DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B.E. COMPUTER SCIENCE AND ENGINEERING

Regulations 2019

CHOICE BASED CREDIT SYSTEM

OPEN ELECTIVES

Sri Eshwar College of Engineering

(An Autonomous Institution)

(Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai)

Kondampatti (Post), Kinathukadavu,

Coimbatore – 641202

B.E. COMPUTER SCIENCE AND ENGINEERING

OPEN ELECTIVES

Sl. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1	U19CS601	Database Technologies	OE	3	3	0	0	3
2	U19CS602	Java Programming	OE	3	3	0	0	3
3	U19CS603	Fundamentals of Operating System	OE	3	3	0	0	3
4	U19CS604	Introduction to Artificial Intelligence	OE	3	3	0	0	3
5	U19CS605	Advanced Data Structures	OE	3	3	0	0	3
6	U19CS606	Fundamentals of Python Programming	OE	3	3	0	0	3
7	U19CS607	Fundamentals of Data Structures	OE	3	3	0	0	3
8	U19CS608	Quantum Computing Technologies	OE	3	3	0	0	3
9	U19CS609	Java Full Stack	OE	3	3	0	0	3

U19CS601	DATABASE TECHNOLOGIES	L	T	P	C
		3	0	0	3

Outcomes

After completion of this course, the students will be able to

CO1	**(Apply)** Demonstrate the basic elements of a relational database management system.	**K3**
CO2	**(Apply)** Ability to design entity relationship model, convert entity relationship diagrams into RDBMS, and apply normalization for the development of application software.	**K3**
CO3	**(Apply)** Formulate basic SQL queries on the data.	**K3**
CO4	**(Apply)** Familiar with advanced SQL commands	**K3**
CO5	**(Apply)** Familiar with the basic issues of transaction processing and concurrency control.	**K3**

MODULE - I INTRODUCTION **9**

Purpose of Database Systems-Database System Applications-View of Data-Data Models-Database System Architecture-Relational Databases-Keys-Relational Algebra-Embedded SQL-Static and Dynamic SQL.

MODULE - II Database Design **9**

ER diagrams- Entities-Attributes and Entity sets-Relationships and Relationship sets- Additional features of ER Model-Normalization-FunctionalDependencies-Closure-1NF-2NF-3NF-BCNF-4NF-5NF-Dependency Preservation-Properties of Decomposition.

MODULE - III Fundamentals of SQL **10**

DDL-create,drop,alter,truncate-DML-insert,delete,select-DCL-Grant,Revoke-Basic operations of SQL-Constraints-Like command-Aggregate Functions-NULL Values- Creating relationships between databases-Sub Queries-Joins- Views-Synonyms-Indexes-Save point.

MODULE - IV Advanced SQL **8**

PL/SQL-procedures, functions-Cursor implementation- Exception Handling-Triggers-Before insertion-After insertion-Before Deletion-After Deletion.

MODULE - V Transaction Processing **9**

Transactions-ACID properties - Serializability-Concurrency Control: Lock–Based Protocols-Two phase commit Protocol- Isolation Levels.

TOTAL: 45 Hours

TEXTBOOKS

1 Abraham Silberschatz, Henry F. Korth, S. Sudharshan, ”Database System Concepts”, Sixth Edition, Tata McGraw Hill, 2013.

REFERENCES

1 RamezElmasri, Shamkant B. Navathe, ”Fundamentals of Database Systems”, Sixth Edition, Pearson Education, 2014.

2 C.J.Date, A.Kannan, S.Swamynathan, ”An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2013.

U19CS602	JAVA PROGRAMMING	L	T	P	C
		3	0	0	3

After completion of this course, the students will be able to

Outcomes

CO1	**(Apply)** Understand and apply the features of Java Programming and semantics	**K3**
CO2	**(Apply)** Identify and apply appropriate object oriented concepts of java in problem solving by adhering to Java Coding standards	**K3**
CO3	**(Apply)** Apply concepts of java collections API for the given scenario	**K3**
CO4	**(Apply)** Apply multithreading concepts in concurrent application development	**K3**
CO5	**(Apply)** Use relevant exception-handling mechanisms to ensure uninterrupted flow of application.	**K3**

