : Simple and Compound Interest Rates, Amortization, Computing more than once a year, Annuity Factor.

Unit II Valuation of Securities :	[4Hrs]

Bond Valuation, Preferred Stock Valuation, Common Stock Valuation, Concept of Yield and YTM; Risk & Return: Defining Risk and Return, Using Probability Distributions to Measure Risk, Attitudes Toward Risk, Risk and Return in a Portfolio Context, Diversification, The Capital Asset Pricing Model (CAPM)

Unit III Operating & Financial Leverage:	[5Hrs]

Operating Leverage, Financial Leverage, Total Leverage, Indifference Analysis in leverage study; Cost of Capital : Concept , Computation of Specific Cost of Capital for Equity - Preference – Debt, Weighted Average Cost of Capital – Factors affecting Cost of Capital 4L; Capital Budgeting : The Capital Budgeting Concept & Process - An Overview, Generating Investment Project Proposals, Estimating Project, After Tax Incremental Operating Cash Flows, Capital Budgeting Techniques, Project Evaluation and Selection - Alternative Methods

Unit IV Working Capital Management:	[6Hrs]

Overview, Working Capital Issues, Financing Current Assets (Short Term and Long Term- Mix), Combining Liability Structures and Current Asset Decisions, Estimation of Working Capital; Cash Management: Motives for Holding cash, Speeding Up Cash Receipts, Slowing Down Cash Payouts, Electronic Commerce, Outsourcing, Cash Balances to maintain, Factoring; Accounts Receivable Management: Credit & Collection Policies, Analyzing the Credit Applicant, Credit References, Selecting optimum Credit period. 4L

Text Books

S.N	Title	Authors	Edition	Publisher
1	Financial Management - Theory & Practice	Chandra, Prasanna		Tata McGraw Hill

Reference Books

S.N	Title	Authors	Edition	Publisher
1.	Financial Management	Srivastava, Misra		OUP
2.	Fundamentals of Financial Management	Van Horne and Wachowicz		Prentice Hall/ Pearson Education.

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CB307T	Human Resource Management	2	-	-	2	15	35	50

Course Objectives	Course Outcomes
1. To provide knowledge about management issues related to staffing, training, 2. To provide knowledge about management issues related to performance 3. To provide knowledge about management issues related to compensation 4. To provide knowledge about management issues related to human factors consideration and compliance with human resource requirements.	CO1: Students would have gained knowledge on the various aspects of HRM CO2: Students will gain the knowledge needed to succeed as human resources professionals. CO3: Students will develop the skills needed for a successful HR manager. CO4: Students would be prepared to implement learned concepts in the workplace while staying aware of emerging HRM concepts.

Unit I : INTRODUCTION TO HUMAN RESOURCE MANAGEMENT	[6 Hrs]
The importance of human resources, Objective of Human Resource Management - Human resource policies - Role of human resource manager.	

Unit II : HR PLANNING, TRAINING AND EXECUTIVE DEVELOPMENT	[6 Hrs]
Importance of Human Resource Planning Internal and External sources of Human Resources - Recruitment – Selection Socialization. Types of training and Executive development methods purpose benefits.	

Unit III : EMPLOYEE COMPENSATION	[6 Hrs]
Compensation plan, Reward, Motivation, Career Development – Mentor, Protégé relationships.	

Unit IV : PERFORMANCE EVALUATION AND CONTROL	[6 Hrs]
Performance evaluation Feedback - The control process Importance Methods grievances Causes Redressal methods.	

Text Books

S.N	Title	Authors	Edition	Publisher
01	Human Resource Management	Decenzo and Robbins	8th Edition	Wiley, 2007
02	Human Resource Management An Experimental Approach	John Bernardin. H.	5th Edition	Tata McGraw Hill, 2013, New Delhi

Reference Books

S.N	Title	Authors	Edition	Publisher
01	Managing Human Resources	Luis R., Gomez-Mejia. David B. Balkin & Robert L. Cardy	7th Edition	PHI, 2012
02	Human Resource Management	Dessler		Pearson Education Limited, 2007

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