MODULEI BASICS OF JAVA PROGRAMMING 9

Introduction to java, JVM, JDK, Java Features , Data types, Operators and expressions,Java Naming conventions , Command Line arguments, Scanner ,Class and Objects – Constructors-Wrapper classes, Variables, Conditional Statements and looping statements

MODULEII OBJECT ORIENTED MECHANISMS 9

Introduction to Object Oriented Programming & Features, Thinking in Object Oriented Approach, OOPs Based Application Design , OOPS-Class and Objects, Inheritance, Abstraction, Polymorphism (static & dynamic), Overloading, Encapsulation, Dynamic Binding

MODULE III ARRAYS ,STRINGS AND PACKAGES 8

Array-1D-2D-Array-Declaration-initialization-array functions-Array manipulation using util package ,advanced for loop,foreach() method in java 1.8,Strings, creation ,declaration of a string, storage structure of a string and its methods, StringBuilder, StringBuffer , IO package-BufferedReader/Writer-File IO

MODULE IV EXCEPTION HANDLING AND DATE –TIME 9

Exception handling-Hierarchy, Types of exception, Mechanisms-try, catch, throw ,throws and finally, Exception propagation-Exception in Inheritance –Introduction Date time Object in java 1.8 and its functions

MODULE V MULTITHREADING AND COLLECTION 10

Introduction to Multiprocessing-threads vs process-threads-Creation of thread-Thread states- Thread Lifecycle and and its methods, Executor Framework, Concurrency API, Synchronization Blocks. Collection Interface – List,Set ,Map

TOTAL: 45 Hours

TEXTBOOKS

1 Herbert Schildt, —Java The complete reference‖, 8th Edition, McGraw Hill Education, 2011

2 Cay S. Horstmann, Gary cornell, —Core Java Volume –I Fundamentals‖, 9th Edition, Prentice Hall, 2013.

REFERENCES

1 Paul Dietel and Harvey Deitel, "Java How to Program", , 8th Edition Prentice Hall of India.

2 Mahesh P. Matha, "Core Java A Comprehensive Study", Prentice Hall of India, 2011.

3 Steven Holzner, "Java 2 Black book", Dreamtech press, 2011.

4 Timothy Budd, "Understanding Object-oriented programming with Java", Updated Edition, Pearson Education, 2000.

U19CS603	FUNDAMENTALS OF OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

Outcomes

After completion of this course, the students will be able to

CO1	**(Apply)** Use the appropriate system calls for resource utilization	**K3**
CO2	**(Apply)** Select suitable scheduling algorithms for optimal CPU utilization	**K3**
CO3	**(Apply)** Examine the mechanisms for solving synchronization problems	**K3**
CO4	**(Apply)** Implement different device and resource management techniques for memory utilization	**K3**
CO5	**(Apply)** Apply the concepts of file system implementation and secondary storage access.	**K3**

MODULE I OVERVIEW OF OPERATING SYSTEMS 9

Components of computer system – Computer system operation – Storage and I/O structure - Multiprocessor and Multicore systems – Types of computing environments. Operating system services - System calls: Implementation and Types – Operating system structure – System programs

MODULE II PROCESS MANAGEMENT 9

Definition - Process states - Process control block - Operations on Processes – Threads – Process scheduling - Inter-process Communication - CPU Scheduling - Scheduling algorithms: First Come First Serve, Shortest Job First, Priority Scheduling and Round Robin scheduling

MODULE III PROCESS SYNCHRONIZATION AND DEADLOCK 9

Process Synchronization - The critical-section problem - Synchronization hardware - Mutex locks – Semaphores - Producer Consumer and Dining Philosophers problem. Deadlock - System model, Deadlock characterization, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock

MODULE IV MEMORY MANAGEMENT 9

Main memory – Background – Swapping - Contiguous memory allocation – Segmentation – Paging - Segmentation with paging. Virtual memory – Background - Demand paging - Page replacement – Page replacement algorithms: FIFO, Optimal and LRU - Thrashing

MODULE V FILE SYSTEMS AND I/O SYSTEMS 9

Files – Attributes – Operations - File types – Structure - Access methods - Directory Structure – Sharing and protection - File System Implementation - Allocation methods - Free Space Management – Mass-storage structure – Disk scheduling – Disk management – I/O systems – Overview – I/O hardware – Application I/O interface

TOTAL: 45 Hours

TEXTBOOKS

1 Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", John Wiley & Sons (Asia) Pvt. Ltd, Ninth Edition, 2018.

REFERENCES

1 Andrew S. Tanenbaum, "Modern Operating Systems", Pearson Education, Third Edition, 2015

2 William Stallings, "Operating Systems: Internals and Design Principles", Pearson Education, Ninth Edition, 2018

3 AchyutS.Godbole, AtulKahate, - "Operating Systems", Mc Graw Hill Education, 2016.

U19CS604	INTRODUCTION TO ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

Outcomes

After completion of this course, the students will be able to

CO1	**(Apply)** Make use of appropriate strategy to solve a given problem	**K3**
CO2	**(Apply)** Identify suitable search algorithm to solve problems where artificial intelligence techniques are applicable	**K3**
CO3	**(Understand)** Infer the way to represent knowledge and plan it accordingly	**K2**
CO4	**(Apply)** Utilize the learning model to model machines	**K3**
CO5	**(Apply)** Design applications that use Artificial Intelligence	**K3**

MODULEI FUNDAMENTALS **9**

Introduction - Definition - Examples of AI - History of AI-Future of AI- Intelligent Agents-Rational Agent- Nature of Environment - Structure of Agents

MODULEII PROBLEM SOLVING APPROACH TO AI PROBLEMS **9**

Problem Solving Methods – Problem Formulation – Toy Problems - Real World Problems – Search Strategies – Uninformed – Informed - Heuristics –Game Playing

MODULE III KNOWLEDGE REPRESENTATION AND PLANNING **9**

Logical Agents – Propositional Logic – First Order Logic – Planning with state space research – partial order planning – planning graph – Planning and Acting in real world

MODULE IV LEARNING **9**

Forms of Learning – Knowledge-Based Classification – Feedback-Based Classification– Learning from decision trees - Machine learning – Deep learning

MODULE V APPLICATIONS OF ARTIFICIAL INTELLIGENCE **9**

AI Applications – Healthcare- Chat bots – AI in Finance- AI in Banking- Robots –AI Agriculture Bots- Expert Systems-Personalized Learning

TOTAL: 45 Hours

TEXTBOOKS

1 S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2015

2 Dr.Nilakshi Jain, "Artificial Intelligence : Making a System Intelligent", Wiley,2019

REFERENCES

1 Nils J. Nilsson, "The Quest for Artificial Intelligence", Cambridge University Press, 2009

2 Vinod Chandra S.S.,AnandHareendran S.,"Artificial Intelligence And Machine Learning", PHI Learning Private Limited,2014

3 R.Radha, "Artificial Intelligence", Charulatha Publications, 2019

U19CS605	ADVANCED DATA STRUCTURES	L	T	P	C
		3	0	0	3

Outcomes

After completion of this course, the students will be able to

CO1	**(Understand)** Understand the various iterative and recursive algorithms.	**K2**
CO2	**(Apply)** Construct balanced tree structures for efficient operations on data.	**K3**
CO3	**(Apply)** Deploy search data structures for efficient range searching and string matching.	**K3**
CO4	**(Analyze)** Identify the suitable algorithm design techniques for solving the program.	**K4**
CO5	**(Understand)**Describe the concepts of NP-completeness, approximation and randomized algorithms.	**K2**

MODULEI ALGORITHM ANALYSIS **9**

Analysis of Iterative and recursive algorithms – Asymptotic Notations – Parallel Algorithms: Introduction – Scalar product of two vectors – Matrix multiplication.

MODULEII BALANCED TREES **9**

Treaps - Red-Black trees – B*tree – Splay trees - Binary heaps – Min-Max heaps - Leftist heaps – Binomial heaps – Fibonacci heaps.

MODULE III SEARCH STRUCTURES **9**

k-d Trees – R-Trees – Tries – Suffix Trees and Arrays – String Matching: KMP and Boyer Moore algorithms.

MODULE IV ALGORITHM DESIGN TECHNIQUES **9**

Dynamic programming: Elements of Dynamic Programming – Matrix-Chain Multiplication – Longest Common Subsequence – Rod Cutting problem - Wildcard Pattern Matching – Greedy Algorithms: An Activity selection problem - Shortest Superstring Problem.

MODULE V ADVANCED ALGORITHM PARADIGMS **9**

Theory of NP completeness – Decision problems – Satisfiability problem – NP problems – Cooks Theorem – NP Complete problems – Randomized algorithms: Primality Testing – Approximation algorithms: Bin-packing, Vertex cover problem – Polynomial time Approximation Schemes : 0/1 Knapsack problem.

TOTAL: 45 Hours

TEXTBOOKS

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein "Introduction to Algorithms", Third Edition The MIT Press 2009
2. Jeff Edmonds, "How to think about Algorithms", Cambridge University Press, 2008.

REFERENCES

1. KarumanchiNarasimha, "Data Structures and Algorithms Made Easy", Fifth Edition, CareerMonk Publication, 2016
2. Adam Drozdek, "Data Structures and Algorithms in Java", Cengage Learning, 4th Edition, 2013
3. R.C.T.Lee, S.S.Tseng, R.C.Chang and Y.T.Tsai, "Introduction to the Design and Analysis of Algorithms A Strategic Approach" Tata McGraw Hill, 2012
4. Richard F. Gillberg, Behrouz A. Forouzan, "Data structures: A Pseudocode Appproach with C", Cengage Learning, Second Edition, 2009.
5. Peter Brass, "Advanced Data Structures", Cambridge University Press, 2008.

U19CS606	FUNDAMENTALS OF PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

Outcomes

After completion of this course, the students will be able to

CO1	**(Apply)** Write python programs using appropriate data types, branching and looping statements	**K3**
CO2	**(Apply)**Apply exception handling concepts to various problems	**K3**
CO3	**(Apply)** Solve problems using strings, list, tuple and dictionary	**K3**
CO4	**(Apply)** Develop modular programs using functions	**K3**
CO5	**(Understand)** Understand the object oriented concepts	**K2**

MODULE I BASICS OF PYTHON PROGRAMMING 9

Introduction to Python - Python Interpreter – Values and types-Keywords and Identifiers- Comments- Precedence of operators

MODULE II PROGRAMMING PARADIGMS IN PYTHON 8

Control structures-Branching-Looping-Strings: String slices-Immutability- String functions and methods-Exception Handling

MODULE III LISTS, TUPLES AND DICTIONARIES 10

Lists: List operations, list slices, list methods, list loop, mutability Tuples: tuple assignment, tuple methods- Tuple as return values- Dictionaries: operations and methods- Advanced List processing- List comprehension

MODULE IV MODULES AND RE-USABILITY 9

Modules and Packages - Variable Scope - Recursion - File Handling - Read - Write - Command Line Programming

MODULE V OBJECT ORIENTED PROGRAMMING AND DEBUGGING 9

Object-Oriented Concepts and Terminology - Custom Classes - Attributes and Methods - Inheritance and Polymorphism Debugging - Debugging Syntax Errors - Debugging Runtime Errors - Scientific Debugging - Testing - Unit Testing - Profiling

TOTAL: 45 Hours

TEXTBOOKS

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second edition, Updated for Python 3, Shroff O'Reilly Publishers, 2016
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2", Network Theory Ltd., 2011.

REFERENCES

1. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-Disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016
2. Timothy A. Budd,"Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015
3. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012
4. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem Solving Focus", Wiley India Edition, 2013

U19CS607	FUNDAMENTALS OF DATA STRUCTURES	L	T	P	C
		3	0	0	3

After completion of this course, the students will be able to

Outcomes	**CO1** **(Understand)**Understand the need for data structures and the notations used in algorithm analysis.	**K2**
	CO2 **(Apply)** Select basic data structures for autonomous realization of simple programs.	**K3**
	CO3 **(Understand)** Understand the importance of stack and queue in problem solving.	**K2**
	CO4 **(Apply)** Implement operations on search tree structures for efficient storage and retrieval of data.	**K3**
	CO5 **(Apply)** Apply appropriate methods for efficient data access through hashing	**K3**

MODULE I BASIC CONCEPTS OF DATA STRUCTURES 9

Introduction – Operations of Data Structures – Need for data structures - Classification of Data Structures – **Complexity of Algorithms:** Time complexity, Space complexity, Order of growth, **Arrays:** One dimensional and Two dimensional arrays – **Structures**: Array of structures.

MODULE II LIST 9

List: Array based implementation, Linked list implementations: Singly linked list, Doubly linked list, Circular linked list, **Applications:** Polynomial Manipulation.

MODULE III STACK AND QUEUE 9

Stack ADT: Array and Linked Stacks, **Applications:** Expression conversion, Postfix evaluation, Recursion – **Queue ADT:** Array and Linked Queue, Circular Queue – Applications.

MODULE IV TREE AND GRAPHS 9

Tree: Tree Terminologies – **Binary Tree:** Types – Representation - Tree traversal - **Binary Search Trees:** Major Operations - Binary Heaps – **Graphs:** Representation of Graph - types of graph – Graph traversal – **Applications:** Topological Sort.

MODULE V SEARCHING, SORTING AND HASHING 9

Searching: Linear Search and Binary search - **Sorting:** Bubble sort – Insertion sort – Selection sort – **Hashing :** Hash Table – Hash Functions – Collision Resolution: Separate chaining – Open Addressing – Double hashing – Rehashing.

TOTAL: 45 Hours

TEXTBOOKS

1 Venkatesan R and Lovelyn Rose S, "Data Structures", Wiley India Pvt.Ltd., New Delhi, 2015.

2 Seymour Lipschutz, "Data Structures using C", First Edition, McGraw Hill Education, 2017.

REFERENCES

1 Mark A.Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 2010.

2 Venkatesan R and Lovelyn Rose S, "Data Structures", Wiley India Pvt.Ltd., New Delhi, 2015.

3 KarumanchiNarasimha, "Data Structures and Algorithms Made Easy", Fifth Edition, CareerMonk Publication, 2016.

4 ReemaThareja, "Data Structures Using C", Second Edition, Oxford University Press, 2019.

U19CS608	QUANTUM COMPUTING TECHNOLOGIES	L	T	P	C
		3	0	0	3

Outcomes

After completion of this course, the students will be able to

CO1	**(Understand)** Understand the basics of quantum computing	**K2**
CO2	**(Understand)** Observe the background of Quantum Mechanics	**K2**
CO3	**(Apply)** Apply the computation models and model the circuits	**K3**
CO4	**(Understand)** Summarize the quantum operations such as noise and error correction	**K2**
CO5	**(Apply)** Outline the basics of quantum information and the theory behind it.	**K3**

MODULE I FUNDAMENTALS OF QUANTUM COMPUTING 8

Global Perspectives- Quantum Bits - Quantum Computation - Quantum Algorithms - Experimental Quantum Information Processing - Quantum Information

MODULE II QUANTUM MECHANICSAND COMPUTATIONAL MODELS 10

Quantum Mechanics : Linear Algebra - Postulates of Quantum Mechanics - Density Operator - The Schmidt Decomposition and Purifications – EPR and the Bell Inequality

Computational Models : Turing Machines - Circuits – Analysis of Computational Problems

MODULE III QUANTUM COMPUTATION 9

Quantum Circuits: Quantum Algorithms – Universal Quantum Gates – Quantum Circuit Model of Computation – Simulation –Quantum Search Algorithms – Quantum Computers

MODULE IV QUANTUM INFORMATION 9

Quantum Noise and Quantum Operations: Classical Noise and Markov processes – Quantum Operations – Examples – Applications – Distance Measures for Quantum Information – Quantum Error Correction – Entropy

MODULE V QUANTUM INFORMATION THEORY 9

Quantum States and Accessible Information – Data Compression – Classical Information Over Noisy Quantum Channels – Quantum Information Over Noisy Quantum Channels –Quantum Cryptography.

TOTAL: 45 Hours

TEXTBOOKS

1 Michael A. Nielsen, Issac L. Chuang, "Quantum Computation and Quantum Information", Tenth Edition, Cambridge University Press, 2010.

REFERENCES

1 Scott Aaronson, "Quantum Computing Since Democritus", Cambridge University Press, 2013.

2 N. David Mermin, "Quantum Computer Science: An Introduction", Cambridge University Press, 2007.

U19CS609	JAVA FULL STACK	L	T	P	C
		3	0	0	3

After completion of this course, the students will be able to

Outcomes	**CO1** **(Apply)** Understand and apply the features of object oriented programming paradigm and Java Semantics	**K3**
	CO2 **(Apply)** Understand and apply the concepts of Client side programming	**K3**
	CO3 **(Apply)** Understand and apply the concepts of Server Side Programming	**K3**
	CO4 **(Apply)** Understand and apply the features of J2EE Web frameworks and project development using MVC Architecture	**K3**
	CO5 **(Apply)** Use relevant Web Frameworks along with MAVEN repository for application building and deployment	**K3**

MODULE I OOPS and Java Overview 9

OOPS-Classes and Objects, Access Specifiers, Abstraction, Encapsulation, Object class-Inheritance-Polymorphism, Abstract Classes and Interfaces-Multithreading-Exception Handling-String-Arrays-Collections I - Lists , Sets, Maps-JDBC

MODULE II HTML / CSS / JavaScript-Client Side Programming 9

Introduction to WEB / Basic HTML Tags (Containers)-Overview of HTML Tags (attributes & styles)-Introduction to CSS & Basic Styles-Introduction to Basic JavaScript (Structured Programming)-Manipulate DOM Tree & styles

MODULE III Servlet, JSP –Server Side programming & Ajax Overview 9

Introduction to Servlets / Servlet Lifecycle - Basic Get & Post / Web.xml-Form Data Processing / Attributes / Request Dispatcher - Include & Forward-Listeners-Session Management-Filters-Introduction to JSP (JSP Lifecycle) - Basic JSP Elements Scripting Elements-Ajax-Tomcat Server / WAR / Deployment.

MODULE IV MVC FRAMEWORKS 9

Introduction to MVC Design Patterns- ORM- Hibernate-Hibernate Mapping and relationships-Framework Overview Spring Core, IOC-Dependency Injection-Auto wiring-JDBC Templates / Prepared Statements / RowMapper-Spring With Hibernate-Spring MVC Overview-Implementing business flow for 3 requirements-Spring MVC CRUD application-Spring Boot

MODULE V SPRING BOOT AND ANGULAR JS FOR APPLICATION DEVELOPMENT 9

Spring Boot-Maven Project build and deployment – Angular JS –Introduction-Capstone Project building and deployment in Cloud(AWS/Azure/Google Cloud).

Total :45 Hours

TEXTBOOKS

1 Deitel and Deitel and Nieto, —Internet and World Wide Web - How to Program‖, Prentice Hall, 5th Edition, 2011.

REFERENCES

1 Stephen Wynkoop and John Burke “Running a Perfect Website”, QUE, 2nd Edition,1999.
2 Chris Bates, Web Programming – Building Intranet Applications, 3rd Edition, Wiley Publications, 2009.
3 Jeffrey C and Jackson, “Web Technologies A Computer Science Perspective”, Pearson Education, 2011.
4 Gopalan N.P. and Akilandeswari J., “Web Technology‖, Prentice Hall of India, 2011.
5 Uttam K. Roy, “Web Technologies”, Oxford University Press, 2011.